# Chapter 1. Credit Market Development in an Endogenous Growth Model*

## 1.1. Introduction

Economists have long argued that the development of financial markets can facilitate economic growth[1]. Nonetheless, recent evidence also appears to indicate that financial repression may help economies to grow. By using highly negative real returns to savings as the proxy of financial repression, Roubini and Sala-i-Martin (1991) find that even though low growth countries are observed to have high degrees of financial repression, countries with moderately depressed financial markets seem not to have serious growth problems. Moreover, they find that highly depressed financial sectors are observed in some high-growth countries, such as Taiwan, Korea, Thailand, and Italy. In addition, Liu and Woo (1994) and Jappelli and Pagano (1994) provide arguments and evidence suggesting that less-developed financial markets may induce a higher saving rate and thus promote growth. In yet another study, De Gregorio and Guidotti (1995) use the ratio of the total private sector credit (including credit to households and firms) to GDP as an indicator of financial development. They find that the coefficient of this indicator is bigger and much more significant in predicting growth rates of middle- and low-income countries than of high-income countries[2] (developed countries). As high-income countries possess well-developed financial markets, this result seems inconsistent with the conclusion that financial market development can unconditionally promote growth. Clearly, the relationship between financial market development and growth is not so clear-cut.

To attempt to shed light on these conflicting results, in this paper we reconsider the relationship between finance and growth, placing attention on one important financial market—the credit market. As lenders and borrowers are asymmetrically informed about the quality of a loan contract, credit rationing is observed in credit markets. However, with credit market development,

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[1] Gurley and Shaw (1955,1960), Goldsmith (1969), Mckinnon (1973), and others have provided considerable evidence in support of this argument

the informational imperfection can be overcome so as to reduce credit rationing. Recent work (see Bencivenga and Smith (1993), Ma and Smith (1996), and Bose and Cothren (1996)) has considered this possibility in the entrepreneur credit market. The decrease in credit rationing allows entrepreneurs to borrow and invest more, so that credit market development promotes growth. Our intention is to reconsider this relationship by including credit both to firms and consumers.

As modeled by Jappelli and Pagano (1994), the presence of borrowing constraints on consumption loan, which arises due to credit market imperfections, may impede consumers to borrow as much as required to carry out their unconstrained consumption plan, and thus may force the economy to save more. To the extent that credit market development is able to overcome credit market imperfections and reduce credit rationing (that is, to release borrowing constraints), it is clear that the development of credit markets will also increase consumption loans, lower savings, and thus lower growth. Consequently, the presence of consumer credit with investment credit could possibly make the relationship between credit market development and growth an ambiguous one. This ambiguity suggests that a more realistic analysis of the relationship between credit markets and growth ought to consider jointly both types of credit. In this framework, we show that there is a mutual dependency between loans to entrepreneurs and consumers; the state of one market is related to the other, and this fact is likely to be of importance for growth. This is true even if exogenous developments in the entrepreneur and consumer credit markets are not related. Interestingly, under such situation development in the entrepreneur market is shown to have no effect on credit conditions facing entrepreneurs, and none on economic growth, but influence credit conditions of consumers. We believe that the framework developed here can provide additional insights into understanding the nature of the link between financial markets and economic growth.

In this framework, it is possible to interpret the findings of De Gregorio and Guidotti (1995). We conjecture that even though the average total credit to the private sector in developed countries could be higher than that of in developing countries, the proportion of credit allocated to households and to firms could well differ between developed and developing countries. Specifically, even if the total credit to the private sector in developing countries is relatively small, it could be the case that most of the credit in developing countries is allocated to firms. In contrast, in developed countries

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[2] By using different indicators, Odedokun (1996) provides a similar result.

we may have the opposite situation; that is, households derive a larger proportion of the credit. In other words, the household credit market in developing countries is relatively less developed than that in developed countries. This conjecture is partly supported by the recent work of Buckley (1994), who shows that the average ratio of mortgage credit supplied by the formal financial sector to housing investment is less than 22% in developing countries. In contrast, this ratio is 85% in OECD countries.

This paper is organized as follows. Section 2 describes the basic structure of the model. To represent the development of credit markets, we adopt the methodology of Bose and Cothren (1996) where borrowers can choose either a rationing contract or screening one. Section 3 shows that the rate of economic growth depends on the equilibrium contracts to consumers and entrepreneurs. In section 4, we determine the equilibrium contract to consumers and entrepreneurs for a given level of credit market development. Section 5 highlights the joint dependency among credit market development, credit market equilibrium, and the equilibrium growth rate. The conclusion and an extension are provided in section 6.

## 1.2. Model

The basic framework is a two-period lived overlapping generations (OG) model. There is discrete time periods and indexed by $t = 0, 1, 2, 3\ldots$ Each generation is identical in size and composition, and is composed of two kinds of agents, lenders and borrowers. Borrowers are further divided into two groups of equal sizes, as consumers and entrepreneurs. The population of borrowers is normalized to 2 for convenience. Consumers and entrepreneurs differ in their endowments and preferences. To introduce imperfect information in credit markets, we further assume that in each group there are two types of borrowers and only a borrower can know his own type. A fraction $\lambda \in (0,1)$ of the borrowers in each group is classified as Type I borrowers. The population of lenders is normalized to $n\lambda$. All agents behave competitively in labor and capital markets. In addition, in each period there exists a competitive financial system in the economy whose activities are described below.

### 1.2.1. Credit Markets

Each lender is endowed with one unit of labor in his first period of life and cares only about his second period consumption. Therefore, the typical activity for a lender in this framework is to supply his first period unit of labor to the competitive market, earning the competitively determined wage rate and saving this amount for second period consumption. As we will describe below, each lender can save through deposits in financial intermediaries in return for a sure interest rate.

The economy contains a competitive financial system, in which financial intermediaries acts as middlemen between lenders and borrowers. The existence of financial intermediaries has been justified by many papers. See example, Diamond (1984) and Williams (1986) who emphasize the importance of large intermediary structures for minimizing the costs of screening borrowers and managers. Our paper follows this path as a means to model the behavior of financial intermediaries. As noted above, borrowers' types are private information. However, as we will describe latter, financial intermediaries can choose to use a screening technology and observe a borrower's type. This screening technology will absorb some resources when it is applied. Assuming that the size of each financial intermediary is sufficiently large, it is then reasonable to assume that each financial intermediary is more efficient in using this screening technology than an individual lender because of economies of scale. In other words, the cost of using this screening technology is lower for each financial intermediary than an individual lender. Moreover, if matching borrowers and lenders is costly, it is also arguable that financial intermediaries can provide a more efficient way to match borrowers and lenders. In particular, in states of rationing each borrower can only borrow a small amount which is far less than the amount an individual lender intended to lend, so an individual lender has to match with more than one borrower. This too would give rise to financial intermediaries. Consequently, lenders have no incentives to make direct loans in this framework and they will deposit all their savings in financial intermediaries.

An additional role financial intermediaries play is providing access to a safe investment. Assume that each financial intermediary can convert $q$ units of time $t$ output good into $q\tau$ units of capital, and then rent capital to firms in next period in return for a competitively determined rental rate, $\rho_{t+1}$. So every financial intermediary can obtain a riskless gross rate of return equal to $\tau\rho_{t+1}$. We denote this riskless return by $r_{t+1}$. We further assume that the population of lenders, $n\lambda$, is sufficiently large that all gains from trade accrue to borrowers. This assumption serves to simplify our analysis to the extent that the interest rate is independent of the contracting regimes (be it a rationing or screening one) and is equal to the riskless rate of return, $r_{t+1}$. The equilibrium contracting regimes of the consumer and entrepreneur markets at time *t* are defined as the form of contracts such that there is no incentive for any borrower to deviate, taking $\rho_{t+1}$ and the choice of other borrowers as given. Note that under a rationing contract the amount of credit supplied to each borrower is rationed. Further, financial intermediaries are indifferent to the types of contract offered.

### 1.2.2. Consumer borrowers

Each Type I consumer is endowed with one unit of labor in his second period of life. The utility function of a Type I consumer of generation *t* is given as

$$ln(C_{t,t}) + ln(C_{t,t+1}). \tag{1}$$

Since they possess no endowment in their first period of life, Type I consumers have to borrow to consume in the first period. A representative Type I consumer's problem is

$$\text{Max. } ln(C_{t,t}) + ln(C_{t,t+1})$$

$$\text{subject to } C_{t,t} + \frac{C_{t,t+1}}{R_{t+1}} = \frac{w_{t+1}}{R_{t+1}},$$

where $R_{t+1}$ is the loan rate charged by financial intermediaries between time *t* and $t+1$. The optimal consumption plan, if there is no borrowing constraint for Type I consumers, will be

$$C_{t,t} = \frac{1}{2}\frac{w_{t+1}}{R_{t+1}} \tag{2}$$

and

$$C_{t,t+1} = \frac{1}{2}w_{t+1}. \tag{3}$$

Equation (3) states that the optimal consumption plan for Type I consumers is to consume $w_{t+1}/2$ in time $t+1$. From (2), the amount repaid by a Type I consumer in period $t+1$ (loan repayment) is given by

$$C_{t,t}R_{t+1} = \frac{1}{2}w_{t+1}, \tag{4}$$

which is independent of the loan rate.

Each Type II consumer is endowed with $\alpha$ unit of labor in the first period of life and only cares about first period consumption. A Type II consumer of generation *t* can utilize his $\alpha$ units of labor to work for time *t* wage rate, in which case the total wage rate he can earn is $\alpha w_t$. Alternatively, he can use his labor endowment to enter the credit market and mimic the behavior of Type I consumers. Once a Type II consumer obtains a loan, he will simply consume it and leave nothing to financial intermediaries. Under this setting, it is apparent that whether Type II consumers enter the credit market depends on the available equilibrium loan size. If the amount Type I consumers borrow is greater than $\alpha w_t$, the wage rate a Type II consumer can earn, all Type II consumers will enter the credit market. Thus, hereafter we will restrict attention to the interesting case where $\alpha w_t$ is less than (2) at any level of the wage rate; in other words, $\alpha \leq w_{t+1} / 2w_t R_{t+1}$ is assumed to hold. In this case, all Type II consumers will enter the credit market if Type I consumers borrow $C_{t,t} = w_{t+1} / 2R_{t+1}$ to carry out their optimal consumption plan.

As mentioned, each financial intermediary has an opportunity rate of return equal to $r_{t+1}$. In this framework, financial intermediaries can offer three kinds of contracts to consumers in any period. The first one is a rationing contract; i.e., the loan size (loan repayment) is bounded by the amount of the wage rate a Type II consumer can earn. In this contract, the loan rate, denoted as $R_{t+1}$, will be equal to $r_{t+1}$ since no consumers will default[3]. The utility level of a Type I consumer in a rationing contract in which the loan size is equal to $\alpha w_t$ is

$$ln \alpha w_t + ln( w_{t+1} - \alpha w_t r_{t+1} ). \quad (5)$$

As in Bose and Cothren (1996), financial intermediaries may elect to use a costly screening technology which enables them to observe borrowers' types. This screening technology will absorb $\delta^c$ units of resources per unit of consumption loans. In other words, if financial intermediaries lend *q* units of output to the consumer in the screening contract, the resources needed to determine the consumer's types is $\delta^c q$. When financial intermediaries employ the screening technology, no Type II consumers will enter into the credit market. Since the optimal consumption profile of a time *t*

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[3] For simplicity, we assume that Type II consumers will not enter into the credit market when the loan size is equal to

Type I consumers is to consume half of next period income ( $w_{t+1}$ ) in time $t+1$, in states of screening every young Type I consumer in time $t$ will borrow the discounted value of the other half of next period income; that is, $w_{t+1} / 2r_{t+1}$. However, as the screening technology will cost $\delta^c$ units of output, the actual amount a Type I consumer can consume when screened is $(1-\delta^c)w_{t+1} / 2r_{t+1}$[4]. Therefore, the utility level of a Type I consumer in a screening contract is

$$ln\frac{(1-\delta^c)}{2}\frac{w_{t+1}}{r_{t+1}} + ln\frac{1}{2}w_{t+1}. \tag{6}$$

As the third possibility, financial intermediaries may offer both types of consumers the loan size equal to $C_{t,1} = w_{t+1} / 2R_{t+1}$. This is a pooling contract. In this contract, the loan rate, $R_{t+1}$, is equal to $r_{t+1} / \lambda$ since the default probability is $1-\lambda$. So, the utility level of a Type I consumer in a pooling contract is

$$ln\frac{\lambda_c}{2}\frac{w_{t+1}}{r_{t+1}} + ln\frac{1}{2}w_{t+1}. \tag{7}$$

Comparing the utility level of a Type I consumer in the screening and pooling regimes, we see that the screening contract dominates the pooling one if

$$\delta^c < 1-\lambda \tag{8}$$

To keep our analysis simple, we assume this condition holds. So, Type I consumers will choose either a rationing contract or a screening one. Comparing the Type I borrowers' utility in a rationing world to a screening world (equation (5) compared to (6)), we have the following lemma.

*Lemma 1*. Define that $g^* = \dfrac{2\alpha}{(1-\sqrt{\delta^c})}$.

(1) If $\dfrac{w_{t+1}}{w_t} > g^*$, Type I consumers prefer a screening contract in equilibrium.

(2) If $\dfrac{w_{t+1}}{w_t} < g^*$, Type I consumers prefer a rationing contract in equilibrium.

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the amount of home product they can produce.

[4] That is, the implicit loan rate is $r_{t+1} /(1-\delta^c)$.

(3) If $\frac{w_{t+1}}{w_t} = g^*$, in equilibrium Type I consumers are indifferent between a rationing and a screening contract.

(See the Appendix A for the complete derivation of these results.)

Lemma 1 states that Type I consumers prefer a screening contract if and only if the wage growth rate is greater than some critical value ($g^*$). In general, consumers always want to borrow more today if they realize that their income increases tomorrow. However, to be able to borrow more, Type I consumers have to pay some additional costs to reveal their types. As a result, if the growth rate of income is not large enough to offset this cost, Type I consumers will prefer using a rationing contract.

### 1.2.3. Entrepreneur Borrowers

Type I entrepreneurs only care about their second period consumption while Type II entrepreneurs consume in their first period of life. Each Type I entrepreneur is endowed with one investment project and a single unit of labor. A Type I entrepreneurs' investment project can be used to produce capital goods with outside inputs and his own labor. Each investment project of Type I entrepreneurs can convert *q* unit of time *t* output into $q\Omega$ unit of time *t+1* capital. Since the output rate of the capital accessible by financial intermediaries is $\tau$, we need to assume that $\tau$ is less than $\Omega$ to ensure that financial intermediaries have incentives to lend to entrepreneurs. Therefore, we assume that $\tau = \Omega\varepsilon$, where $\varepsilon < 1$. Furthermore, since the technology of capital production is linear, we need to impose a maximal scale to limit the loan size of Type I entrepreneurs. Assume that this maximal scale in time *t* is equal to $w_t$[5]. Thus, a Type I entrepreneur in time *t* can operate his investment project at the scale $q_t \leq w_t$. Similar to Type II consumers, a Type II entrepreneur only cares his first period consumption and is endowed with $\alpha$ units of labor. A Type II entrepreneur can supplies his labor endowment to earn time *t* wage rate equal to $\alpha w_t$. Alternatively, Type II

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[5] Under this assumption the maximal scale grows with the economy. Similar results to ours can be obtained if the

entrepreneurs can enter the credit market to mimic the behavior of Type I entrepreneurs. Once a Type II entrepreneur obtains a loan, he will consume everything and leave nothing to financial intermediaries. If a Type II entrepreneur enters the credit market, he cannot supply his labor endowment to work.

Similar to consumers, financial intermediaries can offer three kinds of contracts to entrepreneur borrowers. The first one is the rationing contract in whose loan size is bounded by $\alpha w_t$, the opportunity cost for Type II's entering the credit market. As Type II entrepreneurs will not enter the credit market when only rationing contracts are offered, the loan rate is equal to $r_{t+1}$. The utility of a Type I entrepreneur accepting rationing contract is equal to $\alpha w_t(\Omega\rho_{t+1} - r_{t+1})$, where $\rho_{t+1}$ is the rental rate of capital in time *t+1*.

As a second contract, financial intermediaries may use a screening technology to observe entrepreneurs' types. This screening technology will cost $\delta^e$ units of resources per unit lent when it is applied to entrepreneurial credit. As the production technology exhibits constant returns to scale, a Type I entrepreneur will operate at his maximal scale if he can obtain sufficient funds. Therefore, in the screening contract each Type I entrepreneur will borrow $(1+\delta^e)w_t$, in which he uses $w_t$ to implement his project at maximal scale and pays $\delta^e w_t$ for the screening technology. Since the probability of default is 0, the loan rate in the screening contract is $r_{t+1}$. Consequently, a Type I entrepreneur's utility under the screening contract is $w_t(\Omega\rho_{t+1} - (1+\delta^e)r_{t+1})$[6]. Finally, in the pooling contract financial intermediaries will charge the loan rate equal to $r_{t+1}/\lambda$ because all Type II entrepreneurs will enter into the credit market. In this case, a Type I entrepreneur's utility is equal to $w_t(\Omega\rho_{t+1} - r_{t+1}/\lambda)$.

By comparing the utility level of a Type I entrepreneur under the pooling and screening contract, we see that the screening contract dominates the pooling one if

$$\frac{1}{\lambda} - 1 > \delta^e \qquad (9)$$

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maximal scale is tied to the current level of capital.

[6] If accepting a screening contract is profit maximizing to entrepreneurs, $w_t(\Omega\rho_{t+1} - (1+\delta^e)r_{t+1}) \geq 0$. Given $r_{t+1} = \Omega\varepsilon\rho_{t+1}$, this implies that $1-(1+\delta^e)\varepsilon \geq 0$. We assume that this condition holds.

We assume that this is the case; therefore, Type I entrepreneurs will only choose between a rationing contract or a screening one. Comparing the rationing payoff $\alpha w_t(\Omega\rho_{t+1} - r_{t+1})$ to the screening $w_t(\Omega\rho_{t+1} - (1+\delta^e)r_{t+1})$, we have Lemma 2.

*Lemma 2.* Define $\rho^* = \dfrac{(1+\delta^e - \alpha)r_{t+1}}{\Omega(1-\alpha)}$.

(1) If $\rho_{t+1} > \rho^*$, Type I entrepreneurs prefer a screening contract in equilibrium.

(2) If $\rho_{t+1} < \rho^*$, Type I entrepreneurs prefer a rationing contract in equilibrium.

(3) If $\rho_{t+1} = \rho^*$, in equilibrium Type I entrepreneurs are indifferent between rationing and screening.

Lemma 2 indicates that Type I entrepreneurs will prefer a screening contract if the marginal productivity of capital $(\rho_{t+1})$ in time $t+1$ is large enough. On the other hand, a rationing contract is preferred if $\rho_{t+1}$ is small.

One important implication in Lemma 1 and 2 is that a decrease in screening costs (that is, $\delta^c$ and $\delta^e$) will make the screening contract more attractive both to Type I entrepreneurs and consumers, and thus may enable borrowers to borrow more. Consequently, the decrease of screening costs has a natural interpretation: the development in credit markets. Given this implication, we see that the type of the equilibrium contracts to consumers and entrepreneurs depend on the growth rate of income, the marginal productivity of capital, and the level of credit market development.

### 1.2.4 Endogenous Growth Model

Each Type I entrepreneur in time $t$ becomes a firm owner in time $t+1$. He is able to rent capital (in positive or negative amounts) and hire labor at competitively determined rental rates $\rho_{t+1}$ and $w_{t+1}$ to produce outputs according the following production function:

$$y_{t+1} = \psi_{t+1}^{\eta} k_{t+1}^{\theta} L_{t+1}^{1-\theta}, \tag{10}$$

where $k_{t+1}$ and $L_{t+1}$ are the amount of capital and labor employed by each firm, and $\psi_{t+1}$ is the average per firm capital stock. Note that each firm will employ the same amount of capital in equilibrium, so $\psi_{t+1} = k_{t+1}$. For simplicity, we also set $\eta = 1-\theta$. Thus, the output production technology is a linear one as in the AK model developed by Rebelo (1991). Since labor and capital markets are competitive, the rental rates of labor and capital are

$$w_{t+1} = (1-\theta)k_{t+1}^{\eta+\theta} L_{t+1}^{-\theta} = (1-\theta)k_{t+1} L_{t+1}^{-\theta} \tag{11}$$

and

$$\rho_{t+1} = \theta k_{t+1}^{\eta+\theta-1} L_{t+1}^{1-\theta} = \theta L_{t+1}^{1-\theta}, \tag{12}$$

respectively.

## 1.3. The Growth Rate and Contract Forms

Lemma 1 and 2 assert that the form of contract preferred by Type I borrowers depends on the growth rate of income, the marginal productivity of capital ( $\rho_{t+1}$ ), and the screening cost. In this section we will show that an economy's growth rate in turn depends on the contract regimes of both consumer and entrepreneurial credit.

It is typically argued in the existing literature that a less-developed financial market will negatively influence an economy's investment performance, and thus its growth rate. This is true in this model, as entrepreneurs can only operate their capital project at a low scale under a less-developed credit market (i.e., in a rationing regime). If an economy's credit markets are more developed, so that Type I entrepreneurs choose a screening contract, its capital stock would increase, leading to a higher growth rate. However, our model indicates an additional effect of the development of credit markets on the growth rate. Given that financial intermediaries can convert savings into capital, an economy's capital stock will be reduced if consumers are able to borrow more to finance consumption, which is also likely to happen as credit markets develop. Jappelli and Pagano (1994) have emphasized this effect in a model which only considers the saving behavior of consumers under an exogenously given borrowing constraint. Our model further relates this effect on economic growth by considering the interdependency of credit markets (with credit to entrepreneurs) and economic development.

We now investigate the relationship between contracting regimes and economic growth. There are four cases to consider because there are two kinds of contracts for each of Type I consumers and entrepreneurs. Note that the total number of firms is equal to $\lambda$ as all Type I entrepreneurs become firm owners at time $t+1$. The labor supply in each period includes all old Type I consumers (population is $\lambda$), young lenders (population is $n\lambda$), and young Type I consumers and entrepreneurs ($2(1-\lambda)$); thus labor employed by each firm is $(n-1+2/\lambda)$. In addition, since lenders lend only to financial intermediaries, the total supply of credit is $n\lambda w_t$.

**Case 1. Both groups of borrowers choose the rationing contract**

In this case, each Type I consumer and entrepreneur borrows $\alpha w_t$, so that total resources borrowed are equal to $2\lambda\alpha w_t$. Given that total supply is $n\lambda w_t$, the available resources left for financial intermediaries to produce capital are given as $(n-2\alpha)\lambda w_t$. Consequently, capital produced by Type I entrepreneurs and financial intermediaries is $\lambda\alpha w_t\Omega$ and $(n-2\alpha)\lambda w_t\Omega\varepsilon$, respectively. Therefore, per firm capital stock in time $t+1$, $k_{t+1}$, is given as

$$k_{t+1} = [\lambda\alpha w_t\Omega + (n-2\alpha)\lambda w_t\varepsilon\Omega] / \lambda .$$

The growth rate is then given by

$$\frac{k_{t+1}}{k_t} = \frac{(1-\theta)[\alpha + (n-2\alpha)\varepsilon]\Omega}{L^{\theta}} \equiv g^{r,r} , \tag{13}$$

Note that the first and second superscripts refer to the contract regimes of entrepreneurial and consumer credit, respectively (both are rationing contracts in this case).

**Case 2: Both groups of borrowers choose the screening contract**

Each Type I entrepreneur borrows $(1+\delta^e)w_t$ and each Type I consumer borrows $w_{t+1}/2r_{t+1}$, so that total resources borrowed are $[(1+\delta^e)w_t + w_{t+1}/2r_{t+1}]\lambda$. The available resources for financial intermediaries to produce capital, therefore, is given as

$$n\lambda w_t - \lambda(1+\delta^e)w_t - \lambda w_{t+1}/2r_{t+1} .$$

Capital produced by entrepreneurs and financial intermediaries is $\lambda w_t \Omega$ and

$$[\, n\lambda w_t - \lambda(1+\delta^e)w_t - {\lambda w_{t+1}}\!\big/\!{2r_{t+1}}\,]\,\Omega\varepsilon\,,$$

respectively. As a result, the per firm capital stock, $k_{t+1}$, is derived as

$$k_{t+1} = \{\, \lambda w_t \Omega + [(\, n-1-\delta^e)\lambda w_t - \lambda w_{t+1} / 2r_{t+1}\,]\,\Omega\varepsilon\,\} / \lambda\,.$$

Since both groups of borrowers are able to borrow more in this case, the resources available for financial intermediaries to convert capital will be relatively small. Substituting $w_t$ and $w_{t+1}$ into $k_{t+1}$, the growth rate in this case can be found as

$$\frac{k_{t+1}}{k_t} = \frac{2\theta(1-\theta)\Omega[\,1+(\,n-1-\delta^e)\varepsilon\,]\,L^{1-\theta}}{(1-\theta)+2\theta L} \equiv g^{s,s}\,. \tag{14}$$

**Case 3: Consumers choose the screening contract while entrepreneurs choose the rationing one**

Type I consumers borrow the amount equal to $w_{t+1} / 2r_{t+1}$ and Type I entrepreneurs operate their investment at the scale equal to $\alpha w_t$ in this case. The resources left for financial intermediaries are equal to $n\lambda w_t - \alpha w_t \lambda - \lambda w_{t+1} / 2r_{t+1}$. Per firm capital stock, $k_{t+1}$, is then given as

$$k_{t+1} = [\, \lambda\alpha w_t \Omega + (\, n\lambda w_t - \lambda\alpha w_t - \lambda w_{t+1} / 2r_{t+1})\Omega\varepsilon\,] / \lambda\,.$$

Therefore, the growth rate is derived as

$$\frac{k_{t+1}}{k_t} = \frac{2(1-\theta)\theta(\alpha+(\,n-\alpha)\varepsilon)\Omega L^{1-\theta}}{(1-\theta)+2\theta L} \equiv g^{r,s}\,. \tag{15}$$

**Case 4: Entrepreneurs choose the screening contract while consumers choose the rationing one**

The amounts borrowed by a Type I entrepreneur and consumer are $(1+\delta^e)w_t$ and $\alpha w_t$, respectively, so financial intermediaries are able to convert capital equal to $[\, n-(1+\delta^e)-\alpha\,)]\lambda w_t \Omega\varepsilon$. It is clear that the amount of capital employed by each firm in time *t+1*, $k_{t+1}$, is equal to $[\,\lambda w_t \Omega + (\, n-1-\delta^e-\alpha\,)\lambda w_t \Omega\varepsilon\,] / \lambda$. So, the growth rate is given by

$$\frac{k_{t+1}}{k_t} = \frac{(1-\theta)(1+(n-1-\delta^e-\alpha)\varepsilon)\Omega}{L^\theta} \equiv g^{s,r} \tag{16}$$

These four cases show that an economy's growth rate depends on the contracting regimes of both consumer and entrepreneurial credit because, on one hand, entrepreneurs can produce more capital under a screening regime while, on the other hand, financial intermediaries will not have much resources to convert into capital if consumers are using a screening contract. To proceed further, we need to know the relationship of growth rates in these four cases. Proposition 1 below fully establishes this relationship.

*Proposition 1.*

There exists a $\varepsilon^* \in (0,(1-\alpha)/(1+\delta^e-\alpha)]$, a decreasing function of $\delta^e$, where if $\varepsilon < \varepsilon^*$, then, $g^{r,r} < g^{s,s}$, and overall, the relationship of growth rates is $g^{s,r} > g^{s,s} > g^{r,r} > g^{r,s}$, and if $\varepsilon > \varepsilon^*$, $g^{r,r} > g^{s,s}$, and the relationship of growth rates is $g^{s,r} > g^{r,r} > g^{s,s} > g^{r,s}$.

Proof: See Appendix B.

The intuition underlying this result is clear. Comparing Case 1 (both are rationed) and Case 2 (both are screened), the available resources left for financial intermediaries to produce capital is relatively small if both consumers and entrepreneurs are choosing screening contracts. Moreover, the amount of capital produced by entrepreneurs is always bigger in Case 2 than in Case 1, so we see that $g^{s,r} > g^{r,r}$ and $g^{s,s} > g^{r,s}$. If $\varepsilon$ is small, the role in producing capital played by financial intermediaries is relatively unimportant. Therefore, the decrease in additional capital in the case when consumers choose the screening contract rather than the rationing contract is also relatively small. As a result, comparing the capital stocks in Case 1 and Case2, the increase of capital due to the screening contract employed by entrepreneurs could outweigh the decrease of capital stemming from the choice of screening contract by consumers. On the other hand, if $\varepsilon$ is sufficiently large, the decrease of capital could be greater than the increase.

Another parameter that will influence the relationship between $g^{r,r}$ and $g^{s,s}$ is the screening cost on entrepreneur credit, $\delta^e$. Intuitively, if the screening cost is too high, then even though entrepreneurs are able to implement their projects at the maximal scale, the resources lost in the process of screening could be an important factor in determining the relationship between $g^{r,r}$ and $g^{s,s}$; that is, if $\delta^e$ is too high, we need a very low value of $\varepsilon$ to ensure that $g^{s,s} > g^{r,r}$. Thus, we observe that $\varepsilon^*$ is a decreasing function of $\delta^e$.

## 1.4. Equilibrium Contracts and the Equilibrium Growth Rate

So far we have shown that the equilibrium contracts to consumers and entrepreneurs depend on both the growth rate and the level of credit market development, and that the growth rate in turn is determined by the equilibrium contracts to consumers and entrepreneurs. Clearly, there exists a joint dependency among credit market development, contracting regimes, and economic growth in this framework. Moreover, this joint dependency is quite complicated, as the contracting regimes of consumers and entrepreneurs are related. To illustrate this as simply as possible, we initially assume that $\delta^c$ and $\delta^e$ are unrelated and independent, and $\varepsilon > \varepsilon^*$. This implies that $g^{r,r}$ is always greater than $g^{s,s}$.

### 1.4.1 Consumer Credit

As we mentioned, the level of consumer credit market development can be represented by the value of $\delta^c$. Recall that $g^*$ is the value of the growth rate equal to $2\alpha r_{t+1}/(1-\sqrt{\delta^c})$ (as shown in Lemma 1), so $g^*$ is an increasing function of $\delta^c$. As seen in Lemma 1, if the equilibrium growth rate, *g*, is greater than $g^*$, Type I consumers will prefer a screening contract. Since the equilibrium growth rate depends on credit conditions of entrepreneurs as well, one sees that the equilibrium contract to consumers is influenced by conditions prevailing in the entrepreneur credit market. In this section, we will fix the value of $\delta^e$, and allow $\delta^c$ to vary. So, there are two cases to consider: entrepreneurial credit rationing ($\rho_{t+1} < \rho^*$) and screening ($\rho_{t+1} > \rho^*$).

Case I: Entrepreneurial credit is under a rationing regime

If entrepreneurial credit is in a rationing regime, the equilibrium growth rate is either $g^{r,r}$ or $g^{r,s}$, depending on the level of credit market development in the consumer market. We plot the relationship between $\delta^c$ and the growth rates in Figure 1[7]. Note that $\bar{\delta}^c$ is the upper bound of $\delta^c$, which is derived from (8). Results in the last section indicate that the growth rate is independent of $\delta^c$. However, note that $g^*$ will decrease with a decrease of $\delta^c$. The relationship between $\delta^c$ and the equilibrium growth rate in this case is represented by a solid line in Figure 1.1. As seen in the diagram, we denote the value of $\delta^c$ equating $g^*$ to $g^{r,r}$ and $g^*$ to $g^{r,s}$ as $\delta^c_{r,r}$ and $\delta^c_{r,s}$, respectively. Therefore, if $\delta^c > \delta^c_{r,r}$, $g^* > g^{r,r}$ and if $\delta^c < \delta^c_{r,s}$, $g^* < g^{r,s}$. In the middle level of $\delta^c$ ($\delta^c_{r,s} < \delta^c < \delta^c_{r,r}$), the relation $g^{r,s} < g^* < g^{r,r}$ holds.

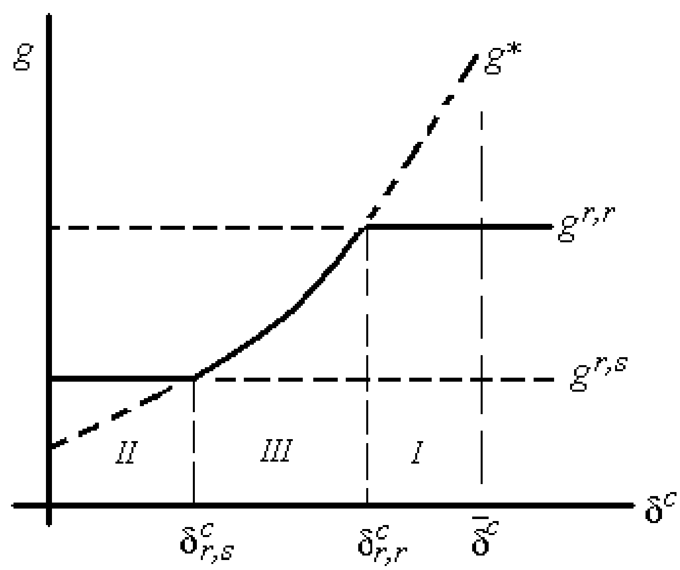


**Figure 1.1**. The growth rate and $\delta^c$ in the case of $\rho_{t+1} < \rho^*$

*Area I*: $\delta^c > \delta^c_{r,r}$

[7] We assume that $g^*$ is greater than $g^{s,r}$ when $\delta^c$ is equal to its upper bound $(1-\lambda)$ and $g^*$ is less than $g^{r,s}$ when $\delta^c$ is equal to $0$. For example, suppose that $\lambda = 0.75$, $\alpha = 0.5$, $n=3$, $\Omega = 2$, $\theta = 0.3$, $\varepsilon = 0.5$, and $\delta^e = 0.25$. If $\delta^c = \overline{\delta^c} = 1 - \lambda = 0.25$, $g^* = 1.583$ and $g^{s,r} = 1.5$. If $\delta^c = 0$, $g^* = 0.274$ and $g^{r,s} = 1.25$. Note that in this example $\varepsilon^* = 0.452$. So $g^{r,r} > g^{s,s}$ because $\varepsilon > \varepsilon^*$.

The screening cost for consumer credit is very high in this area, and $g^{*} > g^{r,r} > g^{r,s}$. Since $g^{*} > g^{r,r} > g^{r,s}$, growth is insufficient to support screening in the consumer market. As all consumers are rationed; therefore, in this area the growth rate is $g^{r,r}$.

*Area II.* $\delta_{c} < \delta^{c}_{r,s}$

In this area, the consumer credit market is well-developed because $\delta^{c}$ is very small. As $g^{r,r} > g^{*}$, rationing in the consumer credit market cannot be an equilibrium. Since $g^{r,s} > g^{*}$, thus, a consumer screening contract is the unique equilibrium, so that the growth rate, *g*, is equal to $g^{r,s}$.

*Area III.* $\delta^{c}_{r,s} < \delta^{c} < \delta^{c}_{r,r}$

In this area, the relation $g^{r,s} < g^{*} < g^{r,r}$ holds. According to Lemma 1, a rationing contract is an equilibrium contract to consumers if and only if the growth rate is greater than $g^{*}$. As entrepreneurial credit is under a rationing regime, rationing in the consumer credit market is an equilibrium outcome if $g^{r,r} > g^{*}$. This does not hold in this area. Similarly, screening in the consumer loan is not an equilibrium outcome because the growth rate, $g^{r,s}$, is less than $g^{*}$. Clearly, the consumer credit is neither typified by 100% screening contracts nor 100% rationing contracts. Lemma 1 indicates that this only occurs if $g = g^{*}$. As $g^{r,s} < g^{*} < g^{r,r}$, financial intermediaries must offer a combination of the rationing and screening contracts, one which gives rise to a growth rate equal to $g^{*}$.

It is possible to determine the fraction of loans that are given as rationing contracts or as screening contracts. This will be interpreted as a mixed contract. Define $p_1$ as the probability that financial intermediaries offer a rationing contract, and with $1- p_1$ being the probability that financial intermediaries offer a screening contract. Then the economic growth rate is equal to $p_1 g^{r,r} + (1 - p_1) g^{r,s}$. As mentioned, this mixed contract could be an equilibrium if and only if

$$g^{*} = p_1 g^{r,r} + (1 - p_1) g^{r,s}.$$

Recall that $g^{r,s}$ and $g^{r,r}$ are independent of $\delta^{c}$ and $g^{*}$ is a decreasing function of $\delta^{c}$. Therefore, given $g^{r,r} > g^{r,s}$, it is clear that, as the screening cost on consumer credit decreases in this area, $p_1$, the probability that financial intermediaries ration consumers, has to decrease to ensure that the relation $g^* = p_1 g^{r,r} + (1 - p_1) g^{r,s}$ is satisfied. In other words, the equilibrium growth rate as well as the probability that financial intermediaries offer a rationing contract to consumers is decreased as $\delta^c$ decreases. We summarize these results in Proposition 2.

*Proposition 2.* If $\delta^c_{r,s} < \delta^c < \delta^c_{r,r}$ and entrepreneurial credit is under a rationing regime, then the equilibrium loan contract to consumers is a mixed one; that is, financial intermediaries offer the rationing with probability $p_1$ and the screening contract with probability $1 - p_1$ to consumers, where $g^* = p_1 g^{r,r} + (1 - p_1) g^{r,s}$ and $\frac{\partial p_1}{\partial \delta^c} < 0$.

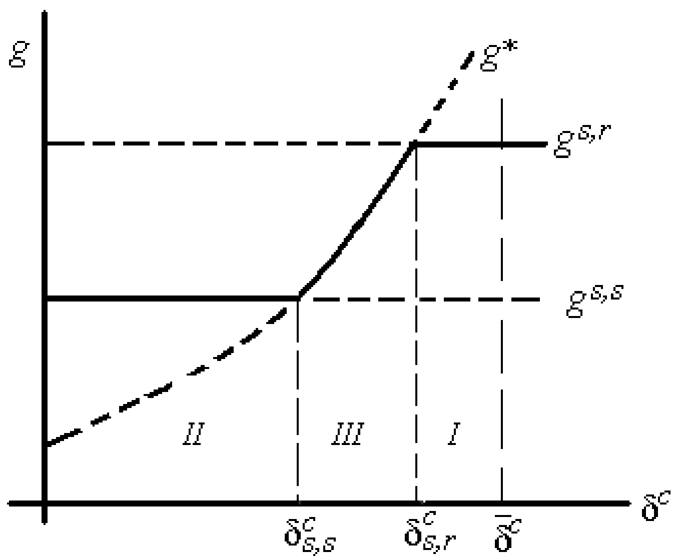


**Figure 1.2.**. The growth rate and $\delta^c$ in the case of $\rho_{t+1} < \rho^*$

Case II. Entrepreneurial credit is under a screening regime; i.e., $\rho_{t+1} < \rho^*$.

The relationship between credit market development ($\delta^c$) and the economic growth rate of this case is plotted in Figure 1.2. As before, we define the value of $\delta^c$ equating $g^*$ to $g^{s,r}$ and $g^{s,s}$ as $\delta^c_{s,r}$ and $\delta^c_{s,s}$, respectively. In *Area I*, consumers will prefer a rationing contract because $g^*$ is greater than $g^{s,r}$. Thus the equilibrium growth is equal to $g^{s,r}$. In *Area II,* the equilibrium contract to consumers is a screening contract because $g^{s,s} > g^*$. Finally, similar to the previous case, the consumer market is under a mixed regime in *Area III*. That is, financial intermediacies offer consumers the rationing and screening contract at the same time. Proposition 3 below summarizes properties of this area.

*Proposition 3*. If entrepreneurial credit is under a screening regime and $\delta^c_{s,r} > \delta^c > \delta^c_{s,s}$, the equilibrium loan contract to consumers will be a mixed one; that is, financial intermediaries offer the rationing with probability $p_2$ and screening contract with probability $1- p_2$ to consumers, where $g^* = p_2 g^{s,r} + (1-p_2)g^{s,s}$ and $\frac{\partial p_2}{\partial \delta^c} < 0$.

Although the analysis is still far from complete, some interesting results are already appeared. First, the equilibrium growth rate is decreased by development of the consumer credit market: In either case, the equilibrium growth rate is higher if the consumer credit market is less developed (i.e., in *Area I*) and lower if the consumer credit market is developed (i.e., in *Area II*). This is consistent with the work of Jappelli and Pagano (1994), which shows that credit rationing on consumer credit may result in a higher aggregate saving rate and thus may promote the growth rate.

Second, by comparing these two cases we see that, for a given level of $\delta^c$, in *Area I* and *II* the equilibrium growth is greater in Case II than in Case I, supporting the conclusion of recent literature that the development of the entrepreneur credit market promotes growth. However, in a mixed regime (i.e., *Area III*), the equilibrium growth is equal to $g^*$, which is independent of the credit conditions of entrepreneurs.

### 1.4.2 Entrepreneur Credit

Lemma 2 states that the equilibrium contract to entrepreneurs depends on the relationship between $\rho_{t+1}$ and $\rho^*$. Since $\rho_{t+1}$ is constant in this framework and $\rho^*$ is an increasing function of $\delta^e$, the equilibrium contract to entrepreneurs is determined by $\delta^e$, the level of credit market development in the entrepreneur market. We denote by $\delta^{e*}$ as the value of $\delta^e$ satisfying $\rho_{t+1} = \rho^*$. Thus, according to Lemma 2, the screening contract is the equilibrium contract to entrepreneurs if $\delta^e < \delta^{e*}$. Before proceeding , note again that we are considering the case where $\varepsilon^* > \varepsilon$ (i.e.,

$g^{r,r} > g^{s,s}$). Since $\varepsilon^*$ (derived in Proposition 1) is a decreasing function of $\delta^e$, $\varepsilon^*$ will increase along with the decrease of $\delta^e$. Denoting $\delta^e_{min}$ as the value of $\delta^e$ equating $\varepsilon^*$ to $\varepsilon$, this is to say that we consider only when $\delta^e > \delta^e_{min}$[8].

In contrast to section 1.4.1, we will discuss, by fixing the value of $\delta^c$ and allowing $\delta^e$ to vary in its domain, the relationship between credit market development in the entrepreneur market and the economic growth rate. We illustrate the relationship between credit market development on entrepreneurial credit and growth by considering two cases: $\delta^e > \delta^{e*}$ and $\delta^e < \delta^{e*}$, respectively.

Case I. $\delta^e > \delta^{e*}$.

In this case, there is credit rationing in the entrepreneur market, so that the equilibrium growth rate is $g^{r,r}$ if the consumer market is in a rationing regime, and $g^{r,s}$ if the consumer market is in a screening regime. Since both $g^{r,r}$ and $g^{r,s}$ are independent of $\delta^e$, it is clear that development in the entrepreneur market has no effect on economic growth, as long as $\delta^e > \delta^{e*}$. This is true even if consumer credit is in a mixed regime because $g^*$ is not influenced by $\delta^e$.

Case II. $\delta^e < \delta^{e*}$.

In this case, entrepreneurs prefer a screening contract, so if the consumer market is in a rationing regime, the equilibrium growth is $g^{s,r}$. On the other hand, if the consumer market is in a screening regime, the equilibrium growth is $g^{s,s}$. As $\delta^e$ decreases in this case, the equilibrium growth rate will also increase because both $g^{s,r}$ and $g^{s,s}$ are decreasing functions of $\delta^e$. Therefore, one sees that credit market development facilitates growth in this case. An interesting result is that, as $\delta^e$ decreases, the rates of increase in the growth rate differ in the two cases: $g^{s,r}$ and $g^{s,s}$. If the equilibrium growth rate is $g^{s,r}$, the increasing rate of growth as $\delta^e$ decreases can be found as

$$\left|\frac{\partial g^{s,r}}{\partial \delta^e}\right| = \frac{(1-\theta)\Omega\varepsilon}{L^\theta}. \quad (17)$$

[8] We also assume that $\delta^e_{min} < \delta^{e*}$; that is, both the rationing and screening contract are feasible in the case $g^{r,r} > g^{s,s}$.

If the equilibrium growth rate is $g^{s,s}$, this rate of increase is

$$\left|\frac{\partial g^{s,s}}{\partial \delta^e}\right| = \frac{2\theta(1-\theta)\Omega\varepsilon L^{1-\theta}}{1-\theta+2\theta L}. \tag{18}$$

Comparing (17) and (18), we see that $\left|\frac{\partial g^{s,r}}{\partial \delta^e}\right| > \left|\frac{\partial g^{s,s}}{\partial \delta^e}\right|$. As a result, even if we distinguish credit market development in the entrepreneur market from the consumer market (that is, even if there is no relationship between $\delta^e$ and $\delta^c$), the effect of development in the entrepreneur credit market on economic growth still depends on credit conditions in the consumer market.

If consumer credit is under a mixed regime in this case, the equilibrium growth is $g^*$, which is given as

$$g^* = pg^{s,r} + (1-p)g^{s,s}, \tag{19}$$

where *p* is the probability that financial intermediaries offer a rationing contract to consumers. As $g^*$ is independent of $\delta^e$ and as long as the consumer credit market remains in a mixed regime, credit market development in the entrepreneur market has no effect on economic growth. However, development in the entrepreneur market will influence credit conditions in the consumer market. To see this, recall that both $g^{s,r}$ and $g^{s,s}$ increase as $\delta^e$ decreases. Therefore, as $\delta^e$ decreases, it must be the case that $p$ should decrease to maintain the equality of (19) because $\left|\frac{\partial g^{s,r}}{\partial \delta^e}\right| > \left|\frac{\partial g^{s,s}}{\partial \delta^e}\right|$ and $g^*$ is constant with respect to $\delta^e$. This is an interesting result because the development in the entrepreneur market has no effect on credit conditions of entrepreneurs and economic growth but can change consumers' credit conditions.

A comparison between Case I and Case II shows another result, related to Bose and Cothren (1996) who show that there is a threshold level for credit market development in the entrepreneur market having effects on economic growth. Suppose that $\delta^e$ is originally greater than $\delta^{e*}$ and consumer credit is in a rationing regime. If $\delta^e$ is decreasing but still greater than $\delta^{e*}$, there is no effect of this decrease on economic growth (the growth rate is always equal to $g^{r,r}$). Only when a threshold level ($\delta^{e*}$) has been crossed, will credit market development promote economic growth.

## 5. Credit Market Development, Credit Market Equilibrium, and the Equilibrium Growth Rate

In contrast to existing literature, a major advantage of this framework is that it allows us to investigate the relationship between credit market development and economic growth by including both credit to consumers and entrepreneurs. Up until this point, $\delta^c$ and $\delta^e$ have been assumed to be unrelated. Hence, it is natural to assume that the value of $\delta^c$ and $\delta^e$ are related in some way. Indeed, it is hard to believe that the development of credit markets will only benefit to consumers or entrepreneurs but not both. To investigate this issue, we impose the following assumption:

$$\delta^c = \beta\delta^e,\ \beta \geq 0. \tag{20}$$

Note that since the upper bound of $\delta^c$ is $(1-\lambda)$, $\beta$ should not be greater than $(1-\lambda)/\delta^e$, for a given $\delta^e$. Thus, we additionally assume that $\beta \leq (1-\lambda)/\delta^e$.

Substituting (20) into $g^*$ in Lemma 1, we see that $g^*$ is equal to $2\alpha r_{t+1}/(1-\sqrt{\beta\delta^e})$. Clearly, $g^*$ is an decreasing function of $\delta^e$. Recall that we define $\delta^c_{r,r}$, $\delta^c_{r,s}$, $\delta^c_{s,s}$ and $\delta^c_{s,r}$ as the value of $\delta^c$ equating $g^*$ to $g^{r,r}$, $g^*$ to $g^{r,s}$, $g^*$ to $g^{s,s}$, and $g^*$ to $g^{s,r}$, respectively. Therefore, for a given $\delta^c$, the equilibrium loan contract to consumers and the equilibrium growth rate can be determined by comparing $\delta^c_{r,r}$, $\delta^c_{r,s}$, $\delta^c_{s,s}$, $\delta^c_{s,r}$ and $\delta^c$. Given that we consider the case where $g^{s,r} > g^{r,r} > g^{s,s} > g^{r,s}$, the relations $\delta^c_{s,r} > \delta^c_{r,r} > \delta^c_{s,s} > \delta^c_{r,s}$ hold. Substituting $\delta^c_{s,r}$ into (20), we define $\delta^e_{s,r}$ as the corresponding value of $\delta^e$ for a given $\beta$; that is, $\delta^e_{s,r} = \delta^c_{s,r}/\beta$. $\delta^e_{r,r}$, $\delta^e_{s,s}$, and $\delta^e_{r,s}$ are defined, similarly. Then, for a given $\beta$, we have the relation $\delta^e_{s,r} > \delta^e_{r,r} > \delta^e_{s,s} > \delta^e_{r,s}$. Given these specifications, the relationship between credit market development and economic growth can be determined by $\delta^{e*}$ and the relation $\delta^e_{s,r} > \delta^e_{r,r} > \delta^e_{s,s} > \delta^e_{r,s}$. For illustrative purpose, we consider three important possibilities. Other cases could be analyzed similarly.

**Case 1.** $\delta^{e*} > \delta^e_{s,r} > \delta^e_{r,r} > \delta^e_{s,s} > \delta^e_{r,s}$.

If $\delta^{e*} > \delta^e_{s,r}$, the transition of contracting regime of the entrepreneur market will take place before the transition in consumer market. This case will arise most likely if screening consumers is more costly than screening entrepreneurs. We plot the relationship between $\delta^e$ and the growth rates in Figure 1.3. The relationship between the equilibrium growth rate and $\delta^e$ in this case is represented by a solid line. As in the figure, we have the following areas to discuss.

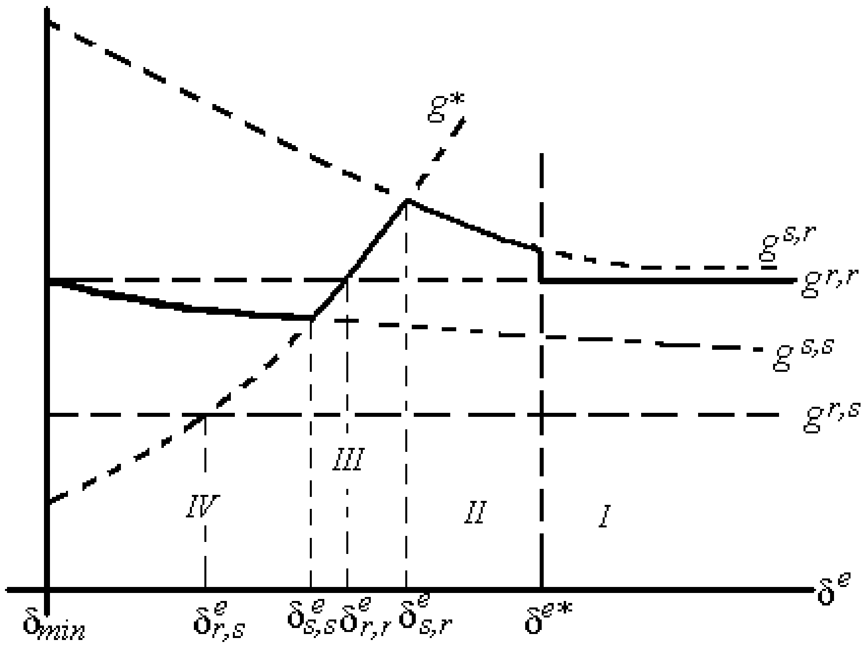


**Figure 1.3.** Credit market development and the equilibrium growth rate:

Case 1

_Area I_. $\delta^e > \delta^{e*}$.

If $\delta^e > \delta^{e*}$, the equilibrium contract to entrepreneurs is a rationing contract, so the growth rate is either $g^{r,r}$ or $g^{r,s}$. Since the growth rate is insufficient to support a screening consumer market, the equilibrium contract to consumers will be the rationing one. As a result, the equilibrium growth rate is $g^{r,r}$.

_Area II_. $\delta^e_{s,r} < \delta^e < \delta^{e*}$

Since $\delta^e < \delta^{e*}$, the equilibrium contract to entrepreneurs is the screening contract, so the growth rate is either $g^{s,r}$ or $g^{r,r}$, depending on the consumer market equilibrium. As $g^{s,r}$ and $g^{r,r}$ are less than $g^*$, the growth rate is not high enough to support a screening consumer market.

Therefore, consumers choose a rationing contract in this area and the economy grows following $g^{s,r}$.

<u>Area III</u>. $\delta^e_{s,s} < \delta^e < \delta^e_{s,r}$

The relation $\delta^e_{s,s} < \delta^e < \delta^e_{s,r}$ implies that $\delta^c_{s,s} < \delta^c < \delta^c_{s,r}$. According to Proposition 3, the equilibrium contract to consumers is a mixed one and the equilibrium growth rate is $g^*$. Obviously, as credit market development occurs in this area, the growth rate is decreased.

<u>Area IV</u>. $\delta^e < \delta^e_{s,s}$

Entrepreneurs continue to use a screening contract in this area. Since the growth rate (either $g^{s,r}$ or $g^{s,s}$) is high enough, consumers will choose a screening contract. As the result, the equilibrium growth rate is $g^{s,s}$.

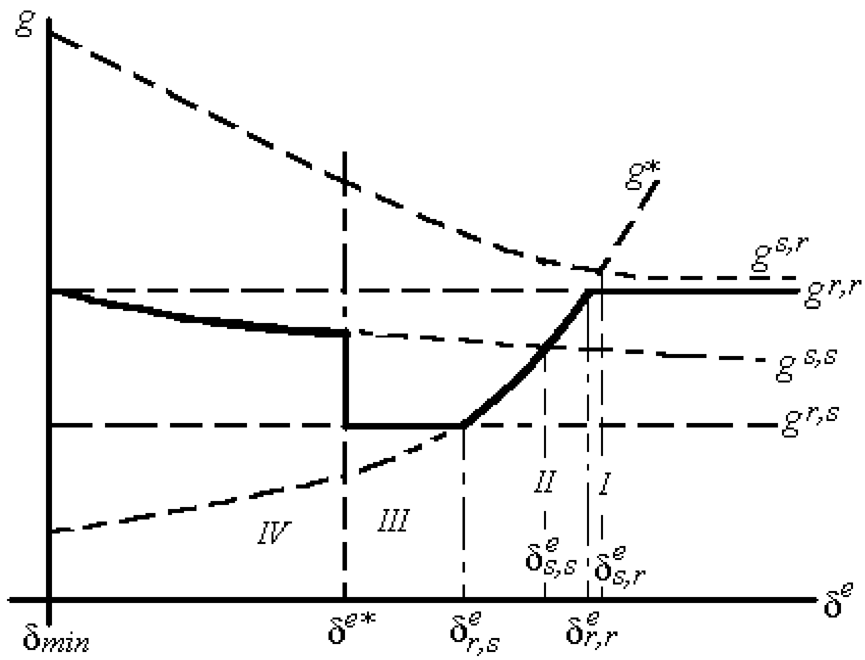


**Figure 1.4.** Credit market development and the equilibrium growth rate: Case 2

**Case 2.** $\delta^e_{s,r} > \delta^e_{r,r} > \delta^e_{s,s} > \delta^e_{r,s} > \delta^{e*}$

The relationship between credit market development and economic growth is plotted in

Figure 1.4. In contrast to the previous case, the transition of contracting regime of the consumer market will take place before the entrepreneur market because entrepreneurs will choose the rationing contract until $\delta^e < \delta^{e*}$. As seen in the figure, we have four areas to consider in this case. In *Area I* ($\delta^e > \delta^e_{r,r}$), the growth rate (either $g^{r,r}$ or $g^{r,s}$) is less than $g^*$, so consumers prefer a rationing contract and the growth rate is $g^{r,r}$. In *Area II* ($\delta^e_{r,s} < \delta^e < \delta^e_{r,r}$), the equilibrium contract to consumers will be the mixed one and the growth rate is $g^*$. In *Area III* ($\delta^{e*} < \delta^e < \delta^e_{r,s}$), the growth rate is high enough to offset the screening cost so that consumers choose a screening contract and the growth rate is $g^{r,s}$. Finally, *in Area IV* ($\delta^e < \delta^{e*}$), credit market development are able to support a screening entrepreneur market. Given that the consumer market is in a screening regime, the growth rate will be $g^{s,s}$. This case describes that the equilibrium growth rate decreases during the process of transition on consumer credit. The growth rate will be an increasing function of credit market development only when $\delta^{e*}$ is crossed, where entrepreneurial credit is under a screening regime.

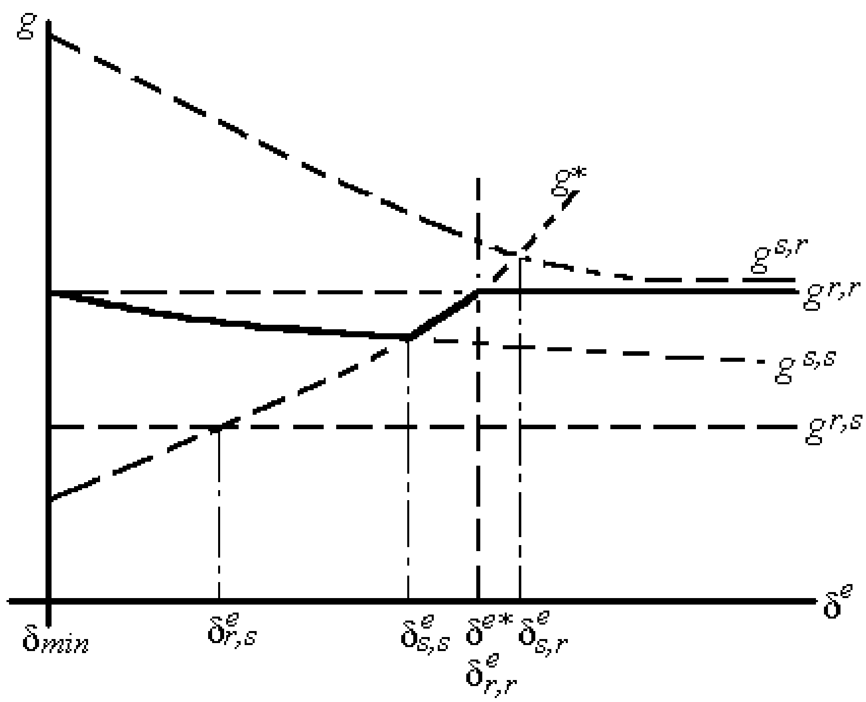


**Figure 1.5.** Credit market development and the equilibrium growth rate:

Case 3

**Case 3**. $\delta^{e}_{s,r} > \delta^{e}_{r,r} = \delta^{e*} > \delta^{e}_{s,s} > \delta^{e}_{r,s}$

This case gives us a situation where the transition from a rationing to a screening regime on both markets occurs at the same time (when $\delta^{e} = \delta^{e*} = \delta^{e}_{r,r}$). The analysis of this case is similar to the previous cases and ignored here. We summarize the relationship between the equilibrium growth rate and $\delta^{e}$ in this case by a solid line in Figure 1.5.

From analysis of these three cases, one sees that the relationship between credit market and economic development may be far from simple when both consumer and entrepreneurial credit are included. As analyzed in Case 1, the growth rate will be enhanced as entrepreneurs are benefited first at the very beginning of credit market development. This effect has been emphasized by the recent literature. In the existing models of credit market imperfections, economists have asserted that the development of credit markets (which, more or less, can solve the inherent imperfection problem of credit market) is growth-enhancing. However, no model took credit market development in the consumer market into account. Once consumer credit is included, the development of credit markets has an additional effect on growth, one which is growth-reducing. In this situation, we see that the relationship between credit market development and economic growth depends on the level of credit market development.

The results of Case 1 above can help to explain the work of De Gregorio and Guidotti (1995), if we assume that $\delta^{e}$ is related to the income level , $w_t$. Since the bigger level of $w_t$ means that more resources are intermediated through financial intermediaries, it is natural to think that $\delta^{e}$ is a decreasing function of $w_t$. Therefore, in low- and middle-income countries (countries with a relatively large value of $\delta^{e}$), the growth rate could be enhanced by the development of credit market as entrepreneurs are granted with more credit. For the high-income countries, where consumers have a relatively big proportion of total private sector credit, the effect of credit market development on economic growth is weaker than that of low- and middle- income countries[9]. Surprisingly, the growth rate could actually be lower in high-income countries than in low- and middle-income countries as shown in Case 1 above.

Moreover, from these three cases, we conclude that the sequence of credit market development has an important implications on the growth pattern of the economy. If the entrepreneur market develops before the consumer market, the economy will grow faster at the early stage of development. This result may justify government interventions in the consumer market to release resources for industrial investment in many developing countries (see Ch. 7, World Development Report 1989).

## 1.6. Conclusion

The framework we develop here complements existing models which investigate the relationship between credit market development in the entrepreneur market and economic growth. A major advantage of this framework is that the interaction between the entrepreneur and consumer credit markets can be investigated. We show that credit conditions of the entrepreneur and consumer markets are related, and moreover that this fact has important implications on economic development.

In this framework, the relationship between credit market development and economic growth is ambiguous. Credit market development may either increase or decrease the growth rate of the economy. In fact, it is possible that the growth rate of a economy with well-developed credit markets may actually be less than that of a economy with less-developed credit markets. This result may appear to be surprising, considering the positive relationship between financial and economic development predominant in the literature. [For examples Bencivenga and Smith (1993), Ma and Smith (1996), and Bose and Cothren (1996).] This is because most of the literature focuses on the efficiency of credit allocation to firms. However, once one incorporates consumer credit markets into these analyses, conclusions are affected drastically. Thus, to investigate the relationship between credit market and economic development, we conclude that this interaction is of central importance.

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[9] This is so because $\left|\frac{\partial g^{s,r}}{\partial \delta^{e}}\right| > \left|\frac{\partial g^{s,s}}{\partial \delta^{e}}\right|$.

Due to the simple structure of this model, dynamic transitions are relatively uninteresting; the marginal products of capital, the growth rate, and the contract forms to both borrowers are invariant with respect to time for a given $\delta^e$. An interesting extension of this framework would be to focus on the endogenous process by which the capital stock and the contract forms of both borrowers jointly evolve over time. This could be done within a neoclassical growth model. In this context, whether financial intermediaries offer a rationing or screening contract to borrowers will depend on some critical level of capital stock, but not directly on the growth rate, as is the case in this model. We can expect that, under this framework, the rationing contract will be employed by financial intermediaries in both markets at a low level of the capital stocks. As capital stock accumulates to some critical level, financial intermediaries may start to offer the screening contract to entrepreneurs and the capital accumulation path will be shifted up. However, once some critical level of the capital stock is reached, consumers will prefer a screening contract and the capital accumulation may be shifted down. This could provide some additional insights in understanding the link between the credit market and the stage of economic development.