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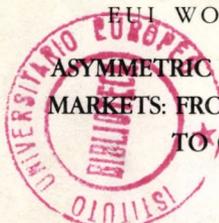
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ASYMMETRIC INFORMATION AND FINANCIAL
MARKETS: FROM FINANCIAL INTERMEDIATION
TO CREDIT RATIONING *

by

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§. 0. INTRODUCTION

During the 70's the economic analysis of uncertainty about product quality exerted a great influence on the finance and banking literature. The celebrated paper by Akerlof (1970), and the works by Spence, Stiglitz and others on adverse selection, screening, signaling, etc., concerned mainly the good and labour markets (1), but they provided an analytical framework which proved useful for the treatment of financial commodities as well. Accordingly, such problems as the nature of financial intermediation, the implications of the Modigliani-Miller theorem, rationing in the credit market, and so on, have been extensively studied within that framework.

In this literature, the analytical arguments brought forward to justify the existence of financial intermediation rely basically on cost advantages in acquiring and processing the relevant information. The aim of this work is to show how these arguments have a particular application to the specific case of credit intermediation. They also account for the possibility of credit rationing, which is viewed as a natural consequence of the kind of uncertainty bringing about financial intermediation.

In the first section of this paper the main notions used to analyse uncertainty about quality are summed up. In the second one a brief account is presented of how such notions lend themselves to a straightforward application to the analysis of financial intermediation. In other words,

financial commodities can be (and indeed have been) looked at as products the quality of which is not perfectly known to the market. A simple analytical scheme is presented in sections 3 and 4. This allows to make the argument more precise, and provides a point of reference for comparing some recent results on financial intermediation. Credit intermediation is shown to be amenable to consideration within that scheme. Credit rationing is seen as emerging naturally from the assumption that the raison d'être of credit intermediation in an informational asymmetry. Accordingly, section 5 deals with credit rationing within the basic framework of financial intermediation. Finally, section 6 provides some concluding remarks.

§. 1. ASYMMETRIC INFORMATION AND PRODUCT QUALITY

There are many markets where buyers and sellers do not have the same information about the quality of the product being traded. Several works have by now appeared, which analyse the effects of such informational asymmetry. The latter is actually a market imperfection: the relevant information cannot be produced without costs, and is therefore not acquired by some agents. It should be stressed that the uncertainty brought about by such a lack of information is not "event" (environment) uncertainty, and cannot therefore be treated

by introducing contingent markets or Arrow securities (2). The kind of uncertainty dealt with here is rather due to information being costly, and it is in principle independent of the stochastic structure of the economy (3).

Asymmetric information on product quality (the importance of which has been recognized only recently (4)) stems basically from the twofold phenomenon that quality may not be easily perceived, and some agents gain from actually concealing it. Two classes of agents can therefore be identified within a market where information is asymmetric in the sense discussed here: some agents do have the relevant information, some do not. This very simple fact brings about two different (though related) economic problems. The former is that owners of good quality products have an interest in signaling such quality to the market, but can find it difficult to do so. This is the so called signaling problem: how one can acquire features which make it possible for the market to identify the product as a good quality one. Obviously, in order that a signal be successful, it must be difficult to obtain for owners of low quality goods; that is to say, the cost of signaling must be inversely related to the quality level (5).

The latter problem concerns the non-informed agents: they may gain from acquiring the relevant information; when ever this is the case, they will try to identify the quality of the commodity being traded. This is the so-called screening problem (6). A particular kind of screening mechanism - which can be found quite often in the literature - is self-selection. One has self-selection whenever the non-informed agent is able to make it convenient for the informed one to

acquire signals which identify the true quality (7).

Signaling, screening and self-selection are all mechanisms aimed at shifting information from one side of the market to the other, i.e. overcoming the informational asymmetry. However, these mechanisms do not necessarily operate. When they do not (for whatever reason), the asymmetry of information can influence the market outcome at its fullest, and we have adverse selection phenomena. Adverse selection is said to operate whenever, due to asymmetric information, the informed agents coming to the market are not a random subset of all informed agents, but tend to form a "bad" subset: i.e., low quality goods drive high quality ones out of the market. In these cases the average quality of goods coming to the market becomes endogenous, and that usually has far reaching implications on the resulting market equilibrium.

The best known example of adverse selection is provided by Akerlof's (1970) paper. This describes a market for second hand cars (the quality of which is known to the seller, but not to the buyer). In this model the demand for cars ends up depending on price and average quality, while supply depends on price and the actual quality of the individual car offered for sale. This brings about a link between the (unique) market price and the average quality of cars being traded. Each price level will reflect average quality: the market will overvalue bad quality cars and undervalue good quality ones. At any given price, top quality cars will therefore be withdrawn, driving down average quality and hence the price level. A feedback process is set in, which eventually may

lead to non-existence of market equilibrium.

Akerlof's path-breaking example is no doubt an extreme one, but it does show that introducing asymmetric information may lead to significant changes in the standard results. Other models have shown how rationing can be the outcome in different market environments (8). At any rate, this kind of market imperfection - as is generally the case - entails welfare costs. Actually, either informational asymmetries are overcome by the above mentioned mechanisms, which are costly; or they are not, in which case adverse selection leads anyway to suboptimal resource allocations. Thus, there is a distributive problem arising in connection with asymmetric information.

Since their first formulation, it was apparent that such notions as signaling, screening, adverse selection, and the like, could be fruitfully applied to the study of financial markets (9). Accordingly, a literature developed which aimed at analysing financial intermediation in terms of asymmetric information. The very existence of financial intermediaries, as well as of particular phenomena (like credit rationing) have been accounted for in such terms.

The next sections take up some of the work done in this area, and try to provide a very simple framework for a (necessarily provisional) assessment of financial intermediation within this literature.

§. 2. FINANCIAL INTERMEDIATION AND UNCERTAINTY ABOUT PRODUCT QUALITY

Admittedly, the first theoretical problem of financial intermediation is its very existence. As is well known, in

fact, "in a perfect market environment, intermediation could perform no unique financial service that investors would be unable to reproduce as easily" (Campbell - Kračaw, 1980, p.863). This holds also when environmental uncertainty is allowed for. The introduction of Arrow securities leads actually to information on the environment (states of nature) being produced: if firms are engaged in the production of commodities subject to a given technology and a given set of states of nature, and if markets are complete and information is freely available, the markets for goods and Arrow securities will lead to a Pareto-optimal allocation under uncertainty, with no need for intermediation (10). In this sense, it has for a long time been recognised that the existence of financial intermediation has something to do with costly market imperfections (11). That is, intermediaries should have some cost advantages in performing some peculiar activities.

Under this respect, e.g., it has been argued that the relevant market imperfection is due to the existence of transaction costs. According to this approach, financial intermediaries owe their existence to their exploiting economies of scale in transaction performing; they are therefore able to secure higher welfare levels to the economy, thanks to their being - so to speak - cost reducing institutions (12). That is, since there are high costs in setting up a complete set of markets, firms and investors would have to devote a great deal of resources in order just to meet in the marketplace (or may not meet at all if the costs are prohibitively high). By bundling together several transactions, intermediaries are

therefore able to match together firms and investors, thus enlarging - so to speak - the set of market opportunities available to agents (13).

The more recent theoretical approach which is considered in this paper puts emphasis, on the contrary, on information costs: information is costly to acquire, and financial intermediaries play the role of efficient information producers.

Actually, if one assumes that there is asymmetric information between firms and potential investors (e.g., firms have better knowledge of the available technology), the notions referred to in the former section become immediately applicable. Under this assumption, in fact, the relevant information is specific to the firm, so that (a) the firm itself may face a signaling problem, due to the difficulty of informing the market; (b) the would-be investors may face a screening problem; (c) there may exist an adverse selection problem in the market, if neither signaling nor screening mechanisms can be implemented.

As in the general case formerly discussed, these phenomena do not depend, in principle, on the stochastic structure of the economy, although such a structure might become relevant if the asymmetric information about it hinges on the quality of the financial commodity (14). Accordingly, we shall rule out environmental uncertainty in the remainder of this work - in general; some discussion on the subject will become inevitable when credit rationing is dealt with.

That informational asymmetries make up a market imperfection has already been stressed. We shall see that, on the one hand, such imperfection can be relied upon as a justification of financial intermediation (e.g., when there are scale economies with respect to screening costs); on the other hand

financial commodities - due to this imperfection - can be interpreted in terms of product quality. As a matter of fact, the products traded on financial markets are just claims on output issued by firms. The quality of such claims obviously depends on the quality of the issuing firm, i.e. on its value (15). If there are some variables which (a) influence the performance of the firm, but (b) cannot be freely observed by agents outside the firm, we have the twofold consequence that (c) financial assets should be treated as heterogeneous goods, but (d) the actual quality of such assets is unknown to (part of) the market.

Both credit and stock market intermediation have been studied in the light of the above considerations. The following simple scheme provides a framework to highlight some of the conclusions which have been reached in the literature.

§.3. FINANCIAL INTERMEDIATION AND INFORMATION GATHERING

3.1. Consider a firm i operating in a one-good economy. It faces a technology which allows to produce an output $y_i > 0$ at time 1, once an amount of capital of at least \bar{x} has been invested at time 0. That is, we stipulate that output can only be produced by firm i according to the following simple relationship:

$$\left. \begin{aligned} f_i(x) &= y_i > 0 && \text{if } x \geq \bar{x} \\ f_i(x) &= 0 && \text{if } x < \bar{x} \end{aligned} \right\} \quad [A.1]$$

If there is a risk free perfect capital market establishing an interest rate r , the present value of firm i, in which an amount of capital \bar{x} has been invested, can be defined as (16)

$$V_i = y_i / (1+r) \quad [1]$$

In other words, if the rate of return on capital invested in

in firm i is r_i , the market value of one dollar invested today in such firm (relative to one dollar invested in the perfect capital market) is

$$v_i = (1+r_i)/(1+r) \quad [2]$$

The last two definitions, [1] and [2], imply a world of certainty, and that $f_i(\cdot)$ is known by the market: v_i is the price at time 0 of a claim on output y_i to be delivered at time 1 (17).

Since production takes time, the firm's manager (18) must raise capital at time 0. He will give claims on output (debts and equities) in exchange to investors, which are ranked according to the following (standard) seniority rule: at time 1, once output is realized, holders of credit contracts will be satisfied first, while equity holders will get the remainder of the produced output net of costs. The Modigliani-Miller theorem ensures that the debt/equity ratio is immaterial to the value of the firm, if financial markets are perfect and fully informed (19). That is to say, the firm's cost of capital is independent of the way capital has been raised. In this framework, since there is a perfect capital market, such cost is r .

Under full information, if $f_i(\bar{x}) > \bar{x}(1+r)$, $v_i > 1$. That is, the market does recognize that an investment \bar{x} in firm i yields a certain output $y_i > \bar{x}(1+r)$. But the recognition that $v_i > 1$, and the resulting consequences on market equilibrium, depend heavily on the assumption of full information: agents can costlessly observe the available technology $f_i(\cdot)$. We now concentrate upon this latter variable, and allow for the possibility of asymmetric information about it.

Assume there are N firms in the market, which differ only

in the technology they have access to. We also make the simplifying but inessential assumption that there are actually only two technologies (and therefore two types of firms), type 1 and type 2. There are N_1 firms of the first type and N_2 firms of the second type, such that $N_1 + N_2 = N$ (20). A.1 is assumed to hold for $i=1,2$, with the further restriction that

$$f_1(\bar{x}) > f_2(\bar{x}) \quad [A.2]$$

which implies that, under full information,

$$v_1 > v_2 \quad [3]$$

This is, of course, a trivial implication of the market perceiving the difference between the firms' production possibilities.

What happens if the market is unable to perceive such a difference? The first point to make is that there must be a reason for agents being unable to distinguish good from bad (technological) quality. The reason is that information must be costly. Thus we make the provisional assumption that it is prohibitively costly to disseminate information: each entrepreneur knows the technology he is able to use, but neither can he profitably signal, nor can the market screen, this technology. Agents outside the firm only know that there is a chance $q = N_1/N$ that a firm be "good" and a chance $(1-q)$ that it be "bad": they only know the distribution of quality across firms. If this is so, a risk neutral market will place a common evaluation on all them, which is (21):

$$\bar{v} = qv_1 + (1-q)v_2 \quad [4]$$

or, alternatively,

$$\bar{v} = qv_1 + (1-q)v_2 \quad [4']$$

for each dollar invested in a given (unrecognizable) firm.

In other words, agents have rational expectations on the (technological) quality distribution, but are unable to

distinguish between individual firms prior to trade: we have a standard case of asymmetric information about product quality (22). The situation is all in all similar to that studied by Akerlof (1970), Campbell - Kracaw (1980) and others: there exists a market price which undervalues some firms and overvalues some other firms.

As already noticed, in Akerlof's model this situation may lead to non-existence of market equilibrium. In our framework, Akerlof's result would be due to top quality firms being driven out of the market since they cannot get the whole of their value. That is, adverse selection leaves on the market only "bad" firms. This solution has been proposed, e.g., by Leland - Pyle (1977, p.371).

However, a counterargument has been put forth (23). Akerlof's model deals with a commodity market, while that discussed here is a financial market: goods are assets, i.e. claims on output, not output itself. As a consequence, Akerlof's adverse selection does not necessarily work here. In order for it to do so, either one or the other of the following remarks should apply: (a) there is a very high proportion of non profitable concerns in the market, such that investment is not profitable on average (24); (b) "good" firms can get better evaluation elsewhere, so that they indeed leave the market to "bad" firms (in which case bad quality - given the simple binomial distribution assumed here - would become evident) (25). If none of these conditions apply, adverse selection cannot operate, since good quality firms cannot get capital outside the market. So "if there are no better alternatives...(type 1 firms) will be willing

to accept this result" (Campbell - Kracaw, 1980, p.868). At any rate, this result is clearly suboptimal, since it entails that bad quality firms (which would get no capital under full information) drive away resources from good quality ones (26).

3.2. Various models have been put forth to work out how intermediation could allow a better resource allocation (27): the point is whether there is an incentive for (a coalition of) agents to specialize in information gathering activities. Obviously, for information gathering to be profitable, the related costs must be finite. The situation described in section 3.1. entails that it pays for no one to meet such costs. In this section we will allow some agents to be able to do so. Two points should be made under this respect.

(A) - On the one hand, some entrepreneurs clearly face a signaling problem. Every type 1 entrepreneur will be ready to forego up to $c_1 = -(\bar{V} - V_1)$ in order to signal the good quality of his investment project to the market (28). On the other hand, however, type 2 entrepreneurs must be willing to forego up to $c_2 = (\bar{V} - V_2)$ each to maintain the status quo (29). That is, moral hazard leads type 2 firms to convey a false signal in order to reap benefits from being wrongly identified as type 1 firms (30). Thus, without assumptions on the available signaling devices (aimed at making them (i) obtainable at a cost less than c_1 or c_2 , according to circumstances; (ii) more costly for bad quality firms to acquire), there is no a priori

reason to expect that type 2 firms would not acquire the same signal as type 1, which is equivalent to no signal at all in the market (31).

However, if such signaling devices are available at different costs to different types of firms, a signaling equilibrium may result, where type 1 firms are indeed able to be identified as good quality ones. Thus, if an incentive schedule for managers is designed, such as to induce them to choose a debt/equity ratio in connection with their firms' technology, such ratio can indeed distinguish good from bad quality. E.g., assume the following incentive schedule is imposed ex ante on managers for payment ex post (32):

$$I_i = (1+r)a_0V_i + a_1A_i \quad [5]$$

where

$$A_i = y_i \quad \text{if } y_i \geq D_i(1+r)$$

$$A_i = y_i - P \quad \text{if } y_i < D_i(1+r)$$

Here, a_0 and a_1 represent positive (less than unity) weights; D_i is the debt level of type i firms, and P is a fixed penalty imposed on bankrupt managers (33). Assume further that the market believes that D_i is a signal of quality, such that, given

$$y_2 \leq \bar{D}(1+r) \leq y_1$$

firms with $D > \bar{D}$ are treated as type 1, while firms with $D < \bar{D}$ are treated as type 2. Then, a Spence signaling equilibrium can be established in the market, such that (given the prior belief of the market) the above incentive schedule leads type 1 managers to issue debt $D_1 > \bar{D}$, and type 2 managers to issue debt $D_2 < \bar{D}$ (34). In this case, therefore, (i) the

Modigliani-Miller theorem no longer applies: the condition $D_1 > \bar{D}$ constrains the debt/equity relationship, and therefore the cost of capital to type 1 firms (and, mutatis mutandis, to type 2 firms as well) is not invariant with respect to its financial capital structure - although, of course, in equilibrium D_1 will be chosen so as to insure that actually $y_1/(1+r) = D_1 + E_1$ (E_1 : equity): the point is that D_1 cannot be anything (35); (ii) via this signaling mechanism, information is transferred to the uninformed part of the market, and the informational asymmetry is overcome by signaling devices. These actually entail different costs to (the two) different types of firms, since type 2 managers would pay a penalty if they chose $D_2 > \bar{D}$. In some sense, type 1 firms can afford to serve an higher debt, and the market believes (a priori) that this is the case (36). Similar reasoning can be found in Leland - Pyle (1977), where the manager's willingness to retain equities out of his personal wealth is used as a signal (37).

(B) - Opposite to firms, would-be investors face a screening problem. They face a firm market value which is \bar{V} irrespective of technology, since the latter cannot be freely observed. Assume the j th investor has a disposable wealth, to invest in assets, equal to W_j . He will be willing to pay up to $c_j = W_j(V_1 - \bar{V})/\bar{V}$ in order to obtain information, enabling him to separate out good from bad quality. c_j is therefore the maximum cost of screening investor j will be willing to incur (38).

Now, screening mechanisms (like certification procedures) may or may not be available at a cost less than c_j . Even if they are indeed available, however, a free-rider problem may

come about, due to the information-conveying nature of asset prices. Grossman (1976) and Grossman - Stiglitz (1976; 1980) have shown that, in rational expectation asset markets with asymmetric information, the equilibrium price is an efficient indicator of asset quality. Thus information becomes a public good (39) and cannot be protected (40).

In our case, all investors for whom c_j is less than the cost of screening (which, however, may vary across investors and/or firms) would purchase only type 1 assets. If these investors make up a sizeable share of the market, the price level of such assets will be higher in equilibrium, thus (a) making it publicly known that type 1 firms are of good quality; (b) making it no more profitable for rational expectation agents to spend resources in information gathering. Thus, under rational expectations, even a cheap screening mechanism might not be used : rational expectations equilibria do not necessarily exist in this kind of markets, and good quality entrepreneurs might end up being locked in;

3.3. Financial intermediation has been shown to be useful in overcoming both signaling and screening problems : an intermediated structure (41) can bring about a Pareto-dominating resource allocation, as compared with the asymmetric information case (42).

To take just one example, Campbell - Kracaw (1980) show that it is possible for managers of good quality firms to overcome the signaling problem (without specific quality-related signaling costs) by offering side payments to refund an investor's screening costs. If there is competition among investors, in the sense that more than one of them can screen

the market at a bearable cost (and is therefore interested in doing so), it will pay for type 1 managers up to the whole of their potential loss $N_1 c_1 = - (V_1 - \bar{V}) N_1$ in offering side payments to one investor. It is in fact the case that :

(a) it is enough for type 1 managers to pay one investor and make evident to him the high quality of their firms : since there is no event uncertainty (43), he will be ready to (raise funds in order to) purchase all assets issued by type 1 firms. On the other hand, type 2 managers should split up their total resources $N_2 c_2 (= N_1 c_1)$ to "bribe" all would-be information producers (investors), since they are asking for false information to be produced : bribed investors cannot make further profits out of the acquired information. Thus type 2 managers are doomed to loose a competitive bidding with type 1 managers.

(b) Due to competitive bidding of would-be intermediaries for type 1 managers' side payments, the latter will amount to $s_1 = c_{j+1} > c_j$, c_{j+1} being the screening cost faced by the most efficient but one investor, and c_j being the lowest bearable cost, borne by investor j .

At the end of the day, the following situation arises. At time 0, investor j constitutes an intermediary, and raises funds to acquire type 1 firms' assets; he will pay for them $N_1 V_1 - s_1$. He will be able to pay out to "depositors" (i.e. investors in the intermediary) the return on type 1 assets, retaining for himself the profit $s_1 - c_j$. Thus competitive pricing cum intermediation performs its role : type 1 firms get their value (net of information costs), depositors get market value for their investment, the intermediary gets the marginal cost of information production (44).

This kind of result crucially depends on $f_i(\cdot)$ being given: the quality of the firm is exogenous. Such an assumption has been questioned on various grounds (45), the main one being that the information acquisition process should affect such quality, as indeed is the case when good markets are dealt with (46). Thus some models were developed where the informational asymmetry concerns a variable (like "effort") whose level is chosen by the entrepreneur. The latter may be rewarded with a share of output for perquisite consumption, to be balanced against the disutility of effort (Chan, 1983); or - as is the case with some credit rationing literature - he may just enter a given cost function in the firm's profit function (47). In either case, managers are able to choose the project quality to be submitted to market evaluation, and it is not necessarily optimal for them to submit the best available quality.

Within our simple scheme, effort could be introduced by modifying [A.1] so as to have, for example (and dropping the subscript i):

$$\left. \begin{aligned} y &= e f(x) - c(e) \\ 0 &\leq e \leq 1 \\ c(0) &= 0 \\ c'(e) &> 0, \quad c''(e) > 0 \end{aligned} \right\} \text{ [A.3]}$$

where [A.1] still holds as far as $f(\cdot)$ is concerned. Here, e is effort by the entrepreneur, and $c(e)$ is a sort of cost function for effort.

[A.3] places technological restrictions on the firm's production possibilities : effort is a necessary input, and $c(e)$ is the cost of effort to the firm, due, e.g. to time

constraints in the entrepreneur's working day. That is, there is no market for effort, and therefore no market determined (opportunity) cost to be charged in the firm's statement of accounts. The only opportunity cost is given by the entrepreneur's utility function. Now, the firm's market value consistent with value maximization is given by

$$V = y^*/(1+r) \quad [6]$$

where

$$y^* = e^* f(x) - c(e^*) \quad [6']$$

e^* being chosen so as to satisfy the marginal condition for value maximization. Under full (costless) information, either [6] is indeed the firm's market evaluation, or (if the effort actually spent by the manager is $e \neq e^*$) the market will recognize that the firm is not run at its best and will react accordingly, by placing on it an evaluation $V' < V$.

However, if effort cannot be observed at all by agents outside the firm, there is no guarantee that actually $e = e^*$. As is well known from the theory of the entrepreneurial firm, in fact, profit maximizing is not necessarily consistent with the entrepreneur maximizing his utility (48). We are therefore in a principal-agent framework: the principal (investor) cannot assume that the agent (manager) will act according to the former's interest, since it is not possible to (costlessly) observe all the variables upon which, as a matter of fact, a deal is to be struck.

As a result, either a "non standard" contractual arrangement is made, or a particular market organization will arise to fill the informational gap (49). In the former case we

have principal-agent contracts, which involve information transfers via monitoring devices (for the principal) or incentive schedules (for the agent); in the latter case intermediation has been shown to step in profitably (50).

An example of this very latter case is provided by Chan (1983): he takes the case where the optimal effort level is the result of the manager's utility maximization over effort and perquisite consumption out of profits. He exploits a recent result by Chan - Leland (1982), according to which, in a commodity market where information about quality is costly, a reduction in these costs leads entrepreneurs to offer a better price/quality mix. This result is shown to hold also in the market for financial commodities : a reduction in information costs leads entrepreneurs to supply a "better" level of effort (51). By modelling information costs as search costs faced by investors, Chan is able to show that (i) the effort levels chosen by entrepreneurs depend on the distribution of search costs across investors; (ii) if some investor faces zero search cost, entrepreneurs are led to offer "better" projects, i.e. to actually make an "optimal" effort; (iii) an intermediary plays the role of a zero search cost investor : cet. par., it raises the amount of effort supplied by entrepreneurs; (iv) an intermediary is indeed able to play such a role, since he can charge his customers with the whole cost of information acquisition; (v) the intermediary is indeed able to charge effectively such a cost, since he exploits scale economies due to information being re-usable across firms (52). As a consequence, also in this case intermediation makes for a better resource allocation.

3.4. We conclude this section with some remarks on the results which have been highlighted so far.

(a) First, the unknown variable being endogenous in the second class of models is of no little consequences. Actually, if it is exogenous, the greater informational efficiency granted by intermediation allows a better allocation of resources across firms, but it does not directly hinge upon the firms' production choices. That is, it does not affect the economy's production efficiency as such (53). This is not the case when effort is dealt with. Then the existing information costs, and hence the intermediary's structure, does have a bearing on the firms' choices, and therefore on the overall accumulation process (54).

(b) Two features, which have been kept implicit so far, render information a very peculiar commodity: reliability and appropriability. It is because of reliability problems that signaling or screening mechanisms must often be implemented; and reliability of the information they produce is surely a requirement intermediaries have to abide by, if they are to survive (point (c) below). It is appropriability which justifies at the bottom the Grossman - Stiglitz non-existence result, and it may make it non-profitable for agents to acquire (produce) a piece of information whose cost they would otherwise be able to meet. This latter point is worth emphasizing: in financial markets, the value of information to an agent depends on his possibility of exploiting it on the market, while keeping it private. These two conditions are very often inconsistent with each other, since the informed agent's market activities tend to reveal his actual information: the possibility of beating the market implies privacy of information, but the very act of beating it may destroy such privacy.

(c) If financial intermediaries are able to gather information, they can solve the appropriability problem quite straightforwardly, provided they are reliable. Take an individual investor. If the asset market is perfectly competitive and he is perfectly rational (55), he may not have an incentive to acquire costly information. Thus, either no trade takes place, or it does take place at prices which do not fully reflect the assets' quality (56). But now take a reliable intermediary, i.e. one whose word is trusted. Like in the above mentioned Campbell - Kracaw model, he can spend resources in information gathering and make a profit: his incentive in doing so is not necessarily destroyed by fully revealing market prices (57). Since he is reliable, agents will like to entrust him with their funds to support his asset purchase; since he has good information, his investment will be successful and his reliability will be confirmed (58)

(d) How does an intermediary establish his reliability which - under the track being taken here - is a condition for his very existence? In some sense, intermediaries face a signaling problem, the relevant quality being the reliability of the information they produce. Therefore, as suggested by various authors, they could make use of the kind of signaling devices hinted at previously (59). In any case, and quite crucially, the conclusion which many authors get to is that reliability has to do with the intermediary's stake in the market, i.e. the relative weight of his portfolio within the financial market. That this should be so is quite intuitive. A piece of information is reliable if the market knows that the information producer has no incentive to cheat; and this incentive is the lower, the greater the intermediary's commit

ment in assets which he claims to be of good quality.

(e) This leads to the dimension of the intermediary being relevant. If reliability is linked to the intermediary's stake in the market, some more efficient information producers cannot establish themselves as intermediaries, because they do not have enough wealth to signal their reliability via high commitments to particular assets (60). That sheer dimension is relevant in the market's assessment of an intermediary's reliability is a result to be found, e.g., in Leland - Pyle (1977), Campbell - Kracaw (1980), Ramakrishnan Thakor (1984) (61). This issue will be taken up - albeit quite shortly - in the context of credit markets.

§. 4. CREDIT INTERMEDIATION AND ASYMMETRIC INFORMATION

4.1. In the former section financial intermediation in general has been dealt with. To the extent to which the Modigliani-Miller theorem holds, what has been said there can be extended to cover the specific case of credit intermediation, albeit with some minor modifications. As section 4.2 emphasizes, these all stem from the fact that default of the borrowing firm is really the event in which a lender (i.e. a debt owner) is interested in.

Obviously, the conditions under which credit intermediation is profitable are not necessarily enough to pin down the actual structure of the (intermediated) credit market. Within the present framework, reliability (section 4.3) plays a key role. Reliability constraints can in fact be imposed which depend also on the distribution of screening costs across would-be intermediaries. Moreover, the distribution of output possibilities across firms (and hence of the signaling costs they are ready to bear) has obvious

implications on the demand for credit (section 4.4).

As a result, the actual working of the credit market within this simple scheme depends heavily on how information is acquired by agents, and this - as section 5 tries to show - leads to the possibility of credit being rationed.

4.2. By resorting to the simple scheme used previously, we may say that a firm i defaults if $y_i < D_i(1+r)$, r being the rate at which the (fixed size) loan D_i has been made: default entails negative equity value. Thus, under full information, a firm is known (at time 0) to be defaulting at time 1 if $V_i < D_i$.

We again consider firms of types 1 and 2, for which [A.1] and [A.2] hold. We add the more restrictive assumption that type 2 firms are so bad as to be doomed to default. That is, the firms' actual values are such that

$$\begin{aligned} D_1 < V_1 > V_2 \\ D_2 > V_2 \end{aligned} \quad [A.4]$$

Under full information, $V_1 > V_2$ is recognized by the market. Moreover, at time 0 no one would lend out to type 2 firms, which are going to default for sure. In other words, a one dollar loan made (at time 0) at the (market) rate r to a type 2 firm is an asset whose value is less than unity : no one is going to buy it.

Assume however that there is asymmetric information about $f_i(\cdot)$, as defined in section 3 . Then the market evaluation of one dollar lent out to an unrecognizable firm is

$$\bar{d} = q + (1 - q) v_2 \quad [7]$$

where, by [A.4] , $v_2 < 1$ and, by definition, $0 < q < 1$. Both variables are known by the market (which cannot distinguish

between individual firms). As a consequence, $\bar{d} < 1$ (62). That is to say, a risk neutral market will place an evaluation on debt which allows no firm (including type 1) to get credit. Within this simple framework, so long as asymmetric information persists and there is a positive number of non-profitable firms, there will not exist a credit market where investors can directly purchase debt assets from the firms pictured here.

This is quite a strong case, and obviously an extreme one, since [A.4] is much stricter than [A.2]. Moreover, the distribution of firms' quality is rather "crude", so to speak, allowing only for the no-credit-at-all/credit-to-all alternative. But the main message is the same as in section 3: under asymmetric information some possible gains from trade are foregone.

We can invoke an argument similar to that put forth in section 3 in order to justify credit intermediation. Each type 1 firm is asking for a loan of size D_1 . If it could be identified by the market and get it, its market value, by [A.4], would be $V_1 > D_1$. Any cost $c_1 < V_1 - D_1$ would therefore allow the firm to stay in business and make a profit. Hence type 1 firms will be willing to forgo an amount $c_1 \leq V_1 - D_1$ in order to convey information to the market. That is, they are willing to pay

$$c_1 \leq y_1 / (1+r) - D_1 \quad [8]$$

for signaling good quality. Given D_1 this amounts to saying that each type 1 firm can accept an interest rate

$$\bar{r} \leq r (1 + c_1 / D_1) + c_1 / D_1 \quad [8']$$

and still make a non-negative profit (63).

If an intermediary is able to acquire information at an average cost $\bar{c} < c_1$ per firm, trade might profitably

take place. The (reliable) intermediary would raise capital by promising to pay an interest rate r . He would lend out to type 1 firms at a rate \bar{r} , and will earn a profit

$$p = \bar{r} - r - \bar{c}/D_1 \quad [9]$$

per dollar lent. Such profit is positive so long as \bar{r} lies in the interval

$$r(1 + c_1/D_1) + c_1/D_1 \geq \bar{r} > r + \bar{c}/D_1 \quad [10]$$

Since $\bar{c} < c_1$ (and $r > 0$) there is room for the intermediary making a profit (64). Thus intermediation could profitably step in even in this very simple framework.

4.3. That intermediation might profitably step in does not imply that it will in fact do so. As was argued in the former section, in fact, an intermediary must be reliable in order to perform its information producing activity.

In order to bring out this point more clearly within the simple scheme developed in sections 3 and 4.2, suppose agents believe a priori that a would-be intermediary is reliable only if he acquires debt contracts from (as yet unrecognizable) firms out of his personal wealth, for an amount of the latter at least equal to \bar{w} . Whatever the distribution of information costs across agents (even if the conditions described in section 4.2 are satisfied), there is no guarantee in this case that an intermediary will actually arise.

In particular, if c_j is the overall screening cost faced by agent j , whose personal wealth is w_j , he will be willing to invest \bar{w} in debt contracts only if

$$\bar{w} \leq w_j \quad [11]$$

$$(\bar{w} - c_j)(1 + \bar{r}) \geq \bar{w}(1 + r) \quad [11']$$

where \bar{r} ($> r$) is the interest rate he is able to charge on firms as a refund for screening costs, as from [10]. [11] is the constraint that \bar{w} be taken out of personal wealth (otherwise the potential investor could always borrow from the perfect capital market). Actually, the above double constraint can be re-written as

$$w_j \geq \bar{w} \geq \bar{w} \frac{1+r}{1+\bar{r}} + c_j \quad [11'']$$

Given \bar{w} , [11''] and [10] impose a reliability constraint on the subset of agents (described by the pair (c_j, w_j)) who will find it profitable to engage in credit intermediation. This subset may be empty if \bar{w} does not satisfy [11], or if the distribution of c_j and w_j across agents are such that no one satisfies [11''] or [10].

Of course, this very sketchy framework is not sufficient to yield precise indications on the actual working of the credit market. Whether or not intermediaries emerge will depend on parameters like w_j , c_j , \bar{w} . But establishing whether or not the resulting (if any) intermediated credit market is competitive would require much more detailed modelling and more precise assumptions. However, if the existing reliability constraints - like the simple one introduced here - are so binding as to yield "few" credit intermediaries, a non-competitive market process is likely to emerge.

4.4. The assumptions on the screening costs firms are ready to meet have an obvious bearing on the demand for credit they will express. Actually, according to [10],

the interest rate \bar{r} charged by any intermediary must be such that

$$r(1 + c_1/D_1) + c_1/D_1 \geq \bar{r} > r + \bar{c}/D_1 \quad [10']$$

where \bar{c} is the bank's average information cost per firm. Throughout this section a fixed size loan has been assumed: D_i is the same for all type i firms. So one can take $D_1 = 1$ without loss of generality. Thus we can write

$$r(1 + c_1) + c_1 \geq \bar{r} > r + \bar{c} \quad [10']$$

$r + \bar{c}$ is the lower limit, which is given by the banker's costs: the interest rate on the perfect capital market (at which the banks raise their funds) plus \bar{c} , the average cost of screening. The upper limit is given by the condition that a bank will not make a loan to a defaulting firm. In fact, the equation

$$\bar{r} = r(1 + c_1) + c_1 \quad [12]$$

gives the maximum interest rate that a firm, whose highest bearable signaling cost is c_1 , can accept without defaulting. It is a sort of reservation interest rate. Under perfect information ($c_1 = 0$), $\bar{r} = r$, since type 1 firms could apply to the perfect capital market (65). Thus, type 2 firms are those which would default at the perfect competitive rate r ; type 1 firms can default at \bar{r} if \bar{r} violates the left hand side of [10'], and therefore [12] establishes their no-default reservation rate. If output varies across type 1 firms, lower levels of \bar{r} allow more type 1 firms to get credit without defaulting.

Of course, supply conditions will affect the market outcome. In addition to [10'], reliability constraints will influence the competitive structure of the market.

Assume for simplicity's sake that w_j and c_j are so dis

tributed that, given \bar{w} , only one banker emerges as credit intermediary: his first choice variable will be the interest rate \bar{r} (66). Then, by paying c_j the banker is able to perfectly discriminate among customers. He will charge them with their no-default reservation interest rate. If output varies across type 1 firms, some of them might not be served, since $c_j > 0$ (67). Thus, costly information may lead to denying credit to some firms which would get it under full information. It follows that, if $c_j = 0$, all type 1 firms will be served and the outcome will be efficient: those firms are served, which would have been served under full information (68).

So, within a very simple framework, it has been shown how the existence of the (intermediate) credit market and some of its features can be accounted for in terms of costly information. There remains to see how adverse selection effects and credit rationing can emerge due to the same kind of uncertainty. Some possible extensions in this direction are taken up in the next section.

§.5. FROM CREDIT INTERMEDIATION TO CREDIT RATIONING: SOME POSSIBLE EXTENSIONS

In general, existing studies do not pay a great deal of attention to credit intermediation per se as founded on informational asymmetries (69). Research has rather been devoted to credit rationing as the optimal response by existing intermediaries to adverse selection phenomena (70).

Within the simple framework formerly discussed, adverse selection led to non-existence of credit markets in which investors could directly lend to firms. An intermediary has been

shown to be able to profitably step in and overcome the existing informational asymmetries. Given some reliability constraint, the banks were able to rule out completely adverse selection. That is, they could successfully screen the market thanks to some available devices, the cost of which was exogenously given.

Under these conditions, credit cannot be rationed by definition: there is no residual quality uncertainty to trigger adverse selection, which in turn is the main cause of non-price rationing in recent credit market models (71). So, the following question arises: how does credit rationing fit in our framework?

(A) - One very simple but unsatisfactory way out is the assumption that quality uncertainty concerns more than one variable, upon one of which there are no available screening devices, in such a way that the available ones make it profitable for a bank to enter the market. An example can be provided quite straightforwardly. We could modify [A.1] and include a random variable R , such that

$$\left. \begin{aligned} y_i &= Rf_i(x) \\ E(R) &= 1 \end{aligned} \right\} \quad [A.1']$$

where [A.1] still holds as far as $f_i(\cdot)$ is concerned. Assume the distribution of R depends on a "risky" parameter h , which measures the spread of realizations of R about its mean, without affecting the latter (72). Then, in a risk neutral market, all conclusions reached in section 4 would hold here. On average, type 2 firms would default, and type 1 would not. Al though - obviously - for some realizations of R the contrary case might obtain, this is immaterial to risk neutral agents.

In this framework, banks can profitably step in and screen type 1 firms. If h varies across firms and there is asymmetric information also about this risky parameter, however, credit could indeed be rationed as in the well known model by Stiglitz - Weiss (1981) (73). That is, the general framework used in the former section could actually be amended to include a credit rationing model. This solution is, however, very unsatisfactory. Credit rationing does arise from the very same kind of uncertainty which brought about credit intermediation, but the former is absolutely independent of the latter, while the above inclusion is highly model-specific.

(B) - In a more coherent fashion, credit rationing should be related to the intermediary's decision to enter the credit market. Given that the framework we worked with is a screening/signaling equilibrium, the "residual" asymmetric information which could yield rationing in the credit market should be the outcome of the banker's optimal choice to stop short of full information (74). In this sense, the necessary amendment to our previous scheme concerns simply the screening cost function. It seems reasonable that more information is more costly to acquire than less information. The would-be intermediary will compare the marginal expected profit from acquiring a given bit of information with the related marginal cost (75). Thus, there may be theoretically satisfying and empirically plausible circumstances under which the intermediary's optimal decision is to enter the market and ration credit, i.e. to step in without fully serving the extant demand (76).

Point (B) above amounts clearly to no more than a very rough account of the broad lines along which further research

might be carried on; but it does provide a tentative modelling strategy to describe the intimate connection between intermediation and rationing.

§.6. CONCLUDING REMARKS

As has been argued recently, imperfect information has dramatic implications for the nature and working of capital markets (77). It gives rise to institutions (like banks) specialized in information gathering and processing; and it leads such institutions to implements non-price mechanisms to allocate credit among customers whose creditworthness is uncertain.

This work has provided some tentative steps towards a more precise theory of the common strand which links these two distinct - but strictly connected - phenomena. It emphasized how financial intermediation in general (and credit intermediation in particular) can make for some gains from trade which could not be achieved otherwise.

Although further research is badly needed, imperfect information seems therefore to ~~shed some~~ light on ~~the~~ direction such research should move to.

FOOTNOTES

(1) See, e.g., Riley (1975), Rothschild - Stiglitz (1976), Spence (1973), Wilson (1977).

(2) As is well known, Debreu (1959, ch.7) extended the standard model of general competitive equilibrium to the (environmental) uncertainty case by introducing state-contingent claims on commodities : with m goods and n states of nature, the competitive allocation is achieved via $n \times m$ prices. Arrow (1964) showed that such an allocation can also be achieved by introducing n "Arrow securities" (one for each state, paying one unit of account if the related state occurs) without markets for contingent commodities. The competitive allocation is therefore reached via $n + m$ prices. This result is equivalent to a complete insurance against every possible state of nature. Radner (1968) extended this treatment to the case where markets are incomplete in the sense that some states cannot be perceived by agents, and trade for contingent commodities is limited by the states agents can actually identify. The resulting optimal allocation is such only relative to a given information structure. A Radner equilibrium exists also in the case where agents have different information on the environment, provided uncertainty about the other agents' behaviour is ruled out. In particular, prices must be known with certainty (Radner, 1968, pp.54-55): market uncertainty is ruled out.

(3) A distinction can actually be drawn between "market uncertainty" and "event uncertainty" (Hirshleifer - Riley, 1979, pp.1376-77). The former is related to imperfect information on endogenous variables ("states of the market"), the latter to imperfect information on exogenous variables ("states of nature"). Thus, e.g., uncertainty about the weather is, of course, event uncertainty, while uncertainty about prices (like in standard search models) is market uncertainty. Quality uncertainty may - to some extent - be considered market uncertainty, since (as we shall see) the quality of commodities actually traded on the market is endogenous in this sort of models. These two types of uncertainty may be somewhat studied within a common analytical framework, known as "information structure". See, e.g., Nermuth (1982).

(4) As is well known, Akerlof (1970) first drew attention on the effects of asymmetric information about product quality.

- (5) A well known example is provided by Spence (1973) in a model where education can be used as a signal to sort out workers of different productivity.
- (6) See, e.g., Stiglitz (1975). Examples of screening mechanisms may be probatory periods for newly hired staff, certification procedures, and the like.
- (7) An example of self-selection is provided by Rothschild - Stiglitz (1976) : in an insurance market, firms can separate out bad from good risks by using different contracts which attract different types of customers.
- (8) This happens, e.g., in the Rothschild - Stiglitz (1976) insurance market model (under some conditions) and also, among others, in the credit market model by Stiglitz - Weiss (1981).
- (9) E.g., see Akerlof (1970, pp.497-99).
- (10) See, e.g., Draper - Hoag (1978). In a setting like that described in the text intermediation is not necessary because agents can achieve whatever package of claims they desire by simply trading in Arrow securities : any state of nature (if markets are complete) can be insured against, and firms can always take insurance against any state, including those in which they would default. See, e.g., Mossin (1977, part II).
- (11) Campbell - Kracaw (1980, p.863).
- (12) E.g., Benston - Smith (1976) consider the financial intermediary as a producer of "financial commodities", the demand for which is derived from maximization of the agents' intertemporal utility over consumption. Purchasing financial commodities allows inter- and intra-temporal transfers of consumption, which would be otherwise too costly. Higher utility levels can be achieved via intermediation, since the intermediary can exploit scale economies in the production of financial commodities (pp.222-223). In this sense financial intermediation is justified by the existence of transaction costs, and can (partially) overcome market incompleteness. Baltensperger (1980, p.1) simply refers to "the existence of transaction and information costs".
- (13) Gale (1982, pp.184-89) argued (in connection with the "fundamental properties of money") that information costs are what "lies at the bottom of any difference between money and other assets". That is, money is defined as an asset the quality

of which is absolutely certain (apart from inflation consideration). Properties of money like liquidity simply derive from the fact that there is no need to check the trustworthiness of the asset "money". In this sense, transaction costs (of the kind studied by Benston - Smith) can just be seen as information costs: if all agents were fully trustworthy, there would be no need for sequential budget constraints, and hence the intertemporal transfer of wealth and consumption would not be a problem. Only if there is some probability of agents being "dishonest" is a sequence of budget constraints necessary. Then, financial intermediation might indeed be seen as exclusively motivated by lack of information; that is, market incompleteness has something to do with agents not being fully trustable.

(14) See Draper - Hoag (1978). An obvious example is Stiglitz - Weiss (1981).

(15) That is, credit is a "named commodity": in so far as have different probabilities of honouring the claims they issued, no credit (or equity) contract is the same as another (Gale, 1982, p.186).

(16) In general, the firm's value is given by discounting (at the relevant rate) its returns net of material costs (including capital depreciation if capital is to be replaced) but gross of capital costs. In our two-period example, the firm is liquidated at the end of period 1, so there is no capital replacement, neither are there any costs but those of capital. Hence, the relevant return is given by output itself.

(17) Since we are in a one-good economy, the spot price at time 1 of one unit of output is just unity. In our framework we are not concerned with the equilibrium relative price of forward vs spot price of output, since this would imply considerations about the nature of the firm's choice variable in investment decisions.

(18) "Manager" and "entrepreneur" are used as synonymous. It is assumed that the manager is paid a given wage which enters the firm's costs (which in turn, however, are not considered in determining the firm's value, since this does not alter the gist of the argument).

(19) As we shall see later on, the Modigliani-Miller theorem ceases to hold in some cases where asymmetric information is allowed for.

(20) The extension to the continuous case is rather straight forward.

(21) Given asymmetric information about quality, but cost less information about prices, the competitive market price must be unique (e.g., Akerlof, 1970).

(22) A similar framework for financial markets has been used by Campbell - Kracaw (1980) and Ross (1977).

(23) Campbell - Kracaw (1980, p.868, fn.9).

(24) That is, suppose $v_1 > 1 > v_2$, and q be such that $\bar{v} = qv_1 + (1 - q)v_2 < 1$. In this case no one would invest resources in any firm, although type 1 firms are indeed profitable.

(25) These two conditions are not necessary within a commodity market, like that considered by Akerlof (1970). Within that framework, in fact, a commodity which is not sold is anyway "enjoyed" by the owner (i.e. it enters his utility function): it is precisely the availability of the consumption alternative which defines a reservation price, under which the market evaluation is not worth the utility evaluation of the commodity. In a financial market framework, when (a) or (b) are not satisfied a firm with a need for capital cannot do better than accepting the market outcome.

(26) I.e., good quality firms are actually subsidizing bad quality ones: good quality firms are "locked in" (e.g., Akerlof, 1970, p.489).

(27) E.g., Campbell - Kracaw (1980), Chan (1983), Diamond (1984), Draper - Hoag (1978), Leland - Pyle (1977), Ramakrishnan - Thakor (1984). These works all deal with the particular issue of financial intermediation, although Ramakrishnan and Thakor provide a somewhat more general framework. On intermediation as such in a general (game theoretic) equilibrium framework, see Townsend (1983).

(28) Campbell - Kracaw (1980), Ross (1977, pp.26-27).

(29) Campbell - Kracaw (1980, p.868). Notice that $c_1 = -(\bar{V} - V_1) = (1-q)(V_1 - V_2)$, and $c_2 = (\bar{V} - V_2) = q(V_1 - V_2)$. Thus, $c_1 \geq c_2$ according as $q \leq \frac{1}{2}$; that is, according to the proportion of good and bad firms in the market. However, the total resources available for signaling are the same, since $N_1 c_1 = N_2 c_2$.

(30) There is moral hazard here, due to the actions of type 2 firms influencing the cost of signaling borne by type 1 firms. Adverse selection operates in so far as asymmetric information affects the quality mix actually traded in the market.

(31) As already noticed, different signals should be acquired by different types of firms (i.e. should entail different costs for them) in order to be successful. See Spence (1973) and Nermuth (1982, ch.s 1-2).

(32) Adapted from Ross (1977).

(33) P is not necessarily a bankruptcy cost imposed on the firm as such. Bankruptcy costs on the firm play a role in some credit rationing literature, following Jaffee - Russell (1976).

(34) Ross (1977, pp.27 ff.) provides an account for this statement. In this case, signaling involves a costless contingent contract, like in Bhattacharya (1980). However, dead weight losses may arise from signaling if the ex post outcome cannot be costlessly observed. This is the case with the Leland-Pyle signaling model (1977).

(35) As is well known, the Modigliani-Miller theorem has been extended to the event uncertainty case by Stiglitz (1969). The theorem ceases to hold when the available set of Arrow securities is incomplete (i.e. there are fewer linearly independent securities than states of nature), such that a default state cannot be insured against (Stiglitz, 1969; Mossin, 1977, ch.9). Thus, in our case, the theorem does not hold since - in some sense - asymmetric information in the market imposes a constraint on the firm's behaviour which cannot be insured against.

(36) The prior belief of the market is the core of Spence's (1977) signaling model. Signaling equilibria of this kind are

weak, in the sense that, provided the signaling variable lies in the equilibrium range, there is a whole continuum of possible equilibrium positions. See Riley (1975).

(37) Leland - Pyle (1977) make use of a capital pricing asset model where, due to asymmetric information, the value of the firm increases with the share of equity held by the entrepreneur. A similar result - but in a completely different framework - is to be found in Baltensperger (1976), where debt and equity are treated according to Lancaster's "commodity characteristics" approach.

(38) Given W_j , the investor has the alternative between the purchase of $n = W_j/V$ assets at the average evaluation, and the purchase of $n^* = (W_j - c_j)/V$ assets of type 1 firms. He will be willing to spend resources in information gathering up to the point where $n = n^*$, from which c_j is easily derived.

(39) The "public good" character of information lies in the possibility that the informed agent transfers it without having to part from it.

(40) It cannot be protected in so far as the informed agent's actions lead to information being revealed. The effects on the incentive to information gathering derive from the crucial assumption that trade takes place only in equilibrium. The Grossman-Stiglitz result entails that a perfectly informed market equilibrium cannot exist because, if information is perfect, equilibrium prices must reflect asset values, but in this case there is no incentive to acquire information. Hence only imperfect information equilibria do exist (see also Stiglitz, 1982). A contrary opinion is that by Hirshleifer (1971), which however implicitly "assumes irrationality and/or noncompetitive behavior" (Stiglitz, 1982, p.119).

(41) The term is by Townsend (1983).

(42) However, since information is costly, the outcome will be in any case a second best solution. This opens up the possibility of government intervention to constrain the intermediaries' behaviour, although any assessment of such an issue must consider the competitive structure of the intermediary sector. These points are not taken up here. See, e.g., Wood (1981).

(43) Event uncertainty would bring in risk attitude considerations, which would complicate matters with no substantial improvement on the gist of the question.

(44) Since $s_j = c_{j+1}$, $s_j - c_j = c_{j+1} - c_j$ is the marginal cost of information production across producers (each producer has a fixed cost). The above model, due to Campbell - Kracaw (1980), assumes honest behaviour. The possibility of dishonest behaviour brings in the question of the reliability of the intermediary, which is taken up later.

(45) E.g., Chan (1983, p.1544).

(46) Chan - Leland (1982).

(47) E.g., Clemenz (1986).

(48) That is, it is not necessarily the case that the amount of effort optimally chosen by a manager with respect to his tastes is such as to maximize market-valued profits, i.e., profits gross of effort, which is not market valued. See, e.g., Gravelle - Rees (1981, ch.13).

(49) Draper - Hoag (1978, p.597).

(50) Diamond (1984), Draper - Hoag (1978), Chan (1983).

(51) Even in the very simple framework described by [A.3], under asymmetric information there is no guarantee that an entrepreneur maximizing utility $u(c, e)$ over consumption and effort, will pick up the value maximizing level of effort. Actually, assume he is paid out of a share of output, k . Then his optimal choice will satisfy

$$-(u_e/u_c) = k(f(x) - c'(e))$$

where u_c and u_e are first partials (u_e is negative). The firm's value is maximized when the right hand side is zero, but nothing ensures that the entrepreneur will pick actually up such a point.

(52) This depends on the above-mentioned "public good" feature of information.

(53) As Chan (1983, p.1544) emphasizes, this parallels Hirshleifer's (1971) idea that information may have no social value, in so far as its acquisition induces no changes in production.

(54) Strictly speaking, asymmetric information with exogenous firm quality does affect production decisions, in so far as zero production is always an open alternative. But it does not affect the level of production, once the decision to produce has been taken.

(55) On the notion of rationality which leads to this kind of results, see Stiglitz (1982, pp.123 ff.).

(56) That is, prices reflect information only partially, as in Grossman - Stiglitz (1980).

(57) If an intermediary is reliable, he can raise funds to purchase financial assets - about which he can acquire costly information. His incentive in acquiring information is not destroyed by the Grossman-Stiglitz result, since asymmetric information makes it convenient for the market to pay for information producing activities, via the firms' side payments.

(58) Campbell - Kracaw (1980) emphasize how reliability constraints must be imposed in face of dishonest behaviour on the intermediary's part. See also Draper - Hoag (1978).

(59) E.g., Leland - Pyle (1977) suggest that the acquisition of financial assets out of the intermediary's personal wealth could be used as a signal. This suggestion is pursued in some detail in section 4.

(60) Campbell - Kracaw (1980, pp.879 ff.). That is, reliability does solve the information production problem, but can put back market inefficiency by acting as a barrier to entry in the intermediation market.

(61) Chan (1983) should also be quoted, although his result is not directly connected with the size issue. In his model, there cannot be "too many" intermediaries in financial markets for the latter to have a competitive equilibrium, since other wise a Grossman - Stiglitz (1980) non-existence result would obtain. In Ramakrishnan - Thakor (1984), information producers have an incentive to form coalitions engaged in financial intermediation. This incentive arises out of the propensity of the information producers to generate unreliable information: the related monitoring costs decreases as more and more information producers join the coalition.

(62) $\bar{d} < 1$ is a sort of Akerlof result: no equilibrium exists in the market. In contrast with the case described in section 3, here the debt value has a ceiling which is given by its face value; hence the presence of default is enough to make debt valueless (good firms cannot counterbalance bad ones, since there a ceiling to the performance of the former).

(63) Of course, [8'] simply gives an acceptable range for the interest rate charged on loans. It implies nothing as to the actual possibility that a banker be able to impose an interest rate within that range. This will depend on the competitive conditions of the (intermediated) credit market.

(64) There is obviously a relationship between c_j (the overall screening cost that would-be bankers can bear) and \bar{c} (the average screening cost). This average will be computed on customers actually served, the number of which is determined cet.par., by \bar{F} (the particular level of which, however, cannot be established in the present framework). As a consequence, in general $\bar{c} \neq c_j/N$.

(65) Under perfect information, $c_1 = 0$ not because $V_1 = D_1$, but simply because there is no need to acquire further information, so that type 1 firms will be willing to forego no resources at all to signal their quality.

(66) This is natural, given that the loan size is fixed. However, he might choose to ration credit by random rejection of applicants (if rationing conditions are satisfied, of the kind hinted at in section 5).

(67) In particular, those firms for which $V_1 - D_1$, albeit positive, is so low that they cannot be charged the average screening cost \bar{c} without defaulting.

(68) This is the standard result of a perfectly discriminating monopolist. It should be noticed that the credit market model by Jaffee - Modigliani (1969) derives rationing from the monopolist's inability to perfectly discriminate among customers.

(69) See, e.g., Baltensperger (1980), Fama (1980).

(70) For a survey of the credit rationing literature before the introduction of the asymmetric information issue, see Baltensperger (1978). For a survey on the literature on asymmetric information credit rationing, see e.g., Devinney (1986, ch.2). It should be stressed that this literature is concerned with the optimal choice of rationing : it is therefore in contrast with the so-called disequilibrium theory, where prices are exogenously assumed to be fixed.

(71) Path-breaking works are those by Jaffee - Russell (1976) and Stiglitz - Weiss (1981).

(72) That is, h is a mean preserving spread of the Stiglitz type, as proposed by Rothschild - Stiglitz (1970).

(73) Actually, Stiglitz and Weiss assume also that the bank is able to put a collateral, which plays quite a significant role in their analysis. On this point, see Bester (1985).

(74) A study which goes somewhat in this direction is that by Callaway - Thakor (1983).

(75) Obviously, this would entail an analysis of the "value of information" to the bank, a general framework for which has been put forth by Gould (1974).

(76) The actual working of such a model should solve such problems as:(i) the "type" of rationing (Keeton, 1979); (ii) the variable upon which there is asymmetric information; (iii) the availability of rationing instruments other than the interest rate, like collateral and bank services. See, e.g., Clemenz (1986).

(77) Blinder - Stiglitz (1983).

BIBLIOGRAPHY

- AKERLOF, G. (1970): "The Market for Lemons: Qualitative Uncertainty and the Market Mechanism", Quarterly Journal of Economics, LXXXIV, 488 - 500.
- ARROW, K. (1964): "The Role of Securities in the Optimal Allocation of Risk Bearing", Review of Economic Studies, XXXI, 91 - 96.
- BALTENSPERGER, E. (1976): "The Borrower - Lender Relationship, Competitive Equilibrium and the Theory of Hedonic Prices", American Economic Review, LXVI, 401 - 405.
- BALTENSPERGER, E. (1978): "Credit Rationing. Issues and Questions", Journal of Money, Credit and Banking, X, 170 - 183.
- BALTENSPERGER, E. (1980): "Alternative Approaches to the Theory of the Banking Firm", Journal of Monetary Economics, VI, 1 - 38.
- BENSTON, G.J. - SMITH C.W. (1976): "A Transaction Cost Approach to the Theory of Financial Intermediation", Journal of Finance, XXXI, Papers and Proceedings, 215 - 231.
- BESTER, H. (1985): "Screening Versus Rationing in Credit Markets with Imperfect Information", American Economic Review, LXXV, 850 - 855.
- BHATTACHARYA, S. (1980): "Nondissipative Signalling Structures and Dividend Policy", Quarterly Journal of Economics, XCV, 1 - 24.
- BLINDER, A.S. - STIGLITZ, J.E. (1983): "Money, Credit Constraints, and Economic Activity", American Economic Review, LXXIII, Papers and Proceedings, 297 - 302.
- CALLAWAY, R. - THAKOR, A.V. (1983): "Costly Information Production Equilibria in the Bank Credit Market With Application to Credit Rationing", Journal of Financial and Quantitative Analysis, XVIII, 229 - 256.

CAMPBELL, T.S. - KRACAW, W.A. (1980): "Information Production, Market Signalling and the Theory of Financial Intermediation", Journal of Finance, XXXV, 863 - 882.

CHAN, Y.S. (1983): "On the Positive Role of Financial Intermediation in the Allocation of Venture Capital in a Market With Imperfect Information", Journal of Finance, XXXVIII, 1543 - 1568.

CHAN, Y.S. - LELAND, H.E. (1982): "Prices and Qualities in Markets with Costly Information", Review of Economic Studies, XLIX, 499 - 516.

CLEMENZ, G. (1986): "Variable Loan Size and Credit Rationing", University of Vienna, mimeo

DEBREU, G. (1959): Theory of Value, Wiley, New York.

DEVINNEY, T.M. (1986): Rationing in a Theory of the Banking Firm, Springer Verlag, Berlin - New York.

DIAMOND, D.W. (1984): "Financial Intermediation and Delegated Monitoring", Review of Economic Studies, LI, 393 - 414.

DRAPER, D.W. - HOAG, J.W. (1978): "Financial Intermediation and the Theory of Agency", Journal of Financial and Quantitative Analysis, XIII, Papers and Proceedings, 595 - 611.

FAMA, E. (1980): "Banking in the Theory of Finance", Journal of Monetary Economics, VI, 39 - 57.

GALE, D. (1982): Money: in Equilibrium, Cambridge University Press, Cambridge - New York.

GOULD, J.P. (1974): "Risk, Stochastic Preference and the Value of Information", Journal of Economic Theory, VIII, 64 - 84.

GRAVELLE, H. - REES, R. (1981): Microeconomics, Longman, London - New York.

GROSSMAN, S. (1976): "On the Efficiency of Competitive Stock Markets Where Traders Have Diverse Information", Journal of Finance, XXXI, 573 - 585.

- GROSSMAN, S. - STIGLITZ, J.E. (1976): "Information and Competitive Price Systems", American Economic Review, LXVI, Papers and Proceedings, 246 - 253.
- GROSSMAN, S. - STIGLITZ, J.E. (1980): "On the Possibility of Informationally Efficient Markets", American Economic Review, LXX, 393 - 408.
- HIRSHLEIFER, J. (1971): "The Private and Social Value of Information and the Reward to Incentive Activity", American Economic Review, LXI, 561 - 574.
- HIRSHLEIFER, J. - RILEY, J. (1979): "The Analytics of Uncertainty and Information. An Expository Survey", Journal of Economic Literature, XVII, 1375 - 1421.
- JAFFEE, D.M. - RUSSELL, T. (1976): "Imperfect Information, Uncertainty and Credit Rationing", Quarterly Journal of Economics, XC, 651 - 666.
- KEETON, W.R. (1979): Equilibrium Credit Rationing, Garland, New York, London.
- LELAND, H.E. - PYLE, D.H. (1977): "Informational Asymmetries, Financial Structure and Financial Intermediation", Journal of Finance, XXXII, Papers and Proceedings, 371 - 387.
- MOSSIN, J. (1977): The Economic Efficiency of Financial Markets, Lexington Books, Lexington.
- NERMUTH, M. (1982): Information Structures in Economics, Springer Verlag, Berlin - New York.
- RADNER, R. (1968): "Competitive Equilibrium Under Uncertainty", Econometrica, XXXVI, 31 - 58.
- RAMAKRISHNAN, R.T.S. - THAKOR, A.V. (1984): "Information Reliability and a Theory of Financial Intermediation", Review of Economic Studies, LI, 415 - 432.
- RILEY, J. (1975): "Competitive Signaling", Journal of Economic Theory, X, 174 - 186.
- JAFFEE, D.M. - MODIGLIANI, F. (1969): "A Theory and Test of Credit Rationing", American Economic Review, LX.

ROSS, S.A. (1977): "The Determination of Financial Structure: The Incentive-Signaling Approach", Bell Journal of Economics, VIII, 23 - 40.

ROTHSCHILD, M. - STIGLITZ, J.E. (1970): "Increasing Risk I: A Definition", Journal of Economic Theory, II, 225 - 243.

ROTHSCHILD, M. - STIGLITZ, J.E. (1976): "Equilibrium in Competitive Insurance Markets: an Essay on the Economics of Imperfect Information", Quarterly Journal of Economics, XC, 629 - 650.

SPENCE, M. (1973): "Job Market Signaling", Quarterly Journal of Economics, LXXXVII, 355 - 379.

STIGLITZ, J.E. (1969): "A Re-examination of the Modigliani-Miller Theorem", American Economic Review, LIX, 784 - 793.

STIGLITZ, J.E. (1975): "The Theory of Screening, Education, and Distribution of Income", American Economic Review, LXV, 283 - 300.

STIGLITZ, J.E. (1982): "Information and Capital Markets", in W.F.SHARPE - C.M.COOTNER (ed.s), Financial Economics. Essays in Honor of Paul Cootner, Prentice Hall, Englewood Cliffs, 118 - 158.

STIGLITZ, J.E. - WEISS, A. (1981): "Credit Rationing in Markets With Imperfect Information", American Economic Review, LXXI, 393 - 410.

TOWNSEND, R.M. (1983): "Theories of Intermediated Structures", in K.BRUNNER - A.H.MELTZER (ed.s), Money, Monetary Policy and Financial Institutions, Carnegie-Rochester Conference Series on Public Policy, Vol.18, North-Holland, Amsterdam, 221 - 272.

WILSON, C. (1977): "A Model of Insurance Markets With Incomplete Information", Journal of Economic Theory, XVI, 167 - 207.

WOOD, J.H. (1981): "Financial Intermediaries and Monetary Control", Journal of Monetary Economics, VIII, 145 - 163.

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