Endogenous information revelation in a competitive credit market and credit crunch

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A B S T R A C T
In this paper, we propose a new mechanism able to explain the occurrence of credit crunches. Considering a credit market with an asymmetry of information between borrowers and lenders, we assume that borrowers have to pay a cost to reveal information on the quality of their project. They decide to be transparent if it is necessary for getting a loan or for paying a lower interest rate. Two types of competitive equilibria may exist: an opaque equilibrium in which all projects receive funding without revealing information; a transparent one in which only the best projects reveal information and receive funding. It is also possible to get multiple equilibria. Incorporating this microeconomic mechanism in an OLG model, the economy may experience fluctuations due to the change of regime, and indeterminacy may occur.

1. Introduction

With the global financial crisis of 2007–2008, originally driven by mortgage-backed securities, the world economy has experienced a strong financial instability. The pre-crisis period was a time of easy credit conditions, low interest rates, and decline in lending standards. The diffusion of structured investment vehicles, the extension of securitization, the development of shadow system banking have increased opacity into the financial markets. The crisis produced a credit crunch related to a crisis of confidence in all the borrowers. The financial crisis was transmitted to the real economy and the credit crunch led to a contraction of the economic activity; asset prices dropped, unemployment increased, and output growth bogged down.

This paper proposes a theory that may explain a sudden credit crunch, associated with the transition from a high income equilibrium to a low income equilibrium. As many previous works, this theory is based on information asymmetry between borrowers and lenders, borrowers having an information advantage on their project. But it departs from these works in assuming that information revelation induces a cost that is borne by the borrower. If the relevance of this assumption has been recognized by different authors (see Tirole, 2006 for a general survey), its consequences have not been subject to a general analysis. More precisely, we assume that a borrower can choose to be “opaque” or “transparent”, and that he must incur a cost to reveal the quality of his project. This cost can be explained by the existence of a direct cost of information revelation: auditing and advertising. It can also be justified by indirect costs, mainly the fact that being transparent implies to quit offshore activities, and to support higher taxes.

In taking into account costly information revelation, we build a signaling model of credit markets. A borrower chooses to be transparent either if it is necessary to get a loan, or if he can get a lower interest payment and earn a higher profit. Moreover, as being transparent reveals the quality of the project to the lenders, only good projects have an incentive to be transparent as bad ones would pay a cost without being financed.

We first consider a simple partial equilibrium model, with the assumption of an exogenous safe interest \( \bar{R} \) at which banks can be refinanced. We show that two threshold levels \( \bar{R} \) and \( \bar{\bar{R}} \) play a role in the equilibrium, with \( \bar{R} < \bar{\bar{R}} \). For a low safe interest \( (\bar{R}_0 < \bar{R}) \), banks are willing to offer loans at low rates. All projects can be financed and no borrowers have incentive to reveal information. This leads to an opaque equilibrium of high activity where all projects obtain a loan. When the safe interest is high \( (\bar{R}_0 > \bar{\bar{R}}) \), banks ask for high repayments. At equilibrium, only the good projects reveal information and are financed. Projects of low quality cannot be financed. This leads to a transparent equilibrium with low activity.
Finally, when the safe interest is middle-valued ($\bar{R} < R_0 < \hat{R}$), both types of equilibria exist together. In this case, there exists some interdependence between good and bad projects. If good projects remain opaque, the average gain on all projects allows financing a return for the bank higher than $R_0$. Consequently, bad projects can be financed. If good projects are transparent, the remaining opaque projects offer an average gain that is too low to be financed.

A simple extension of the static model is obtained in assuming the existence of a supply curve for savings that is increasing in $R_0$. With this assumption, the safe interest rate is endogenously determined. Two types of equilibria may exist, opaque or transparent. It is also possible to obtain multiple equilibria in the interval $[\bar{R}, \hat{R}]$. In this interval, the economy may experience a jump from an opaque to a transparent equilibrium that leads to a credit crunch. The credit crunch generates a sudden fall in loans accompanied by transparency requirements. It also leads to a fall in production.

Finally, the static model is incorporated in an overlapping generations model that allows to endogenize the savings function and to study the dynamics of output. At each period, the economy can be in an opaque or transparent equilibrium. The equilibrium regime of period $t$ determines the amount of output then the quantity of savings available to finance future projects. The demand for loans also depends on the type of equilibrium that will occur in $t + 1$, opaque or transparent. So the economy may experience transitions between the different regimes.

The dynamics is studied with respect to the interest factor $R_{t-1}$, which is a predetermined variable as it is determined by the credit market in $t-1$. The intertemporal equilibrium can lead to different types of dynamics and some numerical examples are provided. Depending on the value of the parameters, the dynamics can be determinate or not. In the case of determinacy, for any value of $R_{t-1}$ there exists only one value for $R_t$.

Even in the case of determinacy, the economy may experience endogenous fluctuations corresponding to a change of regime between opaque and transparent equilibria. We also present examples of indeterminacy for which the two regimes may be possible at a given period. The coordination of agents on one regime would need some selection mechanism such as some self-fulfilling prophecy.

Our model is based on previous works. First the static model can be viewed as an extension of Drees et al. (2013), who consider a model with investors that can choose between more or less opaque projects. They show that investors favor more transparent projects when the interest rate is higher. Our static model is based on a simplified version of their model, but it makes endogenous the choice for a firm to be opaque or transparent.

Since the pioneer work of Stiglitz and Weiss (1981), a large literature has studied the role played by asymmetric information in determining the credit market equilibrium, considering adverse selection and moral hazard. Lenders’ lack of information on the relevant characteristics of the borrowers may result in underinvestment, and credit is said to be rationed. This seminal article has been extended in various directions, e.g., Diamond (1984), Williamson (1987), De Meza and Webb (1987) and Gale and Hellwig (1985). In all these contributions, acquiring information may induce a cost for the lender but not for the borrower.

As for signaling problems in credit market, Jaffee and Russell (1976) and Leland and Pyle (1977) are the first contributions that consider the incentive for loans applicants to signal their quality either by choosing a particular contract or by investing in their own projects. The possibility of screening by the banks has been studied in various studies, see e.g. Milde and Riley (1988) and Besanko and Thakor (1987).

Bencivenga and Smith (1991, 1993) and Azariadis and Smith (1998) have investigated the macroeconomic consequences of imperfect capital markets. They have developed overlapping generations models in which imperfection of information may generate fluctuations and low activity equilibria. A recent contribution in this vein is Alberto and Filippo (2013). With respect to this literature, we propose an original mechanism that is able to generate fluctuations and indeterminacy.

The paper is organized as follows. Section 2 presents the signaling problem framework in the static model and optimal decisions of agents. Section 3 characterizes the static equilibrium. Section 4 incorporates the static framework in an OLG model and presents various examples of dynamics that may lead to endogenous fluctuations and indeterminacy. Section 5 develops the macroeconomic implications of the model. Acknowledgments are provided, and the most demanding proofs are presented in the Appendix.

2. The model

2.1. Agents and gains

Consider a credit market populated by two kinds of agents: entrepreneurs and investors. The entrepreneurs, also termed as “borrowers”, are endowed with one project that needs to raise capital. Investors, also termed as “lenders” or “banks”, are financial intermediaries that collect savings and invest in projects. All agents are risk-neutral. Each borrower needs to raise 1 unit of fund to proceed a project, which yields a random return of $v$. The return of the project varies across borrowers and is private information of the owner of the project. Lenders only know the cross-sectional distribution $H(v)$ of $v$. The associated density function $h(v)$ is positive and continuous for $v \in [\underline{v}, \bar{v}]$ and zero elsewhere.

Borrowers, when facing a certain loan contract proposed by a lender, have the option to choose either to publish information on their project or to remain silent. Publishing information is costly; the cost is $c > 0$ and borne solely by the borrower. It may correspond both to direct costs (auditing, advertising), and indirect ones (no offshore activities). We call the borrowers who reveal information transparent borrowers and those who do not reveal information opaque ones. The fact that transparency has a cost for the borrower is the main assumption of the model. The borrowers who choose to be transparent reveal full information about the return of their projects and lenders know the realization of the return as well as the project owner. Otherwise, lenders have no more information on the return other than the distribution of $v$, $H(v)$.

The market for loans is competitive and composed of two sub-markets: one for transparent projects and one for opaque ones. Lenders offer loans that must be repaid with interest at the end of the period. The repayments required by the lenders are different for transparent and opaque borrowers: $R_1$ for opaque borrowers and $R_2$ for transparent ones.

The contract between a borrower and a lender is a debt contract. Repayment $R_1$ is fulfilled only when the realization of the return exceeds the corresponding amount, i.e. $v \geq R_1$ for an opaque project, and $v - c \geq R_2$ for transparent project. Otherwise lenders could only get what is realized, $v$ or $v - c$. Williamson (1987) proved that the debt contract is an optimal arrangement between borrowers and lenders when informational problems exist and monitoring is costly.

Such contracts serve to economize on monitoring costs. They are optimal if borrowers have no initial endowment to be pledged. Thus, the payoff of a transparent borrower for a project with a return $v$ is

$$\pi_1^T = \max\{v - R_2 - c, 0\}. \quad (1)$$
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