



Contents lists available at ScienceDirect

## Journal of Economic Dynamics &amp; Control

journal homepage: [www.elsevier.com/locate/jedc](http://www.elsevier.com/locate/jedc)

## Firm entry, credit availability and monetary policy

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## ARTICLE INFO

*Article history:*

Received 27 September 2009

Received in revised form

29 September 2010

Accepted 24 February 2011

Available online 10 March 2011

*JEL classification:*

E32

E44

E52

*Keywords:*

Credit channel

Credit crunch

Credit rationing

Firm entry

Monetary policy transmission

## ABSTRACT

This paper presents a dynamic general equilibrium model that incorporates firm entry under credit rationing. Goods-producing firms in this model are bank dependent in the sense that they have no choice but to borrow funds from banks to cover labor wages that must be paid in advance of production. The results show that a cut in the policy rate enhances firm entry by mitigating the severity of credit rationing. This policy transmission is different from the conventional balance sheet channel in that a change in the policy rate directly affects borrowers' credit availability. I also show that a sudden stop in the credit supply to new firms is most likely to occur shortly after a credit boom. This is because endogenous downward wage rigidity prohibits the credit risk of prospective firms from decreasing enough to re-equilibrate the loan market.

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## 1. Introduction

In the face of the recent financial turmoil, central banks have paid great attention to the credit availability of firms, especially small and medium-sized enterprises (SMEs). In the traditional literature on the credit channel of monetary policy, it is widely recognized that SMEs are more susceptible to shifts in monetary policy compared to large firms (Gertler and Gilchrist, 1993, 1994; Bougheas et al., 2006). Proponents of the bank-lending channel argue that this is because SMEs do not have access to alternative sources of external finance such as CP or corporate bonds, which are issued mostly by large firms. Advocates of the balance sheet channel, on the other hand, insist that SMEs bear the brunt of a tightening of monetary policy since SMEs' external finance premiums tend to be higher than large firms' (Bernanke et al., 1996). A crucial difference between the bank-lending channel and the balance sheet channel is that, in the latter, a rise in the policy rate does not affect credit availability itself while it reduces SMEs' demand for external funds.

In this paper I focus on the role of credit availability in monetary policy transmission and business cycles. Although credit availability has been deemed a key factor in the context of the bank-lending channel, the practical validity of this channel has been questioned since most financial institutions in practice can usually raise external funds from the financial market in various ways.<sup>1</sup> In Bernanke et al.'s (1999) "financial accelerator" model, on the other hand, the possibility of credit rationing is precluded for the purpose of solving the model, so that the credit market is always

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<sup>1</sup> See, for example, Bernanke (2007). Ashcraft and Campello (2007) point out that small banks that are affiliated with the same holding company can reallocate funds internally in response to monetary policy shocks. They conclude that borrowers' creditworthiness is crucial in determining the volume of bank loans.

equilibrated. However, various kinds of data and empirical studies strongly support the existence of credit rationing, and some of them report that monetary policy affects the severity of firms' credit availability (e.g., [Atanasova and Wilson, 2004](#); [Jiménez et al., 2010](#)).

Based on [Bergin and Corsetti \(2005\)](#), [Ghironi and Melitz \(2005\)](#) and [Bilbiie et al. \(2007, 2008\)](#), I construct a dynamic general equilibrium model that incorporates endogenous firm entry.<sup>2</sup> I assume that each firm is required to raise funds to cover fixed costs that must be paid in advance of production. The most important departure from the previous studies is that firms have no choice but to obtain credit from financial intermediaries to finance the fixed costs. Other sources of financing, such as equity, commercial papers and corporate bonds, are unavailable.<sup>3</sup> In this environment, whether or not a potential firm can enter the market depends fully on the availability of credit.

Following [Williamson \(1987\)](#), [Bernanke et al. \(1999\)](#) and others, I assume that financial intermediaries must incur auditing costs in order to reveal the state of defaulted firms (costly state verification). In the presence of auditing costs, there would exist a threshold of loan rates above which the lender can no longer extend credit.<sup>4</sup> If the lending rate is determined at the threshold value, then some applicants will necessarily be unable to obtain credit. In fact, the analysis shows that credit rationing arises in equilibrium since prospective entrants continue to enter the market until their credit risk becomes too high for financial intermediaries to extend credit. The point is that the creditworthiness of prospective firms is decreasing in the mass of firms because an increase in the amount of labor leads to higher wages. The mass of new firms is thus determined at a finite value even when the expected profits of entry are still positive.

Since firms with lower technology are more likely to go bankrupt, the distribution of firm-specific technology levels would shift over time. As a consequence, the credit spread tends to become smaller as the firm ages. Each firm's specific technology will be revealed only if a bank audit is made while the bank knows the distribution of each generation's technology. When solving this model, one needs to keep track of each generation's technology distribution and the corresponding mass.

I show that a change in the nominal interest rate has a significant impact on real output through its effect on loan supply. The intuition for this is as follows: suppose that the central bank cuts the nominal interest rate, which is the cost of funds for financial intermediaries. Since debt contracts are made in nominal terms, a reduction in the nominal interest rate will allow the financial intermediaries to take higher risks. This implies that a part of the prospective entrants who would otherwise be unable to obtain credit become able to get credit. Therefore, an expansionary monetary policy enhances new firm entry and stimulates aggregate output. This "credit rationing channel" originated by the extensive margin effect differs from the conventional bank-lending channel in that rationing stems not from the lack of bank liquidity, but from the lack of borrowers' creditworthiness. In this sense, the credit rationing channel may be viewed as complementing the traditional balance sheet channel.

The influence of monetary policy on firm dynamics is also explored by [Bergin and Corsetti \(2005\)](#) and [Bilbiie et al. \(2008\)](#), who assume that new entrants can issue equity to cover entry costs. In their models, a policy shift can affect each firm's entry decision through its influence on the firm's current value as long as price stickiness exists. In contrast, the real effects of monetary policy considered in this paper do not rely on price stickiness. Other studies related to this paper are [De Fiore and Tristani \(2008\)](#) and [Stebunovs \(2008\)](#). [De Fiore and Tristani \(2008\)](#) considered the role of nominal financial contract in a model without endogenous entry based on [Bernanke et al.'s \(1999\)](#) model. [Stebunovs \(2008\)](#) introduced endogenous entry into a DSGE model with banks, but he considered a situation in which banks' bargaining power is so strong that they can collect all the firms' profits without incurring auditing costs.

Finally, I examine in what circumstances a "credit crunch" or "credit crisis" is most likely to occur. In this model, a "credit crunch" or "credit crisis" is defined as a situation in which bank lending to new entrants suddenly stops. The simulation shows that, in the midst of a credit boom, a relatively small shock can induce a credit crunch. More specifically, a credit crunch tends to follow a significant increase in the aggregate output, the mass of firms, the amount of credit supplied, aggregate labor, labor wages, TFP, and sharp declines in default probability and credit spreads. I discuss why these phenomena can be symptomatic of a credit crisis.

## 2. SMEs' credit constraints and the real economy: the case of Japan

Before proceeding to a formal analysis, this section takes a brief look at the Japanese data regarding the condition of SMEs' external finance and its correlation with the real economy.

### 2.1. Two types of credit rationing

In general, credit rationing arises for two reasons. One is a borrower's lack of creditworthiness. If a loan applicant is judged unable to yield a sufficient amount of profits in the future, then the expected net return of lending will be negative

<sup>2</sup> [Devereux et al. \(1996\)](#), [Broda and Weinstein \(2010\)](#) and [Bernard et al. \(2010\)](#) show that net firm entry is procyclical and that a significant fraction of output fluctuations is attributable to the creation of new products and the destruction of existing products.

<sup>3</sup> As I show below, approximately 90% of SMEs in Japan exploit bank loans as a source of funding. [Jaffee and Stiglitz \(1990\)](#) provide some reasons why bank lending tends to be the only source of financing for small firms.

<sup>4</sup> Another strand of literature, such as the work by [Stiglitz and Weiss \(1981\)](#), focuses on adverse selection between lenders and borrowers as the source of credit rationing. See [Jaffee and Stiglitz \(1990\)](#), [Tirole \(2006\)](#) and [Freixas and Rochet \(2008\)](#) for a survey of the literature on credit rationing.

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