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Cash flows and credit cycles

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ABSTRACT

Aggregate productivity falls in recessions and rises in expansions. Several empirical studies suggest that the systematic behavior of lending standards, with laxer (tighter) standards applied during expansions (recessions), is responsible for reverting trends in aggregate productivity. We build a dynamic model that rationalizes these findings. Adverse selection in credit markets emerges as a potential source of macroeconomic instability. The key idea modeled is that in order to effectively signal their type to financiers, productive entrepreneurs must suffer a cost. The effective cost of signaling rises with higher cash flow brought about by stronger economic fundamentals, because higher cash flow makes it easier for the unproductive type to mimic the productive type. Competition among the financiers then results in suboptimally lax lending standards. Low productivity entrepreneurs obtain financing, the producer composition effect inducing a recession. This, in turn, creates conditions – weak economic fundamentals and low cash flow – conducive to the emergence of tighter lending terms, the strong composition effect leading to an economic recovery.

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1. Introduction

This paper investigates the dynamic interaction between financial markets and macroeconomic fluctuations. Several empirical studies document that lending standards, i.e. contractual arrangements used to screen borrowers, are eased in expansions and tightened in recessions, such systematic behavior of lending terms influencing aggregate productivity dynamics (e.g. Asea and Blomberg, 1998; Berger and Udell, 2004; Lown and Morgan, 2006). These studies suggest that laxer standards during economic booms allow for the unproductive firms to be funded, reducing aggregate productivity through the producer composition effect. On the contrary, tight lending standards during economic downturns tend to exclude bad projects, thus sowing the seeds of an economic recovery. These studies also support the popular view that credit markets create economic instability through the producer composition effect (e.g. Kindleberger, 1996).

In a recent work, Myerson (2012) argues there is a pressing need for applying the insights from microeconomic theory of credit markets to macroeconomic models of business cycles. There is undoubtedly a need for a deeper understanding of the forces underlying macroeconomic instability, the financial sector being one potential culprit especially in light of the recent financial crisis. To this end, we propose a simple dynamic model with endogenous lending standards and aggregate productivity, which allows to study their interaction.

The model dynamics is consistent with the empirical behavior of lending standards, default rates, entrants' quality, investment and cash flows over the business cycle. In sharp contrast to related theoretical literature – where instability is driven by some changes taking place at producer level (intensive margin) – instability in our model is driven by *producer composition dynamics* (extensive margin)[1] (Section 2). Our focus on the extensive margin is motivated by the empirical behavior of lending standards.

Our model features private types of entrepreneurs and a competitive credit market. The key idea, novel to this context, is that in order to effectively signal their type to the financiers, productive entrepreneurs must suffer a cost. Effective signals are costly. Indeed, if costless, signals would be easily mimicked by the unproductive types. The main insight that emerges from the model is that the signal cost is related to cash flow, and therefore, economic fundamentals. In times of high cash flow, it is easier for the unproductive type to mimic the productive types, and therefore the signal cost is greater.

To clarify the intuition, suppose there are two types of entrepreneurs, good (G) and bad (B). Type B is unproductive, has little

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[1] Matsuyama (2013) is one exception.

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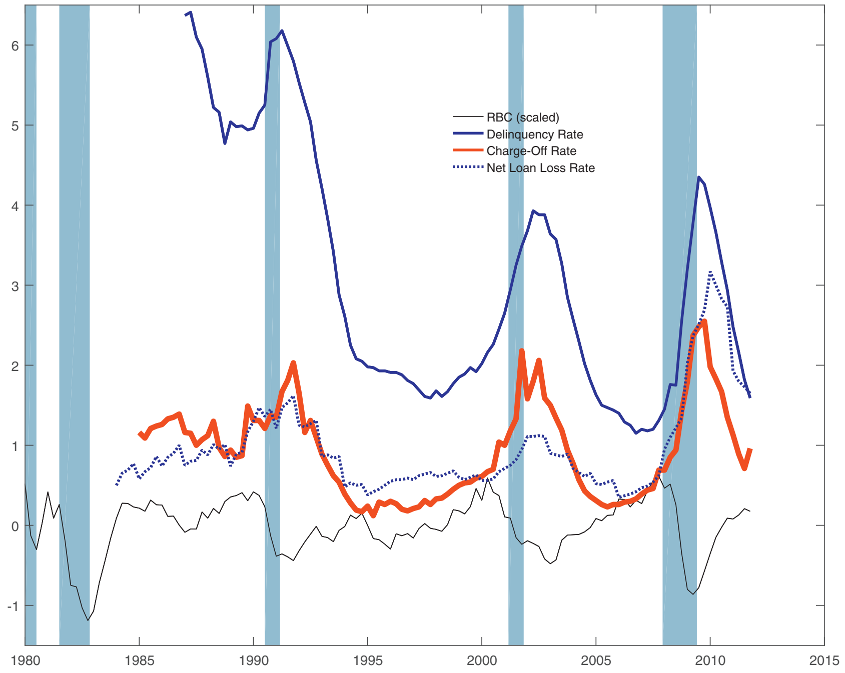

Fig. 1. Real business cycles, delinquency and charge-off rates on C&I loans *Notes*: the shaded areas are NBER-marked recessions. Real business cycles (RBC) are calculated by detrending the log of quarterly GDP data via the Hodrick–Prescott filter ($\lambda = 1600$).[35] Charge-off, delinquency and net loan loss rates are calculated for all business loans for all U.S. commercial banks. Charge-off rate on business loans is the value of business loans removed from the books and charged against loss reserves, net of recoveries, measured as a percentage of average total loans, and annualized. Delinquency rate is the value of business loans that are past due at least thirty days, measured as a percentage of average total loans. Net Loan Loss rate is the value of loan losses, net of recoveries, measured as a percentage of average total loans.[36]

to lose in case of default, and therefore always chooses to default. Contracts that exclude type *B* (separating contracts) necessarily restrict investment levels for type *G* – this is the cost of effective signaling. This cost endogenously increases with economic conditions: as cash flow rises, tighter investment restrictions are needed in order to exclude type *B*. The particularly high signaling cost makes separating contracts unattractive to type *G* in times of high cash flow. Competition for the productive types in the financial sector therefore results in pooling contracts, type *B* entrepreneurs entering as a side effect.

Lending standards are suboptimally lax (relative to the standards imposed by the planner with the same informational constraints) when the economic conditions are strong, which allows for greater investment at producer level, but also implies a misallocation of funds. Low productivity entrepreneurs are financed along with high productivity types, the producer composition effect sending the economy into a recession. This, in turn, creates conditions – weak economic fundamentals and low cash flow – conducive to the emergence of tighter lending terms, the strong composition effect leading to an economic recovery. Endogenous cycles may emerge, highlighting asymmetry of information in credit markets as a potential source of instability.

Rajan (1994) provides evidence from financial press and bankers' opinions showing that projects of negative present value are increasingly funded in economic expansions.[2] This view is also reflected in business loan delinquency rates beginning to rise while the economy is still expanding (Fig. 1). Policy makers have also expressed concerns regarding lax lending terms in times of strong economic fundamentals, pointing out that as much as 80% of new loan applications get approved without a formal projection of the borrowers' future performance (e.g. Supervisory letter SR 98-18 of the Board of Governors). Consistent with our model's insight, the letter quotes "intense competition to attract customers" combined with the presence of adverse selection as the reason behind the lending terms easing. Our explanation complements the explanation in Rajan (1994), based on banks' rational manipulation of current earnings. Note that information asymmetry is crucial for understanding the suboptimally lax standards and financing of ex-ante bad projects.

Ideally, if loan-level data were publicly accessible, we would explore the importance of cohort effects in accounting for the delinquency rate dynamics. The aforementioned papers some of which work with loan-level data would argue that delinquency rates increase during expansions at least partly because of the most recent borrowers, i.e. selection effects. After all, strong economic conditions should benefit the incumbent borrowers. To drive our point further though, we obtained data on Moody's rated corporate bonds and loans which exhibit similar delinquency dynamics over the cycle. Specifically, we use cumulative issuer-weighted default rates by year and by annual cohort (1970–2008)[3] to estimate cohort effects on default probability. To do so, we regress the year-specific default rate on the cohort age, age squared, economic conditions[4] and the cohort effect. Fig. 2 plots the obtained cohort effects together with the business cycle at the time of debt issuance. The data suggest that debt issued near the end of economic expansions is most likely to be defaulted upon.

In Section 4, we discuss a simple extension to three types of entrepreneurs, which more clearly marks the periods of economic expansions and recessions thereby helping illustrate the empirical relevance of the mechanism. The dynamics of cash flows, investment, credit lines and default rates all conform to their empirically observed behavior along the cycle. Expansions last longer than recessions, as in the data. In our model, the relatively high entrant quality in troughs is a result of tight financing terms. Consis-

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[2] Financing of ex-ante bad projects is probably best exemplified with the dot-com mania of the late nineties and the recent subprime mortgage lending.

[3] The data is retrieved from Moody's Special Comment, Global Credit Policy – Corporate Default and Recovery Rates, 1920–2008, Februrary 2009.

[4] We use the contemporaneous change in the real business cycle to proxy for the economic conditions.

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