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Anatomy of a credit crunch: From capital to labor markets [☆]

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ABSTRACT

Why are financial crises associated with a sustained rise in unemployment? We develop a tractable model with frictions in both credit and labor markets to study the aggregate and micro-level implications of a credit crunch—i.e., a sudden tightening of collateral constraints. When we simulate a credit crunch calibrated to match the observed decline in the ratio of debt to non-financial assets of the United States business sector following the 2007–2008 crisis, our model generates a sharp decline in output—explained by a drop in aggregate total factor productivity and investment—and a protracted increase in unemployment. We then explore the micro-level impact by tracking the employment dynamics for firms of different sizes and ages. The credit crunch causes a much larger reduction in the net employment growth rate of small, young establishments relative to that of large, old producers, consistent with the recent empirical findings in the literature.

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1. Introduction

Financial crises are associated with severe economic contractions and lasting deteriorations in labor market conditions. The experiences of the Great Depression and the 2007–2008 financial crisis are dramatic examples. The evidence in Reinhart and Rogoff (2009) provides a broader picture of such phenomena. Despite the close connection between financial crises and sustained rises in unemployment, few models incorporate both credit market and labor market frictions. The goal of our paper is to build one.

We incorporate financial and labor market frictions into a tractable quantitative framework with heterogeneous agents. This allows us to study the joint dynamics of aggregate productivity, total credit in the economy and unemployment, which show more persistence than the underlying economic shocks owing to the interplay of the frictions in the financial and the labor markets over time. At the same time, we can trace out the differential impact of the shocks and market frictions on producers of different productivity, size and age.

In our model, depending on their wealth and entrepreneurial productivity, individuals choose to be entrepreneurs or (prospective) workers in each period. As workers, everyone is assumed to provide the same labor service. Entrepreneurs rent capital subject to a collateral constraint that limits the amount of capital input as a function of their financial wealth. This is the financial frictions. There is a centralized, competitive labor market where entrepreneurs hire available workers.

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The arrival of unemployed workers into this centralized hiring market is where the labor market frictions are. This friction is modeled in the form of a simple matching function that dictates how many currently unemployed workers enter the hiring market. While this assumption of centralized hiring market for homogeneous labor may be simplistic, it enables a tractable and transparent analysis of an economy with both financial and labor market frictions.

We use a quantitative version of our theory to analyze the effects of a credit crunch—i.e., a sudden, unanticipated tightening of the collateral constraint on capital input. In the model, a credit crunch leads to a sharp decline in output—explained by a large drop in aggregate total factor productivity (TFP) and a relatively small decline in capital stock—and a sustained increase in unemployment.

The tightening collateral constraint reallocates capital from entrepreneurs with low net worth toward unconstrained entrepreneurs who expand their production in response to lower factor prices. The reallocation of capital is accompanied by the reallocation of complementary labor across entrepreneurs. Essentially, production factors are reallocated away from productive but constrained entrepreneurs toward those who are relatively unproductive but unconstrained. As a result, the aggregate TFP suffers.

At the same time, labor reallocation, especially the scaling down of constrained entrepreneurs' labor input due to deleveraging, entails an excess job destruction. Although unconstrained entrepreneurs expand in response to lower wages, laid-off workers must re-enter the hiring market subject to the matching friction and hence the unemployment rate abates only gradually. As the tightening of the collateral constraint recedes in the subsequent periods, capital and labor are reallocated back toward productive entrepreneurs with low net worth. This process generates a second phase of excess job destruction, which is again gradually mediated by the frictional labor market and further prolongs the higher-than-normal unemployment rates. Indeed, we find that even a very short-lived credit crunch leaves persistent adverse effects on aggregate output, total credit and unemployment.

We also explore the behavior of the economy in response to an aggregate TFP shock. We find that the implications for the dynamics of unemployment with the TFP shock are starkly different from those with the credit shock. With the TFP shock, the unemployment rate does not change at all in our model. The reason is that a decline in the aggregate TFP affects the capital and labor demands of all firms symmetrically, and flexible wages and interest rates fully offset the contractionary effect of the lower TFP on employment. On the other hand, an economy-wide credit shock has differential effects across firms depending on entrepreneurs' productivity and wealth, and such heterogeneous responses of individual firms make it impossible for a low wage—that must be equalized across firms—alone to maintain firm-level or aggregate employment. In a nutshell, it is the reallocative nature of credit shocks that is essential for realistic unemployment dynamics in the model.

In two simple extensions, we also consider how the main mechanisms of the model interact with (i) downward rigidity in wages and (ii) variable capital utilization at the aggregate level.

The remainder of our quantitative analysis explores the implications of the credit crunch for employment dynamics at a more disaggregate level. A large empirical literature has documented that credit shocks affect firms of different sizes differently. The working hypothesis of these studies is that small businesses are more heavily reliant on credit to finance their production and capital expenditures, and are hence more susceptible to recessions caused by negative credit shocks. Gertler and Gilchrist (1994) found evidence supporting this claim and, more recently, Fort et al. (2012) extended the analysis to highlight the role of firms' age as well as size: During a credit crunch, the employment growth rate of small, young firms declines by more relative to that of large, old firms.

Our model predictions are in line with the findings of these empirical studies. We show quantitatively that net employment growth rates fall by more for small, young firms relative to large, old firms. This result reflects the reallocation of labor and capital from constrained to unconstrained entrepreneurs: In the initial stationary equilibrium of the model, we discover that more than 90 percent of small, young firms are financially constrained, while less than 10 percent of old, large firms are. This information is affirmed by the distribution of marginal returns to capital across firms in the model, which shows an excess return of 10 percentage points for the former group of firms relative to the latter, a significant deviation from the equalization of rates of return across firms in the frictionless allocation.

In this context, our paper provides a theoretical underpinning for the working hypothesis of the empirical literature and explains how the aggregate behavior of the economy is shaped by the heterogeneous responses to credit shocks at the firm level.

The rest of the paper is organized as follows. We provide a review of the literature below and describe the model in Section 2. We present the results of our quantitative analysis in Section 3. We first explain how parameter values and time series for the collateral constraint are calibrated (Section 3.1). We then analyze the macroeconomic implications of a credit crunch and compare them to those of a negative TFP shock, followed by the two extensions with wage rigidity and a notion of capital utilization (Section 3.2). We also examine the impact of the credit crunch at the individual firm level and report how it varies across firms of different ages and sizes (Section 3.3). We conclude in Section 4.

Related literature Our paper is related to several strands of the literature. Our modeling of financial frictions closely follows the work of Kiyotaki and Moore (1997), in which credit is limited by a collateral constraint arising from a limited enforceability problem between creditors and debtors. However, we abstract from feedback effects going from asset prices to collateral constraints. Jermann and Quadrini (2009) adopt the same modeling strategy for financial frictions to study the role of credit as a driver of business cycles. The most salient difference between our work and theirs is that we introduce credit shocks in an economy where entrepreneurs are heterogeneous and, hence, the tightness of credit at any given point

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