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Borrowing constraints, collateral fluctuations, and the labor market

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ABSTRACT

This paper studies the effects of changes in collateral requirements on the cyclical properties of unemployment and job creation. I develop a general equilibrium model in which labor market frictions prevent the costless adjustment of employment. Financial frictions arise from an imperfect enforcement contract. An environment in which borrowing limits are linked to the firm's physical capital stock can quantitatively account for the sluggish response of labor market variables to productivity shocks. I find that fluctuations in those variables are mainly driven by changes in financial conditions. The model can explain 75% of the variation in job creation observed in the data, and it can also account for the persistent reduction in both output and leverage that follows a contraction in credit availability.

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1. Introduction

The 2008 financial crisis has highlighted the need for a better understanding of the extent to which financial frictions can affect macroeconomic aggregates. The fact that a tightening of credit conditions was followed by a substantial increase in unemployment rates suggests that understanding how fluctuations in job creation are affected by changes in the availability of credit for firms not only constitutes an important theoretical exercise, but also an essential policy matter. Nevertheless, the literature has yet to focus on how exogenous changes in collateral requirements affect both labor markets and the hiring decision of firms in a fully stochastic and dynamic general equilibrium environment. Motivated by this, I develop a general equilibrium environment, with frictions in both labor and financial markets to quantitatively assess the importance of changes in credit availability in accounting for the cyclical dynamics in unemployment and vacancy creation.

Can a framework with these characteristics bring us closer to explaining the volatility observed in labor market variables? Moreover, what fraction of these fluctuations can be explained by variations in credit conditions? What are the implications of a sudden increase in credit tightness in an economy in which firms are financially constrained and there are costs and frictions

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associated with hiring workers? The framework presented is suited to answer these questions. I show that an environment in which borrowing limits are linked to the firm's physical capital stock can quantitatively account for the sluggish response of labor market variables to productivity shocks. In addition, I find that fluctuations in those variables are mainly driven by changes in financial conditions. Quantitatively, the model can account for 75% of the variations in job creation observed in the data.

I model financial frictions as arising from a contract with imperfect enforcement, in the spirit of Kiyotaki and Moore (1997). A firm's ability to borrow is constrained to be less than a fraction of its collateralizable assets. The collateral consists of the stock of capital owned by the firm at the beginning of the period. Subjecting the firm to this type of collateral constraint has the advantage that it provides a direct link between collateral requirements and asset prices, which some authors argue played an important role in the 2008 financial crisis.[1] Recent studies have emphasized the importance of financial shocks in generating fluctuations in macroeconomic aggregates.[2] I borrow from these studies and introduce exogenous variations in collateral requirements, which I refer to as 'credit shocks'. These variations are meant to capture the uncertainty in credit conditions faced by firms. Together with the borrowing constraint, these disturbances capture the fact that credit tightness fluctuates over time. While those fluctuations may arise as optimal responses to other changes in the economy, modeling the endogenous determination of financial conditions is beyond the scope of this paper. The approach here is to draw out the implications of the deteriorating credit conditions.

The model presented in Section 2 has two types of agents. Households supply labor and funds. Capitalists do not supply labor but rather own the firms (and thus own the capital stock). In the model, firms can finance their operations through the use of debt (issued to households) or equity and are subject to a cash flow mismatch that requires them to take intra-period loans. As the possibility of default is assumed to arise at the end of the period, both inter- and intra-period loans are subject to the collateral requirement. A negative credit shock, i.e. a tightening of credit conditions, reduces the amount the firm can borrow against its collateral.

The labor market is modeled as a search and matching environment. This introduces frictions that make hiring a costly process. It follows that periods in which the availability of credit is tight are also periods in which it is relatively more costly to post vacancies. As firms are financially constrained, a contraction in credit directly affects the ability of firms to create jobs. Following a tightening of credit, the reduction in vacancy creation is significant. Since it takes several quarters until hiring can catch up with the worker separations that occur every period, the effects of financial conditions on unemployment are persistent.

Working capital requirements induce firms to cut job creation following a tightening in credit conditions and this effect is amplified by the way wages are determined, i.e. through a bargaining problem. Unlike standard labor search models, the bargaining position of firms is not constant but depends on credit market conditions. A contraction in credit endogenously improves the bargaining position of firms by increasing the sensitivity of the firm's surplus to changes in wages. This implies that, relative to a standard search and matching framework, small changes in wages generate larger movements in labor market variables. In contrast to recent studies that also address the effects of credit shocks, a contraction in credit availability is accompanied by an increase in the effective bargaining position of firms. This allows the model to generate declining wages during periods of reduced job creation. Furthermore, the decrease in borrowing that follows a contraction in credit generates deleveraging consistent with the evidence that these are periods in which firms reduce their level of debt relative to their level of production (Reinhart and Reinhart, 2010).

The presence of credit constraints can quantitatively account for the empirical sluggishness in the response of employment and labor market tightness (the ratio of vacancies to unemployment, v/u) that follows a productivity shock. Following a positive productivity shock, firms prioritize investment in the asset used as collateral: capital. Relative to a model without financial frictions, the firm's preference for relaxing the constraint (by increasing its capital stock) reduces the immediate increase in vacancy posting. This generates a more protracted and persistent response of employment and labor market tightness. Quantitatively, the v/u ratio continues to increase for three consecutive quarters after the shock and more than 60% of its total increase occurs in periods that follow the shock.

In Section 3 I carry out a quantitative exercise in which the mean and the standard deviation of the process that governs the credit shock in the model are calibrated to match the empirical features of the debt-to-GDP ratio. The model is successful in producing volatility in the extensive margin, generating an unemployment rate that is almost four times as volatile as GDP. Although this is still less than the relative volatility of unemployment observed in the data (which, with the detrending used, it is almost seven times higher than the volatility of GDP), it represents a significant improvement relative to standard models that can only generate an unemployment rate whose volatility is on par with that of output (see Shimer, 2005).

The model can account for more than 75% of the variation observed in vacancies and roughly 40% of the fluctuations observed in labor market tightness. I find that while productivity shocks are important in generating movements in output and investment, credit shocks are responsible for an important share of the fluctuations observed in labor market variables. This result is mainly driven by a low sensitivity of wages with respect to credit shocks, so that changes in financial conditions do not fully translate into changes in wages (in contrast to Shimer, 2005, for example), but instead generate movements along the extensive margin. Put differently, in contrast to productivity shocks, the adjustments that follow changes in credit conditions are mainly through quantities and not prices. Negative productivity shocks decrease the incentives of the firm to invest and to post vacancies, therefore reducing the degree of credit tightness faced by firms. However, a negative financial shock generates the opposite result and

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[1] See for instance Geanakoplos (2009) and Krishnamurthy (2010).

[2] Important examples are Jermann and Quadrini (2012) and Liu et al. (2013).

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