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Costly external finance and labor market dynamics

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ABSTRACT

We study the role of agency frictions and costly external finance in cyclical labor market dynamics, with a focus on how credit-market frictions may amplify aggregate TFP shocks. The main result is that aggregate TFP shocks lead to large fluctuations of labor market quantities if the model is calibrated to the empirically observed countercyclicality of the finance premium. A financial accelerator mechanism thus amplifies labor market fluctuations by rendering rigidity in real wage dynamics. In contrast, if the finance premium is procyclical, which the model can be parameterized to accommodate, amplification is absent, and labor-market fluctuations display the Shimer (2005) puzzle.

1. Introduction

This paper studies the role of costly external finance in the dynamics of labor markets. The starting point of the model is that firms require working capital to finance their operating costs, and the focus of the analysis is on how credit-market frictions may amplify neutral technology shocks. The environment in which this question is studied brings together a benchmark business-cycle model of financial frictions and a benchmark business-cycle model of labor search-and-matching frictions. The main result is that aggregate technology shocks can lead to large cyclical fluctuations of labor market quantities—in particular, unemployment, vacancies, and labor-market tightness, the quantities identified by Shimer (2005) as failing to be explained by standard search models. The framework quantitatively accounts for the empirically observed large fluctuations of labor markets very well, even though it is calibrated to the cyclical nature of financial conditions rather than to the cyclicality of labor markets. The model thus provides a joint explanation of some salient financial-market and labor-market dynamics.

The property of the model economy that is crucial for amplification is a countercyclical external finance premium. In a version of the model featuring instead a procyclical external finance premium—which the model can be parameterized to accommodate—no amplification occurs, and the model displays the Shimer (2005) volatility puzzle. A broad message of the

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paper is thus that costly external finance can play an important role in amplifying shocks into the labor market, but it is not financing frictions per se that are important. Rather, the cyclical behavior of financing costs is crucial for the amplification mechanism; in particular, the mechanism imparts rigidity to the real wage. Real wage rigidity has been the main theme in the recent DSGE literature, as summarized by Rogerson and Shimer (2011).

The cyclicality of the finance premium is governed by a single parameter in the model economy, the elasticity of firms' idiosyncratic productivity with respect to aggregate total factor productivity (TFP). Once this parameter is selected via simulated method of moments to match U.S. empirical evidence on the dynamics of the finance premium—in particular, a contemporaneous cyclical correlation with GDP of about -0.50—all other parameters regarding credit markets and labor markets hardly matter quantitatively for the response of the labor market to shocks to aggregate TFP. Furthermore, the model's predictions of the cyclical fluctuations of key labor-market quantities matches well cyclical fluctuations observed in the U.S., even though the model is calibrated to match the cyclical properties of the finance premium, not to match the cyclical properties of labor markets. The amplification the model displays is thus not merely qualitative in nature, but also a good quantitative fit.

The mechanism of the model turns on how fluctuations in aggregate TFP shift the distribution of firms' idiosyncratic productivity, an effect referred to as a "technology spillover" or a "productivity correlation." If there is no technology spillover, then the finance premium is (mildly) procyclical and labor-market dynamics in the face of TFP shocks are similar to those predicted by baseline DSGE search models such as Andolfatto (1996) and Merz (1995) despite the presence of credit market frictions. On the other hand, if technology spillovers are sufficiently positive—specifically, if an improvement in aggregate TFP raises sufficiently the mean of the distribution from which firms draw idiosyncratic productivity—the finance premium is countercyclical. Because firms borrow to finance their inputs, a countercyclical finance premium leads to sharper expansions of firm activity, including hiring activity, during aggregate upturns and sharper pullbacks of firm activity during aggregate downturns. A financial accelerator mechanism thus amplifies labor market fluctuations.

The financial accelerator effect accounts for 60 percent of the model's ability to improve on standard search models in explaining labor market fluctuations. This channel operates by sharply reducing a firm's idiosyncratic risk of bankruptcy for a given size positive aggregate TFP shock, which lowers the bankruptcy premium charged by the firm's lenders. A lower finance premium in turn allows net-worth-constrained firms to expand activity, including new job-vacancy creation, more than otherwise.

The other 40 percent of the model's mechanism operates through a direct productivity channel. At the firm level, productivity is the sum of an aggregate component and an idiosyncratic component. If aggregate TFP shocks shift positively the distribution of a firm's idiosyncratic productivity, a firm's effective productivity moves more than without the positive spillover. This direct productivity correlation induces sharper adjustments, including hiring adjustments, in response to shocks than if there were no productivity correlation between the macro level and the micro level, even if the cyclical behavior of the finance premium remained unchanged.

Nascent evidence from firm-level studies is suggestive of the type of positive technology correlation present in our model. By constructing new measures of firm-level productivity, Petrin et al. (2011) document, among many other micro-macro supply-side empirical relationships, this type of productivity correlation. Of particular relevance for the calibration of our model, Petrin et al. (2011) compute an annual correlation between aggregate productivity growth, as measured by an aggregate Solow residual, and growth in firms' technical efficiency, which is a measure of firm-specific technology, in the range of 0.79–0.89. Our model, which is driven by only an aggregate TFP shock, portrays this high correlation in the extreme, assuming a correlation of unity. Nonetheless, we are still left with the task of selecting the appropriate elasticity of idiosyncratic productivity with respect to aggregate TFP, which we do via simulated method of moments to match the cyclical properties of the finance premium.

The positive technology spillover in the model in this paper is also virtually identical to a key mechanism underlying Faia and Monacelli's (2007) study of optimal monetary policy in a New Keynesian model featuring financial frictions and perfect labor markets. At a theoretical level, we think it is important to know that a modeling strategy that has proven useful in a very different branch of the business-cycle literature turns out to also be important for the question under study in this paper. At an empirical level, the work cited above by Petrin et al. (2011), in addition to recent work by Foster et al. (2008), Acemoglu et al. (2012) and Oberfield (2012) (the latter two document and model this positive relationship), adds some realistic foundation to the Faia and Monacelli (2007) assumption.[1] Given this positive relationship, the main question of this paper is how much amplification is induced in labor markets due to productivity shocks.

Regarding the question addressed in this paper, the study most closely related is Petroksy-Nadeau (2009). Our work shares with his the basic ideas that financing frictions may induce an amplified response of the labor market to aggregate TFP shocks and that the cyclicality of the finance premium is important for the transmission mechanism. In these respects, the two studies are highly complementary. Several modeling choices, however, most importantly the ones that govern the precise amplification mechanism, distinguish our work from Petroksy-Nadeau (2009).

[1] However, opposite to the direction of causality in this paper, it is changes in idiosyncratic conditions affect aggregate conditions in the Acemoglu et al. (2012) and Oberfield (2012) models. There is also evidence in this very active literature against the assumption used in this paper, such as Lee and Mukoyama (2013) and Clementi and Palazzo (2013), who highlight the firm entry and exit mechanism.