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Financial intermediation, consumption dynamics, and business cycles

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ABSTRACT

The recent financial crisis highlighted the need to deepen our understanding of the impact of the financial intermediation sector on the real economy. We examine the quantitative implications of financial intermediation and firm's financing frictions in explaining the observed cyclical properties of both real and financial variables. We find that a modified version of the financial intermediation framework of Gertler and Karadi (2011) augmented with financing frictions in production does a good job in matching the unconditional moments of financial fluctuations without compromising key real co-movements. Our results are relevant for macro-prudential policy analysis as they underscore the importance of carefully identifying the sources of aggregate fluctuations in models in which financial intermediaries and financial frictions play a non-trivial role.

1. Introduction

The Great Recession (2007–2009) made it painfully clear that financial markets have important real effects. In particular, the financial intermediation sector has been identified as a crucial component to understand the recent financial crisis (Woodford, 2010). Furthermore, financial intermediaries and markets constitute an important source of corporate funding in the U.S. A recent study by Ajello (2016) points out that a substantial 35% of corporate sector investment is funded through financial markets. Furthermore, about one third (1/3) of total financial dependence is associated with firms operating expenditures (i.e., working capital needs).

In this study we pose two questions. First, what are the cyclical properties of aggregate variables in the financial sector? And second, to what extent does financial intermediation and financial frictions impinge on real outcomes? To answer the first question we document five empirical linkages of macro and financial variables in the U.S during the period 1984–2010. We examine the second question through the lens of a dynamic stochastic general equilibrium (DSGE) framework that incorporates a financial intermediation sector and firm's financial frictions. The financial intermediation sector draws on the framework proposed by Gertler and Kiyotaki (2010) and Gertler and Karadi (2011). In this framework, disruptions in financial markets can cause large swings in economic activity, and financial frictions can have large effects on how shocks affect the economy. In particular, an external finance premium arises from movements in asset prices that affect the balance sheet of the intermediation sector. Intermediaries are assumed to be constrained in their lending activities, which limits their ability to attract funding from savers. This leads to a premium of external financing over internal financing. As a result, shocks that affect the size of the balance sheet of the intermediation sector impinge on the external finance (risk) premium, which in turn affects the ability of firms to borrow and produce, effectively propagating credit disturbances into the real economy.

The contribution of this study is twofold. First, I document jointly five empirical regularities of macro and financial co-movements. Second, I explain the evidence by developing a basic extension of the financial intermediation framework of Gertler and Karadi (2011). Namely, I assume (1) financing frictions in production and (2) only two sources of fluctuations, productivity and monetary policy shocks. I find that, unlike the baseline financial frictions model, the extended model fits the co-movements of financial variables without compromising the dynamic properties of aggregate consumption.

On the empirical side, this study documents five linkages of financial and real variables that are still little understood, namely, (i) counter-cyclical risk premium, (ii) pro-cyclical debt, (iii) pro-cyclical net worth, (iv) counter-cyclical financial intermediation leverage, and (v) the negative co-movement between labor and average productivity. Facts (i)–(iv) apply to aggregate variables in the U.S. financial sector and have been independently confirmed by Mimir (2015).

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Furthermore, fact (v) is consistent with the findings of Barnichon (2010), Gali and van Rens (2015), and Fernald and Wang (2015). We add to this literature through a joint study of all five empirical regularities.

On the theory side, we examine the quantitative implications of different specifications of the financial intermediation framework of Gertler and Karadi (2011) (henceforth GK). We find that (1) the baseline GK model has key counter-factual implications for the dynamics of consumption and (2) a modified version of the baseline that assumes financing frictions in production has a better quantitative fit in terms of the co-movements of both real and financial variables. Crucially, in the baseline model shocks that affect the level of investment imply counter-factual consumption co-movements.[1] Thus, we simplify the model and eliminate exogenous disturbances to investment. Further, we augment the model assuming a basic financing friction where firms rely on outside finance in order to fund their operating (working capital) expenses. Our theoretical results are twofold. First, they underscore the need to carefully identify sources of fluctuations in models in which financial intermediaries play a non-trivial role. Second, they suggest an important effect of firm’s financing frictions on the dynamic properties of both real and financial variables.

1.1. Literature review

This study is related to a strand of the literature that examines the behavior of financial conditions and real outcomes. Bernanke et al. (1999) propose a financial accelerator mechanism in which the cost of external funds (i.e., the external finance premium) is negatively associated with the net worth position of entrepreneurs. Along these lines, Christensen and Dib (2008) estimate the Bernanke et al. (1999) model and find evidence for a financial accelerator mechanism at work in the U.S. economy. Christiano et al. (2014) implement a version of Bernanke et al. (1999) with the addition of a risk shock, defined as time varying volatility of an idiosyncratic productivity shock. Their estimation results ascribe a large fraction the variation in real variables to the risk shock. Merola (2015) estimates a medium-scale DSGE model with financial accelerator and shows that the model does well in explaining the Great Recession. This literature provides consistent evidence on the importance of the financial accelerator for explaining aggregate fluctuations. More closely related with this study, Gertler and Karadi (2011) and Gertler and Kiyotaki (2010), apply the financial accelerator mechanism to develop a financial intermediation framework where fluctuations in financial intermediaries' balance sheets influence the risk premium, investment, and real economic outcomes.

Our study is also closely related to Mimir (2015) who independently confirms the stylized facts of financial variables documented here. In a similar vein, Mimir (2015) uses the GK financial intermediation framework to account for the cyclical properties of financial and real variables. Consistent with this paper, our study finds that the GK framework is relevant to account the fluctuations of financial variables. Importantly, our study adds to the literature by examining the implications of different specifications of the GK framework on the cyclical properties of consumption, as well as the co-movement between labor and average productivity.

Last, this study documents a negative co-movement between labor and average labor productivity in the U.S. during 1984–2010, which is consistent with the findings of Barnichon (2010), Gali and van Rens (2015), and Fernald and Wang (2015) who document that strength of the co-movement between average labor productivity and labor has steadily diminished since the post-war period. These studies attribute the observed phenomenon to non-technology shocks, declining power of labor unions, and reduced variation in factor utilization, respectively. I add to this literature by providing an alternative explanation where financial conditions may play an important role in explaining the declining co-movement between labor and average productivity.

The rest of the paper proceeds as follows. Section 2 presents the empirical findings. Section 3 describes the model. Section 4 discusses the model solution and calibration. Section 5 analyzes the model's quantitative properties and dynamic behavior. Section 6 concludes.

2. Empirical regularities

This section documents five features of macro and financial data that received little attention prior to the Great Recession. First, I examine the dynamic behavior of average labor productivity. Second, I document the cyclical properties of four financial variables, namely the corporate bond premium (credit spread), total financial assets, total financial liabilities, and aggregate financial net worth in the U.S. financial sector.

I use NIPA quarterly data from Federal Reserve Bank of St Louis, labor data from the Bureau of Labor Statistics, and aggregate financial data from the Federal Reserve Board Flow-of-Funds Accounts. The data is quarterly, seasonally adjusted, and the period is 1984–2010. Full details on the data are provided in Appendix B.

First, I document the negative co-movement between hours worked and average labor productivity. Fig. 1 shows the co-movement of labor and labor productivity in the US during 1984–2010. The correlation during this period is negative and significant with a coefficient of correlation of −0.56.

Early studies (Christiano and Eichenbaum, 1992; Gali, 1999) argue that demand shocks, not technology shocks, are important to explain the cyclical behavior of labor and average productivity. Recent studies that examine this relationship document that these two variables historically have been mildly positively correlated, but more recently, they are counter-cyclical (Barnichon, 2010; Gali and van Rens, 2015; Fernald and Wang, 2015). This latter empirical observation is known as the labor productivity puzzle, and it is in stark contrast to the positive co-movement between labor and productivity implied by the standard DSGE model in which during expansions both output and labor increase with labor increasing less than output.[2]

Next I document the co-movement of financial variables with output. The premium or credit spread is measured as the difference between Moody's corporate (baa) bond rate and the 10-year Treasury bill rate, which is a widely accepted measure of default risk (Gilchrist and Zakrajsek, 2012). Debt is measured as real, per capita, credit market instrument liabilities of non-financial business. Financial net worth is the difference between total assets and total liabilities of an aggregate of financial institutions (e.g., commercial banks, asset backed securities (ABS) issuers, finance companies, and funding corpora-

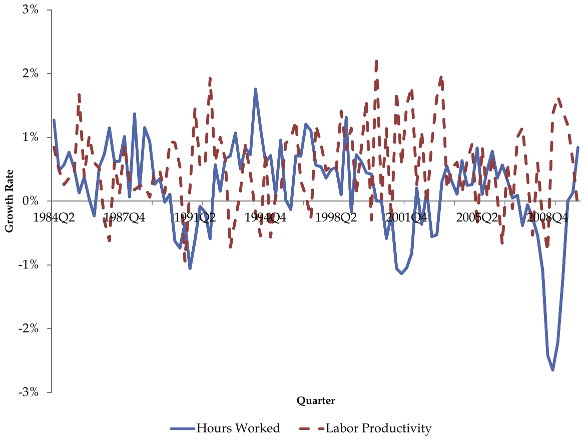

Fig. 1. Hours and labor productivity.

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[1] This result is consistent with other studies that document a co-movement problem between consumption and investment in response to investment shocks (Furlanetto and Seneca, 2014; Kamber et al., 2015).

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