

Author's response to the referee's report 1

I would like to thank the Referee for the comments.

1. The main channel of spillovers is in all cases is the labor market and labor income it generates.

This statement is not correct because there are two channels, which are labor income channel and collateral channel, affect the dynamic of macroeconomic variables in this paper.

2. Default risk is not appearing in the paper.

Yes, I agree with the Referee. This paper does not deal with a default risk in financial markets. The default risk is another topic, and one needs another paper to deal with the default risk in a systematic study. However, my paper is based on a theory of limited enforcement literature (see Kiyotaki and Moore (1997) and Quadrini (2011) and Jermann and Quadrini (2012)). This theory is to some extent touching on the issue of default when borrowers repudiate their debt (please see point number 5 in this reply).

This paper focuses on the role of asset prices (in this case are the housing prices) that affect the macroeconomic variables.

3. There are no explicitly defined uncertainties or randomness anywhere in the model.

There are uncertainties in the model; I describe the exogenous shocks on the page 7 and 9. The tightness household credit conditions and business credit conditions follow an AR(1) stochastic process.

4. The Referee seems to be skeptical about the contribution of this paper.

My paper is based on Iacoviello (2005). The main idea of his model is that collateral constraints act as credit frictions which amplify the macro impact of exogenous shocks (productivity and monetary shocks). More specifically, his central idea is that credit frictions exacerbate a recession but are not the cause of the recession. These shocks would create a recession despite the absence of collateral constraints. However, with collateral constraints, the magnitude of recession is bigger.

In my paper, I have credit shocks (tightness household credit conditions and business credit conditions) that directly affect collateral constraints of borrowers; hence, credit supply disruptions directly generate a recession.

Jermann and Quadrini (2012) and Liu et al (2013) study the macroeconomic effects of a credit disruption in the business sector (a tightening of business credit conditions). In their models, the spillover effect from the business sector to the household sector arises through labor income channel.

By including financially constrained households in my model, the credit disruption in the business sector transmits to the household sector both through the labor income and the collateral value of housing. Thus, the effects of a tightening of business credit conditions are amplified.

Another contribution of this paper is that I also study the effects of credit supply disruptions that directly hit the household sector (a tightening of household credit conditions). Jermann and Quadrini (2012) and Liu et al (2013) only study the effects of tightening of business credit conditions.

My main results show that a tightening of household credit conditions creates a bigger drop in GDP and consumption than a tightening of business credit conditions. A tightening of household credit conditions creates a bigger decline in inflation than a tightening of business credit conditions.

5. Is the division of households into constrained and unconstrained an assumption of a theorem?
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The division of households in this paper is an assumption that allows us to have a financial friction in the model.

This section is based on Quadrini (2011). There are few ways to introduce financial frictions in DSGE model, but I will discuss two methods.

(a) Limited enforcement: the basic idea of limited enforcement is that the lender is able to observe whether or not the borrower is fulfilling his or her contractual obligations. However, there are no tools that allow the lenders to enforce the contractual obligations.

My paper is based on the limited enforcement theory. I assume a limit on the obligations of the borrowers (constrained households). In the case of default the lender can only recover a fraction of the collateral value. Thus, maximum amount of the loan that the borrower can

obtain is bound by their collateral value which gives rise to the borrowing constraint equations in the paper.

To insure that the borrower does not save enough to make the borrowing constraint irrelevant, the discount factor for the borrower is lower than the lender (see Kiyotaki and Moore (1997) and Iacoviello (2005) for further explanations). Hence, this gives a division between the lender and the borrower.

I forgot to write down no Ponzi-game condition in my paper that is

$$\lim_{j \rightarrow \infty} E_t \alpha \frac{debt_s}{\prod_{s=0}^j Real\_interst\_rate} \leq 0.$$

All of the agents in this model do not engage in the Ponzi game.

(b) Financial frictions can arise through Information asymmetry, but this paper does not deal with information asymmetry. An example of papers that are based on this theory are Bernanke, Gertler, and Gilchrist (1999); Carlstrom and Fuerst (1997).

#### 6. Why savers and borrowers labor inputs are imperfect substitutes?

The labor income share of unconstrained household is about 64 percent according to Iacoviello (2005) and Iacoviello and Neri (2010) and this number is within the range of various studies. Using the 1983 Survey of Consumer Finances, Jappelli (1990) estimates 20 percent of the population to be liquidity constrained. Thus, it is appropriate to model labor inputs as imperfect substitutes.

#### 7. Money and financial intermediary (banking sector) are left out in the paper

Since an interest rate rule is part of the model, money supply will always meet money demand at the equilibrium nominal interest rate. As utility is separable in money balances, the quantity of money has no implications for the model, and can be dropped out.

The credit shocks directly hit the borrowing constraints of households and entrepreneurs; thus, the shocks directly enter the optimal conditions of households and entrepreneurs. Therefore, by including banking sector in this paper, it will not have significant implications for the results in this context.

#### References

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