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On the amplification role of collateral constraints☆

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ABSTRACT

This letter explores the role of costly liquidation of the collateralized asset in a stochastic version of the Kiyotaki and Moore (1997) model. We document that the degree of inefficiency in the debt enforcement procedure plays a key role in the endogenous amplification of productivity shocks generated by collateral constraints.

1. Introduction

Standard Real Business Cycle theories account for business cycle observations of aggregate quantities, such as output, investment and consumption, by relying mainly on large and persistent aggregate productivity shocks. Kiyotaki and Moore (1997) and Kiyotaki (1998) show that if debt is fully secured by collateral, even small and temporary productivity shocks can have large and persistent effects on economic activity. Kiyotaki and Moore's theoretical work successfully influenced the inclusion of collateral debt in business cycle models.

More recently, Kocherlakota (2000) and Cordoba and Ripoll (2004) demonstrate that collateral constraints *per se* are unable to propagate and amplify exogenous shocks. In particular, Cordoba and Ripoll (2004) document that the endogenous amplification generated by Kiyotaki and Moore (1997) is driven by unorthodox assumptions on agents' preferences, such as lenders' linear utility, and technology, such as borrowers' linear technology in the collateral asset. As a result, in a modified version of the model in which all agents face the same concave preferences and production technologies, implausible parameters' values are required in order to generate amplification.

Djankov et al. (2008) show that debt enforcement procedures around the world are significantly inefficient. Worldwide, an average of 48% of an insolvent firm's value is lost in debt enforcement. Thus, limiting the amount lent to a fraction of the value of the collateralized asset turns out to be a reasonable assumption.

This letter revisits the amplification role of collateral constraints allowing for costly repossession of the collateralized asset in a stochastic general equilibrium version of the Kiyotaki and Moore (1997) model. As in Cordoba and Ripoll (2004), all agents face concave production and utility functions and are generally identical, except for the subjective discount factor.

We provide insightful results. First, when debt is fully secured by collateral, the allocation of capital under collateral constraints is very close to the allocation in the frictionless economy. Credit frictions in the form of collateral constraints do not, then, have sizable implications for aggregate production. Second, the sensitivity of output to productivity shocks varies in a non-linear way w.r.t. the degrees of inefficiencies in the liquidation of the collateralized asset. For reasonable degrees of inefficiencies in debt enforcement, collateral constraints significantly amplify the effects of productivity shocks on output, even under standard assumptions about preferences and technology.

We show that the role of the degrees of inefficiencies in debt enforcement for amplification is independent from the other parameters such that our results are, thus, robust to alternative calibrations. More general results in terms of the effect of the degree of debt enforcement on the solution of the model, show that in the first-order approximate solution all parameters are locally identifiable and no multicollinearity is found. Thus, changing the

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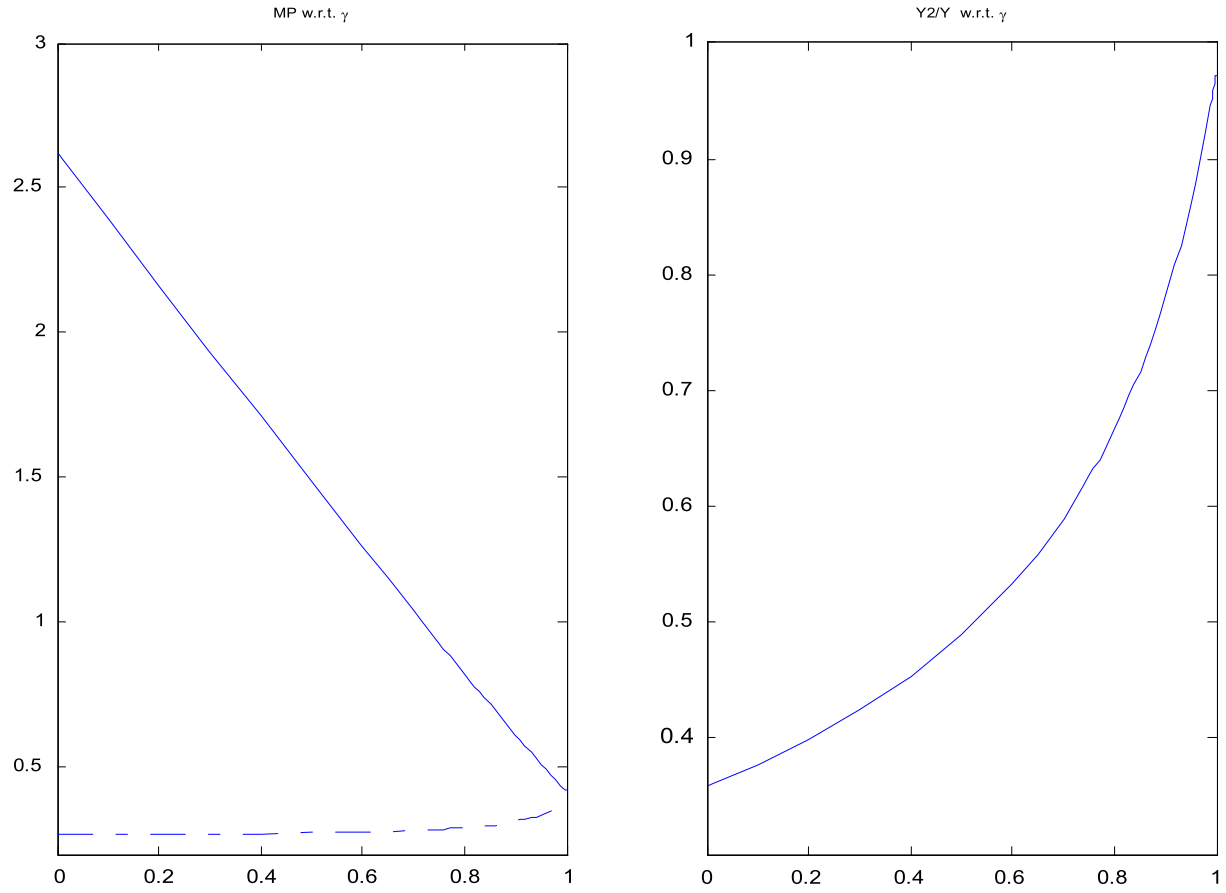

Fig. 1. Steady state. Left panel: steady state productivity gap between the two groups of agents as a function of y (solid line borrowers, dashed line lenders); Right panel: steady state borrowers' share of total production as a function of y.

degree of inefficiency in debt enforcement affects the solution of the model differently than changing any other parameter.

2. How important are the degrees of inefficiencies in the debt enforcement procedures for the amplification role of collateral constraints?

To address this question, we rely on a stochastic version of the Kiyotaki and Moore (1997) model. Our model differs mainly in that it introduces costly liquidation of the collateralized asset and assumes that all agents face concave production and utility functions. The economy is populated by two types of agents of unit mass: $(1-m)$ *Patient Entrepreneurs* (denoted by 1) and m *Impatient Entrepreneurs* (denoted by 2). We assume ex-ante heterogeneity on the subjective discount factor – $\beta_2 < \beta_1 < 1$ – to allow for credit flows.

Agents of type i – $i = 1, 2$ – maximize their expected lifetime utility as given by concave preferences

$$\max_{\{c_{it},k_{it},b_{it}\}} E_0 \sum_{t=0}^{\infty} (\beta_i)^t \frac{c_{it}^{1-\sigma}}{1-\sigma}$$

s.t. a budget constraint

$$c_{it} + q_t(k_{it} - k_{it-1}) = y_{it} + \frac{b_{it}}{R_t} - b_{it-1}$$

where y_{it} is the individual production, k_{it} is a durable asset, c_{it}, is a consumption good, and b_{it}, is the debt level. The durable asset, k_{it}, does not depreciate and has a fixed supply normalized to one.

Both agents produce the commodity good using the same concave production technology:

$$y_{it} = Z_t k_{it-1}^{\alpha} \tag{1}$$

where Z_t represents a temporary aggregate productivity shock. The shock follows an AR(1) process.

As in Kiyotaki and Moore (1997), agents are free to walk away from the production process and from debt contracts between t and $t+1$. Thus, lenders protect themselves by collateralizing the borrower's asset. However, unlike Kiyotaki and Moore (1997), we assume that lenders can repossess the borrower's assets after paying a proportional transaction cost, $[(1-\gamma)E_t q_{t+1} k_{it}]$. Thus, lending is limited to a fraction, γ, of the value of the asset, such that next period's repayment obligation cannot exceed the expected value of next period assets,

$$b_{it} \leq \gamma E_t \left[q_{t+1} k_{it}\right]. \tag{2}$$

The lower γ, the more costly, and, thus, inefficient, is the debt enforcement procedure. The fraction γ, referred to as the Loan-to-Value ratio (LTV henceforth), should not exceed one and is treated as exogenous to the model. Heterogeneity in the discount factors ensures that in equilibrium patient households lend and impatient households borrow.

Steady state. The period of the model is one quarter. We set the model's parameters to values commonly used in the literature.[1] See Table 1. Some robustness to alternative values will be performed in the next section.

It is possible to show that as long as $\beta_2 < \beta_1 < 1$, the Lagrange multiplier associated with the borrowing constraint for the impatient household is strictly positive,

$$\mu_2 = (\beta_1 - \beta_2)\, u_{c_2}. \tag{3}$$

[1] Among others, see Iacoviello (2005) and Iacoviello and Minetti (2006).