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1 Introduction

Brounen and Eichholtz (2005) survey a large number of corporations across different countries and find that the overall real estate ownership appears to be decreasing over time, due to the gaining popularity of lease alternative. Leasing has the advantage that a lessor is able to repossess control of an asset easier than for a secured lender, which relaxes the credit constraints of borrowers. However, leasing is subject to agency problem due to a separation of ownership and control. On the other hand, the sources of financing for investing in capital equipment, whether leasing or buying, have been the focus of studies in corporate finance (Meyers and Majluf (1984), Chemmanur and Fulghieri (1994), Boot and Thakor (1997), Repullo and Suarez (2000), and Bolton and Freixas (2000, 2004)).

The purpose of this paper is to bring together these two strands of literature and In the model, firms determine whether to lease or buy capital and then acquire external finance from bank lending or securities issues. We study whether there is a connection between the choice of leasing/buying capital and the financing structure of firms, and how the fluctuations of asset prices play a role in affecting the firms' tenure choice as well as the financing structure.

When a firm plans to make an investment for production, it can raise funds to purchase capital either from bank financing or bond issues; alternatively it can simply lease capital. Eisfeldt and Rampini (2005) argue that there are several advantages for firms to lease rather than to buy the capital. First, according to the U.S. bankruptcy code (Chapter 11), it is much easier for a lessor to repossess control of an asset than it is for a secured lender to repossess it; and second, this makes the debt capacity of a firm that leases its capital exceeds the debt capacity of a firm that purchases an asset and then collateralizes it for bank loans. On the other hand, however, leasing is subject to agency problem due to a separation of ownership and control. Evidence shows that small and medium firms opt for leasing more than large firms because leasing relaxes the credit constraint of small and medium firms.

Next, when seeking for external financing, a firm can choose either bank financing or securities issues. The importance of bank loans for certain bank-dependent firms have been studied extensively in the literature (e.g., Kashyap et al. (1993), Bernanke and

Gertler (1995)). However, the development of financial markets has prompted research on the interactions of bank financing and securities issues, which provides a rationale for firms to use mixed finance on bank loans and bonds. The main difference between bank and bond financing is that debt restructuring is not possible due to wide dispersion of ownership of corporate bonds (Bolton and Scharfstein (1996)), however, financial intermediation is costly. Recent empirical evidence also demonstrate that there is a substitution effect between bank credit and securities issues following a change in monetary policy (e.g., Kashyap et al. (1993), Gertler and Gilchrist (1994)). In this project we add another twist on the interactions of bank lending and bond financing by considering the tenure choice of buying/leasing assets by firms and also fluctuations of asset value. This leads to the third element of our model: collateral is recognized in recent studies as a primarily important factor in determining external financing and investment (Kiyotaki and Moor (1997), Chen (2001), Iacoviello (2005)). Thus, when bank loans are collateralized, fluctuations of the value of collateralized assets affect the firm's ability to obtain external financing, thus magnifying business fluctuations through this "collateral channel."

How does the choice of tenure affect firms' credit constraints, investments, and capital structure? When buying capital, an entrepreneur seeks for external finance (either borrowing from banks or issuing bonds) while contributing his own capital. Apparently, the choice of leasing/buying will affect the amount of liquid asset that the entrepreneur can hold on hand and thus the entrepreneur's expected net worth (due to fluctuations of asset prices). The entrepreneur's net worth position then affects his choice of financing structure. Some evidence show that real estate ownership and a firm's stock returns are related negatively (Liow (2004)). Brounen and Eichholtz (2005) find the same pattern, however, after controlling for the variation in risks no significant return patterns remain. Thus, it is not justifiable why firms would like to buy real estate if their sole objective is to maximize their stock returns. Furthermore, some find that real estate leasing raises stock returns (e.g., Allen et al. (1993)). We will investigate whether and under what conditions the (ex post) returns of the initial investment are higher for firms which buy rather than lease real estate capital.

We find that the decisions of tenure choice and the capital structure of a firm depend on the interactions of agency costs and the fluctuations of asset prices. When the risk in the

resale value of capital increases, the tenure choice of fixed capital leads to a substitution effect between bank loans and securities. Furthermore, when the moral hazard problem worsens and thus raises agency costs, the credit constraints affect capital structure and leads to a shift in leasing/buying choices. Our model thus characterizes a wider spectrum of firms' financing decisions under credit constraints.

2 Relation to the Literature

The literature on leasing mostly focuses on the tax-incentives for leasing (e.g., Miller and Upton (1976)). The benefit of repossession were informally discussed by Smith and Wakeman (1985), Krishnan and Moyer (1994), and Sharpe and Nguyen (1995). Krishnan and Moyer (1994) and Sharpe and Nguyen (1995) provide evidence that credit-constrained firms lease more. Krishnan and Moyer (1994) provide evidence that leasing has lower expected bankruptcy costs to the lessor than borrowing has to the lender, resulting in lower financing costs for the lessee than the borrower, *ceteris paribus*. The results indicate that lease financing is an attractive financing option for those firms with higher bankruptcy potentials. Similarly, Sharpe and Nguyen (1995) find evidence that firms facing high information-cost premiums for external funds finance a significantly greater proportion of their balance sheet fixed assets with leases. Eisfeldt and Rampini (2005) argue that the debt capacity of a firm that leases its capital exceeds the debt capacity of a firm that purchases an asset and then collateralizes it for bank loans. This makes leasing valuable to credit constrained firms. However, leasing is subject to agency problem due to a separation of ownership and control (the financier retains the ownership). They find that the benefit of leasing outweighs the cost for credit-constrained firms and thus these firms prefer leasing capital. For less credit-constrained firms, the ownership of capital minimizes the agency cost and it is thus better for them to purchase capital. Their results are confirmed by the U.S. micro data.

The project is also related to a recent theoretical literature concerned with the co-existence of bank lending and bond financing, notably, Besanko and Kanatas (1993), Chemmanur and Fulghieri (1994), Boot and Thakor (1997), Holmstrom and Tirole (1997),

and Repullo and Suarez (2000), and Bolton and Freixas (2000, 2004).¹ Diamond (1991) examines the interactions between reputational capital (a good track record) and monitoring, and find that the typical bank borrowers will be the entrepreneurs with intermediate credit ratings. Holmstrom and Tirole (1997) examine the role of net worth in financial structure when both entrepreneurs and banks are subject to moral hazard problems vis-a'-vis their respective lenders. They demonstrate that smaller firms have to rely on bank financing because their own net worth at stake is so small that they have an incentive to commit moral hazard by opting for bad projects (which give entrepreneurs some private benefits but have a lower probability of success). While larger firms with abundant own capital provides them an incentive to choose good projects and they are able to obtain investors' direct financing without being monitored. Repullo and Suarez (2000) use a model of entrepreneurs' financing choices to analyze the two strands of the credit view – balance sheet channel and bank lending channel. Bank finance involves a higher monitoring intensity than market finance, which ameliorates the entrepreneurial moral hazard problem. They show that in equilibrium the set of firms can be divided according to the value of their net worth ratio (the ratio of their internal funds to the investment required by their projects) into three groups. Firms with large net worth prefer market financing, firms with intermediate net worth get bank lending, and firms with little net worth are unable to obtain credit.

Bolton and Freixas (2000) build a model of financial markets and corporate finance with asymmetric information, in which firms endogenously determine their financial structure. They borrows from Hart and Moore (1995) that bank debt is more easily renegotiated than a dispersed bond (Lummer and McConnell (1989), Gilson et al. (1990)), and from Diamond (1994) that even though bank loans are easier to restructure, there exists intermediation costs. A main feature of this paper is that equity issues, bank debt, and

¹This may be considered to be a distinct subset of research of the literature on capital structure. In general, Meyers and Majluf (1984) proclaim that there exists a pecking order on corporate external financing, with bank loans first, bonds the next, and equities as the last resort. The idea is that firms raising equities bear informational dilution cost when there is asymmetric information between firms and investors (Calomiris and Wilson (1998)). Here we abstract from equities issues. See below for the justifications.

bond financing co-exist in equilibrium. They find that in equilibrium the financing structure of firms are segmented into three categories: (i) the riskiest firms (e.g., start-ups) are either unable to obtain funding or constrained to issue equity; (ii) the safest firms finance from securities markets and thus avoid paying the intermediation cost; and (iii) the ones in between take out bank loans.

Finally, recent studies have demonstrated the importance of collateral channel in explaining the dynamics of macroeconomic aggregates through the interaction of credit constraints and the value of collateralized assets (Kiyotaki and Moor (1997), Chen (2001), Iacoviello (2005)). Furthermore, collateralization of loans may also distort the investment decision of firms and/or loan renewal decision of banks (Allen and Gale (2000), Lorenzoni (2005)). Kiyotaki and Moore (1997) investigate exogenous shocks' transmission mechanism of collateral channel through the interaction of credit constraints and the value of collateralized assets. Fluctuations in asset prices change the value of the collateral and affect the firm's ability to obtain external financing, thus magnifying business fluctuations. Chen (2001) extends the connection of collateral value and bank loans by taking banks' financial characteristics into consideration, emphasizing the role of banks in affecting the amount of collateral-secured loans. Their models hence provide a theoretical link between fluctuations of collateral value, firms' credit constraint, and the capacity of bank lending. Iacoviello (2005) contributes to the literature on financial frictions and the macroeconomy by tying housing values to collateral constraints on both the firm and the household side. He shows that the collateral effects allow the model to match some key aggregate time-series data. Lorenzoni (2005)) considers a model with endogenous asset prices and fire sales to study the effect of asset price movements on the entrepreneurs balance sheet and on the feedback between net worth and asset prices. He first demonstrates that the economic environment may lead to excessive borrowing and over-investment. During a fire sale, the "asset price channel" implies that a decline in asset prices exerts a negative effect on entrepreneurs balance sheet. This pecuniary externality arising from fire sales can be reduced if entrepreneurs commit to reduce initial borrowing and investment.

3 The Model

To study the interactions of the choice of leasing/buying capital, the firms' credit constraints, and financing structure, we consider a model where entrepreneurs choose between buying capital and leasing capital, and at the same time choose between bank financing and bond financing. The equilibrium interest rates of bank lending and bond issue will be determined in equilibrium. We modify the model by Bolton and Freixas (2000, 2004) to incorporate the above-mentioned features.

Consider a three period model, $t = 0, 1,$ and 2 . There are three type so agents: entrepreneurs, intermediaries, and lessors, each with population one. The agents consume only at date 2. There are two types of goods: consumption goods and a productive asset. The technology uses only the asset as an input, $y = f(k)$. Each entrepreneur is endowed with w units of goods. The asset market opens at time 0 and 1. We denote q_0 and q_1 as the date 0 and 1 prices of capital respectively.

When capital is leased, the entrepreneur leases k_l units of capital and pays a rental rate u_l up-front. At date 2 the depreciated capital is returned to the lessor. Since leasing involves a separation of ownership and control, which is costly due to agency problems. We thus assume that the depreciation rate under lease δ_l is larger than that under buying, $\delta_l > \delta$ (Alchian and Demsetz (1972)). When the entrepreneur buys the capital at date 0, the entrepreneur can raise funds either from banks or bond issue.

If the entrepreneur chooses to borrow from a bank, he can at most borrow a fraction of the resale value of his capital,

$$Rb \leq \phi(1 - \delta) E(q_1) k_0$$

where b is the amount of funds raised, k_0 is the amount of capital invested by buying capital, δ is the depreciation rate of owned capital, and R is the gross rate of interest. Financial intermediation is more costly than bond issues. If the investment is financed by issuing securities, the bond issue specifies a repayment schedule R_B . We distinguish bank credit from bond financing by assuming that bank credit is easier to restructure than bond financing. We will specify the details later.

Lessors are credit unconstrained agents who own and lease capital. We assume that leased capital is more easily repossessed by the lessor. The lessors are competitive so that

their expected profits are zero. Taking the time 0 capital price, expected resale value of capital, rental rate of leasing as given, the lessors determine the amount of capital leased to the entrepreneur

$$\max u_l k_l - q_0 k_l + (1 - \delta_l) E(q_1) k_l / R$$

where u_l is rental rate of capital, k_l is the amount of capital to the lessee, and δ_l is the depreciation rate of leased capital.

The first order condition is given by

$$u_l = q_0 - \frac{(1 - \delta_l) E(q_1)}{R}.$$

We then specify the maximization problems of entrepreneurs and banks later, and solve the problem backwards: given date 0 decisions, banks decide whether to restructure the bank debt or not at date 1, and then return to the date 0 decisions.

4 Reference

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5 Main Findings and Assessments

We have the following preliminary findings. We find that the decisions of tenure choice and the capital structure of a firm depend on the interactions of agency costs and the fluctuations of asset prices. When the risk in the resale value of capital increases, the tenure choice of fixed capital leads to a substitution effect between bank loans and securities. Furthermore, when the moral hazard problem worsens and thus raises agency costs, the credit constraints affect capital structure and leads to a shift in leasing/buying choices. Our model thus characterizes a wider spectrum of firms' financing decisions under credit constraints.

In this paper, we concentrate on the land (real estate) as the sole capital. This is because liquidity of the resale market of capital depends on the specificity of that capital.² In order to focus on the role of fluctuations of asset prices played in determining the interaction of leasing/buying decision and corporate financing structure, we focus on the type of capital that has a well-developed resale market and has a easily discernible market value, that is, land or real estate, which serves as both collateral and production input.

Furthermore, we abstract from several aspects which are common in the literature of corporate finance. In particular, we omit the role of equities in the model. One justification is that evidence shows that the pecking order appears to break down for risky start-up firms, for these firms equity financing is the only option available (Petersen and Rajan (1994, 1995)). Bolton and Freixas (2000) show that adding equities allows the model to explain why the pecking order breaks down in the start-up firms. Therefore, we exclude the financing choice of issuing equity for the current project. Here our focus is on how the potential fluctuations of asset prices affect the choice of leasing/buying as well as financial structure. We will leave the choice of equities for future research. We will need to provide some more results and polish the manuscript before submitting to a journal.

²Krishnan and Moyer (1994) find that leasing is significantly less used for external financing for firms in manufacturing industries, where asset specificity is greater, than for firms in most other major industry groupings.