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Optimal capital structure, bargaining, and the supplier market structure[☆]

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ABSTRACT

This paper studies the relationship between firm leverage and supplier market structure. We find that firm leverage decreases with the degree of competition between suppliers. Specifically, leverage decreases with the elasticity of substitution between suppliers. Leverage also decreases with the number of suppliers when the elasticity of substitution is high, and increases with the number of suppliers when the elasticity is low. We also provide empirical evidence that is consistent with the model predictions.

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1. Introduction

Firms often have close connections with their key suppliers, and these key suppliers are generally considered important stakeholders of the firms. It is therefore interesting to see how suppliers affect firm financial policies. Recent advances in corporate finance theory have addressed many interesting questions in this area, for example, how the bargaining power of employees and suppliers affect firm capital structure (e.g. [Hennessy and Livdan, 2009](#); [Berk, Stanton, and Zechner, 2010](#)). However, very few papers have studied the effect of competition between suppliers on firm financial policies. This paper fills this gap and studies the interaction between leverage

and supplier market structure, and how this interaction affects firm leverage choice.

The first goal is to theoretically explore how competition between suppliers affects firm leverage choice. I incorporate the customer-supplier relationship into an otherwise standard structural model, and model a firm with n suppliers. The firm produces an output good via a constant elasticity of substitution (CES) production function. The CES production function allows the use of the elasticity of substitution and the number of suppliers to measure competition between suppliers (e.g. [Caballero, 1991](#); [Aghion, Harris, Howitt, and Vickers, 2001](#), [Aghion, Bloom, Blundell, Griffith, and Howitt, 2005](#)). All suppliers make cost-reducing relation-specific investments before trading with the firm. The firm and the suppliers bargain to determine the input price once the relation-specific investment is in place.

In this model, leverage increases the firm's bargaining power and reduces its suppliers' incentive to make relation-specific investment. Higher leverage increases a firm's

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default probability. The firm's default will hurt not only the firm but also its suppliers because the suppliers' relation-specific investment becomes useless once the firm defaults. The suppliers, when facing a highly levered customer firm, will have to demand less payment from the firm to reduce the firm's default risk, which increases the firm's bargaining power. For the same reason, the suppliers make less relation-specific investment to reduce their exposure to the firm's default risk.

On the other hand, competition between suppliers also increases a firm's bargaining power and reduces its suppliers' incentives to make relation-specific investment. When the suppliers' market is competitive, the firm can credibly threaten to replace the existing suppliers with their close competitors. The existing suppliers, therefore, have to offer concessions to maintain their relationship with the firm. Competition between suppliers also reduces the suppliers' incentives to make relation-specific investment, because the suppliers fear that they will be replaced by their competitors and lose the value of their investment.

I find that the effects of debt and supplier competition are substitutable. Specifically, a firm's leverage decreases with the elasticity of substitution between suppliers. This result is consistent with the empirical findings of Kale and Shahrur (2007), who find that firms have lower leverage when their suppliers are in a more competitive industry.

Next, I find that the relationship between firm leverage and the number of suppliers depends on the elasticity of substitution. When the elasticity of substitution is low, leverage increases with the number of suppliers; when the elasticity is high, leverage decreases with the number of suppliers. When the elasticity is low, each supplier is very important to the firm, and is therefore able to extract more surplus during the bargaining process. The greater the number of such important suppliers, the less bargaining power the firm has. In the extreme case of zero elasticity of substitution, the production function becomes Leontief. With a Leontief production function, each supplier has a monopoly in supplying the unique input to the firm, and therefore, each supplier has the highest possible bargaining power against the firm. In the opposite extreme case of perfect substitutability, the suppliers' industry becomes an oligopoly. The suppliers lose bargaining power when there are more suppliers in the industry. This result is still consistent with Kale and Shahrur (2007), because only suppliers with sufficient substitutability are empirically considered to be in the same industry.

To test the predictions of the model, I construct two separate samples. The first sample, called the industry sample, identifies firms' supplying industries using the Bureau of Economic Analysis Input-Output Use Table; the second sample, the individual sample, identifies firm-level key suppliers using the Compustat segment data. For the industry sample, I use input good heterogeneity at the industry level to measure the elasticity of substitution between input goods, and I use the number of supplying industries to measure the number of supplying firms with low substitutability. Consistent with the model predictions, I find that leverage is positively associated with input good heterogeneity and the number of supplying

firms. For the individual sample, I use the number of industries of the dependent suppliers as a proxy for the number of supplying firms with low elasticity of substitution, and the average number of suppliers per supplying industry as a proxy for the number of supplying firms with high elasticity of substitution. Consistent with the model predictions, I find that leverage is positively associated with the number of supplying industries, and negatively associated with the average number of suppliers per supplying industry.

My theoretical model builds on the insights of Dasgupta and Sengupta (1993) and Hennessy and Livdan (2009), who show that debt improves a firm's bargaining power against its suppliers or employees. This paper complements their analysis by modeling the effects of competition between suppliers on firm leverage decisions. Introducing supplier competition makes the interaction between the firm and its suppliers more realistic because firms usually have alternative options in choosing their suppliers. Moreover, supplier competition can erode the effectiveness and the necessity of using debt as a bargaining tool. It is therefore important to consider supplier competition when studying the impact of suppliers on firm leverage choice. I also choose a different modeling strategy than Dasgupta and Sengupta (1993) and Hennessy and Livdan (2009). While Dasgupta and Sengupta (1993) choose to model a static bargaining game and Hennessy and Livdan (2009) choose to incorporate the bargaining effects of leverage into relational contracting models, I embed the bargaining process within a continuous time structural model. The structural model provides a standard way of modeling firm capital structure to avoid making ad hoc assumptions. Furthermore, the model delivers novel predictions regarding the effects of the supplier market structure on firm leverage choice.

The empirical work contributes to the growing literature on the effects of suppliers or customers on firm leverage (Bronars and Deere, 1991; Kale and Shahrur, 2007; Matsa, 2010). Our focus on testing the effects of substitutability and the number of supplying firms on leverage is new in the literature. For example, Kale and Shahrur (2007) also study how supplier competition affects firm leverage, and they use industry Herfindahl index to measure competition. However, strictly speaking, the Herfindahl index is a valid measure of competition only for oligopolistic industries. My measures, on the other hand, are valid under different market structures. Moreover, as suggested by the model, my measures are able to discern the interaction of suppliers in different industries.

The rest of the paper is organized as follows. Section 2 develops the model, Section 3 presents the all-equity benchmark, Section 4 presents the model results, Section 5 presents the empirical analysis, and Section 6 concludes.

2. The basic model

2.1. The model setting

The model includes one downstream firm (DF) and n upstream suppliers (UF). The DF produces an output good using the n inputs supplied by the n UFs according to the

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