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Why Trade Credit Financing is More Important than Developing Large Customer Relationships for Video Game Suppliers

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ABSTRACT

Trade credit extended to suppliers in the video game industry does not serve as a commitment device for large customers in determining which vendors to make relationship-specific investments in. Suppliers of video games are better off investing in relationships with trade creditors than seeking out large customers. The costs of large customer relationships are lower sales growth and less long-term debt financing. Also, large customers do not form relationships with suppliers in this industry that have high research and development expenditures nor do they facilitate economic viability with regard to continued independent operational performance or listing on a stock exchange.

Keywords: Trade credit, innovation, relationship-specific investments, suppliers, large customers, economically-linked firms, vertical supply chain

JEL Codes: G10, G30, G32

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"Many 21st Century business ninjas received some of their earliest training from video games. They fit the gamer stereotypes in their youth. Maybe they were alienated, pimple-faced geeks. Perhaps they were losers, slackers, nerds. But everyone is awkward and alienated in puberty and adolescence. What is it about video games that contributed to marking the geeks of the 20th Century into the innovative entrepreneurs of the 21st Century?" [2]

I. Introduction

The video gaming sector is known for its innovation by entrepreneurs. The early 1980s is considered to be the golden age of the video game and arcade industry, followed by advancement in gaming technology in the 1990s.[3] However, the golden age diminished in the 2000s, when many entrepreneurial firms entered the market and quickly went out of business. Today, many entrepreneurs pursue fame and fortune by developing smartphones and social gaming platforms like Zynga (Mafia Wars) and Rovio (Angry Birds), despite the fact that the majority of video game software releases are commercial failures.[4]

What receives minimal investigation in the literature is how each component of the vertical integration supply chain—vendor, supplier, and customer— impacts financing, intangible relationship investments, and survivability of the supplier firm. There is little research on whether the type of financing or the ability to contract with large, economically important customers decreases the likelihood of failure for publicly-listed gaming suppliers. On the one side, it is not unusual for suppliers in industries with a large degree of innovation and turnover to experience credit rationing that may impede their ability to fulfill orders from large customers (Freear and Sohl, 2001; Gadenne, 1998). Existing studies suggest that having a business-to-business relationship with a large customer in a manufacturing industry is considered to be valuable to suppliers due to lower perceived risk by creditors and more stable sales growth (Kale and Meneghetti, 2014; Fine, 1998; Tyndall and Kamauff, 1998).[5] This assertion, however, implies that suppliers gain from establishing relationships

[2] Jordan Shapiro, Feb 15, 2014, How video games nurtured a generation of entrepreneurs, Forbes, http://www.forbes.com/sites/jordanshapiro/2014/02/05/how-video-games-nurtured-a-generation-of-entrepreneurs/#36270c30c8f3.

[3] https://en.wikipedia.org/wiki/Golden_age_of_arcade_video_games

[4] https://en.wikipedia.org/wiki/List_of_commercial_failures_in_video_gaming

[5] Instead, most of the literature shows that large customers benefit from having dedicated suppliers (Johnson, Kang, and Yi, 2010).

with large customers. Yet, creating intangible relationship investments has not been empirically tested for suppliers in this entrepreneurial product sector.

On the other side of the vertical supply chain, these same dedicated suppliers are customers of vendors that provide them with raw material and different product inputs. Many suppliers finance inventory with accounts payable trade credit for operational needs. Few studies, however, examine how financing along the vertical supply chain within an entrepreneurial industry affects the supplier's incentive to make and maintain intangible relationship investments. Is accounts payable financing related to suppliers' tendency to have product market transactions with large customers, and is the value of an intangible relationship tied to higher sales growth, more long-term debt, greater research and development intensity, or the probability of being defunct?

Understanding how the supplier's ties to large customers or its trade credit partners affects the firm's ability to survive financial problems and remain a public entity is an important part of the trade credit literature. Brau, Fawcett, and Morgan (2007) suggest that competition forces firms in creative industries to increase organizational effectiveness by working closely with key customers. They and others state that many entrepreneurial firms rely on the resources and knowledge of their key customers and suppliers to compete successfully. It is unknown, however, whether publicly traded suppliers' ability to take advantage of investment opportunities that come from selling to large customers is related to their access to accounts payable trade credit from vendors.[6] To our knowledge, no existing study in entrepreneurial finance analyzes this issue. Researchers mainly surmise that access to capital and relationships with key stakeholders contribute to the success and initial survivability of many small businesses and IPOs. Few authors examine the importance of vendor-supplier-customer relationships across the vertical supply chain.[7]

We find that large customer relationships do not facilitate supplier firm survival in the video gaming sector, a volatile and rapidly changing market. The existence of an economically important customer is associated with lower sales growth and less long-term leverage. Those suppliers with atomistic customers grow at a faster rate and have greater long-term debt. Moreover, suppliers linked to large

[6] Beck, Demirgüç-Kunt and Maksimovic (2008) provide evidence from a survey that covers 48 countries, that on average 19.7% of all investment is financed with trade credit. Similarly, Cunat and Garcia-Appendini (2012) show that 60% of small businesses rely on suppliers for operations.

[7] Instead, most studies concentrate on success factors associated with start-ups, early stage ventures, and established ventures (Allen and Hall, 2008; Brown, 2005; Duchesneau and Gartner, 1990; Robb, 2002).

customers do not have higher research intensity or a better chance of remaining an independent entity than other similar suppliers. Therefore, within the video gaming sector, intangible customer relationships are not value-adding investments.

In contrast, video gaming suppliers that receive substantial accounts payable trade credit from their own vendors are actually less likely to have large, economically important customers. The intangible relationship investment in their vendors appears to be beneficial given that these firms have the largest sales growth and the least likelihood of being defunct. Thus, the ability of suppliers to obtain accounts payable funding should be more of a credible signal of supplier longevity to the capital markets than the existence of large customers. It is important for entrepreneurs in this industry with scarce resources to cultivate inter-firm alliances with trade creditors more so than with large customers.

II. Literature Review

Numerous studies identify factors that influence both a firm's demand for and supply of credit such as firm age, size, and cash levels (Berger and Udell, 1998; Cuñat, 2007; Watson and Everett, 1996; Liu, Woodlock, Qi, and Xie, 2006). However, none of the above papers discuss how a supplier's ability to get accounts payable trade credit funding is related to relationships with large customers (Allen and Hall, 2008; Brown, 2005; Bull and Willard, 1993; Choi and Stack, 2005; Colombatto and Melnik, 2007; Covin and Slevin, 1990; Duchesneau and Gartner, 1990; Gadenne, 1998; Gartner, Starr, and Bhat, 1998; Lechler, 2001; Lumpkin and Dess, 2001; Keeley and Roure, 1990; Shepherd, Douglas, and Shanley, 2000; Timmons, 1994; Vesper, 1990). The papers' findings that large customer relationships are an important determinant of small private firms' ability to survive do not focus on suppliers' importance as customers in the vertical supply chain, nor do they consider the value of intangible investment in trade creditor relationships (Coleman, 2005; Moro, Lucas, and Grim, 2012). [8]

The existence of a large, economically important customer can be detrimental for small publicly listed suppliers with respect to survival or sales growth if a game becomes unpopular or the economy falls into a recession (Bartholomew, 1999; Blackwell, 1997; Christopher and Ryals, 1999; Dell and Fredman, 1999). Arend and Wisner (2005) find that small to medium-sized enterprise (SME) performance

[8] Much of the empirical evidence on the validity of each of these theories of trade credit has been done using the Survey of Small Business Finances (SSBF), carried out by the Board of Governors of the Federal Reserve Bank on a sample of small US firms.

declines when supply chain relationships become more intertwined. However, Wynarczyk and Watson (2005) show that from 1993 to 1999, inter-firm partnerships increased sales growth rates for 34 SME U.K. subcontractors, known to obtain the majority of their business from members of their supply chain network. In contrast to Arend and Wisner (2005), their results suggest that developing close, long-standing, strategically important relationships with customers or providers of financing creates a competitive advantage.

Other research finds that leverage, volatility in the macro economy, and research and development intensity (R&D) are also related to the value of having a large customer or a supplier relationship. Supplier and customer product market considerations impact a firm's capital structure decision through two channels. The first channel relates to how the firm's debt level affects its investment decisions. In most studies, relationship-specific investment is measured with two variables: the customer and supplier's R&D expenses, and the presence of a strategic alliance or joint venture between the two. In the second channel, high leverage reduces the bargaining power of a supplier as well as its share of the economic surplus (Hennessy and Livdan, 2009).

Limited empirical research provides evidence on the relationship between supplier-customer alliances and both debt financing and R&D investment decisions (Chemla and Faure-Grimaud, 2001; Chu, 2012; Kale and Meneghetti, 2014). Building on the intuition of Titman (1984) and Maksimovic and Titman (1991), Banerjee, Dasgupta, and Kim (2008) and Kale and Shahrur (2007) find that both customers and suppliers strategically choose to have low debt levels to induce the other party to undertake relationship-specific investments. Kale and Shahrur (2007) find that both a customer and suppliers' leverage is decreasing in the intensity of the industries' R&D level. A supplier that is dependent on a major customer for a significant portion of its sales maintains lower debt and competes in industries with high levels of R&D.

Another possible benefit of a supplier having either a large customer or access to trade credit is an increase in sales. Fabbri and Klapper (2009) and Daripa and Nielsen (2005) find that firms use trade credit to foster sales. In earlier studies, Boissay and Gropp (2007), Meltzer (1960), and Nilsen (2002) show how different types of firms use trade credit at different phases of the business cycle. Marotta (1997) performs a similar analysis on a sample of Italian firms and reports that trade credit partially absorbs the effects of a monetary contraction on firms. Similar to Kohler, Britton and Yates (2000), the authors find that large companies provide extra trade credit financing to smaller firms during recessionary periods or when the monetary policy tightens.

Yet, Opler and Titman (1994) theorize that large customer relationships may not be as valuable as trade creditor ties during recessions because a bankruptcy

disrupts a supplier's ability to fulfill product and service demands. Maksimovic and Titman (1991) extend this supposition by showing that large customer firms may be reluctant to buy a product from a firm near bankruptcy or financial distress, even in the absence of liquidation costs. The supplier may renege on its implicit contractual obligation, e.g. product quality guarantees. Suppliers in captive product market relationships may have a higher likelihood of becoming defunct due to the lack of diversification among customers.[9]

Some studies theorize that the likelihood of being defunct can be minimized by suppliers' fostering trade credit relationships. Wilner (2000) models how firms with a higher default risk should prefer to borrow from trade creditors. In our analysis, his theory is consistent with suppliers needing large amounts of accounts payables to fund supply chain activities for large customers. An empirical implication is that suppliers avoid bankruptcy, delisting, distress, and acquisition by relying on funding from trade creditors.

Profitability and cash liquidity are other important factors. Ferris (1981) argues that trade credit may emerge as a natural way to reduce costs inherent in a firm's cash management. In his paper, selling to large customers enables suppliers to better predict when the timing of the cash flows will occur, which eliminates the need to liquidate assets or to obtain an overdraft facility, thereby reducing the likelihood of delisting and deceased operations (see also Emery, 1984). As an extension, we examine whether accounts payable is as an efficient way for video game suppliers to obtain relationships with large customers.

It is possible that large customer relationships are not facilitated by access to trade credit, given that suppliers that rely on a few big customers typically have larger accounting returns and operate more efficiently in terms of selling, general, and administrative expenses and inventory turnover (Patatoukas, 2012). Well managed and profitable firms have less liquidity needs.

[9] Baranchuk and Rebello (2011) develop a model predicting that bankruptcy affects firms along the supply chain with respect to rivals, suppliers, and customers. Hertzel, Li, Officer, and Rodgers (2008) study the wealth effects of financial distress and bankruptcy filings for customers and suppliers of a filing firm. Evidence of linkages and contagion among firms along the supply chain exist because suppliers of filing firms experience negative abnormal returns during customer firms' bankruptcy filing and in the pre-filing distress period. Interestingly, they do not find evidence of contagion to the customers of a filing supplier firms. As such, the causality appears to be only from the customer to the supplier. Kolay, Lemmon, and Tashjian (2012) also find that suppliers experience a negative abnormal return around the pre-filing distress date of a large customer, and suppliers continue to extend credit to their distressed customers.

III. Gaming Firms Failures and Consolidations

In direct business-to-business relationships, partnerships are an essential part of supply chain management for firms in entrepreneurial industries, especially in today's intensive scale driven, technology economy. Pressured to meet competitive demands in an industry with a high failure rate, some suppliers choose to create partnership-style relationships by focusing on customers that represent a large portion of their sales.

As a form of outsourcing in the gaming industry, large customers are increasingly reliant on their suppliers to reduce costs, improve quality, and develop new products faster than rival vendors. In fact, experts in a 2004 Harvard Business Review article advise U.S. corporations to build supplier keiretsu similar to their Japanese rivals.[10] Yet, this same article states that the 1980s experiment to limit the number of suppliers at large corporations failed, on average, because U.S. firms continued to focus on costs instead of continuous improvement and loyalty. In essence, supply chain integration and aggregation between customers and their suppliers does not necessarily create more value.

Aoyama and Izushi (2003) describe how the video game industry is comprised of large and small console manufacturers, video game publishers, and video game development firms. The entrepreneurs in this industry need a variety of skills, ranging from technically-oriented computer programming to graphic artistry. All sectors of the industry continually have new entrepreneurs that create more realistic graphics and faster response games that provide opportunities for engineers, programmers, and novices (Izushi and Aoyama, 2006). Nolan Bushnell, considered a founding father of the industry, states, "… we provided a place for creative people to be part of something completely new. These were people who wanted to create something intellectually stimulating and fun. They wanted to put their talent into making games, not bombs" (Sheff, 1993).

However, little is known about the benefits and costs of maintaining a relationship with large customers in the gaming industry. For large customers in an entrepreneurial industry, suppliers are hopefully a part of the strategic plan to maintain competitiveness and innovation. Since technological breakthroughs are critical, customers should have a long-term outlook on suppliers' product development process. For similar reasons, a supplier may gain from working with a large customer in terms of survival, access to long term debt, more research and development, and higher sales growth. If so, having a large customer would enable

[10] https://hbr.org/2004/12/building-deep-supplier-relationships

captive suppliers to obtain more accounts payable from their trade creditors, in addition to long-term debt due to a positive signaling effect. To our knowledge, it is unknown whether there are greater benefits to supply chain partnerships for suppliers in entrepreneurial industries that engender close business relationships with large clients.

The gaming industry is faced with tumultuous competition, constantly changing consumer preferences, and rapidly evolving technologies. According to Jain and Ramdas (2005), firms in an evolving technology environment need to frequently reposition their products through innovation from research and development to respond to internal and external shocks in a timely manner. If the reaction time is too slow, the firm's products have a higher likelihood of failure and, thus, a lower chance of forming a cooperative relationship with large, economically important customers.

Relationships with large customer firms may also enable suppliers to reach economies of scale (Jeppesen, 2005). Another possibility, however, is that business-to-business collaborative relationships may only form after suppliers reach economies of scale due to the success of a standardized video game or product that receives loyal end-user following for an extended period of time.

Consistent with definitions of an entrepreneurial industry and the trend in number of firms in Table 1, disruptive technologies cause a high amount of new firm entry or exit (Bower and Christensen, 1995; Klepper, 1996). Over 200 independent video game developers operate in the US today, with most working under the typical structure of an advance from a customer.[11] This entrepreneurial space is dominated by large publishers like Electronics Art who control the game flow from suppliers and develop their own games internally.

As seen by Table 1, development in the video game industry has grown exponentially from 1990-2014. Not surprisingly, the number of firms quintuples in 2000. Since 2002, there has been a steady decrease in the number of firms, but in 2014, there are still double the number of firms compared to 1990. At the same time, we observe that firms become defunct almost each year. In fact, over the sample period, 60% of the firms become defunct.

The failure rate for publicly-traded video game firms is consistent with Titman (1984) and Maksimovic and Titman's (1991) assertion that unique products with short life cycles impose potential liquidation-related costs on suppliers and customers that undertake relationship-specific investments. And while the failure rate for this industry is relatively high, most years we observe new publicly traded entrants.

[11] http://digitalstrategies.tuck.dartmouth.edu/digital/assets/images/05_shah.pdf

Table 1: Number of Firms

This table reports the number of video gaming and arcade firms classified by SIC code 7372 in the universe of CRSP firms from January 1990-December 2014. The numbers include all sample firms, those linked with at least one large customer and those that are not. The third column reports the number of firms that become defunct each year. Firms are categorized as defunct if they are delisted from the exchange during the sample period. The fifth column presents the number of new entrants to the video gaming and arcade industry.

Number of Firms by Year				
Year	Total	Defunct	% of Total	Entrants
1990	56	7	12.5%	-
1991	50	5	10.0%	1
1992	47	3	6.4%	2
1993	48	1	2.1%	4
1994	47	5	10.6%	0
1995	46	2	4.3%	4
1996	47	8	17.0%	3
1997	38	2	5.3%	0
1998	43	5	11.6%	7
1999	45	4	8.9%	7
2000	244	17	7.0%	203
2001	259	40	15.4%	32
2002	226	34	15.0%	7
2003	197	32	16.2%	5
2004	177	18	10.2%	12
2005	164	16	9.8%	5
2006	172	16	9.3%	24
2007	165	19	11.5%	9
2008	146	19	13.0%	0
2009	132	17	12.9%	5
2010	121	16	13.2%	6
2011	115	8	7.0%	10
2012	105	11	10.5%	0
2013	105	7	6.7%	11
2014	101	4	4.0%	3

Therefore, the information asymmetries in the video game sector provides an ideal experiment for how uncertainties in the product market are an important part of trade credit decisions and supply chain relationships.

The focus on video game firms extends the research on the importance of entrepreneurship for publicly traded firms. For example, Johnson, Koo-Kang, and Yi (2010) argue that large publicly-traded customers have a certifying role in their supplier's initial public offering (IPO). Their results show that IPO firms with large customers experience higher IPO valuation and exhibit better long-term operating performance, especially when the product is unique. A similar argument can be made about video game suppliers. Those firms with large customers could have relatively more accounts payable because they are predicted to honor their trade credit obligations more so than other vendors with small clients. Our analysis is unique to the entrepreneurial finance literature, and it extends Smith's (1987) theoretical analysis on how uncertainty in the product market provides a more complete theory of trade credit.

IV. Hypotheses

The importance of supply chain relationships between suppliers, their key customers, and their vendors is particularly relevant in the video game and arcade industry, which is expected to grow rapidly due to the expansion of gaming platforms, cloud technology, and mobile phones. In this industry, disruptive technology can either be a chance for great riches for companies that continue to innovate or an insurmountable setback that will sink a supplier, as seen in Table 1. According to Black, Burton, and Johnson (2009), firms able to maintain their innovative strategies by improving upon the product (or service) they offer are able to meet the long-term needs of their customers, which should result in increased sales growth and greater access to capital.

Few studies, however, examine whether suppliers' access to trade credit is related to relationship specific investments in large customers. Our paper specifically tests whether the existence of an economically-linked supplier-customer relationship is related to several performance measures. By doing so, we help clarify the opportunities and potential problems that exist for firms in vertical supply chain relationships.

Hypothesis 1 evaluates whether the difference between suppliers in a linked relationship with a large customer is related to the level of accounts payable as a percentage of total assets or profitability, as defined by return on assets.

H1: The existence of a large customer is more related to the level of accounts payable trade credit financing and the linked supplier's profitably than for unlinked suppliers in the gaming industry.

The next set of hypotheses considers the costs and benefits of having an economic link with a large customer. Investment and financing opportunity theories predict that an advantage of having an economically significant relationship with a large customer is stable, increasing sales. Williamson (1975) comments that suppliers and customers agree to invest in specialized relationships when future sales growth is expected to be profitable.

H2: Economically linked suppliers have larger sales growth than unlinked suppliers.

In the context of our analysis, another possible benefit is that a large customer understands the importance of constant innovation, which may lead to more research and development funding.

H3: Economically-linked suppliers have higher research and development than unlinked suppliers.

Moreover, other lenders could interpret access to accounts payables or an economically-linked relationship with large customers as a positive signal of a supplier's creditworthiness and reliability, which would increase long-term debt financing. Alternatively, as previously discussed, bargaining theory predicts that linked suppliers reduce leverage in order to reduce customers' ability to extract a greater share of the surplus. In this case, unlinked firms should have higher debt than linked firms.

H4: *Economically-linked suppliers have different levels of long-term debt leverage than unlinked suppliers.*

Lastly, given that limited access to capital markets increases small firms' dependence on trade credit, major supply chain disruptions can lead to death spirals (Petersen and Rajan, 1997). When this occurs, management often responds by cutting research and development and new investments due to an inability to obtain new sources of capital. The reduction in sales then leads to a decrease in profitability, which then increases the probability of the firm being defunct through bankruptcy, liquidation, or acquisition. We extend the literature by examining whether large customers help smaller, young economically-linked suppliers avoid the death spiral.

From a supplier's perspective, the death spiral is a serious possibility because customers in an industry that constantly depends on innovation might quickly switch to a new vendor with the latest technology, more popular video game, or cloud gaming ability. If an important customer severs its relationship, a supplier will experience a sharp fall in demand for its products, which will dramatically decrease sales and potentially lead to failure.

In contrast, the presence of deep pocket vendors that provide accounts payable can act as an insurance device if trade credit serves as liquidity for suppliers. Petersen and Rajan (1997) find that trade credit is more often extended to firms in financial distress, but only when they expect an increase in the flow of sales. In addition,

Wilner (2000) and Cuñat (2007) document that vendors tend to provide liquidity support to growing firms facing financial difficulties. What is unknown in the entrepreneurial finance literature is whether suppliers benefit from having a relationship with key customers or vendors or do either supply chain partners step aside and allow the supplier to become defunct. For example, did large customers or vendors support mobile giant Zynga, the developer of the smash hit mobile game Words with Friends, when the firm laid off 520 employees after several consecutive quarters of losses? Hypothesis 5 tests this conjecture for all publicly trade suppliers in the video game industry.

H5: *Economically-linked suppliers have lower incidences of being defunct and delisted from exchanges than unlinked suppliers.*

V. Sample and Data

We restrict our sample to the universe of publicly-traded firms from January 1990-December 2014 with SIC code 7372 in CRSP, for a total of 682 unique firms. [12] In order to determine whether supplier-customer relationships are beneficial or detrimental to publicly traded suppliers, we divide the sample into economically-linked (285) and unlinked firms (397) that either do or do not have customers representing at least ten percent of their sales. Following Cohen and Frazzini (2008), we identify the linked firms based on the supplier-customer relationships. Regulation SFAS No. 131 requires management to disclose the existence of corporate customers that make up at least ten percent of suppliers' sales. As a result, we are able to designate suppliers that file Regulation SFAS No. 131 as economically-linked to a client from the Compustat KeyCustomers Segment database.[13] In the analysis, the subsample of suppliers with at least one large customer is differentiated from the subsample with atomistic clients with the dichotomous variable *Linked*. *Linked*

[12] U.S. Department of Labor provides a more detailed definition of SIC code 7372 firms. More specifically, these firms specialize in applications, computer games, operating systems, and utility software.

[13] The collection process is tedious because Compustat does not report the names of the customer firms consistently over the sample years. For instance, Microsoft appears as "MICROSOFT," "MICROSOFT CORP," and "MICROSOFT CP." Therefore, we use an algorithm to match the customer name to the corresponding firm listed on CRSP and Compustat. We then manually verify that each customer firm is correctly matched. In cases where we cannot match a customer name or the match is ambiguous, we remove the observation from the sample, consistent with Cohen and Frazzini (2008).

equals one for those listed in the Compustat's KeyCustomers Segment file, and zero otherwise.[14]

Our sample is comprised of 10,273 firm-quarter observations. Data for firm-specific variables are obtained from the following sources: Center for Research in Security Prices (CRSP), Compustat, Thomson Reuters Institutional Holdings database, and Thomson Financials Institutional Brokers' Estimate System (IBES). The specific variables considered are the number of years listed on the stock exchange, size, return on assets, negative equity, accounts payable, research and development (R&D), change in sales, cost of goods sold, cash, leverage, recessionary periods, institutional ownership, analyst coverage, and whether the firm is listed on the NASDAQ exchange. We winsorize variables at the 5% and 95% level to avoid outliers driving the results for this unique industry. All variables are defined in the tables.

Tables 2 provides summary statistics for the sample as a whole, and for the economically-linked and unlinked suppliers. Panel A reports the firm characteristics for all the video gaming firms in our sample. In Panel B, the univariate analysis shows preliminary differences between the economically-linked and unlinked supplier-customer subsamples. In each subsample, the average length of time that the firm has been listed on a stock exchange is 20-21 years. Publicly traded firms in the gaming industry are relatively established, primarily trading on NASDAQ. NASDAQ firms represent 74.2 and 82.3 percent for unlinked and linked firms, respectively. Other univariate differences are that linked suppliers have higher accounts payable as a percentage of total assets, research and development as a percentage of total assets, and cash as a percentage of total assets than unlinked suppliers. On average, linked suppliers have lower fixed costs as a percentage of sales and lower long-term debt. Institutional ownership and the existence of analysts covering the firm are not significantly different between the two samples.

Consistent with the industry's failure rate in Table 1, the more detailed summary statistics on ROA in Panel C reveal that a majority of the firms in the unlinked and linked subsamples have negative performance (the mean ROA is -0.50 percent). At the 20th percent quintile, the average ROA for the unlinked and linked firms are -34.1 percent and -38.1 percent, respectively. Skewness is prevalent given

[14] The dichotomous variable identifies linked suppliers with a six-month lag after the actual filing date. The rationale for this variable specification approach to ensure that market participants and stakeholder firms are aware of the economic link between the two firms (Cohen and Frazzini, 2008; Fama and French, 1993).

Table 2: Summary Statistics

This table presents the firm characteristics of the video gaming and arcade sample firms (SIC code 7372) each quarter from January 1990-December 2014. In panel A, statistics are presented for all sample firms, those linked with at least one large customer and those that are not. In Panel B, statistics are presented for the subsample of linked and unlinked firms. Linked is a binary variable equal to one if the firm has at least one large customer that comprises at least 10% of their sales, and zero otherwise. LogME is the natural log of the market capitalization of the firm. Market capitalization is the price times the number of shares outstanding. Age equals the number of years that the firm has been listed on the exchange. ΔAccounts Payable is the change in accounts payable during the quarter. Accts Payable equals the accounts payable scaled by total assets. R&D equals the research and development expense scaled by total assets. ROA equals the operating income before depreciation scaled by total assets. ΔSales equals the change in sales during the quarter. COGS equals the cost of goods sold scaled by sales. Cash equals cash and short-term investments scaled by total assets. Recession is a binary variable equal to one if the quarter is classified as a recessionary period according to the National Bureau of Economic Research, and zero otherwise. Longtermdebt Dummy is a binary variable equal to one if the firm has long term debt during the quarter, and zero otherwise. Longtermdebt equals total long-term debt scaled by total assets. Neg Equity Dummy is a binary variable equal to one if the book value of equity for the quarter is negative, and zero otherwise. ΔInstit Ownership is the change in institutional ownership during the quarter. Instit Ownership equals the number of shares held by institutions scaled by the number of shares outstanding. Analystcoverage Dummy is a binary variable equal to one if the firm has at least one analyst estimate reported for the quarter, and zero otherwise. NASDAQ is a binary variable equal to one if the firm is listed on the NASDAQ exchange, and zero otherwise. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. Panel C presents the average ROA for each quintile, sorted by ROA, of all firms and the subsamples.

Panel A: Summary Statistics for All Gaming Firms

	N	Mean	Min	Max	StdDev	Median
Linked	10273	0.079	0.000	1.000	0.270	0.000
LogME	9561	11.928	4.043	19.101	1.912	11.922
Age	10273	20.818	9.000	35.000	7.488	19.000
ΔAccts Payable	10273	-0.005	-0.043	0.045	0.022	-0.001
Accts Payable	10273	0.049	0.006	0.197	0.052	0.029
R&D	10273	0.027	0.000	0.096	0.027	0.021
ROA	8171	-0.071	-0.441	0.088	0.152	-0.004
ΔSales	10273	-0.004	-0.325	0.475	0.204	0.015
COGS	10273	0.378	0.080	1.071	0.273	0.313
Cash	10273	0.248	0.000	0.765	0.249	0.181

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Recession	10036	0.194	0.000	1.000	0.396	0.000
Longtermdebt Dummy	9420	0.500	0.000	1.000	0.500	0.000
Longtermdebt	9108	0.070	0.000	1.863	0.153	0.000
Neg Equity Dummy	9420	0.057	0.000	1.000	0.232	0.000
ΔInstit Ownership	10273	-0.006	-0.060	0.105	0.043	0.000
Instit Ownership	10273	0.290	0.000	0.969	0.338	0.110
Analystcov Dummy	10273	0.571	0.000	1.000	0.495	1.000
NASDAQ	10273	0.749	0.000	1.000	0.434	1.000

Panel B: Summary Statistics for Linked and Unlinked Firms

	Unlinked		Linked		Differences	
	N	Mean	N	Mean	Diff	t-stat
LogME	8786	11.927	775	11.941	-0.014	(-0.22)
Age	9461	20.897	812	19.900	0.997***	(4.22)
ΔAccts Payable	9461	-0.005	812	-0.004	-0.800	(0.43)
Accts Payable	9461	0.049	812	0.053	-0.001**	(-2.09)
R&D	9461	0.026	812	0.037	-0.011***	(-11.39)
ROA	7444	-0.070	727	-0.087	0.017***	(2.69)
ΔSales	9461	-0.005	812	0.007	-0.012	(-1.45)
COGS	9461	0.383	812	0.327	0.056***	(5.71)
Cash	9461	0.244	812	0.327	-0.048***	(-5.11)
Recession	9242	0.195	794	0.327	-0.560	(0.13)
Longtermdebt Dummy	8662	0.510	758	0.327	0.129***	(6.99)
Longtermdebt	8370	0.072	738	0.327	0.023***	(4.77)
Neg Equity Dummy	8662	0.056	758	0.327	-0.007	(-0.76)
Instit Ownership	9461	0.289	812	0.327	-1.330*	(-1.75)
ΔInstit Ownership	9461	-0.007	812	0.327	-0.006***	(-4.05)
Analystcoverage Dummy	9461	0.568	812	0.327	-0.030*	(-1.69)
NASDAQ	9461	0.742	812	0.327	-0.081***	(-5.69)

Panel C: Average ROA Quintiles

	ROA		
	All	Unlinked	Linked
Q1-Low	-0.345	-0.341	-0.381
Q2	-0.059	-0.057	-0.087
Q3	-0.005	-0.005	-0.013
Q4	0.013	0.013	0.010
Q5-High	0.039	0.040	0.037

that at the 80th percent quintile, the average ROA for unlinked and linked firms are only 4.0 percent and 3.7 percent respectively.

VI. Results

A. Determinants of an economically linked supplier-customer relationship

The first hypothesis tests whether economically-linked suppliers have different levels of profitability and funding from trade creditors than unlinked suppliers. It is plausible that entrepreneurial suppliers within the gaming industry increase their likelihood of a business relationship with a large customer by having access to trade credit. This supposition is plausible given that, for many small businesses, trade credit is the major source of funding that enables management to continue operating (Giannetti, 2003; Rajan and Zingales, 1995). Thus, trade creditors could provide funding that results in accounts payables to suppliers that helps them meet the demands of large customers on a timely basis. To ensure sufficient economies of scale, suppliers with large fixed costs may particularly need both access to accounts payables and large customers. Moreover, large customers may be reluctant to form a business relationship with less profitable suppliers unless trade creditors are willing to provide them funding.

In Table 3, regression (1) presents the results from a logistic model estimating the likelihood of being an economically linked supplier. The dependent variable, *Linked*, equals one if the supplier has at least one customer representing at least ten percent of its sales, and zero otherwise. Inconsistent with signaling theory, suppliers with the largest accounts payable are less likely to have large customers based on the coefficient of -0.095 on *Accts Payable*. Instead, those suppliers with the least trade credit funding have linked relationships with large clients and rely more on long-term debt sources. The coefficient of 0.196 on *Long Term Debt* is statistically significant at the 1% level.

Technical solvency is also an important predictor of a supplier's relationship with a large customer. The coefficient on the negative equity dichotomous variable of -0.423 is statistically significant at the 5% level. Thus, suppliers that are technically in default are much less likely to have a relationship with large customers in the entrepreneurially oriented gaming industry. Yet, consistent with economies of scale, suppliers with larger fixed costs, as measured by cost of goods sold as a percentage of sales, are more likely to have a large, economically important customer.

Interestingly, firms with the most research and development (R&D) or cash as a percentage of sales have the fewest large customers. The coefficients on *R&D* and *Cash* variables are -0.31 and -0.09, respectively. Apparently, large customers prefer to form alliances with suppliers at a more mature stage of product development. Those firms with cash have a more diversified customer base.

As a sensitivity test, models (2) and (4) substitute firm size for firm age as a publicly traded firm. The coefficients on age in both models (0.119 and 0.169, respectively) are statistically significant at the 1% level. Also, the interaction variable *ROA*Age* has a highly significant coefficient of 0.146. These results are consistent with profitable, older publicly traded suppliers relying on large customers for business. As stated previously, the most distressed suppliers are shunned by large customers.

B. Do large customers help suppliers increase sales growth?

The second hypothesis predicts that an advantage of having a relationship with a large customer is increased sales. It is probably easier and more cost effective to sell more products or services to a current large customer than to try to convince smaller customers to switch from their existing vendors. Having at least one large customer should enable a supplier to better understand customer expectations within a competitive and volatile industry that requires constant innovation.[15] To examine this issue, Table 4 provides the results from regressions that test whether sustained sales growth is a benefit of having an economically-linked relationship.

The results in Table 4 are inconsistent with the third hypothesis. In model (1), the coefficient on *Linked* is statistically insignificant, and in model (2) the coefficient is significantly negative. Thus, large customers are correlated with lower sales growth for suppliers. Additional findings reveal that suppliers should strategically align themselves with trade creditors. In models (1) and (2), the coefficients on *Accts Payable* are positive and statistically significant (0.027 and 0.042, respectively). As

[15] Sample firms have between one and five major customers. A majority (64%) of the firms have only one large customer.

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Table 3: Likelihood of Being a Linked to a Large Customer

This table presents the results from a logistic regression that predicts whether or not firms are linked to a large customer. The dependent variable is Linked, which equals one if the firm has at least one large customer that comprises at least 10% of their sales, and zero otherwise. R&D equals the research and development expense scaled by total assets. Longtermdebt equals total long-term debt scaled by total assets. LogME is the natural log of the market capitalization of the firm. Market capitalization is the price times the number of shares outstanding. Age equals the number of years that the firm has been listed on the exchange. Accts Payable equals the accounts payable scaled by total assets. ΔSales equals the change in sales during the quarter. Cash equals cash and short-term investments scaled by total assets. COGS equals the cost of goods sold scaled by sales. Instit Ownership equals the number of shares held by institutions scaled by the number of shares outstanding. Analystcoverage Dummy is a binary variable equal to one if the firm has at least one analyst estimate reported for the quarter, and zero otherwise. Neg Equity Dummy is a binary variable equal to one if the book value of equity for the quarter is negative, and zero otherwise. ROA equals the operating income before depreciation scaled by total assets. All variables except binary variables are normalized to have zero mean and unit standard deviation χ^2-statistics are reported in the parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

	Dependent variable: *Linked*			
	(1)	(2)	(3)	(4)
Intercept	2.476***	2.501***	2.392***	2.367***
	(1,075.42)	(1,103.53)	(866.29)	(861.85)
R&D	-0.312***	-0.305***	-0.299***	-0.257***
	(61.67)	(59.95)	(51.90)	(42.15)
Longtermdebt	0.196***	0.161***	0.204***	0.202***
	(13.07)	(9.33)	(13.15)	(13.15)
Accts Payable	-0.095**	-0.079*	-0.105**	-0.083***
	(4.80)	(3.36)	(5.34)	(3.42)
Cash	-0.086**	-0.088**	-0.026	0.050
	(4.31)	(4.70)	(0.29)	(1.01)
COGS	0.203***	0.199***	0.203***	0.208***
	(18.41)	(18.40)	(16.47)	(17.46)
Instit Ownership	-0.049	-0.099*	0.037	-0.003
	(0.79)	(3.64)	(0.32)	(0.00)
Analystcov	0.136	0.105	0.066	0.026
	(1.68)	(1.02)	(0.31)	(0.05)
LogME	-0.094*		0.204***	
	(3.06)		(13.15)	
Age		0.119***		0.169***
		(7.77)		(12.85)
Neg Equity	-0.423**	-0.315*		

	(4.39)	(2.77)		
ROA			0.086*	0.057
			(3.61)	(1.30)
Neg Eq*LogME	-0.159			
	(0.85)			
Neg Equity*Age		-0.257		
		(1.45)		
ROA*LogME			0.034	
			(0.60)	
ROA*Age				0.146***
				(8.13)
Pseodu R^2	4.01%	4.04%	3.93%	9.24%
Obs	9,052	9,108	7,562	7,579

such, trade credit funding should be an important part of a supplier's strategic plan. Our results are consistent with firms in the gaming industry needing good and reliable trade creditors, an important aspect of supply chain management. It appears that an alliance with trade creditors increases suppliers' competitiveness.

C. Do large customers benefit suppliers by encouraging suppliers' R&D?

Ruyter, Moorman, and Lemmink (2001) state, "the level of complexity and inherent perceived risk involved in customers' relationships in high-technology markets leads to an intricate interplay of factors determining commitment and trust that in turn affect customer intentions to remain in the relationship." Their concerns about customer loyalty and collaboration with their suppliers is very relevant for video game developers. To stay competitive, R&D is the life line of these suppliers. Few studies examine whether large customers form relationship investments by investing in suppliers with relatively large R&D expenses. Dass, Kale, and Nanda (2014) find that a firm's accounts payables is positively related to its supplier-industry's relationship specific investment level as measured by R&D. The underlying premise is that R&D leads to relationship-specific investments resulting from the specialized nature of the products and technology. It is unclear whether this premise holds in the video game industry.

The high failure rates within this industry may cause skepticism in small, less informed customers resulting in delayed or postponed purchases of the suppliers' products or services, which might make it beneficial for the supplier to link themselves with large clients. Suppliers most likely have greater communication with large customers in order to conduct forward-looking, primary research that decreases the likelihood of product market failure for both constituents. Given that R&D is a

Table 4: Change in Sales

This table reports the results from OLS regressions that explain the change in sales. The dependent variable is ΔSales, which equals the change in sales during the quarter. Linked is a binary variable equal to one if the firm has at least one large customer that comprises at least 10% of their sales, and zero otherwise. Accts Payable equals the accounts payable scaled by total assets. ROA equals the operating income before depreciation scaled by total assets. Recession is a binary variable equal to one if the quarter is classified as a recessionary period according to the National Bureau of Economic Research, and zero otherwise. Age equals the number of years that the firm has been listed on the exchange. LogME is the natural log of the market capitalization of the firm. *t*-statistics are reported in the parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

	Dependent variable: Δ*Sales*	
	(1)	(2)
Intercept	0.093***	0.108***
	(8.66)	(10.24)
Linked	-0.036	-0.020
	(-0.99)	(-0.56)
Accts Payable	0.027**	0.042***
	(2.40)	(3.71)
Linked*Accts Payable	0.019	0.004***
	(0.59)	(0.13)
ROA	-0.006	-0.037***
	(-0.55)	(-3.54)
Recession	-0.042***	-0.031***
	(-3.98)	(-2.94)
Recession*Linked	0.017	0.012
	(0.47)	(0.34)
Recession*Accts Payable	0.005	0.004
	(0.54)	(0.41)
Age	-0.005	
	(-0.46)	
LogME		0.109***
		(9.78)
R^2	0.32%	1.43%
Obs	7,969	7,850

hit-or-miss opportunity that relies on experimentation rather than proven sales, large customers may facilitate greater relative expenditures on R&D by accepting higher rates of development failure in order to mutually benefit from suppliers' continuous learning process. An informal joint collaboration could be a form of loss risk-sharing

if suppliers know that they will be rewarded with loyalty for paying for R&D that helps both management understand customer firms' problems and opportunities in the gaming industry.

An underlying assumption for the third hypothesis is that large customers create competitive advantages from intangible asset production because they have an educated understanding of R&D knowledge specificity. This allows linked suppliers to have a long-term horizon when developing a strategic plan related to innovation and R&D. This assertion is the theoretical underpinning for the highly touted lean strategy. In fact, lean strategy encourages customers and suppliers to share information about new-product planning, product conception, design, and pricing. In order to compete, customers need to have an understanding of suppliers' market positioning and the innovation demands of the industry and vice versa.

Yet, it is unclear whether large customers actually support linked suppliers' R&D initiatives. Raman and Shahrur (2008) show that suppliers can exaggerate expected sales and engage in earnings management. In Table 5, the results show that linked suppliers do not have higher increases in R&D expenditures than unlinked suppliers. The only statistically important variable is change in sales of the prior period. For completeness, in unreported tests, the change in R&D is replaced with the level of R&D expenses. In the unreported analysis, the linked variable remains statistically insignificant.

D. Do customers benefit suppliers by helping them obtain sources of long-term debt as a substitute or compliment to trade credit?

As previously discussed in the literature review section, large customers in industries with customized products or technology may be reluctant to link themselves to a supplier with high leverage due to the risk of default or distress. It is predicted that suppliers will limit their use of debt financing to signal a reduced default risk to the potential large customer. The rationale is that if the supplier liquidates or reneges on its contractual obligations due to default, the large customer will be forced to face substantial switching costs. Thus, low leverage and reliance on long-term debt sources are implicit assurances of the supplier's ability to fulfill their obligations over an extended period of time. Titman and Wessels (1998) present evidence that firms in durable goods industries choose lower debt ratios partially in order to not impose high relationship investment costs on their suppliers, but they do not examine if suppliers make similar debt financing decisions with respect to long-term debt and trade credit, nor discuss this issue for an entrepreneurial industry. To our knowledge, empirical evidence showing that supplier-customer relationships in a high-technology environment such as the gaming industry is scarce. Hypothesis four predicts that linked suppliers have lower leverage and greater reliance on long term

debt. The empirical results from the analysis are provided in Table 6. Panel A estimates the level of long-term debt as a percentage of total assets, and Panel B estimates the likelihood of a supplier having long-term debt.

The results in Table 6 are consistent with suppliers choosing to have less long-term debt as a percentage of total assets when they are economically-linked to a large customer. The coefficient of -0.18 in model (1) of Panel A is statistically significant at the 1% level. This finding along with the result that linked suppliers are more likely to include long-term debt in their capital structure is consistent with low leverage being used as an implicit assurance of credibility. Their own trade creditors, however, appear to not need the same assurances from supplier firms given that long-term debt leverage in Panel A is slightly higher than when accounts payable is low (coefficient of 0.03 in model 1), and supplier firms tend not to have less long term debt as accounts payable increases.

As expected, insolvent (profitable) firms with negative equity (positive ROA) have a lower (higher) likelihood of having long-term debt and a lower long-term debt leverage ratio. What is interesting is that linked suppliers have a higher probability of having long-term debt than unlinked suppliers during recessions. Larger size and older corporations have less need for credibility by having large long-term debt leverage ratios than smaller and younger firms in the video game industry.

E. Do customers benefit suppliers by lowering the likelihood of being delisted?

Given that suppliers in the video game industry have higher exit rates, it is important to directly analyze whether large customers develop relationships with suppliers that have the highest rate of survival. Banerjee, Dasgupta and Kim (2008) and Kale and Shahrur (2007) build on the work by Titman and Wessels (1988) by theorizing that firms in a linked relationship select a capital structure policy that takes into consideration the effect of liquidation on suppliers and customers.

Baranchuk and Rebello (2011) present a theoretical model showing that all stakeholders along the supply chain are negatively impacted by bankruptcy, liquidation, or any other event that severs the relationship between a supplier and its large customers. Empirically, Kolay, Lemmon and Tashjian (2012) and Hertzel et al. (2008) report that the wealth effects surrounding financial distress and bankruptcy filings are negative for suppliers, but not for the filing firm's customers.

We re-examine this issue in hypothesis five and present the results of a logistic model predicting a change in the supplier and customer relationship due to the firm being defunct, as defined by delisting from a stock exchange due to liquidation, bankruptcy, distress, or acquisition. Including acquisition of the supplier by an unaffiliated acquirer is important because the former relationship-specific investments could lose value if the new vendor severs the business relationship with

Table 5: Change in R&D

This table reports the results from OLS regressions that explain the change in research and development (R&D). The dependent variable is ΔR&D, which is the change in the research and development expense scaled by total assets during the quarter. Linked is a binary variable equal to one if the firm has at least one large customer that comprises at least 10% of their sales, and zero otherwise. ΔSales equals the change in sales during the quarter. Cash equals cash and short-term investments scaled by total assets. Longtermdebt equals total long-term debt scaled by total assets. Recession is a binary variable equal to one if the quarter is classified as a recessionary period according to the National Bureau of Economic Research, and zero otherwise. LogME is the natural log of the market capitalization of the firm. Market capitalization is the price times the number of shares outstanding. Age equals the number of years that the firm has been listed on the exchange. Age equals the number of years that the firm has been listed on the exchange. *t*-statistics are reported in the parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

	Dependent variable: Δ*R&D*	
	(1)	(2)
Intercept	0.012	0.013
	(1.54)	(1.60)
Linked	0.019	0.017
	(0.66)	(0.59)
ΔSales	0.019**	0.018**
	(2.17)	(2.05)
Cash	-0.013*	-0.014*
	(-1.67)	(-1.81)
Longtermdebt	-0.002	-0.004
	(-0.25)	(-0.55)
Recession	0.001	0.002
	(0.14)	(0.29)
Accts Payable	0.001	0.007
	(0.10)	(0.98)
Linked*ΔSales	-0.043	-0.043
	(-1.59)	(-1.57)
Linked*Longtermdebt	0.022	0.020
	(0.62)	(0.56)
Linked*Recession	-0.037	-0.037
	(-1.37)	(-1.36)
LogME	-0.015*	
	(-1.80)	
Age		0.000
		(-0.04)
R^2	0.17%	0.14%
Obs	8,612	8,660

Table 6: Debt Financing

This table reports the results from OLS regressions (panel A) and logistic regressions (panel B) that explain and predict the likelihood of debt financing. In panel A, the dependent variable is Longtermdebt, which equals total long-term debt scaled by total assets. In panel B, the dependent variable is Longtermdebt Dummy, which equals one if the firm has long-term debt during the quarter, and zero otherwise. Linked is a binary variable equal to one if the firm has at least one large customer that comprises at least 10% of their sales, and zero otherwise. Accts Payable equals the accounts payable scaled by total assets. R&D equals the research and development expense scaled by total assets. Recession is a binary variable equal to one if the quarter is classified as a recessionary period according to the National Bureau of Economic Research, and zero otherwise. ROA equals the operating income before depreciation scaled by total assets. Neg Equity Dummy is a binary variable equal to one if the book value of equity for the quarter is negative, and zero otherwise. LogME is the natural log of the market capitalization of the firm. Market capitalization is the price times the number of shares outstanding. Age equals the number of years that the firm has been listed on the exchange. Age equals the number of years that the firm has been listed on the exchange. χ^2-statistics are reported in the parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Predicting Level of Long-term Debt Financing

	Dependent variable: Longtermdebt			
	(1)	(2)	(3)	(4)
Intercept	0.036***	-0.068***	0.025**	-0.068***
	(2.89)	(-6.56)	(2.03)	(-6.66)
Linked	-0.186***	-0.176***	-0.194***	-0.168***
	(-4.45)	(-4.97)	(-4.68)	(-4.75)
Accts Payable	0.030**	-0.049***	0.086***	-0.059***
	(2.49)	(-4.95)	(6.74)	(-5.99)
Recession	-0.033***	-0.031***	-0.018	-0.028***
	(-2.62)	(-3.00)	(-1.41)	(-2.75)
ROA	0.006		-0.025**	
	(0.46)		(-2.00)	
Neg Equity		1.869***		1.897***
		(39.22)		(39.80)
Recession*Linked	0.064	0.049*	0.056**	0.056
	(1.55)	(1.37)	(1.38)	(1.58)
Recess*Accts Pay	0.016	0.012	0.018***	0.014
	(1.38)	(1.30)	(1.56)	(1.48)
LogME			0.161***	
			(12.18)	
Age				0.071***
				(7.32)

R^2	0.46%	14.91%	2.38%	15.41%
Obs	7,575	9,101	7,562	9,101

Panel B: Predicting Likelihood of Debt Financing

	Dependent variable: Longtermdebt Dummy			
	(1)	(2)	(3)	(4)
Intercept	-0.093***	-0.015	-0.076***	-0.014
	(15.16)	(0.45)	(9.77)	(0.39)
Linked	0.544***	0.542***	0.564***	0.533***
	(43.56)	(47.96)	(46.11)	(46.30)
Accts Payable	-0.073***	-0.104***	-0.170***	-0.393***
	(9.81)	(24.40)	(45.66)	(17.91)
Recession	-0.020	-0.016	-0.048**	-0.019
	(0.66)	(0.55)	(3.93)	(0.77)
ROA	0.070***		0.123***	
	(8.88)		(25.81)	
Neg Equity		-0.377***		-0.393***
		(16.49)		(17.91)
Recession*Linked	0.148*	0.134*	0.168**	0.127
	(3.18)	(2.81)	(4.04)	(2.51)
Recess*Accts Pay	-0.028	-0.033	-0.032***	-0.035*
	(1.57)	(2.65)	(2.06)	(2.96)
LogME			-0.278***	
			(113.14)	
Age				-0.077***
				(13.55)
Pseodu R^2	1.20%	1.46%	3.93%	1.65%
Obs	7,729	9,413	7,562	9,413

the customer (Cen, Dasgupta, and Sen, 2015; Johnson, Karpoff, and Yi, 2015). Losses occur when dedicated assets cannot be redeployed if the original supplier is either liquidated, restricted by bankruptcy rules, or acquired. It is not clear if large customers are committed to distressed suppliers.

In contrast to established theory, the value of a firm in the video game industry does not crucially depend on the implicit guarantees they have with their large economically-linked customers. In Table 7, the coefficients on *Linked* are statistically insignificant in models (1) and (2). The size or age of the supplier are much more important. Older firms have a lower probability of being defunct as evidenced by the

-0.16 coefficient in model (2). What is surprising is that larger firms (0.63 coefficient on the *LogME*) have a larger probability of being defunct. More detailed analysis reveals that larger video game firms are the most attractive acquisition targets by customers, their own vendors, or other competitors. For a similar reason, suppliers with the most positive ROA are more likely to become defunct. The related targets and acquirers might explain why the likelihood of being defunct decreases for video game suppliers during recessions (coefficients in models (1) and (2) are -0.07 and -0.13). During periods of macroeconomic decline, most firms in this industry do not perform well. As a result, fewer potential acquirers have the resources to purchase suppliers.

As expected, the suppliers with the most cash have a lower probability of being defunct (coefficients in model (1) and (2) of -0.18 and -0.24, respectively). When *Age* is included in the logistic regression in model (2), the likelihood of being defunct decreases with the percentage of accounts payable scaled by total assets (coefficient in model (2) of -0.09). Likewise, long-term debt reduces the likelihood of being defunct (coefficients in model (1) and (2) of -0.08).

External monitoring by institutional investors increases the incidence of a video game supplier being defunct (coefficients of -0.02 and -0.29 in models (1) and (2)), whereas analyst coverage by at least one expert has the opposite effect (coefficients of -0.83 and -0.73 in models (1) and (2), respectively). Consequently, video game suppliers should actively manage their relationships with both institutions and analysts.

For example, after leaving his position as a video game developer and designer at Activision, Garry Kitchen founded Absolute Entertainment Inc. on August 19, 1986 with his brother Dan Kitchen, David Crane, Alex Demeo, John Van Ryzin. Absolute Entertainment, a video game publishing firm, produced Atari, Sega, Game Boy, and Nintendo games. Eventually, Absolute Entertainment's Nintendo displaced his former employer Activision's Atari. In December 2007, Activision merged with its competitor Vivendi Games to form Activision Blizzard. Absolute Entertainment published more than 30 games before dwindling sales from diminishing product quality lead to liquidation in 1995. Kitchen formed a new video game company called Skyworks Technologies immediately prior to ceasing operations, terminating all employees, and filing for Chapter 7 bankruptcy. It is no surprise that large customers do not readily invest in relationships with suppliers in this industry.

Table 7: Predicting Defunct Firms

This table reports the results from logistic regressions that explain the likelihood of a firm becoming defunct. The dependent variable is Defunct, which equals one if the firm eventually becomes delisted in the sample period, and zero otherwise. Linked is a binary variable equal to one if the firm has at least one large customer that comprises at least 10% of their sales, and zero otherwise. ΔAccts Payable is the change in accounts payable during the quarter. Accts Payable equals the accounts payable scaled by total assets. ΔSales equals the change in sales during the quarter. COGS equals the cost of goods sold scaled by sales. ROA equals the operating income before depreciation scaled by total assets. Cash equals cash and short-term investments scaled by total assets. Longtermdebt equals total long-term debt scaled by total assets. Instit Ownership equals the number of shares held by institutions scaled by the number of shares outstanding. Analystcoverage Dummy is a binary variable equal to one if the firm has at least one analyst estimate reported for the quarter, and zero otherwise. Recession is a binary variable equal to one if the quarter is classified as a recessionary period according to the National Bureau of Economic Research, and zero otherwise. LogME is the natural log of the market capitalization of the firm. Market capitalization is the price times the number of shares outstanding. Age equals the number of years that the firm has been listed on the exchange. χ^2-statistics are reported in the parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

	Dependent variable: Defunct	
	(1)	(2)
Intercept	0.382***	0.328***
	(61.87)	(47.91)
Linked	0.036	0.036
	(0.16)	(0.17)
ΔAccts Payable	-0.003	-0.003
	(0.01)	(0.96)
Accts Payable	0.002	-0.089***
	(0.00)	(10.67)
ΔSales	0.010	0.057*
	(0.10)	(3.48)
ROA	0.271***	0.372***
	(91.17)	(156.60)
Cash	-0.178**	-0.242***
	(40.06)	(74.47)
COGS	0.087***	0.035
	(10.38)	(1.81)
Longtermdebt	-0.081***	-0.044*
	(10.55)	(3.28)
Instit Ownership	0.017	0.290***
	(0.19)	(69.85)
Analystcoverage Dummy	-0.831***	-0.731***
	(135.72)	(110.15)
Recession	-0.073***	-0.126***

	(7.65)	(23.80)
Linked*ΔAccts Payable	-0.036	-0.011
	(0.13)	(0.01)
Linked*ΔSales	0.086	0.084
	(1.00)	(1.00)
Linked*Recession	0.117	0.125
	(1.96)	(2.29)
ROA*ΔSales	0.036	0.034
	(2.14)	(1.96)
Recession*ΔAccts Payable	0.024	0.026
	(0.71)	(0.88)
LogME	0.634***	
	(317.49)	
Age		-0.155***
		(36.48)
Pseodu R^2	12.02%	6.94%
Obs	7,562	7,575

VII. Conclusion

Most of the literature in finance finds that supplier-customer relationships are most beneficial to distressed small, private firms and that trade credit is extended when banks and other financial intermediaries will not. The standard question is not *whether* suppliers should seek business relationships with large customers but *how* they can take advantage of supply chain relationships. We find that trade credit in the form of accounts payable is also a very important form of financing for publicly traded suppliers in the video gaming industry, and that intangible relationship investment in large customers is less beneficial.

For suppliers in the video game industry, developing and maintaining relationships with large customers representing a significant portion of sales leads to lower sales growth, no increase in research and development, less long-term debt, and no loyalty in terms of the supplier remaining as an independent firm by avoiding stock market delisting (defunct) either due to liquidation, bankruptcy, demotion to the pink sheets, or acquisition. Instead, suppliers within this industry gain more value by developing collaborative relationships with trade creditors, increasing their bargaining power in the supply chain relationship by strategically pursuing small customers. Overall, the findings are consistent with trade creditor (large customer) partnerships increasing (decreasing) suppliers' competitiveness in the video game industry. It appears that suppliers can develop long-term relationships of loyalty and trust with their vendors that help them increase sales and avoid becoming defunct.

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