Customer-base concentration, profitability and distress across the corporate life cycle

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Abstract

Using a recently expanded data set on supplier-customer links, we examine how customer concentration affects firm profitability. We find that the relation between customer concentration and firm profitability is more complex than recent literature suggests. We confirm that customer concentration promotes operating efficiencies for profitable firms. However, we find a different result for younger, less profitable firms where customer concentration impairs firm profitability and can increase distress risk. We explain these differences by introducing a relationship life-cycle hypothesis wherein the relation between customer-base concentration and profitability is time-varying; being significantly negative in the early years of the relationship, and turning positive as the relationship matures. The key driver of this dynamic is the customer-specific investments the relationship entails. These investments result in larger fixed costs and greater operating leverage early in the relationship, but can significantly benefit the firm as the relationship matures.

JEL Classifications: L25; M41; G31; G33

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1 Introduction

Winning the business of a major customer is an exciting event in the life of the firm. Business from major customers can increase firm revenues markedly and permit efficiencies of scale in operations and delivery. Despite these advantages, economists have long warned of the danger of supplying a considerable fraction of firm output to a particular customer. Lustgarten (1975) credits Galbraith (1952) with the origin of the concept that large customers are threats to manufacturer's operating profits. The problem with major customers is that margin improvements that the firm can receive, through selling efficiencies or other economies of scale, do not necessarily accrue to the firm. Major customers recognize their strong bargaining position and can engage in ex-post renegotiation over the contract terms (Klein, Crawford and Alchian (1978), Williamson (1979)). Once the firm has committed resources to production for a major customer, these customer-specific investments represent costs that the firm cannot fully recover unless they can complete the order for the customer. Major customers can impair firm profitability by demanding price concessions, extended trade credit or other benefits. For example, Balakrishnan, Linsmeier and Venkatachalan (1996) argue that major customers are aware of the firm's cost savings from JIT adoption, and that subsequent customer demands for concessions prevent the adopters from improving profitability.[1] In his empirical study of customer concentration, Lustgarten (1975) concludes that high customer concentration (at the industry level) reduces firm profitability.

Patatoukas (2012) challenges the conventional wisdom that customer concentration impairs firm profitability. Using SFAS 14 and SEC Reg S-K mandated disaggregated revenue disclosures available from Compustat, he creates a firm-specific measure of customer concentration and finds a positive relation between customer concentration and accounting rates of return. Patatoukas (2012) points out that a narrow focus on customer concentration and gross margins can obscure the effects of customer concentration on key valuation metrics such as accounting rates of return. Highlighting the ability of the DuPont profitability analysis to make this point, Patatoukas (2012)

[1] Recently, Ng (2013) relates the example of Procter and Gamble who plan to extend the time they take to pay suppliers from 45 days to 75 days.

naturally follows earlier studies on firm profitability (Fairfield and Yohn (2001), Soliman (2008)), and focuses on firms with positive operating performance. While this sample selection criterion is often unavoidable in valuation research, such as the case where negative current earnings cannot be capitalized, the criterion can be avoided in a study of supplier-customer relations.

Taking advantage of a recent expansion in this data set, we extend the Patatoukas (2012) analysis to include firms with negative operating performance and re-examine the relation between customer concentration and firm profitability over the 1977-2007 period. We find that the relation between customer concentration and profitability is more complex than a simple positive or negative relation. While we find that many of Patatoukas' (2012) conclusions about profitable firms hold using the expanded data set, we also show that they are not generalizable to firms with negative operating performance. Such firms tend to be younger, their sales more dependent on major customers, they encounter greater demand uncertainty, and they face a higher probability of financial distress. The adverse impact of customer concentration on unprofitable firms produces a negative relation between customer concentration and firm profitability in the full sample.

These results challenge us to synthesize our findings with Patatoukas (2012). To do so, we develop a life-cycle hypothesis about the effects of customer concentration on firm profitability. We show that the relationship between customer concentration and firms' operating risk and profitability largely reflects the differing costs and benefits that occur throughout the relationship life cycle. Motivated by Williamson (1979) and Anderson, Banker and Janakiraman (2003) we emphasize the importance of customer-specific selling, general and administrative (SG&A) investments in explaining these life-cycle effects. We find that early in the relationship firms with higher customer concentration make more customer-specific SG&A expenses believing that such investments will lead to the operating efficiencies documented in Patatoukas (2012). However, customer-specific SG&A expenses are, by definition, less transferable than general SG&A investments and thus increase the fixity of SG&A costs, leading to higher operating leverage. To document this relation, we show that the elasticity of SG&A costs with respect to sales is lower in firms with higher customer concentration. These negative effects are ameliorated as the relationship matures, eventually firms

with high levels of customer concentration are rewarded with higher operating profits, consistent with Patatoukas' (2012) results.

Our results also suggest that customer concentration is one potential explanation for the Banker, Byzalov and Plehn-Dujowich's (2014) counterintuitive finding that cost elasticity is inversely related to demand uncertainty. After establishing that customer concentration is negatively related to cost elasticity we then show that higher customer concentration is positively related to demand uncertainty. This is logical as firms with major customers have relatively undiversified sources of revenue, and their customer-specific investments prevent them from easily finding alternative sales when faced with declining demand from their major customers. Consistent with this argument, we find that demand uncertainty monotonically increases from the lowest customer concentration quintile to the highest customer concentration quintile.

For firms with concentrated customer bases, a higher level of demand uncertainty exacerbates the increase in operating leverage. These operating risks have significant effects on capital structure and firm failure. We find that customer concentration is positively related to the probability of firm failure in our sample. Extending the sample to firms that have no major customers, we find that firms with the lowest customer concentration values have lower probabilities of failure than firms that have no major customers. This result is explained by the fact that the lowest customer concentration firms have less debt compared to firms that have no major customers, even though these two distinct groups of firms have similar levels of profitability, cash holdings and idiosyncratic volatility. More generally, customer concentration profoundly affects capital structure: The higher the customer concentration index, the lower the amount of debt in the firm's capital structure. This result is consistent with the proposition that firms with concentrated customer bases constrain leverage to protect themselves from the devastating effect of losing a major customer (Banerjee, Dasgupta, and Kim (2008)). We find that credit ratings deteriorate as customer concentration increases, thus adding a cost dimension to the Banerjee et al. (2008) hypothesis.

Facing increases in operating leverage and demand uncertainty, a concentrated customer base is

a risky choice for firms. However, as shown by Patatoukas (2012) customer concentration can lead to operating efficiencies and the possibility of achieving higher profits in the future. By examining a subsample where the age of the supplier-customer link can be identified, we find a number of results that are consistent with our life-cycle hypothesis which we use to explain the dichotomy between profitable and unprofitable firms. We document an important benefit from having a major customer by showing that the initial year of the relationship leads to significant growth in firm sales. We also find that as the relationship matures, the initial adverse effects of customer concentration reverse, leading to improvements in firm operating margins and profitability. These results are consistent with our contention that the initial relationship-specific-costs major customers entail can eventually pay off in significant benefits for the firm. The equity market appears to recognize the net benefits from these relationships as positive abnormal returns are associated with changes in customer concentration.

A major contribution of this paper is that it identifies the existence and magnitudes of both the costs and benefits of customer concentration and how they vary over the relationship life cycle. Knowledge of both the costs and benefits of customer concentration is important to managers making the crucial decision of whether to make customer-specific investments in the relationship between the firm and a major customer. Our ability to document the costs and benefits involved in this decision supports the usefulness of mandated disaggregated revenue disclosures and, as in Patatoukas (2012), highlights some of the benefits of improving disaggregated information about firms' operations.

2 Hypothesis Development

In contrast to the traditional view that major customers can extract benefits from their suppliers and thus lower firm profitability, there are several reasons why major customers could be beneficial to the firm. All orders are different, in either their design, manufacture or logistical delivery. Meeting the demands of many small customers is expensive and firms can achieve economies of scale from dealing with a few major customers. Volume discounts to large customers are common

and reflect these economies. Although a number of small orders can produce the same total sales as a single large order, the firm faces the problem of customer retention and acquisition. As customer retention and acquisition can be expensive, by dealing with a few major customers, firms can potentially reduce these costs. Cohen and Schmidt (2009) document some of the benefits of attracting large clients and Carlton (1978) outlines how a lower customer-per-firm ratio helps the firm coordinate pricing and production decisions. Jap and Ganesan (2000), Fee, Hadlock and Thomas (2006) and Costello (2013) show how covenant restrictions and customer equity stakes can alleviate contracting problems arising in the relationship.

Investigating the empirical evidence on customer concentration and firm profitability, Patatoukas (2012) cites two studies (Newmark (1989) and Kalwani and Narayandas (1995)) that challenge Lustgarten's (1975) finding that customer concentration reduces profitability. Faced with this mixed evidence, Patatoukas (2012) argues that whether major customers are beneficial or detrimental to the firm is ultimately an empirical issue. He answers that question in the affirmative by showing that customer concentration leads to improved profitability. Firms achieve this profitability through efficiencies in SG&A expenses, inventory turnover and cash conversion improvements.

However, Patatoukas (2012) only examines firms with positive profits. To understand how customer concentration is related to firm profitability across the full range of profitability, we develop several hypotheses focusing on why the relation between customer concentration and firm profitability varies across the relationship life cycle. First, we hypothesize that the nature of the firm's customer base affects the fixity of SG&A expenses (Anderson, Banker and Janakiraman (2003)). Higher customer concentration leads firms to make customer-specific SG&A investments to capture operating efficiencies that come with major-customer relationships. Such customer-specific investments, by definition, are less transferable to other uses than more general investments. Firms with high customer concentration thus tend to have a larger fixed cost component in their SG&A expenses. If this contention is true, then the elasticity of SG&A expenses with respect to sales should be lower the more concentrated the firm's customer base.

Second, we hypothesize that a firm with high customer concentration faces higher demand uncertainty. This occurs because firms with only a few major customers have relatively undiversified sources of revenue, and their customer-specific investments prevent them from easily finding alternative sales when faced with declining demand from their major customers. Firms with higher customer concentration are more exposed to idiosyncratic demand shocks generated by their major customers because when major customers receive their own demand shocks, they transfer these demand shocks to their suppliers.

Third, we hypothesize that higher customer concentration increases firms' operating risk. This hypothesis is a natural extension of our initial two hypotheses, as higher fixed costs lead to increases in operating leverage which, coupled with higher demand uncertainty, increases operating risk. We expect the amplification of operating risk that comes with higher customer concentration to manifest itself through the credit risk channel leading to higher failure probability and higher cost of debt.

Fourth, we hypothesize that the relation between customer concentration and firms' operating risk and performance largely reflect the different cost and benefits that occur throughout the relationship life-cycle. Since accounting research has not previously addressed how the life-cycle of major customer relationships can affect firms' operating risk and performance, to construct our hypotheses we draw on the literature in marketing and management. The literature we cite routinely studies the impact of major suppliers on dependent retailers rather than that of major customers on dependent suppliers. However, from the theoretical and survey evidence provided we can infer general principles that guide our exploration of how the life-cycle of the relationship affects firm profitability.[2]

Wilson (1995) discusses how the major customer relationship presents the firm with both costs and benefits. The key features of his model incorporate relationship-specific investments that provide both potential value but also increase operating risk. Wilson (1995) focuses on the life-cycle of the relationship and posits that the success of the relationship can vary dynamically. This

[2] The limited accounting research that addresses life-cycle issues (Anthony and Ramesh (1992); Dickinson (2011)) examines the life cycle of the firm rather than the life-cycle of the major customer relationship.

suggestion is key as it is necessary for our hypothesis to establish that there must be different stages, with different costs and benefits, in the life cycle of the relationship. However, in Wilson's (1995) theory, the value of the relationship to the parties involved depends on hard-to-measure concepts such as trust, cooperation and commitment.[3] Jap and Ganesan (2000) also introduce a dynamic framework when they outline how the optimal contract to deal with relationship-specific investments can change over the relationship life-cycle. Finally, both Jap and Anderson (2007) and Eggert, Ulaga and Schultz (2006) use survey data to formalize the supplier-customer relationship into exploration, build up, maturity and decline stages and provide evidence on how the concepts outlined by Wilson (1995) can change over the life-cycle. Jap and Anderson (2007) find that the decline phase of the relationship can last for a considerable period and suggest that this reflects the fact that relationship-specific investments can have surprisingly long lives. Eggert et al. (2006) conclude that the value created from major customer relationships can increase over time but this potential requires great commitment by both parties during the exploration and build-up phases.

From this literature we infer two broad principles of major customer relationships that guide our empirical investigation. First, the relationship is dynamic and that optimal profitability for the firm may not occur until the relationship reaches its maturity phase. The second principle is that the often explosive growth of the relationship during the exploration and build-up phases requires relatively high relationship-specific investments early in the life-cycle. While Jap and Anderson (2007) find that these idiosyncratic investments can often provide surprisingly long-lived benefits, the Eggert et al. (2006) finding that optimal profitability often occurs later in the relationship suggests that these relationship-specific investments can increase costs during the early stages of the relationship life-cycle.

These principles suggest that we can expect customer concentration to have a negative impact on firm profitability early in the relationship where profitability is impaired by the build up of customer-specific investments. However, if the relationship succeeds, then suppliers can expect

[3] Schloetzer (2012) provides a fine example of an attempt to outline the effects of difficult to quantify measures such as information sharing and interdependence.

operating profitability to increase as the relationship matures. We can test these predictions for a subsample where customers can be identified and thus, the age of the link between the supplier and customer firms can be determined ($LINKAGE$). Where the necessary data to construct $LINKAGE$ is not available, we use the age of the supplier firm as an instrument for the age of the relationship. Empirically, firm age is highly correlated with the age of major customer relationships, yet still is an inferior instrument relative to $LINKAGE$. We also investigate whether firm age reflects the same life-cycle information as $LINKAGE$.[4]

3 Data

FASB accounting standards require all public companies to disclose the identities of their major customers representing more than 10% of their total sales. We extract the identities of each firm's major customers from the Compustat Customer Segment Files. We focus on the period between 1977 and 2007. Compustat Customer Segment Files provide for each firm the names of its major customers, revenue derived from sales to each major customer, and the type of each major customer.[5]

For each firm we determine whether its customers are listed in the CRSP-Compustat database. If they are, then we assign them to the corresponding firm's PERMNO. Since the focus in this paper is on customer concentration and its impact on firms' operating and financial performance, even when the customer firm cannot be assigned a PERMNO, we still keep the supplier-customer link in the sample and identify the customer firm as a non CRSP-Compustat company.[6]

Following Patatoukas (2012), we construct our primary measure of customer concentration using

[4] We recognize the validity of the Eggert et al. (2006) critique that link age itself is an imperfect measure of life-cycle stage as some relationships may be designed to be shorter than others. However, the literature does not supply an alternative instrument.

[5] The dataset groups customers into three broad categories based on their type: "company" (COMPANY), "domestic government" (GOVDOM), and "foreign government" (GOVFRN). We exclude information on customers that are identified as domestic or foreign governments, even if they may be major customers for a certain supplier firm.

[6] Cohen and Frazzini (2008) report that the Compustat Customer Segment files report the names of customer companies but often fail to provide company identification codes such as customer firms' PERMNO's. For these firms, we use a phonetic string matching algorithm to generate a list of potential matches to the customer name. We then hand-match the customer to the corresponding PERMNO based on the firm's name, segment, and SIC code.

the following formula:

$$CC_{i,t} = \sum_{j=1}^{n} \left(\frac{Sales\ to\ Customer_{i,j,t}}{Total\ Sales_{i,t}} \right)^2 \quad (1)$$

If firm i has n major customers in year t, the measure of customer concentration $(CC_{i,t})$ of the firm is defined as the sum of the squares of the sales shares to each major customer. The sales share to each customer j in year t is calculated as the ratio of firm i's sales to customer j in year t scaled by firm i's total sales in year t. Patatoukas (2012) constructs his customer concentration measure in the spirit of the Herfindahl-Hirschman index, and suggests that the measure captures two elements of customer concentration: the number of major customers and the relative importance of each major customer. By definition, the customer concentration (CC) is bounded between 0 and 1 as CC is equal to 1 if the firm earns all of its revenue from a single customer and as the customer base diversifies CC tends to 0.

As in Patatoukas (2012), we exclude financial services firms from the sample. Our sample consists of all firms listed in the CRSP-Compustat database with non-negative book values of equity, non-missing values of customer concentration (CC), market value of equity (MV), annual percentage sales growth ($GROWTH$), and accounting rates of return at the fiscal year-end when we can identify major customers.[7] After imposing these restrictions, we are left with 49,760 supplier firm-year observations between 1977 and 2007.

Sample composition

Our sample differs from the sample used in Patatoukas (2012). Patatoukas (2012) focuses on the subsample of firm-year observations with positive operating margins, whereas we include firm-year observations with operating losses. Of the 49,760 firm-year observations in our sample, 22,480 firm-year observations have the corresponding CRSP-Compustat customer data necessary to construct $LINKAGE$ (45.2 percent), while 10,836 firm-year observations have operating losses (21.8 percent).

[7] Including firms with both negative earnings and negative book values confounds a direct interpretation of higher ROE as a good outcome. We drop negative book value firms to avoid this confusion. In unreported analysis, we include negative book value firms and find consistent results.

Using the $LINKAGE$ customer data subset, we can test our relationship life-cycle hypotheses. The latter subset on operating losses allows us to determine if the impact of customer concentration on firm profitability is different for unprofitable firms. Furthermore, over a comparable period we have significantly more firm-year observations with positive operating margins (38,924) than Patatoukas' (2012) 25,389.[8][9]

3.1 Descriptive statistics

Figure 1 presents the time series of average customer concentration from 1977 to 2007 as reported in the Compustat customer segment files. During this period each supplier averages 1.89 major customers who generate 33 percent of its annual sales. However, each supplier firm accounts for only 2% of their customers' cost of goods sold. Over the sample period, customer concentration exhibits a marked increase from the early years of the sample through 1997, a period coincident with a general increase in the number of listed firms. The number of firms reporting customer concentration then falls from a high of close to 3,500 in 1997 to what appears to be a steady state of just over 2,000 for the 2002-2007 period. Consistent with Patatoukas (2012), median customer concentration reveals a generally increasing trend over time, from a low of 0.03 in 1977 and 1978 to a high of over 0.06 in 2007.

Table 1 lists our variable definitions, grouped into two categories: (i) Supplier-firm characteristics, and (ii) Default prediction variables used in our extension of the Campbell, Hilscher and Szilagyi (2008) default prediction model. CC is the basic measure of customer concentration described in Equation (1) and ΔCC measures the year over year change in CC.

Table 2 presents summary statistics for several key variables for the full sample (Panel A), the subset of firms with identifiable customers (Panel B), and for positive and negative profitability groups (Panel C). The variables MV, AGE, and $GROWTH$ define the basic characteristics of

[8] Hoechle, Schmid, Walter and Yermack (2012) report a temporary deletion of valid Compustat segment file observations during 2007-2008. This problem, as well as periodic updates to the Compustat segment files, can account for the difference in sample sizes between our paper and Patatoukas (2012).

[9] To alleviate concerns regarding our sample, we repeat all analyses using only the subset of firm-year observations with positive operating margins and find results qualitatively similar to Patatoukas (2012).

supplier firms. MV measures the firm's market value of equity in millions of dollars. AGE is the firm's age in years, measured from the time of its initial public offering. $GROWTH$ is the supplier firm's annual sales growth rate. ROA, ROE, and SGA, define key operating characteristics of supplier firms. ROA is the ratio of income before extraordinary items to the beginning of year book value of total assets for the firm. ROE is the ratio of income before extraordinary items to the beginning of year book value of equity for the firm. SGA is the ratio of selling, general, and administrative expenses to sales. $IHLD$ is the ratio of inventory to the book value of total assets for the firm. $TLMTA$ and $CASHMTA$ are defined as in Campbell et al. (2008) as total liabilities and total cash scaled by the market value of total assets.

Panel A of Table 2 reports the mean, standard deviation, skewness, median, 25th, and 75th percentile values for the key variables in this study. CC averages 10.1% for the 49,760 observations in the sample with a standard of deviation of 14.7%. The latter statistic suggests that there is large cross-sectional variation in firms' dependence on their major customers for revenues. Our sample is considerably larger than the restricted sample in Patatoukas (2012), but mean CC is close to the mean in Patatoukas (2012). This fact shows that any differing results due to our expansion of the sample is not attributable to radical differences in customer concentration. Our sample firms are younger and smaller than those in Patatoukas (2012). Firms in our sample average only 10.3 years of age compared to 14.8 in Patatoukas (2012) with a market cap of $806 million relative to Patatoukas' (2012) $1,206 million. Because we do not censor on profitability, the average ROA and ROE are lower at -0.01 (Patatoukas (2012), 0.06) and -0.03 (0.13), respectively. Three of our main dependent variables, ROA, ROE and SGA, and the key explanatory variable, CC, are all significantly skewed. In order to mitigate the effect of skewness, we use the decile rank of CC (ΔCC) instead of CC (ΔCC), as in Patatoukas (2012), in our regression analyses.

Panel B of Table 2 examines statistics for the subsample of firms whose customers can be identified and thus, $LINKAGE$ can be determined. The average and standard deviation of CC are comparable to the full sample at 11.6% and 14.8%. Indeed, the summary statistics of all the key variables are comparable to the full sample. The $LINKAGE$ subset firms are moderately

larger with a mean market value of $997.0 million (compared to $806 in the full sample), and have a slightly lower sales growth rate of 20% (22%).[10]

Panel C of Table 2 separates the sample into positive and negative operating margin groups. For each group, we report the mean, median, and standard deviation of key variables and report the differences in means across the two groups. Positive operating margin firms dominate the composition of the sample by a ratio of almost 4:1. The differences between these two groups are striking and almost always statistically and economically significant. Negative operating margin (OM) firms have a mean customer concentration of 14.2%, compared to 9.0% for positive OM firms (t-statistic of the difference = -27.6). They are also younger, averaging only 7.3 years compared to 11.1 years for the positive OM subsample (t-statistic of the difference = 48.6). Total liabilities to market assets averages 0.30 for the negative OM firms and 0.36 for positive OM firms. Negative OM firms have more cash to total assets ($CASHMTA$) at 0.17 relative to the 0.09 cash holdings of positive OM firms. We note by inspection that positive OM firms have more debt and less cash, but both types of firms have significant debt in their capital structure. Firms that are not profitable are, on average, younger, smaller in size, and more reliant on their major customers for their revenues. Furthermore, firms with negative operating margins have significantly higher SG&A expenses as a percentage of their sales than profitable firms.

In the rest of the paper we try to understand the differences between firms with positive operating margins and firms with negative operating margins and determine whether our life-cycle hypothesis is a key driver of these differences.

[10] Patatoukas (2012, p. 373) also provides evidence that this subset is consistent with the full sample.

4 Results

4.1 Customer concentration and firm performance

4.1.1 Correlation Analysis

Table 3 presents Pearson and Spearman correlations across the full sample (Panel A), the positive operating margin subsample (Panel B) and the negative operating margin subsample (Panel C). By analyzing these correlations, we can get an initial idea of how the relation between customer concentration and firm profitability depends on the sign of operating profitability. In the full sample, customer concentration is negatively related to ROA and ROE with correlation coefficients of -0.11 and -0.08, respectively. In the positive OM subsample, the correlations are positive for ROA at 0.03 and ROE at 0.01. In the negative OM subsample, the signs of these correlations reverse. Here, the correlation between customer concentration and ROA is -0.07 and -0.02 for ROE.[11] The correlation between customer concentration and SGA, a key measure of operating efficiency in Patatoukas (2012), is positive in the full sample, indicating that customer concentration is not generally associated with cost savings. Nevertheless, in the positive OM subsample, the correlations are negative (-0.04), consistent with the findings in Patatoukas (2012). In the negative OM subsample, the sign of the correlation is reversed and relatively large at 0.23. Customer concentration is negatively correlated with firm age in all three panels, suggesting that younger firms tend to have higher customer concentration.

Our tests confirm Patatoukas' (2012) finding that customer concentration can be positively related to profitability and that operating efficiencies associated with customer concentration are a plausible cause for the increased profitability in already profitable firms. We suggest that the contrary results for unprofitable firms largely reflect the differing stages of the relationship life cycle. We hypothesize that early in the life cycle significant relationship-specific expenses can increase costs and impair profitability. The significant positive correlation between customer concentration and SG&A expenses for negative OM firms is consistent with this hypothesis, but these connections

[11] Note that the skewed distribution of CC can cause the subsample correlations to fail to bracket the full sample correlation, an illustration of Simpson's paradox.

should be confirmed controlling for the covariates included in Patatoukas (2012).

4.1.2 Regression Analyses

We verify the net effect of customer concentration on profitability and costs in Table 4 which presents the average coefficients of Fama-MacBeth regressions using six firm operating characteristics as the dependent variables. Following Patatoukas (2012) the independent variables we use are customer concentration rank ($Rank(CC)$) and control variables for market value (MV), firm age (AGE), sales growth ($GROWTH$), an indicator variable for firms having more than one line of business ($CONGLO$), and financial leverage ($FLEV$). The full sample results in Panel A show that inclusion of negative operating margin firms has a profound effect on the relation between customer concentration and firm operations. Unlike Patatoukas' (2012, 373) results, customer concentration is negatively related to both ROA and ROE in the full sample. Customer concentration is also negatively related to asset turnover (ATO) and positively related to SG&A expenses. These results show that Patatoukas' (2012) results do not generalize to firms with operating losses and that a further explanation is required to explain how customer concentration affects firm profitability.

Panel B of Table 4 presents the same analysis for profitable firms only. For these firms and using the same set of control variables, we generally can confirm many of the findings in Patatoukas (2012). Customer concentration is positively related to ROA and ROE as well as profit margin (PM), but we do not confirm, in our larger sample of positive OM firms, that customer concentration has beneficial effects on asset turnover. In line with Patatoukas (2012) and arguments on the impact of customer power in Kelly and Gosman (2000), we find that suppliers with more concentrated customer bases report significantly lower gross margins. Patatoukas (2012) argues that the negative effects on gross margins can be offset if high CC firms spend less on SG&A expenses. As in Patatoukas (2012) we find this offsetting effect exists in this subsample. Positive operating margin firms with higher customer concentration tend to spend significantly less on SG&A expenses.

When we examine firms with negative operating margins in Panel C of Table 4, we find that the relation between customer concentration and firm operating characteristics is markedly different

than it is for firms with positive operating margins. In Panel C, we find that customer concentration has a negative effect on ROE, ROA, and profit margin (PM). Unlike the results for positive operating margin firms in Panel B, the negative impact of customer concentration on gross margins is not offset by lower SG&A expenses. In the SG&A regression reported in Column (6), the coefficient on customer concentration is significantly positive.

To summarize, we expand upon one of the main tables in Patatoukas (2012, Table 2, Panel A) in Table 4. While we find generally consistent results regarding the effects of customer concentration in the subsample of positive operating margin firms, we find contrary results in the subsample of firms with negative operating margins. Furthermore, the coefficients on the rank of customer concentration in the negative operating margin subsample are larger in magnitude and of the opposite sign to those in the subsample of positive operating margin firms.

4.1.3 Impact of customer concentration on operating leverage and demand uncertainty

In Section 2 we develop the hypothesis that expenses and profits vary over the life-cycle of the major customer relationship and this variation can explain the differences we observe in how customer concentration affects profitable and unprofitable firms. The dynamics underlying the life cycle rely on contentions about how the customer base affects firm costs, initially on the patterns of cost-rigidity in SG&A expenses. To demonstrate the relative importance of SG&A costs in our sample, we first show in Panel A of Table 5 average operating expenses. Cost of goods sold average 64.4% of sales and SG&A expenses average 39.1%. As a component of SG&A expenses, advertising expense averages only 1.0% of sales.[12]

Panel B of Table 5 examines the elasticity with respect to sales for cost of goods sold and SG&A expenses, across five different quintiles of customer concentration. Our examination of cost elasticity is derived from the cost-fixity arguments of Anderson et al. (2003) and Baumgarten,

[12] The latter figure indicates why the improvements in advertising expenses customer concentration allows do not necessarily translate into operating profitability.

Bonenkamp and Homburg (2010). Cost elasticity with respect to sales measures the percentage variation in costs relative to percentage variation in firm sales. We find that for all firms, costs are inelastic, varying less than one-to-one with sales variation. We also find a distinct pattern in cost elasticity: the higher a firm's customer concentration, the lower its cost elasticity. The differences are significant across the concentration quintiles, and particularly dramatic for SG&A elasticity. SG&A cost elasticity is 0.79 for firms in the lowest customer concentration quintile falling to 0.56 in the highest customer concentration quintile. Economically, we infer from this data that firms with higher customer concentration make greater fixed investments in customer-specific SG&A expenses. They do this to capture potential operating efficiencies. Such investments allow firms to more easily expand their operations when major customers increase their demand (Banker et al. 2014). However, when demand falls, these customer-specific fixed investments are less transferable to other customers than more general costs.

To understand the effects of major customer demand we examine how sales volatility varies with customer concentration. Banker et al. (2014) postulate that demand uncertainty (measured by the volatility of sales), can lead to lower cost elasticity. They argue that firms facing high demand uncertainty make large fixed investments to capitalize in high-demand states. Firms that do not make such investments would, due to high short-term adjustment costs, be unable to capitalize on the high profits available in high-demand states. Their arguments would dovetail into our findings on cost elasticity and customer concentration if demand uncertainty increases with customer concentration.

When we examine demand uncertainty across customer concentration quintiles in Panel C of Table 5, we find that demand uncertainty significantly increases from the lowest customer concentration quintile (0.19) to the highest customer concentration quintile (0.32). If one considers firm sales in a portfolio context, then this finding makes sense. Firms with a few major customers are relatively undiversified in sales and thus, customer-specific demand shocks are more likely to impact their sales compared to firms with diversified customer bases.

We verify the validity of the univariate sorts conducted in Panels B and C using Fama-MacBeth style regressions in Panel D. The monotonically increasing relation we find between customer concentration and demand uncertainty complements the arguments of both Patatoukas (2012) and Banker et al. (2014). If the relationship encourages firms to make customer-specific investments, then firms will have more inelastic cost structures and potentially higher profits should the relationship succeed. However, the higher fixed costs incurred coupled with higher demand uncertainty could lead to a greater probability of financial distress for these firms. We investigate this issue in detail in the empirical tests below.

4.2 Impact of customer concentration on firm failure and cost of debt

Observing that firms with high customer concentration have lower cost elasticity and higher demand uncertainty, we next investigate the relation between customer concentration (CC) and probability of firm failure. For this purpose we replicate the firm failure model of Campbell et al. (2008) to highlight the incremental power of customer concentration to explain financial distress.

4.2.1 Failure Prediction

Earlier we speculate that customer concentration could be risky for supplier firms. We support this contention by analyzing whether our measure of customer concentration $Rank(CC)$ is related to the probability of firm failure. To accomplish this we run a dynamic model predicting firm failure for all firms over the period between 1980 and 2007. The dependent variable is the dichotomous outcome variable: firm failure or no failure in a particular firm-year.

We use the framework in Campbell, Hilscher, and Szilagyi (2008) who use financial and market variables to predict default.[13] We adopt their nomenclature for the set of predictive variables: Total liabilities to the market value of assets ($TLMTA$), net income to market value of assets ($NIMTA$), the standard deviation of stock returns over the previous three months ($SIGMA$), market to book

[13] In unreported results we conduct a similar, albeit a static, failure prediction analysis for firms that recently have gone public in order to assess the impact of customer concentration on the likelihood of firm failure in the five years that immediately follow an IPO. Following Demers and Joos (2007), we obtain qualitatively similar results.

ratio (MB), relative size of the firm as measured by the log of the market value of the firm relative to the log of market value of the S&P 500 Index ($RSIZE$), the ratio of firm cash holdings to the market value of total assets ($CASHMTA$), and the prior month's stock returns relative to the S&P 500 Index returns over the same time period ($EXRET$).[14]

Campbell et al. (2008) find that this set of independent variables is able to predict default. We examine this finding for our sample in Column (1) of Panel A in Table 6. In this specification, we use the independent variables proposed by Campbell et al. (2008) to estimate the failure probability for 48,948 firm-year observations that have a corresponding customer base concentration value. For our sample of firms with customer concentration data, we find results that confirm the Campbell et al. (2008) model of failure predictability. The model has a psuedo-R^2 of 20.9% and all of the independent variables are significant with the expected sign.

In Column (2) of Panel A in Table 6 we add the measure of customer concentration, $Rank(CC)$, to the regression. We find significant results from including the customer-base concentration variable. The coefficient on $Rank(CC)$ in Column (2) is positive and significant. This result demonstrates that customer concentration captures failure-related information that is not already reflected in the existing predictors of firm failure.

In Column (3) of Panel A we expand the sample to include firms that do not have any major customer data ($NoCC$). Although customer concentration increases the likelihood of failure in sample, we do not know what the global effect of major customers might be. By definition, it is impossible to calculate CC for firms without major customers, so we split up the entire sample into five groups, the $NoCC$ group, and four categories of customer concentration. Firms with $Rank(CC)$ values between zero and zero point three are categorized as $Rank(CC)\_1$, firms with $Rank(CC)$ values between zero point three and zero point five are categorized as $Rank(CC)\_2$, firms with $Rank(CC)$ values between zero point five and zero point eight are categorized as $Rank(CC)\_3$ and finally firms with $Rank(CC)$ values between zero point eight and one are grouped under

[14] All financial variables are observable 12 months prior to the failure event to avoid endogenous relations being recorded between the predictive variables and the failure event.

$Rank(CC)\_4$.[15]

Given that the probability of firm failure increases in $Rank(CC)$, this regression produces the surprising result that the $NoCC$ firms have significantly higher failure probabilities than some firms with major customers. Specifically, $Rank(CC)\_1$ firms have significantly lower likelihood of failure than $NoCC$ firms. Within the four $Rank(CC)$ categories, failure increases monotonically with $Rank(CC)$, as in the column (2) regression, but the differences are not always statistically significant.

Figure 2 and Panel B of Table 6 presents the predicted failure probabilities for the five different groups. These data illustrate the non-linear relation between customer concentration and the probability of failure. The predicted probability of failure for $NoCC$ firms is 1.8 percent. This likelihood falls to 1.3 percent for the $Rank(CC)\_1$ firms, and then rises monotonically as customer concentration increases, a result consistent with the results in Panel A.

To understand why $NoCC$ firms have higher failure probabilities than $Rank(CC)\_1$ firms Panel C focuses on four important firm characteristics associated with firm failure. Panel C reveals that firms that have no major customers ($NoCC$) are very similar in terms of profitability, return volatility and cash holdings to firms with low customer-base concentration ($Rank(CC)\_1$). We document, however, a large difference in the leverage utilized by these two different types of firms: $Rank(CC)\_1$ firms have markedly lower leverage than $NoCC$ firms. This finding suggests that even firms with diversified customer bases ($Rank(CC)\_1$) are aware of the asymmetric bargaining power of their major customers and thus choose to reduce their financial leverage. Firms in the $Rank(CC)\_2$, $Rank(CC)\_3$ and $Rank(CC)\_4$ groups also have markedly lower leverage levels than firms in the $NoCC$ group. Furthermore, as customer concentration increases firms steadily increase their cash holdings; a second action that reduces their failure probability. These capital structure changes lower the failure probability, relative to $NoCC$ firms, for $Rank(CC)\_1$ firms. However, the same strategy does not reduce the failure probabilities for firms in $Rank(CC)\_2$,

[15] The tested specification in Column (3) drops the $Rank(CC)\_3$ variable to avoid the dummy variable trap.

$Rank(CC)\_3$ and $Rank(CC)\_4$. This is because as customer base concentration increases idiosyncratic volatility significantly rises and profitability is significantly reduced (Panel C). Panel A confirms that both leverage and cash holdings are significant predictors of firm failure. Hence we conclude that the non-linear relation between customer concentration and failure in Panel B represents the interaction between customer concentration, which increases failure probability, and leverage, which decreases failure probability.

Banerjee et al. (2008) find a negative relation between major customers and leverage for a sample of durable goods manufacturers in the 1980's and 1990's. Their explanation for this relation is that firms reduce leverage to protect themselves from the possibility of major customer bankruptcy. While we agree that their explanation is likely to be present, aside from extending their result to a much broader range of firms, we also add to their analysis by proposing that the debt markets are capable of determining the risks from major customers. If this is the case, then debt should be costlier, or credit ratings more negative as customer concentration increases. We proceed to empirically test this conjecture.

4.2.2 Customer base concentration and cost of debt

In Table 7, we estimate whether customer concentration has a significant effect on a firm's credit rating. Standard and Poors (S&P), an important credit rating agency, records firm-specific credit ratings on a letter scale running from AAA rating for the strongest credits, to D for firms in default. Compustat records S&P ratings as a numeric score for each firm running from a 2 (AAA rated) to 27 (D rated). As the firm credit rating is on an ordinally-ranked scale, standard OLS assumptions do not apply. Therefore, we estimate firm credit rating using an ordered logit model.[16] Credit ratings are widely used to compensate bondholders for credit risk and represent compensation for firm-specific credit risk as well as exposure to systematic default risk and, as such, reflects the firm's cost of debt.

[16] The scale has gaps occuring at random intervals, including numbers 3 and 22. However, by construction, credit rating is ordered, so we use an appropriate econometric method. OLS results are consistent with the results presented in in the paper.

Column (1) of Table 7 documents a negative association between customer-base concentration and credit rating; the greater is $Rank(CC)$, the worse the firm's credit rating. Column (2) controls variables known to affect credit rating and finds that the $Rank(CC)$ coefficient is 0.564 (t-statistic = 7.34). This coefficient is also economically significant. For example, the mean rating for the 50th percentile of $Rank(CC)$ is BB, but increasing customer concentration to the 75th percentile of $Rank(CC)$ drops the credit rating to BB-, increasing the cost of issuing debt. We find that customer-base concentration not only leads to a higher probability of firm failure, but also to a higher cost of debt. We interpret this result as evidence that, in addition to the reason posited by Banerjee et al. (2008), the cost channel plays a significant role in explaining the leverage decisions of firms with major customers.

4.3 Impact of changes in customer concentration on firm value and performance

In the previous sections we document that, in the full sample, customer concentration leads to higher operating leverage, SG&A cost fixity and demand uncertainty culminating in higher probability of failure as well as higher cost of debt. Since all of these consequences are costly, it seems unlikely that firms would seek out major customers unless there were offsetting benefits. In this section we investigate the valuation implications of changes in customer base concentration, $Rank(\Delta CC)$. We combine two Patatoukas (2012) analyses in Table 8 where we estimate the effect of changes in customer concentration rank on contemporaneous and future abnormal returns, as well as future operating performance.

In column (1) of Panel A of Table 8, we show that contemporaneous buy-and-hold equity returns are positively related to changes in customer base concentration, $Rank(\Delta CC)$, suggesting that investors' believe that increasing reliance on major customers is a positive development for the firm. This contemporaneous result is consistent with Patatoukas (2012). In contrast, in column (2) we find that the market seems to incorporate the valuation impact of customer concentration in the current year; although buy and hold abnormal returns are positive in year $t+1$ (relative to the year of customer concentration change), they are not statistically significant.

To test a causal relation between changes in $Rank(CC)$ and operating performance, we regress next period's changes in ROA and SGA on changes in customer concentration and changes in a set of control variables. As in Patatoukas (2012) we calculate the effects of changes in the rank of customer concentration to better define the direction of causality between customer concentration and firm operating characteristics. Patatoukas (2012) finds that changes in customer concentration, $Rank(\Delta CC)$, have a significantly positive effect on changes in ROA (ΔROA), and a significantly negative effect on changes in SG&A expenses (ΔSGA).[17] Columns (3) and (4) of Panel A estimates these regressions using our sample and finds that changes in customer concentration rank are significantly negatively related to changes in ROA and significantly positively related to changes in SG&A expenses. These results are consistent with the evidence on customer concentration and firm performance presented earlier; an increase in customer concentration leads to both higher selling, general and administrative costs and lower profitability in the next period.[18] Our contention is that early in the relationship life-cycle, investments in the customer-specific relationship tend to increase costs and impair performance. Eventually, if the relationship succeeds, these investments result in the lower costs and improved profitability documented in Patatoukas (2012).

Panel B of Table 8 attempts to provide an answer to two puzzles driven by the Panel A results: why are contemporaneous returns positive when customer concentration increases, and why initial costs are so high that the full sample contains a negative relation between $Rank(CC)$ and operating performance? We calculate the change in sales for *Initial* relationships, those years in which a firm acquires a new major customer. To control for confounding characteristics that might influence our results, we match each *Initial* firm to a firm with no major customers. We match *Initial* and comparable firms by previous year's firm age, size, book-to-market ratio,and sales growth. We present year-by-year results of *Initial* firm sales growth, comparable firm sales growth, and calculate

[17] Patatoukas (2012) also finds a positive relation between changes in customer concentration and changes in ROE. We do not include ROE changes as the specification in Patatoukas (2012) contains no leverage control. When we estimate the Table 8 regressions for changes in ROE with a leverage control variable, the coefficients on changes in customer concentration are insignificantly negative.

[18] These results would be in complete agreement with our observations in Table 7 as lower profitability and higher costs would inevitably lead to a higher cost of debt capital. In column (2) we find no relationship between changes in customer base concentration and future equity returns, suggesting that the impact of customer base concentration on cost of debt capital is driven largely by an increase in expected losses rather than an increase in systematic risk.

the difference. In 25 of the 27 years that we can estimate, *Initial* firms have higher sales growth than do comparable firms. This difference averages an impressive 11.6 percent sales growth advantage for *Initial* firms (t-statistic = 6.41). In the following year *Initial* firms average 18.6 percent sales growth, 5.6 percent more than comparable firms. This sales growth evidence reconciles the results observed on contemporaneous returns in Panel A with the evidence presented earlier in the paper. Initiating new major customer relationships produces economically significant sales gains. This increase in cash flow is apparently recognized by the equity investors, who provide the firm with higher contemporaneous returns.

However, the benefits from acquiring a major customer do not immediately become apparent in operating performance. We suggest that the growth in *Initial* firm sales is economically large, and thus requires considerable customer-specific investment in the early years of the relationship. These investments are not immediately amortized, rather they provide long-term benefits (Jap and Anderson (2007)) that eventually improve operating performance and increase profitability. We proceed to test this contention in the following section.

4.4 Customer concentration and the life cycle of supplier-customer relationships

4.4.1 Impact of duration of customer links on firm performance and risk

To substantiate our life-cycle hypothesis we need to determine first, that there are different stages with differential effects on firm operations over the life cycle, and second, that these stages unfold in a way that is consistent with our hypothesis. Specifically, we have argued that SG&A investments should increase early in the relationship and that these investments lower profitability, but these effects should reverse as the relationship matures. To do this we replicate our analysis in Panel A of Table 4 controlling for the duration of the firm's relationship with a major customer. We separate 22,311 firm-year observations with identifiable customer data into five quintiles based on the duration of the relationship with major customers.[19] Relationship age is measured by

[19] 178 observations are lost from the 22,489 in Table 2 Panel B due to missing covariate observations.

$LINKAGE$ which is a weighted average of the (log) years that a firm has maintained sales to its major customers. We then sort all observations into quintiles every year based on the value of $LINKAGE$. The dummy variables LA_Q1, LA_Q2, LA_Q3, LA_Q4 and LA_Q5 are equal to one if the firm-year observation falls into the first, second, third, fourth or fifth quintile of average age of major customer relationships in a particular year.

To analyze the effects of $LINKAGE$ parsimoniously, we interact the rank of customer base concentration, $Rank(CC)$, with the quintile dummy variables. In this specification the coefficient on $Rank(CC)$ represents the baseline effects of the youngest relationships and the remaining four dummy variables create interactive slope coefficients that measure the change in the effect of customer concentration on firm operations as the relationship matures. Our life-cycle hypothesis predicts that, for firms with the youngest relationships, $Rank(CC)$ will have a positive affect on SG&A expenses and a negative affect on ROA.

In Panel A of Table 9, we estimate the effects of $LINKAGE$ by examining the coefficient on $Rank(CC)$ as the relationship matures. We first note that the coefficients on the interactive variables are, with the exception of the gross margin regression in column (5), statistically significant. This indicates that the stage of the relationship life cycle is important in measuring the effects of customer concentration on firm operations and profitability. Further, we observe that all the adverse effects of customer concentration are mitigated as the duration of the relationship increases. In column (1) we regress ROA on $Rank(CC)$ and the standard set of controls utilized throughout the paper. Results in Column (1) show that the coefficient on $Rank(CC)$ is statistically significant and economically relevant at -0.06, suggesting that return on assets is six percent lower for firms with youngest relationships. The interaction of $Rank(CC)$ with the dummy variable LA_Q2 is statistically significant and equal to 0.04, suggesting that a significant portion of the adverse impact of customer concentration on profitability is alleviated as the major customer relationship matures into the second quintile of relationship age. $Rank(CC) * LA\_Q3$, which denotes the interaction between $Rank(CC)$ and the dummy variable that takes on the value of one if the firm is in the third quintile of $LINKAGE$ is 0.059, suggesting that firms can eliminate all the adverse effects of

customer base concentration on profitability once the duration of the link reaches approximately four years. Subsequent rows reveal that the adverse effects of customer base concentration on ROA are fully reversed for the two top quintiles of relationship age.

We observe qualitatively very similar results in columns 2 through 4, for return on equity, ROE, asset turnover, ATO, and profit margin, PM, regressions. These results suggest that, for all measures of profitability, adverse effects of customer concentration are reduced, eliminated or reversed as the links with major customers mature. In column (5) we regress gross margin GM on $Rank(CC)$, interaction of $Rank(CC)$ with the linkage dummy variables and the usual set of control variables. Column (5) reveals that the adverse effect of customer concentration on gross margin is not negated with the duration of the major customer links, suggesting that major customers continue to exercise their bargaining power throughout the duration of the relationship. In column (6) we show that long duration links with major customers lead to large efficiency gains in the form of reduced SG&A expenses. In fact, our results suggest that firms in the top two $LINKAGE$ quintiles are able to fully amortize the large fixed $SG\&A$ investments incurred at the beginning of the relationship. In all the analyses conducted in Panel A, we control for firm age, AGE, as well as firm size, MV, sales growth rate, $GROWTH$, the indicator variable for firms having more than one line of business, $CONGLO$, and financial leverage, $FLEV$. Perhaps the most significant of these control variables is firm age, AGE. Controlling for AGE establishes that the impact of the duration of the customer links, $LINKAGE$, on firm performance is independent from the impact of AGE on firm performance. This result establishes the the relationship life-cycle effects are distinct from the life cycle of the firm.

In Panel A we are confined to the subsample of firms with identifiable customers. In Panel B, we use firm age, AGE, as a proxy for $LINKAGE$. Correlation of AGE with $LINKAGE$ is economically significant (0.42). This statistic indicates that while Panel A identifies a relationship life-cycle effect distinct from the life-cycle of the firm, AGE may contain enough information about the relationship age to allow us to determine if relationship life cycle effects exist in the full sample. Using AGE, instead of $LINKAGE$ allows us to expand the data set from 22,311 firm-year

observations to 49,118 firm-year observations. Results in Panel B are qualitatively very similar to the results in Panel A. Having established the distinct nature of the impact of $LINKAGE$, on firm performance from the impact of firm age, AGE, on firm performance in Panel A, the interpretation of the results in Panel B is clear: As supplier firms mature they are able to reduce the adverse impact of customer base concentration on firm performance. A careful examination reveals that firm maturity does not alleviate the adverse impact of customer base concentration on gross margins, GM. This observation suggests to us that firms do not obtain additional bargaining power with their major customers by simply surviving. Results in column (6) of Panel B in Table 9 suggest that the reversal of the adverse effects of customer concentration on firm performance follows the same pattern observed in Panel A: Firms are able to reverse the adverse effects of customer base concentration on firm performance by reducing SG&A expenses as they mature. Thus, although firm age is an imperfect instrument for $LINKAGE$, the results in Panel B suggest that young firms tend to have young relationships with their major customer and that firm age contains enough information on relationship duration to substitute for $LINKAGE$ in future studies on the life-cycle effects of major customer relationships when $LINKAGE$ is unavailable.

In Panel C of Table 9 we investigate the impact of the relationship life-cycle on the connection between customer concentration, SG&A elasticity and demand uncertainty. In Table 5, we propose that the economic drivers of our full sample results are increases in cost fixity and demand uncertainty. To test whether our life-cycle hypothesis can explain changes in these underlying factors and thus the profitability results we present in Panels A and B, we regress the elasticity of SG&A expenses, $SG\&AElasticity$, and demand uncertainty on $Rank(CC)$, the interaction of $Rank(CC)$ with $LINKAGE$, $(Rank(CC) * LINKAGE)$, and a set of control variables.

Columns (1) through (3) of Panel C report significant life-cycle effects on $SG\&AElasticity$. Consistent with the levels results presented in Table 5, the coefficient on $Rank(CC)$ is significantly negative. However, the coefficient on the interactive variable, $Rank(CC) * LINKAGE$, is significantly positive. The interactive coefficient shows us that, as the relationship matures, the negative association between customer base concentration and fixity of SG&A expenses reverses. We in-

terpret this result as supportive evidence for the conjecture that the bulk of the customer-specific investments occur early in the relationship and as the relationship matures, the initial operating risk is ameliorated.

In Table 5 we establish a positive relationship between customer concentration and demand uncertainty. Columns (4) through (6) in Panel C of Table 9 clearly document that the positive association between customer-base concentration and demand uncertainty is reduced as the duration of the relationship increases. This suggests that durable relationships with major customers eventually lead to less volatile revenues.

The results in Table 9 suggest that as the relationships between firms and their major customers mature, they amortize a significant portion of their customer-specific SG&A investments. This amortization gradually increases firm profitability and reduces operating risk.

4.4.2 Impact of customer concentration on operating efficiency throughout the relationship life-cycle

Patatoukas (2012) examines the effect of customer concentration on specific operating efficiency metrics. To determine how our life-cycle hypothesis applies to the details of firm operations, we examine the effect of customer concentration on inventory, asset turnover components, advertising, as well as variables that measure working capital efficiency, while controlling for firm size, age, sales growth, lines of business and financial leverage. The key independent variables in this analysis are $Rank(CC)$ in Panel A of Table 10 to measure baseline customer concentration effects and the interactive variable $Rank(CC) * LINKAGE$ in Panel B. The latter variable will indicate, which operating variables, if any, are affected by the life cycle of the major customer relationship.

By examining the $Rank(CC)$ coefficients in Panel A of Table 10 we find that many of Patatoukas' (2012) conclusions about customer concentration and operating efficiency hold in our expanded sample. Having large and important customers allows suppliers to reduce inventory holding costs ($IHLD$), and improve inventory turnover. This finding suggests that the ties that develop

between the firm and its major customers allow the firm to effectively manage its inventory. With the exception of cash turnover and advertising expenses, the other components of asset turnover are consistent with the contention that customer concentration improves operating efficiency. However, customer concentration has a significantly negative effect on cash turnover.[20] In columns (8) through (10) we examine the effect of customer concentration on working capital efficiency. We find that customer concentration increases days receivable, reduces days of inventory, and reduces the provision for doubtful accounts.

The coefficient on $Rank(CC) * LINKAGE$ in Panel B of Table 10 reveals that long duration links with major customers can benefit firms significantly. Columns (1) and (2) examine inventory management. In column (1) we note that although inventory holdings tend to increase as relationships mature, the increase does not appear large enough to offset the overall inventory benefits from customer concentration. Column (2) shows that all of the significant inventory turnover improvements reported in Panel A come as the relationship matures, as the coefficient on $Rank(CC)$ is no longer significant, but inventory turnover significantly improves as link age increases. We see a similar pattern for intangibles turnover in column (5) as significantly higher intangibles turnover ($INTANG$) is a result driven by increases in $LINKAGE$. Columns (3) and (4) reveal that receivables turnover and PP&E turnover do not improve with the relationship life-cycle. Column (6) shows that cash turnover improves for concentrated suppliers that have long duration links with their major customers. This suggests that longer duration links with major customers help build trust between the parties which leads to more efficient deployment of cash. We observe in column (7) that while earlier results document that relationship life-cycle improvements are observed for SG&A expenses, the same is not true for advertising expenses. The benefits from a reduction in advertising expenditures are present in this sample, but importance of the relationship itself, rather than the relationship duration seems to be the driving factor producing this result. Finally columns (8) through (10) show that all working capital efficiency improvements come with time. As the

[20] In Panel C of Table 6 we find that cash holdings increase with customer-base concentration. This finding is consistent with high customer concentration firms holding higher precautionary cash balances, which impairs their cash turnover.

relationship matures, the ratio of accounts receivable to sales ($DAYS\_RCVBLE$), the ratio of inventory to cost of goods sold ($DAYS\_INVT$), and the provision for doubtful accounts relative to accounts receivable ($DOUBTFUL$) all decrease.

5 Conclusion

All supplier firms face the dilemma of whether to cater to a few dominant customers or whether to seek a more diversified customer base. A long line of research dating back to Galbraith (1952) suggests that major customers are threats to firms' operating profits because, as important customers with significant bargaining power, they can demand price discounts and other concessions from suppliers. In a recent study, Patatoukas (2012) challenges this view. Rather than looking at industry-level concentration, as in previous studies, he creates a firm-specific measure of customer concentration and finds that profitable firms with high customer concentration benefit from customer-specific investments through improved operating efficiencies and reduced SG&A expenses.

In this paper we use a recently expanded data set of sales to major customers to study the economics of supplier firms. By examining all such firms, whether profitable or not, we outline a relationship life-cycle hypothesis wherein firms with major customers face significant operating risks. These risks arise because establishing and maintaining relationships with major customers require large, fixed investments, especially early in the relationship life-cycle. However, as the relationship matures, these firms can eventually benefit from some of the operating efficiencies documented in Patatoukas (2012).

We find that in the subsample of firms with positive operating margins, the correlation between ROA and customer concentration is positive, while the correlation between SG&A expenses and customer concentration is negative. However, in the subsample of firms with negative operating margins the relations reverse as the correlation between ROA and customer concentration is negative, while the correlation between SG&A expenses and customer concentration is positive. The exclusion of firms with negative operating margins from an analysis investigating the impact of

customer concentration on the operations of firms thus introduces a bias. Firms with positive operating margins appear to be the set of firms in mature relationships with their major customers, while the adverse effects of customer concentration are strongly evident in firms that are at the early stages of their relationship life cycles.

We find that many of the operating efficiencies documented in Patatoukas (2012) exist, but these benefits are negated by the negative impact of customer concentration on SG&A expenses. We conjecture that at the outset of a relationship with a major customer firms make customer-specific investments, particularly in SG&A expenses, and these customer-specific investments are harder to transfer to other customers should the customer-supplier relationship deteriorate. We find that firms with higher customer concentration have more inelastic SG&A expenses and costs of goods sold, a finding that supports our conjecture. Such customer-specific investments lead to higher fixity of costs for firms with high customer concentration resulting in higher operating leverage.

The operating leverage effect enhances profitability in profitable periods while increasing the firm's losses in unprofitable periods, consequently increases the risk of financial distress and the cost of debt. Firms with major customers respond to these costs by significantly reducing leverage. Thus, customer concentration brings significant costs and benefits to the firm. Identifying these costs and benefits over the full range of the relationship life-cycle allows us to reconcile the conventional wisdom with Patatoukas' (2012) results.

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Table 1: Variable definitions

This table describes the main variables used in this study. Supplier and customer firm characteristics are defined as in Patatoukas (2012). The customer-base concentration variable (CC) measures the extent to which a firm's customer base is more or less concentrated. Supplier-customer relationships are obtained from the COMPUSTAT Customer Segment files. Market equity prices, accounting profitability measures and other financial statement items are from the CSRP-COMPUSTAT merged database. In Table 6, we run dynamic logistic regressions as in Campbell, Hilscher and Szilagyi (2008) (hereafter CHS (2008)). Variables used in predicting firm failures with the dynamic CHS (2008) failure model are defined as in CHS (2008).

Variable	Definition
Supplier Firm Characteristics as defined in Patatoukas (2012)	
CC	Customer-base concentration measure ($0 \leq CC \leq 1$)
ΔCC	Annual change in CC
MV	Market value of equity
AGE	Firm age of the supplier firm, measured from the time of the firm's Initial Public Offering (IPO)
GROWTH	Annual sales growth
ROA	Income before extraordinary items / Beginning of year book value of assets
ROE	Income before extraordinary items / Beginning of year book value of equity
SGA	Selling, general, and administrative expenses / Sales
GM	Gross margin of the supplier firm: (Sales - Cost of goods sold) / Sales
PM	Profit margin of the supplier firm: Income before extraordinary items / Sales
IHLD	Inventory / Beginning of year book value of assets
ATO	Asset turnover of the supplier firm: Sales / Beginning of year book value of assets
FLEV	Beginning of year book value of assets / Beginning of year book value of equity
CONGLO	An indicator variable equal to 1 if the supplier firm reports at least two business segments
Default Prediction Variables Used in Table 6, as defined in Campbell Hilscher and Szilagyi (2008)	
TLMTA	Total liabilities / Market value of total assets*
CASHMTA	Cash and short-term assets / Market value of total assets*
SIGMA	Standard deviation of the firm's daily stock returns over the past 3 months
MB	Market-to-Book ratio
RSIZE	Log ratio of market capitalization to S&P 500 index
PRICE	Log price per share
EXRET	Monthly log excess return on equity relative to S&P 500 index

*We follow CHS (2008) and adjust the market value of total assets. Adjusted market value of total assets is equal to the book value of total assets as measured in Compustat quarterly (data item: ATQ) plus ten percent of the difference between the market and book values of equity.

Table 2: Descriptive statistics for the main variables

This table reports the mean, standard deviation, skewness, 25th percentile, median, and 75thpercentile values of the main variables used in this study. MV is in millions of US dollars while AGE is in years. The descriptive statistics are based on the samples used in the regression analyses. Our samples include firms from 1977 to 2007. We only include non-financial firms which have non-missing customer-base concentration measures, non-missing accounting profitability measures, and non-negative book values of equity. Panel A describes our full sample of 49,760 supplier firm year observations where a customer concentration (*CC*) value can be assigned to a supplier firm. Panel B reports the same values for the same set of variables for the subset of firms that have identifiable major customers. Panel C divides the full sample utilized in Panel A into two groups: supplier firm year observations with positive operating margins and supplier firm year observations with negative operating margins. The mean differences between the two groups and the corresponding t-statistics are reported on the right-hand side of Panel C.

Panel A: Full sample

Variable	Observations	Mean	Std. Dev.	Skewness	25th Percent.	Median	75th Percent.
CC	49,760	0.101	0.147	2.930	0.014	0.046	0.125
ΔCC	43,048	-0.003	0.094	-0.534	-0.018	0.000	0.015
MV	49,335	805.6	3,886.7	12.0	16.5	65.7	318.6
AGE	49,760	10.3	9.0	1.3	3.0	7.0	15.0
GROWTH	49,667	0.22	0.62	4.60	-0.03	0.10	0.29
ROA	49,760	-0.01	0.22	-2.77	-0.05	0.03	0.09
ROE	49,760	-0.03	0.51	-2.90	-0.10	0.07	0.18
SGA	49,760	0.39	0.63	6.12	0.14	0.24	0.40
IHLD	49,410	0.16	0.15	0.83	0.03	0.14	0.26
TLMTA	49,256	0.35	0.24	0.51	0.15	0.31	0.52
CASHMTA	49,254	0.11	0.14	2.72	0.02	0.06	0.14

Panel B: Supplier firms with the link age information

Variable	Observations	Mean	Std. Dev.	Skewness	25th Percent.	Median	75th Percent.
CC	22,489	0.116	0.148	2.785	0.024	0.063	0.148
ΔCC	20,616	-0.005	0.092	-0.682	-0.022	-0.001	0.017
MV	22,375	997.0	4,596.6	10.4	19.3	76.1	359.7
AGE	22,489	10.7	9.3	1.3	4.0	8.0	15.0
GROWTH	22,464	0.20	0.56	4.46	-0.04	0.10	0.29
ROA	22,489	-0.01	0.21	-2.70	-0.05	0.03	0.09
ROE	22,489	-0.02	0.49	-2.92	-0.09	0.07	0.18
SGA	22,489	0.37	0.55	6.34	0.13	0.23	0.40
IHLD	22,338	0.16	0.14	0.83	0.03	0.14	0.25
TLMTA	22,337	0.35	0.23	0.52	0.15	0.31	0.52
CASHMTA	22,337	0.11	0.14	2.68	0.02	0.06	0.15

Panel C: Profitable firm years (positive-OM sample) vs. unprofitable firm years (negative-OM sample)

	Positive OM sample				Negative OM sample				Mean	
Variable	Observations	Mean	Std. Dev.	Median	Observations	Mean	Std. Dev.	Median	differences	(t-stat)
CC	38,924	0.090	0.133	0.040	10,836	0.142	0.184	0.072	-0.052	(-27.63)
ΔCC	33,841	-0.001	0.078	0.000	9,207	-0.010	0.136	-0.002	0.009	(5.85)
MV	38,589	990.2	4,344.9	91.9	10,746	143.0	999.0	23.2	847.2	(35.11)
AGE	38,924	11.1	9.4	8.0	10,836	7.3	6.7	5.0	3.9	(48.63)
GROWTH	38,902	0.22	0.49	0.12	10,765	0.21	0.93	-0.03	0.01	(0.92)
ROA	38,924	0.06	0.10	0.05	10,836	-0.28	0.29	-0.20	0.34	(120.82)
ROE	38,924	0.11	0.31	0.11	10,836	-0.51	0.74	-0.34	0.63	(86.44)
SGA	38,924	0.23	0.15	0.20	10,836	0.96	1.15	0.60	-0.73	(-65.67)
IHLD	38,627	0.17	0.15	0.15	10,783	0.14	0.15	0.10	0.02	(15.16)
TLMTA	38,534	0.36	0.23	0.33	10,722	0.30	0.24	0.24	0.06	(22.81)
CASHMTA	38,532	0.09	0.11	0.05	10,722	0.17	0.21	0.09	-0.08	(-38.58)

Figure 1: Time-series trend of customer-base concentration

This figure plots the time series of the cross sectional median of customer-base concentration over the 1977-2007 period. The line chart shows the time-series trend of the yearly median customer-base concentration measure (CC) and the bar chart shows the number of supplier firms that report their major customers in COMPUSTAT customer segment files.

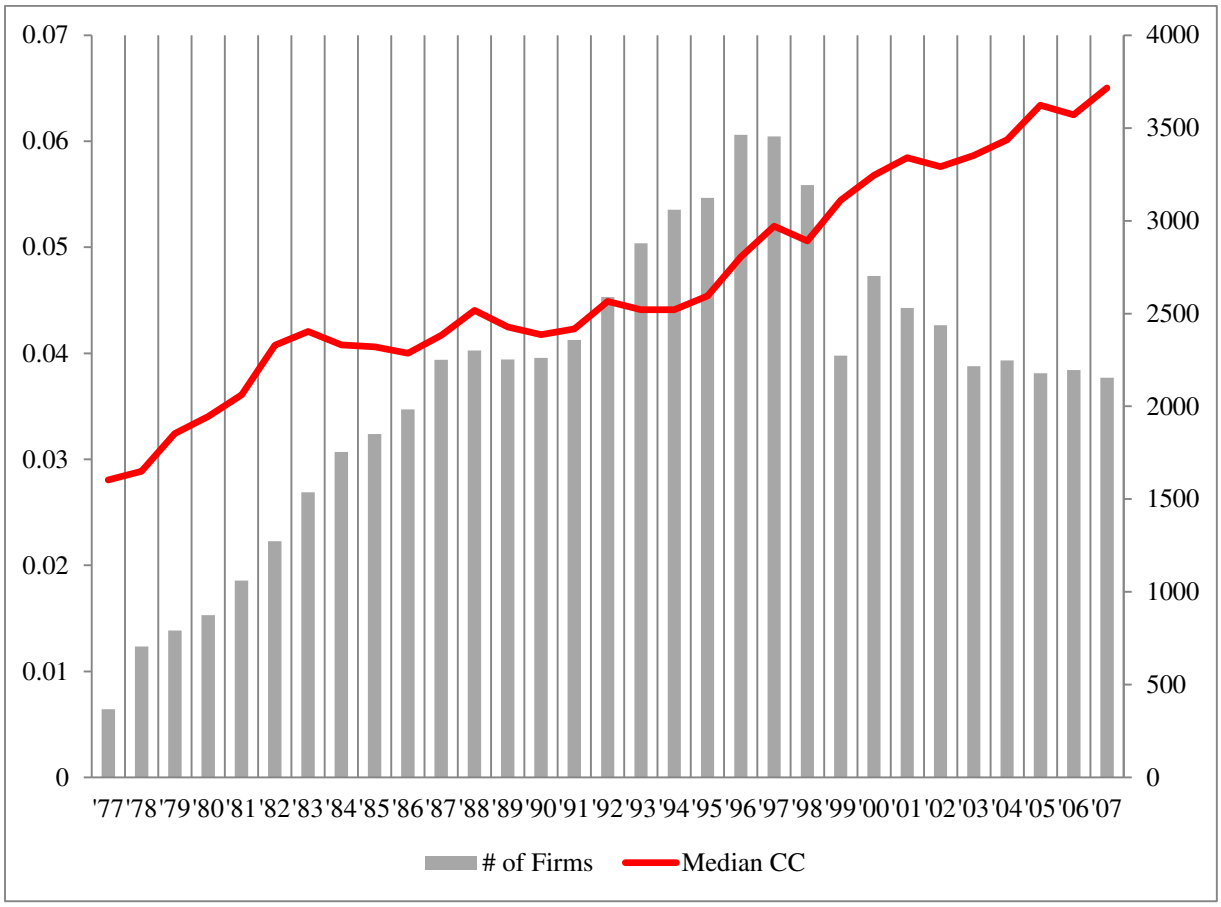

Table 3: Pearson and Spearman correlations

This table reports the Pearson (above) and Spearman (below) correlation coefficients for the main variables used in our study. Panel A employs the full sample with available customer concentration (*CC*) values, whereas Panels B and C report the correlations for firms with positive operating margins (OM) and firms with negative operating margins, respectively. All correlation coefficients are statistically significant at the one percent level (significant at $p < 0.01$) except for the correlations denoted by "a" (significant at $p < 0.05$) and the ones denoted by "b" (statistically insignificant).

Panel A: Full sample

	CC	*MV*	*AGE*	*GROWTH*	*ROA*	*ROE*	*SGA*	*TLMTA*	*CASHMTA*
CC		-0.11	-0.10	0.08	-0.11	-0.08	0.18	-0.12	0.10
MV	-0.13		0.19	0.06	0.25	0.22	-0.11	-0.28	-0.13
AGE	-0.11	0.18		-0.21	0.16	0.12	-0.18	0.14	-0.08
GROWTH	0.00[b]	0.18	-0.18		-0.04	-0.02	0.07	-0.14	-0.07
ROA	-0.10	0.34	0.12	0.32		0.75	-0.56	-0.03	-0.09
ROE	-0.11	0.34	0.12	0.31	0.92		-0.38	-0.05	-0.05
SGA	0.05	-0.19	-0.21	-0.06	-0.36	-0.37		-0.40	0.28
TLMTA	-0.14	-0.27	0.15	-0.21	-0.23	-0.15	-0.25		-0.20
CASHMTA	0.11	-0.05	-0.05	-0.08	-0.04	-0.09	0.21	-0.27	

Panel B: Positive-OM sample

	CC	*MV*	*AGE*	*GROWTH*	*ROA*	*ROE*	*SGA*	*TLMTA*	*CASHMTA*
CC		-0.10	-0.09	0.08	0.03	0.01	-0.04	-0.09	0.10
MV	-0.12		0.17	0.04	0.21	0.15	-0.05	-0.31	-0.12
AGE	-0.09	0.17		-0.21	-0.04	0.00[b]	-0.12	0.11	-0.02
GROWTH	0.03	0.12	-0.23		0.16	0.11	0.02	-0.13	-0.06
ROA	0.01[a]	0.24	-0.03	0.35		0.63	-0.05	-0.44	0.03
ROE	-0.02	0.25	-0.01	0.34	0.89		-0.06	-0.23	-0.01[b]
SGA	-0.07	-0.09	-0.11	0.02	-0.01[a]	-0.09		-0.37	0.24
TLMTA	-0.10	-0.29	0.12	-0.24	-0.52	-0.33	-0.35		-0.22
CASHMTA	0.10	-0.05	-0.02	-0.04	0.09	-0.02	0.24	-0.28	

Panel C: Negative-OM sample

	CC	*MV*	*AGE*	*GROWTH*	*ROA*	*ROE*	*SGA*	*TLMTA*	*CASHMTA*
CC		0.01[b]	-0.06	0.09	-0.07	-0.02[a]	0.23	-0.16	0.01[b]
MV	0.01[b]		0.03	0.12	-0.04	0.01[b]	0.09	-0.42	0.03
AGE	-0.06	0.03		-0.24	0.19	0.10	-0.19	0.18	-0.08
GROWTH	0.00[b]	0.19	-0.20		-0.22	-0.13	0.11	-0.17	-0.08
ROA	-0.09	0.00[b]	0.22	-0.09		0.65	-0.45	0.19	0.12
ROE	-0.03	0.07	0.14	-0.05	0.84		-0.23	0.01[b]	0.16
SGA	0.17	0.14	-0.26	0.05	-0.49	-0.30		-0.51	0.22
TLMTA	-0.18	-0.43	0.18	-0.21	0.17	-0.06	-0.34		-0.13
CASHMTA	0.04	0.14	-0.05	-0.08	0.12	0.24	0.12	-0.15	

Table 4: Customer-base concentration and supplier firm performance

This table reports the results of yearly cross-sectional regressions of accounting performance measures on *Rank(CC)* and a set of control variables. *Rank(CC)* is the decile rank of customer-base concentration (CC) scaled to be bounded between 0 and 1. Our sample includes firms from 1977 to 2007. We only include non-financial firms which have non-missing customer-base concentration measures, non-missing accounting profitability measures, and non-negative book value of equity. Panel A reports results for the full sample which includes both profitable and unprofitable firm years, while Panel B reports results for the subset of firm years that have positive operating margins, and Panel C reports the results for firm years with negative operating margins. We average the coefficients over time and report the means in the first rows and the corresponding Newey-West-adjusted t-statistics in the rows below in parentheses. Following Patatoukas (2012), we calculate the customer-base concentration measure (CC) as the sum of the squares of the sales shares of a supplier firm's major customers. The dependent variables include (1) return on assets (ROA), (2) return on equity (ROE), (3) asset turnover (ATO), (4) profit margin (PM), (5) gross margin (GM), and (6) the ratio of selling, general and administrative expenses to sales (SGA). Other control variables include the log of market value of equity (MV), the log of firm age (AGE), annual sales growth rate (GROWTH), the indicator variable that equals 1 if the firm reports at least two business segments (CONGLO), and the leverage ratio defined as book value of assets divided by book value of equity (FLEV). N is the number of firm-year observations used in the regression.

Panel A: Full sample

	(1) ROA	(2) ROE	(3) ATO	(4) PM	(5) GM	(6) SGA
Intercept	-0.158	-0.343	1.038	-1.104	0.274	0.987
	(-5.01)	(-3.46)	(3.57)	(-7.11)	(5.26)	(13.13)
Rank(CC)	-0.022	-0.039	-0.131	-0.245	-0.055	0.109
	(-3.85)	(-3.34)	(-8.90)	(-4.65)	(-7.82)	(3.84)
MV	0.030	0.058	-0.019	0.057	0.020	-0.034
	(11.69)	(13.69)	(-2.45)	(4.80)	(10.31)	(-4.64)
AGE	0.016	0.028	0.070	0.098	-0.014	-0.073
	(3.10)	(3.47)	(12.32)	(3.39)	(-2.08)	(-11.42)
GROWTH	0.006	0.033	0.372	0.010	0.024	0.027
	(0.53)	(1.30)	(7.76)	(0.56)	(3.87)	(2.59)
CONGLO	-0.004	-0.005	0.001	0.055	-0.054	-0.081
	(-1.61)	(-2.24)	(0.14)	(5.10)	(-20.61)	(-9.00)
FLEV	-0.002	-0.010	0.011	0.009	-0.005	-0.013
	(-2.12)	(-1.33)	(2.01)	(3.33)	(-8.00)	(-7.08)
Industry F.E.	Yes	Yes	Yes	Yes	Yes	Yes
Avg. R^2	0.197	0.166	0.323	0.131	0.201	0.195
N	49,118	49,118	49,118	49,118	49,118	49,118

Panel B: Positive-OM sample

	(1) ROA	(2) ROE	(3) ATO	(4) PM	(5) GM	(6) SGA
Intercept	0.018	-0.095	1.374	-0.007	0.385	0.330
	(1.20)	(-0.20)	(5.72)	(-1.40)	(-6.56)	(-10.98)
Rank(CC)	0.017	0.033	-0.045	0.017	-0.014	-0.047
	(6.56)	(4.80)	(-2.22)	(15.00)	(-1.69)	(-5.46)
MV	0.014	0.030	-0.051	0.015	0.015	-0.007
	(11.61)	(10.68)	(-5.19)	(9.64)	(-7.64)	(-4.34)
AGE	-0.005	-0.006	0.041	-0.002	-0.024	-0.014
	(-1.42)	(-0.87)	(5.42)	(-0.72)	(-4.89)	(-4.79)
GROWTH	0.040	0.097	0.508	0.021	0.015	0.000
	(6.52)	(5.17)	(16.00)	(6.63)	(-3.26)	(-0.20)
CONGLO	-0.016	-0.028	-0.012	-0.013	-0.063	-0.036
	(-11.53)	(-13.74)	(-2.23)	(-10.84)	(-32.46)	(-27.95)
FLEV	-0.004	0.017	0.006	-0.004	-0.006	-0.005
	(-8.77)	(2.50)	(1.31)	(-12.82)	(-9.30)	(-9.34)
Industry F.E.	Yes	Yes	Yes	Yes	Yes	Yes
Avg. R^2	0.219	0.175	0.366	0.174	0.383	0.322
N	38,542	38,542	38,542	38,542	38,542	38,542

Panel C: Negative-OM sample

	(1) ROA	(2) ROE	(3) ATO	(4) PM	(5) GM	(6) SGA
Intercept	-0.312	0.073	0.984	-1.584	0.168	0.984
	(-6.68)	(0.37)	(3.97)	(-3.27)	(2.30)	(4.89)
Rank(CC)	-0.062	-0.108	-0.378	-0.824	-0.139	0.454
	(-4.86)	(-3.52)	(-2.66)	(-8.13)	(-6.46)	(10.26)
MV	0.008	0.015	-0.029	-0.011	-0.002	0.008
	(2.18)	(2.50)	(-1.42)	(-0.51)	(-0.29)	(0.72)
AGE	0.040	0.062	0.047	0.305	0.008	-0.169
	(10.75)	(6.32)	(1.34)	(7.14)	(1.07)	(-9.99)
GROWTH	-0.035	-0.059	0.166	0.041	0.038	0.049
	(-3.03)	(-2.61)	(2.64)	(0.82)	(2.53)	(1.66)
CONGLO	0.023	0.055	0.053	0.257	-0.032	-0.240
	(3.19)	(2.60)	(0.80)	(4.86)	(-2.01)	(-7.20)
FLEV	0.001	-0.152	-0.006	0.038	-0.003	-0.025
	(0.47)	(-15.65)	(-0.29)	(3.44)	(-0.89)	(-2.56)
Industry F.E.	Yes	Yes	Yes	Yes	Yes	Yes
Avg. R^2	0.288	0.452	0.42	0.278	0.279	0.326
N	10,572	10,572	10,572	10,572	10,572	10,572

Table 5: Impact of customer-base concentration on operating leverage and demand uncertainty

Panel A reports panel data means of operating expenses as a percentage of sales. Panel B of Table 5 reports the mean and median elasticity values of costs of goods sold (COGS) and selling, general and administrative expenses (SG&A) with respect to sales. Panel C of Table 5 reports the mean and median values of demand uncertainty for each customer-base concentration quintile. Panel D of Table 5 reports Fama MacBeth regressions of COGS elasticity, SG&A elasticity and demand uncertainty on *Rank(CC)* and other firm covariates. Each year firms are sorted into ten portfolios based on their customer-base concentration measure (*CC*): *Rank(*CC*)* is the corresponding decile rank scaled to be bounded between 0 and 1. The marginal elasticity of COGS (SG&A expense) with respect to sales of firm i in year t is calculated as the change in log-COGS (SG&A expense) for firm i from year t-1 to year t , $\Delta \ln COGS_{i,t}$ ($\Delta \ln SG\&A_{i,t}$), divided by the change in log-sales for firm i from year t-1 to year t ($\Delta \ln Sales_{i,t}$). The demand uncertainty for firm i is defined as the standard deviation of annual changes in log-sales. Following Banker et al. (2012), we estimate demand uncertainty on a rolling basis, using the data for the most recent 5 years. H-L column reports the cross-sectional differences between the mean and median COGS elasticity, SG&A elasticity and demand uncertainty estimations of the highest and lowest customer-base concentration quintiles. N is the number of firm-year observations. H-L cross-sectional differences that are statistically significant at the one percent level (significant at $p < 0.01$) are denoted with ***, those that are statistically significant at the five percent level (significant at $p < 0.05$) are denoted with **, and those that are statistically significant at the ten percent level (significant at $p < 0.10$) are denoted with *. H-L cross-sectional differences that are statistically insignificant are not marked. *MB* is the market-to-book ratio, and *AT* measures total assets. All other control variables are as defined in earlier tables.

Panel A: Operating expenses

Item	% of Sales
Cost of Goods Sold	64.4%
SG&A Expenses	39.1%
Advertising Expense	1.0%
Non-advertising SG&A Expenses	38.1%

Panel B: Customer base concentration and elasticity of operating expenses with respect to sales

Customer-base Concentration	COGS Elasticity			SG&A Elasticity		
	N	Mean	Median	N	Mean	Median
Lowest	9,867	0.97	0.98	9,867	0.79	0.83
2	9,889	0.95	0.97	9,889	0.72	0.74
3	9,889	0.91	0.96	9,889	0.69	0.7
4	9,843	0.92	0.96	9,845	0.66	0.65
Highest	9,727	0.87	0.96	9,727	0.56	0.52
H - L		-0.10***	-0.02***		-0.23***	-0.31***

Panel C: Customer base concentration and demand uncertainty

Customer-base Concentration	Demand Uncertainty		
	N	Mean	Median
Lowest	7,030	0.19	0.13
2	7,024	0.22	0.15
3	6,722	0.24	0.17
4	6,282	0.26	0.19
Highest	5,838	0.32	0.22
H - L		0.12***	0.09***

Panel D: Relationship of customer concentration to cost elasticity and demand uncertainty

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	COGS Elasticity			SG&A Elasticity			Demand Uncertainty		
Intercept	1.234	1.199	1.175	0.703	0.666	0.659	0.466	0.462	0.476
	(2.58)	(2.44)	(2.43)	(1.61)	(1.49)	(1.46)	(6.42)	(7.73)	(7.63)
Rank(CC)	-0.058	-0.059	-0.051	-0.144	-0.149	-0.134	0.069	0.076	0.067
	(-1.95)	(-1.90)	(-1.65)	(-2.48)	(-2.61)	(-2.40)	(5.59)	(6.26)	(5.95)
MV	0.006	0.000		0.071	0.067		-0.023	-0.022	
	(2.19)	(0.20)		(6.09)	(5.74)		(-44.07)	(-34.19)	
AT			0.008			0.072			-0.028
			(1.62)			(9.85)			(-30.16)
AGE	-0.005	-0.006	-0.007	-0.033	-0.025	-0.033	-0.055	-0.056	-0.051
	(-0.51)	(-0.61)	(-0.64)	(-1.68)	(-1.27)	(-1.49)	(-6.72)	(-6.84)	(-5.98)
GROWTH		-0.003	-0.003		0.009	0.036		0.110	0.103
		(-0.11)	(-0.09)		(0.56)	(2.58)		(14.08)	(12.68)
CONGLO		0.074	0.070		0.019	0.003		0.010	0.016
		(3.23)	(2.97)		(0.81)	(0.11)		(2.04)	(3.14)
FLEV	0.006	0.002	0.002	0.013	0.012	0.006	0.003	0.005	0.007
	(1.85)	(0.86)	(0.73)	(1.49)	(1.31)	(0.79)	(1.30)	(2.42)	(3.51)
MB	-0.013			-0.010			0.013		
	(-3.08)			(-2.49)			(10.38)		
Industry F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Avg. R^2	0.051	0.051	0.051	0.055	0.055	0.055	0.212	0.225	0.234
N	49,139	49,112	49,112	48,675	48,652	48,652	32,854	32,843	32,843

Table 6: Impact of customer-base concentration on the likelihood of firm failure

Panel A reports results from dynamic logistic regressions of the failure indicator on the predictor variables for all firms in CRSP-COMPUSTAT between 1980 and 2007. Panel B reports mean failure probabilities for all firms including those with missing customer links, while Panel C reports mean values for firm characteristics known to affect failure rates. The dependent variable is a dummy variable equal to one if the firm fails in a given year, where failure is defined in the spirit of Demers and Joos (2007). The data are constructed such that all independent variables are observed 12 months before the failure event. Each year firms are sorted into ten portfolios based on their customer-base concentration value (*CC*): *Rank(*CC*)* is the corresponding decile rank scaled to be bounded between 0 and 1. *SG&A Elasticity* is the elasticity value of selling, general and administrative expenses (*SG&A*) with respect to sales. *No CC* is equal to 1 if the firm has no available CC value, *Rank(CC)_1* is equal to 1 if *Rank(CC)* is less than or equal to 0.3, *Rank(CC)_2* is equal to 1 if *Rank(CC)* is between 0.3 and 0.5 and is suppressed to avoid the dummy variable trap. *Rank(CC)_3* is equal to 1 if *Rank(CC)* is between 0.5 and 0.8, and *Rank(CC)_4* is equal to 1 if *Rank(CC)* is between 0.8 and 1. *TLMTA* is the ratio of total liabilities to the market value of total assets. *NIMTA* is the ratio of net income to the market value of total assets. *SIGMA* is the standard deviation of daily stock returns over the previous three months. *MB* is the market-to-book ratio. *RSIZE* is the log ratio of market capitalization to the market value of the S&P 500 index. *CASHMTA* is the ratio of cash to the market value of total assets. *PRICE* is the log of last available price. *EXRET* is the monthly log excess stock return relative to the S&P 500 index as calculated in CHS (2008). Values of *z-statistics* are reported in parentheses below coefficient estimates. *N* is the total number of firm-year observations in the sample and *# of Failures* is the number of failure events observed in the entirety of the sample. McFadden pseudo R^2 values are reported for each regression.

Panel A: Dynamic failure prediction

	(1) Failure	(2) Failure	(3) Failure
Intercept	-14.040	-14.159	-12.908
	(-31.70)	(-31.75)	(-55.76)
Rank(CC)		0.401	
		(3.21)	
No CC			0.268
			(3.27)
Rank(CC)_1			-0.094
			(0.90)
Rank(CC)_3			0.099
			(1.01)
Rank(CC)_4			0.250
			(2.39)
TLMTA	2.380	2.456	1.805
	(13.79)	(14.08)	(19.66)
NIMTA	-21.716	-21.560	-22.061
	(-13.48)	(-13.38)	(-24.80)
SIGMA	0.457	0.454	0.795
	(3.87)	(3.84)	(13.35)
MB	0.291	0.286	0.168
	(10.24)	(10.05)	(10.01)
RSIZE	-0.675	-0.666	-0.617
	(-18.68)	(-18.33)	(-33.60)
CASHMTA	-1.251	-1.302	-1.088
	(-3.57)	(-3.71)	(-5.55)
EXRET	-4.123	-4.097	-0.641
	(-5.33)	(-5.30)	(-4.62)
# of Failures	771	771	2,607
N	48,948	48,948	142,398
Pseudo R^2	0.209	0.210	0.202

Panel B: Customer base concentration and failure probability

Customer-base Concentration	Customer-base Concentration Rank	N	Mean Default Probability	Std. Dev.
No CC	N/A	90,867	0.018	0.037
Rank(CC)_1	0<=Rank(CC)<=0.3	16,591	0.013	0.030
Rank(CC)_2	0.3<Rank(CC)<=0.5	10,609	0.017	0.033
Rank(CC)_3	0.5<Rank(CC)<=0.8	15,143	0.020	0.037
Rank(CC)_4	0.8<Rank(CC)<=1	9,213	0.025	0.043

Panel C: Customer base concentration and firm characteristics vital for survival

Concentration	Customer-base Concentration Rank	N	Profitability	Volatility	Cash Holdings	Leverage
No CC	N/A	90,867	0.35%	49.44%	7.84%	47.88%
Rank(CC)_1	0<=Rank(CC)<=0.3	16,591	0.34%	53.49%	7.67%	40.19%
Rank(CC)_2	0.3<Rank(CC)<=0.5	10,609	0.15%	59.89%	9.21%	36.18%
Rank(CC)_3	0.5<Rank(CC)<=0.8	15,143	0.07%	63.29%	10.11%	34.03%
Rank(CC)_4	0.8<Rank(CC)<=1	9,213	-0.32%	67.95%	12.16%	27.88%

Figure 2: Physical default probability in customer concentration groups

This figure plots the mean values of predicted annual failure rates in customer base concentration groups using the full sample period. *No CC* denotes firms without any available major customer information. Each year, firms with major customer information are sorted into ten portfolios based on their customer-base concentration measure (*CC*). *Rank(*CC*)* is the corresponding decile rank scaled to be bounded between 0 and 1. *Rank(CC)_1* corresponds to firms with *Rank(CC)* values between 0 and 0.3. *Rank(CC)_2* is composed of firms with *Rank(CC)* between 0.3 and 0.5, *Rank(CC)_3* includes firms with *Rank(CC)* between 0.5 and 0.8, while *Rank(CC)_4* group corresponds to firms with *Rank(CC)* between 0.8 and 1. The firm failure probability values are obtained using the model parameters in column (3) of Panel B of Table 6.

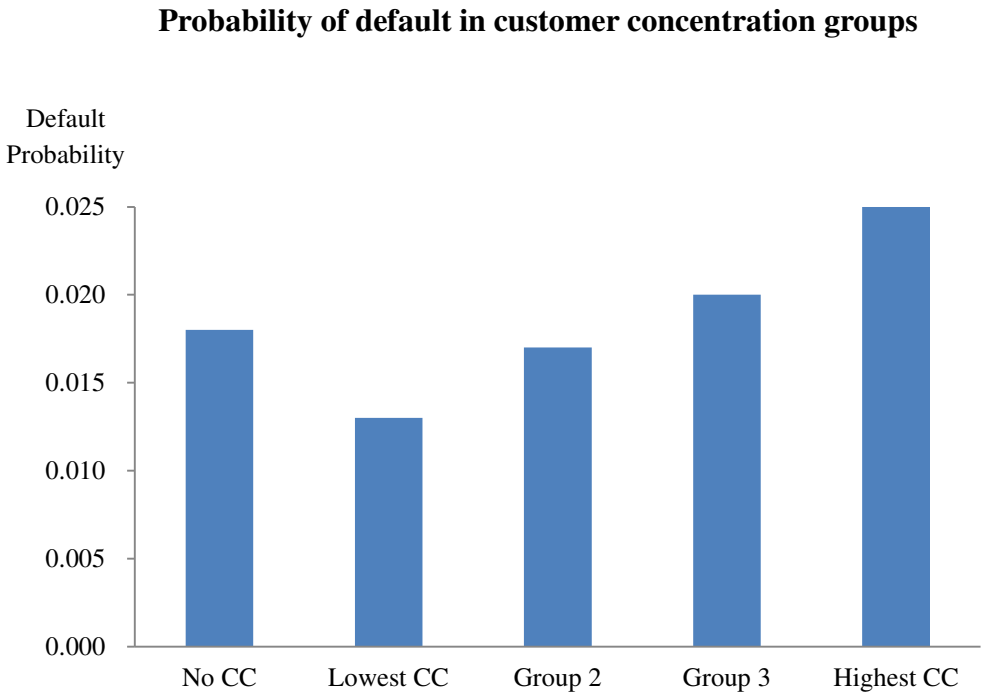

Table 7: Customer-base concentration and credit risk

This table reports results for ordered logistic regressions of the determinants of firm credit ratings. We run annual regressions of Standard & Poor's (S&P) Rating (*RATING*) on the decile rank of customer-base concentration (*Rank(CC)*) and other control variables that are known to explain firms' default risk (See Campbell, Hilscher, and Szilagyi (2008)). The dependent variable *RATING* is a number that corresponds to S&P Issuer credit rating from COMPUSTAT. *RATING* increases from 2 (for AAA-rated firms) to 27 (for D-rated firms) as the credit quality decreases. We report the coefficients in the first rows and z-statistics in parentheses. Control variables include leverage (*TLMTA*), profitability (*NIMTA*), the standard deviation of the daily stock returns over the past 3 months (*SIGMA*), market-to-book ratio (*MB*), a firm's relative size to the S&P 500 index (*RSIZE*), a firm's cash holdings to its market value of assets (*CASHMTA*) and the average of monthly log excess returns (*EXRET*) calculated in the fashion suggested by CHS (2008).

	(1)	(2)
	RATING	*RATING*
Rank(CC)	1.084	0.564
	(14.57)	(7.34)
TLMTA		1.173
		(8.32)
NIMTA		-4.396
		(-10.07)
SIGMA		61.129
		(25.81)
MB		0.048
		(5.92)
RSIZE		-0.834
		(-34.18)
CASHMTA		3.385
		(9.88)
EXRET		-0.017
		(-0.08)
N	5,954	5,954

Table 8: Impact of changes in customer-base concentration on firm performance

This table reports results for Fama–MacBeth regressions. In Panel A, we study the impact of changes in customer base concentration on stock returns and future firm performance. The dependent variables are contemporaneous one-year buy-and-hold abnormal return in year t ($BHAR_t$), future one-year buy-and-hold abnormal return in year t+1 ($BHAR_{t+1}$), and changes in return on assets (ΔROA_{t+1}) and SG&A costs (ΔSGA_{t+1}) in year t+1. The decile rank of the annual change in customer-base concentration and control variables are calculated in year t. We run annual regressions of year t to year t+1 changes in ROA and SGA as well as BHARs calculated in year t and t+1 on the decile rank of annual change in customer-base concentration from year t-1 to year t and on year t values of a number of control variables. Our sample includes firms from 1977 to 2007. We only include non-financial firms with non-missing customer-base concentration firm-year observations, non-missing accounting profitability measures, and non-negative book value of equity. $Rank(\Delta CC_t)$ is the decile rank of annual change in customer-base concentration scaled to be bounded between 0 and 1. Other control variables are profit margin (PM_t), asset turnover (ATO_t), annual change in profit margin (ΔPM_t), annual change in asset turnover (ΔATO_t), ratio of income before extraordinary items scaled by the beginning of year market value of equity (EARN), market beta (BETA) and sales growth (GROWTH). N is the number of firm-year observations used in the regression. In Panel B, we compare the future sales growth of suppliers that recently have acquired a major customer to be new supplier firms with a matched sample of firms that have no major customers. At the bottom of panel B, we average the coefficients over time and report the means in the first rows and the corresponding Newey-West-adjusted t-statistics in the rows below in parentheses.

Panel A: Change in customer base concentration, stock returns, and future performance

	(1)	(2)	(3)	(4)
	$BHAR_t$	$BHAR_{t+1}$	ΔROA_{t+1}	ΔSGA_{t+1}
Intercept	-0.219	-0.077	0.002	0.014
	(-2.36)	(-0.65)	(0.22)	(0.80)
$Rank_t(\Delta CC)$	0.072	0.015	-0.007	0.017
	(3.46)	(1.38)	(-2.22)	(6.07)
PM_t	0.207	-0.138	-0.076	0.047
	(1.35)	(-0.97)	(-1.50)	(1.86)
ATO_t	0.053	0.010	-0.010	-0.002
	(2.65)	(0.50)	(-12.71)	(-1.04)
ΔPM_t	0.049	0.222	0.021	0.024
	(1.06)	(1.06)	(0.78)	(0.97)
ΔATO_t	0.290	-0.004	0.003	0.000
	(5.70)	(-0.23)	(1.10)	(0.08)
Industry F.E.	Yes	Yes	Yes	Yes
Avg. R^2	0.174	0.132	0.120	0.191
N	35,488	31,716	35,668	35,419

Panel B: Suppliers with new major customer links compared to similar firms with no major customers

		Sales Growth $_t$			Sales Growth $_{t+1}$		
Year	N	New suppliers	Matching firms	Difference	New suppliers	Matching firms	Difference
1981	79	0.238	0.148	0.089	0.064	0.029	0.033
1982	75	0.188	0.077	0.111	0.136	0.049	0.111
1983	88	0.436	0.219	0.231	0.244	0.172	0.080
1984	91	0.238	0.322	-0.084	0.108	0.060	0.051
1985	114	0.166	0.145	0.020	0.132	0.201	-0.074
1986	114	0.345	0.170	0.175	0.323	0.194	0.205
1987	88	0.319	0.420	-0.100	0.243	0.119	0.127
1988	92	0.284	0.172	0.109	0.168	0.083	0.096
1989	92	0.334	0.113	0.221	0.170	0.027	0.156
1990	93	0.292	0.143	0.148	0.112	0.050	0.081
1991	99	0.187	0.077	0.110	0.142	0.156	-0.012
1992	123	0.219	0.128	0.090	0.258	0.236	0.006
1993	136	0.321	0.094	0.227	0.280	0.274	0.032
1994	110	0.394	0.173	0.181	0.304	0.095	0.175
1995	120	0.400	0.199	0.201	0.193	0.204	0.013
1996	143	0.304	0.231	0.073	0.227	0.264	0.016
1997	127	0.483	0.198	0.285	0.263	0.153	0.119
1998	174	0.300	0.200	0.101	0.134	0.138	0.004
1999	144	0.326	0.210	0.117	0.300	0.244	0.041
2000	160	0.486	0.220	0.305	0.093	0.066	0.043
2001	141	0.165	0.100	0.063	-0.030	0.013	-0.044
2002	177	0.045	0.091	-0.046	0.149	0.081	0.058
2003	130	0.120	0.117	0.003	0.272	0.182	0.064
2004	114	0.274	0.164	0.110	0.196	0.182	0.021
2005	104	0.245	0.125	0.120	0.166	0.114	0.042
2006	97	0.236	0.113	0.131	0.210	0.164	0.068
2007	82	0.350	0.123	0.226	0.204	0.142	0.062
Mean		0.284	0.169	0.116	0.185	0.138	0.054
				(6.15)			(5.03)

Table 9: Impact of survivorship and duration of customer links on firm performance and risk

This table reports the results of yearly cross-sectional regressions of accounting performance measures on *Rank(CC),* the interaction terms between *Rank(CC)* and the quintile dummies of link age and firm age well as control variables. *Rank(CC)* is the decile rank of customer-base concentration *(CC)* scaled to be bounded between 0 and 1. Our sample includes firms from 1977 to 2007. Panel A reports results for link age quintiles, where *LINKAGE* measures in log years the weighted average of the duration of the relationships that a firm has maintained with its major customers and *LA_Q2, LA_Q3, LA_Q4* and *LA_Q5* are dummy variables that equal one if *LINKAGE* falls into the second, third, fourth, and fifth quintile, respectively. Panel B reports analogous results for *AGE* quintiles, where *AGE* equals the age of the firm as a public corporation. Panel C further tests the relationship life-cycle hypothesis by adding *LINKAGE* and the interaction of *Rank(CC)* and *LINKAGE* to the set of control variables, using suppliers with identifiable major customers. All dependent variables as well as control variables are described in detail in Tables 1 and 4.

Panel A: Impact of customer concentration on firm performance as customer links mature

	(1) ROA	(2) ROE	(3) ATO	(4) PM	(5) GM	(6) SGA
Intercept	-0.186	-0.244	1.100	-0.855	0.327	0.874
	(-3.53)	(-2.25)	(6.68)	(-7.32)	(14.48)	(10.30)
Rank(CC)	-0.060	-0.121	-0.246	-0.391	-0.066	0.229
	(-6.74)	(-5.10)	(-6.72)	(-6.09)	(-4.67)	(5.39)
*Rank(CC) * LA_Q2*	0.040	0.101	0.144	0.108	-0.015	-0.101
	(4.34)	(4.47)	(6.23)	(2.16)	(-1.37)	(-3.20)
*Rank(CC) * LA_Q3*	0.059	0.113	0.169	0.227	-0.003	-0.165
	(8.41)	(6.52)	(10.07)	(4.64)	(-0.31)	(-3.48)
*Rank(CC) * LA_Q4*	0.079	0.141	0.235	0.322	0.009	-0.227
	(6.47)	(6.26)	(8.54)	(3.96)	(0.53)	(-4.85)
*Rank(CC) * LA_Q5*	0.088	0.154	0.322	0.318	-0.014	-0.251
	(6.38)	(5.65)	(8.21)	(4.04)	(-0.86)	(-4.90)
MV	0.029	0.055	-0.025	0.050	0.022	-0.029
	(16.07)	(16.58)	(-3.85)	(8.44)	(11.00)	(-8.76)
AGE	0.011	0.021	0.044	0.069	-0.012	-0.051
	(2.51)	(2.66)	(3.98)	(3.00)	(-1.86)	(-8.35)
GROWTH	0.015	0.058	0.381	0.035	0.027	0.005
	(2.75)	(5.52)	(22.43)	(1.65)	(4.10)	(0.46)
CONGLO	-0.001	-0.002	0.038	0.060	-0.055	-0.083
	(-0.23)	(-0.29)	(3.02)	(7.25)	(-25.58)	(-13.21)
FLEV	-0.002	-0.012	0.016	0.009	-0.005	-0.012
	(-2.08)	(-1.11)	(3.86)	(4.42)	(-4.29)	(-15.73)
Industry F.E.	Yes	Yes	Yes	Yes	Yes	Yes
Avg. R^2	0.220	0.198	0.374	0.168	0.249	0.231
N	22,311	22,311	22,311	22,311	22,311	22,311

Panel B: Impact of customer concentration on firm performance as the firm matures

	(1) ROA	(2) ROE	(3) ATO	(4) PM	(5) GM	(6) SGA
Intercept	-0.176	-0.266	1.356	-0.879	0.222	0.766
	(-5.42)	(-3.22)	(3.91)	(-4.99)	(5.27)	(10.77)
Rank(CC)	-0.073	-0.117	-0.322	-0.602	-0.064	0.325
	(-5.04)	(-4.89)	(-17.91)	(-3.72)	(-2.58)	(6.13)
*Rank(CC) * AGE_Q2*	0.033	0.044	0.124	0.320	0.047	-0.158
	(3.14)	(2.29)	(5.82)	(2.47)	(2.25)	(-4.11)
*Rank(CC) * AGE_Q3*	0.057	0.080	0.210	0.416	0.024	-0.235
	(9.11)	(7.03)	(4.61)	(3.59)	(1.49)	(-9.35)
*Rank(CC) * AGE_Q4*	0.084	0.139	0.246	0.538	0.008	-0.334
	(4.95)	(6.53)	(18.27)	(3.36)	(0.21)	(-9.67)
*Rank(CC) * AGE_Q5*	0.088	0.140	0.363	0.555	-0.027	-0.377
	(3.48)	(3.25)	(22.56)	(3.46)	(-0.72)	(-8.98)
MV	0.031	0.059	-0.019	0.060	0.020	-0.036
	(11.34)	(13.40)	(-2.47)	(4.56)	(9.73)	(-4.68)
GROWTH	0.007	0.033	0.370	0.012	0.028	0.028
	(0.55)	(1.25)	(7.46)	(0.63)	(4.28)	(2.71)
CONGLO	-0.004	-0.004	0.005	0.058	-0.055	-0.084
	(-1.35)	(-1.74)	(0.60)	(4.53)	(-22.12)	(-8.78)
FLEV	-0.002	-0.010	0.012	0.009	-0.005	-0.013
	(-1.99)	(-1.32)	(2.04)	(2.98)	(-7.98)	(-6.42)
Industry F.E.	Yes	Yes	Yes	Yes	Yes	Yes
Avg. R^2	0.206	0.171	0.326	0.140	0.206	0.204
N	49,118	49,118	49,118	49,118	49,118	49,118

Panel C: Impact of relationship duration on cost fixity and demand uncertainty

	(1)	(2)	(3)	(4)	(5)	(6)
	SG&A Elasticity			Demand Uncertainty		
Intercept	-0.864	-0.864	-0.839	0.350	0.348	0.359
	(-0.95)	(-0.98)	(-0.95)	(6.27)	(7.18)	(6.79)
Rank(CC)	-0.287	-0.287	-0.283	0.181	0.180	0.166
	(-4.14)	(-4.55)	(-4.23)	(20.95)	(22.14)	(18.91)
Rank(CC) LINKAGE*	0.080	0.083	0.082	-0.094	-0.090	-0.086
	(3.49)	(3.49)	(3.28)	(-6.63)	(-6.30)	(-6.18)
MV	0.045	0.044		-0.019	-0.018	
	(2.68)	(2.78)		(-24.30)	(-24.24)	
AT			0.038			-0.023
			(2.40)			(-21.84)
AGE	-0.031	-0.019	-0.019	-0.043	-0.047	-0.042
	(-1.55)	(-0.92)	(-0.84)	(-6.26)	(-7.54)	(-6.09)
GROWTH		0.049	0.066		0.091	0.086
		(1.60)	(2.47)		(17.72)	(16.96)
CONGLO		-0.006	-0.012		0.012	0.017
		(-0.13)	(-0.25)		(2.48)	(3.19)
FLEV	-0.008	-0.008	-0.011	0.002	0.004	0.006
	(-0.77)	(-0.61)	(-0.78)	(0.98)	(1.62)	(2.19)
MB	0.000			0.011		
	(0.06)			(7.33)		
Industry F.E.	Yes	Yes	Yes	Yes	Yes	Yes
Avg. R^2	0.082	0.077	0.082	0.275	0.281	0.287
N	22,117	22,112	22,112	15,182	15,181	15,181

Table 10: Impact of the duration of customer links on operating performance

We analyze the impact of customer-base concentration on the components of firms' operating performance. Panel A presents results for the full sample and Panel B presents results for the subsample with identifiable customers. The dependent variables include inventory holdings, asset turnover components as well as selling, general and administrative expenses and three variables that capture working capital efficiencies: (1) IHLD: the ratio of inventory to the book value of total assets, (2) INVT: inventory turnover, (3) RCVBLE: account receivables turnover, (4) NPP&E: net PP&E turnover, (5) INTANG: intangible asset turnover, (6) CASH: cash turnover, (7) ADVERT: advertising expense to sales, (8) DAYS_RCVBLE: days' receivables measured as the ratio of accounts receivable to sales multiplied by 365, (9) DAYS_INVT: days' inventory measured as the ratio of inventory to cost of goods sold multiplied by 365, and (10) DOUBTFUL: provisions for doubtful accounts; measured as the ratio of estimated doubtful accounts receivable to total accounts receivable. *Rank(*CC*)*, is the firm's decile rank based on its customer-base concentration score, and is bound between 0 and 1. Other control variables include the log of market value of equity (MV), the log of firm age (AGE), annual sales growth rate (GROWTH), the indicator variable that equals 1 if the firm reports at least two business segments (CONGLO), the leverage ratio defined as book value of assets divided by book value of equity (FLEV), and link age (*LINKAGE*), the weighted average of the duration of the relationships between a firm and its major customers.

Panel A: Full Sample

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
		Asset turnover components						Working capital efficiencies		
	IHLD	INVT	RCVBLE	NPP&E	INTANG	CASH	ADVERT	DAY_RCVBLE	DAY_INVT	DOUBTFUL
Intercept	0.182	50.529	7.002	30.082	101.306	46.725	0.008	124.121	117.915	0.057
	(5.69)	(1.71)	(2.61)	(2.47)	(1.66)	(5.57)	(1.67)	(7.13)	(4.20)	(8.41)
Rank(CC)	-0.034	2.939	0.516	4.562	18.009	-14.412	-0.003	12.387	-6.225	-0.006
	(-7.00)	(2.41)	(3.17)	(2.14)	(1.89)	(-6.95)	(-1.59)	(5.15)	(-2.28)	(-2.63)
MV	-0.014	0.343	-0.010	-1.545	1.300	-5.783	0.000	-2.651	-3.990	-0.004
	(-34.45)	(2.39)	(-0.15)	(-5.56)	(0.40)	(-5.79)	(0.82)	(-8.64)	(-5.79)	(-16.18)
AGE	0.013	-2.116	-0.163	0.649	-13.319	2.720	-0.001	-4.777	-2.144	-0.002
	(21.88)	(-4.81)	(-1.19)	(0.66)	(-1.13)	(1.73)	(-6.06)	(-4.51)	(-2.58)	(-1.45)
GROWTH	-0.001	11.515	6.884	12.618	11.168	6.721	0.002	-31.784	-25.360	0.000
	(-1.10)	(7.56)	(20.96)	(10.21)	(1.10)	(2.87)	(2.41)	(-16.21)	(-11.25)	(-0.05)
CONGLO	-0.004	0.040	-0.441	-3.925	-43.557	-4.433	-0.004	-3.108	-11.543	-0.002
	(-2.40)	(0.06)	(-3.79)	(-3.63)	(-1.82)	(-1.99)	(-21.73)	(-1.42)	(-8.20)	(-2.40)
FLEV	0.001	0.001	0.038	0.110	-0.588	6.283	0.000	0.456	-0.658	0.000
	(6.38)	(0.01)	(0.55)	(0.82)	(-0.64)	(4.96)	(-3.23)	(1.49)	(-0.95)	(3.47)
Industry F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Avg. R^2	0.449	0.274	0.251	0.108	0.111	0.111	0.115	0.155	0.229	0.140
N	48,773	42,031	48,818	49,072	24,770	48,763	49,118	48,974	48,771	37,933

Panel B: *LINKAGE* sample

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
		Asset turnover components						Working capital efficiencies		
	IHLD	INVT	RCVBLE	NPP&E	INTANG	CASH	ADVERT	DAY_RCVBLE	DAY_INVT	DOUBTFUL
Intercept	0.117	29.476	3.837	18.096	67.911	108.254	0.009	93.644	61.902	0.052
	(25.50)	(4.48)	(9.89)	(4.49)	(1.52)	(2.96)	(2.07)	(12.99)	(7.91)	(5.38)
Rank(CC)	-0.032	-2.021	1.356	1.598	9.019	-32.882	-0.008	20.271	6.071	0.005
	(-7.34)	(-0.76)	(2.88)	(1.65)	(1.06)	(-13.23)	(-10.07)	(5.17)	(1.31)	(1.04)
*Rank(CC)*LINKAGE*	0.008	3.011	0.215	-0.255	45.919	15.530	0.000	-11.135	-11.447	-0.009
	(3.40)	(3.09)	(0.59)	(-0.50)	(2.17)	(9.87)	(0.21)	(-4.48)	(-8.08)	(-4.80)
MV	-0.015	0.724	0.016	-1.327	-0.020	-6.823	0.001	-2.388	-3.978	-0.004
	(-24.27)	(3.27)	(0.35)	(-6.25)	(-0.01)	(-3.72)	(1.370	(-7.94)	(-4.73)	(-12.61)
AGE	0.013	-3.385	-0.155	0.267	-8.587	-0.841	-0.001	-2.034	1.328	0.000
	(10.62)	(-4.08)	(-1.01)	(0.44)	(-1.32)	(-0.37)	(-1.96)	(-1.67)	(1.22)	(0.28)
GROWTH	0.003	7.581	6.018	10.104	23.179	8.659	0.000	-30.578	-24.520	0.000
	(1.58)	(7.43)	(9.14)	(8.55)	(3.16)	(3.78)	(0.90)	(-20.55)	(-9.41)	(-0.14)
CONGLO	0.001	-0.158	0.042	-2.531	-46.819	-4.005	-0.004	-5.338	-10.795	-0.002
	(0.21)	(-0.37)	(0.77)	(-2.05)	(-1.88)	(-1.43)	(-24.51)	(-1.68)	(-5.11)	(-2.25)
FLEV	0.001	0.067	0.072	0.055	2.408	8.219	0.000	-0.163	-0.872	0.001
	(8.01)	(1.51)	(1.57)	(0.66)	(1.32)	(5.78)	(0.42)	(-1.28)	(-1.27)	(2.95)
Industry F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Avg. R^2	0.469	0.310	0.376	0.178	0.171	0.146	0.150	0.200	0.259	0.171
N	22,160	19,201	22,178	22,303	11,011	22,166	22,311	22,247	22,160	16,972