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The impact of social capital on major customer supply chain power

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ABSTRACT

We investigate the impact of regional social capital on firms' ability to attain bargaining power over their supply chain partners. Using ordinary least squares and instrumental variables estimations, we find a positive relationship between firm-level supply chain power and US county-level social capital. Additionally, we observe this positive effect to be stronger for firms in durable goods manufacturing and the services industry, but not for nondurable goods manufacturers. We conclude that firms headquartered in US counties with high social capital are preferred by suppliers, resulting in greater supply chain power.

1. Introduction

Firms try to be on good terms with their supplier network to secure better sourcing deals than their competitors. In this context, Supply Chain Power (SCP hereafter) enables a company to influence the actions of its sourcing partners (Emerson, 1962). SCP has been associated with favorable exchange terms, prioritized order processing, and improved supplier resource allocation (Elking et al., 2017; Handley and Benton, 2012; Panayides and Lun, 2009; Rahaman et al., 2020). However, the prospect of dominant power held by major customers raises concerns among suppliers about potential negative externalities.

Social capital serves as an environmental factor influencing organizational behaviors (Guiso et al., 2004; Putnam, 2001). It confines opportunistic and self-serving behavior while fostering trust and a propensity to honor obligations. Therefore, firms from regions with high social capital are generally considered more trustworthy (Jha and Chen, 2015; Nahapiet and Ghoshal, 1998). According to the prosocial view of corporate behavior, social capital is associated with curbing negative decision-making, such as lower tax avoidance (Hasan et al., 2017a), and increased involvement in corporate social responsibility initiatives (Jha and Cox, 2015). However, the influence of prosocial corporate behavior through social capital on customer-supplier relationships remains unexplored. In this context, we hypothesize that suppliers value the influence of regional social capital on a firm's actions, leading to the development of effective customer-supplier ties.

Utilizing US firm-level SCP data and county-level social capital index, we demonstrate that firms from counties with high social capital achieve greater SCP. Our findings remain robust against endogeneity concerns through instrumental variables. The positive effect is particularly pronounced among durable goods manufacturers, who necessitate frequent supplier interactions, compared to nondurable goods manufacturers and service sector firms. Our study contributes to two streams of existing literature. Firstly, we complement the growing body of scholarly work on the impact of social capital on financial decision-making (Gupta et al., 2020; Hasan et al., 2017a, 2017b; Hasan et al., 2020; Jha and Cox, 2015). Secondly, we extend the contemporary literature on the customer-supplier relationship (Costello, 2020; Lanier Jr et al., 2019; Rahaman et al., 2020) by investigating potential sources behind this bargaining power.

The paper is structured as follows: Section 2 presents the research model and data, Section 3 provides empirical findings, and Section 4 concludes the study.

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Table 1
Summary Statistics.

Variable	N	Mean	S.D.	Quantile		
				0.25	Median	0.75
NUMSUPP	10,190	0.52	0.30	0.30	0.48	0.60
SDISPERSION	10,190	0.20	0.28	0.00	0.02	0.44
MKTPOWER	10,190	0.21	0.46	0.20	0.34	0.53
SCP	10,190	0.24	0.31	0.00	0.19	0.33
Social Capital	10,190	0.29	0.13	0.18	0.40	0.43
Ln (Total Assets)	10,190	7.69	1.66	6.76	8.28	9.12
Tobin's Q	10,190	2.28	1.61	1.20	1.77	2.89
Book Leverage	10,190	0.27	0.22	0.12	0.25	0.38
ROA	10,190	0.10	0.10	0.07	0.08	0.13
Asset Tangibility	10,190	0.54	0.61	0.14	0.31	0.68
Current Ratio	10,190	1.89	1.51	1.06	1.53	2.27
Ln (County Population)	10,190	13.81	0.29	13.29	13.82	14.33
Ln (Population Density)	10,190	7.36	1.23	6.65	7.30	7.77
Ln (County Income Per Capita)	10,190	10.61	0.38	10.31	10.59	10.88

Note: This table reports the descriptive statistics for our dependent, independent and control variables. All variables are winsorized at the 1st and 99th percentile.

2. Data

2.1. Dependent variable - Supply chain power (SCP)

We construct a composite SCP index for major customer firms using data sourced from the Compustat Customer Segment dataset.[1] We identify major customers and suppliers operating in the US from 1992 to 2018 employing a fuzzy name-matching algorithm (Cen et al., 2017; Cohen and Frazzini, 2008). We consider three indicators of SCP for a major customer, representing the sourcing density (NUMSUPP), dispersion (SDISPERSION), and heterogeneity (MKTPOWER).[2] These measures enable us to assess the level of power that the firm possesses over its supply chain partners. A higher density of suppliers implies a wider selection of suppliers available to the firm (NUMSUPP), while a greater value of SDISPERSION suggests that no individual supplier is likely to dominate the supply chain. Furthermore, a higher value of MKTPOWER indicates a lower ability of suppliers to exert market power over the firm. To aggregate the overall bargaining power that firms hold over their suppliers, these measures are combined into a single SCP index using principal component analysis (PCA),[3] following the approach of Rahaman et al. (2020) .[4] To provide meaningful interpretations, we normalize the PCA SCP variable (mean = 0, standard deviation =1) .[5] We utilize the individual dimensions and the normalized SCP PCA proxy in our baseline regression estimates.

2.2. Independent variable - Social capital

The key independent variable, social capital, is measured using US county-level data from the Northeast Regional Center for Rural Development (NRCRD) (Rupasingha et al., 2006). We consider voter turnouts in presidential elections (PVOTE) and response rates in US census surveys (RESPN) to reflect on the manifestation of civic responsibilities in the local individual behaviors (as voting or participating in census surveys have no legal or direct material incentives). We also consider the total number of nonprofit organizations (NCCS) and the total number of 10 types of social organizations in US counties (ASSN) to capture horizontal social interactions among many social networks and associations. According to the social capital definition, this is consistent with the network ties in social environments that reinforce civic norms of the network (Hasan et al., 2017a). NRCRD data are available for 1990, 1997, 2005, 2009, and 2014 for all US counties. Therefore, we use PCA to construct the social capital index for these years and fill in the data for the missing years through linear interpolation of the estimated index in the preceding year where data is available, similar to prior studies (Hasan et al., 2020; Jha and Cox, 2015).[6] Non-US-based firms are excluded from the analysis, yielding a total of 10,190 firm-year observations from 1992 to 2018.[7]

2.3. Regression model

We use the following baseline regression model to test our main hypothesis:

$$SCP_{i,c,t} = \beta_0 + \beta_1 SOCIAL\ CAPITAL_{c,t} + \beta_2 FIRM\ CONTROLS_{i,t} + \beta_2 COUNTY\ CONTROLS_{c,t} + \gamma_t + \theta_{ind} + \varepsilon$$

Where: *SCP* is the firm-level proxy for supply chain power (and the individual dimensions) in firm *i* and *SOCIAL CAPITAL* is the level of social capital in the firm's headquarters county *c*, at time *t*. Since our social capital construct could be influenced by county-level demographic factors, we include county population, population density, and income per capita to isolate the relationship between social capital and SCP. We also control for size (natural logarithm of total assets), Tobin's Q, book value of leverage, Return on Assets (ROA), asset tangibility, and current ratio as the firm level control variables. We include year (γ_t) and industry (θ_{ind}) fixed effects. We have winsorized the variables at 1 % and 99 % of their empirical distributions. Summary statistics from Table 1 indicate that there are considerable variations in the social capital level across US counties, and the variable statistics are in line with those reported in prior studies (Hasan et al., 2020; Rahaman et al., 2020).

3. Findings

3.1. Baseline results

Table 2 presents the baseline regression estimates, with the three dimensions of SCP as dependent variables in models 1–3, and the constructed SCP index as the dependent variable in model 4. Standard errors are clustered at the firm level. Our findings indicate that firms headquartered in US counties with higher levels of social capital attain

[1] Statement of Financial Accounting Standards - SFAS No. 14 (before 1997) and SFAS No. 131 (after 1997) require suppliers (regardless of the number of segments operated) to disclose the presence of and sales to all major customers representing more than 10% of their revenue. Compustat customer segment database identified such major customers for all the supplier firms. While it lists many suppliers voluntarily disclosing major customers representing less than 10% of their revenue, we only include major customers with more than 10% of their revenue to maintain consistency.

[2] Additional details about these measures are provided in Appendix 1.

[3] The first component of the PCA for SCP has an Eigenvalue of 1.8545 and explains 71.82% of the corresponding sample variance. No other principal components have an eigenvalue greater than one, so we take the first component as the SCP index.

[4] We exclude utility (SIC codes: 4900 – 4990) and financial sector (SIC codes: 6000 – 6990) firms from our sample due to their regulated nature and different structure of financial statements. We focus only on nonfinancial and nonregulated firms located in the US.

[5] We appreciate the reviewer for making this suggestion.

[6] The first component of the PCA for social capital has an Eigenvalue of 1.7995 and explains 73.02% of the corresponding sample variance. No other principal components have an eigenvalue greater than one, so we take the first component as the social capital proxy.

[7] Sample firms are reasonably scattered across different regions, with New York (NY), Santa Clara (CA), Harris (TX) and Dallas (TX) having the highest number of firm-year representation in our sample.

Table 2
Baseline Regressions.

Dependent Variables	(1) NUMSUPP	(2) SDISPERSION	(3) MKTPOWER	(4) SCP
Social Capital	0.0111***	0.0153***	0.0025*	0.0328***
	(0.0037)	(0.0037)	(0.0051)	(0.0037)
Ln (Total Assets)	0.0853***	0.0709***	0.0160**	0.0901***
	(0.0016)	(0.0015)	(0.0063)	(0.0017)
Tobin's Q	0.0240***	0.0165***	−0.0100	0.0238***
	(0.0020)	(0.0016)	(0.0068)	(0.0019)
Book Leverage	−0.1026***	−0.0820***	0.0343	−0.1029***
	(0.0125)	(0.0118)	(0.0340)	(0.0126)
ROA	−0.3620***	−0.2555***	−0.4510**	−0.3722***
	(0.0244)	(0.0226)	(0.1185)	(0.0126)
Asset Tangibility	0.1781***	0.1235***	0.0464***	0.1701***
	(0.0065)	(0.0058)	(0.0154)	(0.0061)
Current Ratio	−0.0081***	−0.0081***	−0.0432***	−0.0101***
	(0.0012)	(0.0013)	(0.0090)	(0.0013)
Ln (County Population)	0.0024	−0.0057	0.0012	−0.0004
	(0.0056)	(0.0054)	(0.0174)	(0.0056)
Ln (Population Density)	−0.0078***	−0.0109***	−0.0111	−0.0087***
	(0.0027)	(0.0028)	(0.0106)	(0.0029)
Ln (County Income Per Capita)	0.0382***	0.0135	0.0260	0.0398***
	(0.0109)	(0.0111)	(0.0401)	(0.0110)
Constant	−0.5963***	−0.4064***	−0.0618	−0.8878***
	(0.1374)	(0.1403)	(0.5014)	(0.1397)
Observations	10,190	10,190	10,190	10,190
Adjusted R-squared	0.5057	0.3728	0.1457	0.5069
Year FE	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES

Note: This table reports the baseline regression results. In all the models, standard errors are adjusted for heteroscedasticity and clustered at the firm level. Robust standard errors are in parentheses. Significance at the 10%, 5% and 1% level is indicated by *, **, and ***, respectively.

significantly higher levels of SCP over their suppliers, even after controlling for firm and county-level characteristics.[8] These results are consistent across the three SCP dimensions.

Based on the estimates in model 4, a one standard deviation increase in social capital is associated with a 3.28 % increase in SCP for the major customer firm, with similar positive effects for the three SCP dimensions. This demonstrates a significant positive impact of regional social capital around firm headquarters in gaining bargaining power over its supply chain.

3.2. Endogeneity concerns

Our baseline OLS regression results are subject to potential biases arising from omitted variables that can jointly influence SCP and social capital. To mitigate such endogeneity concerns, we use a two-stage least squares regression (2SLS) approach. We consider the logarithm of the distance from the firm's headquarters to the closest Canadian border as an instrument. Putnam (2001) argues that the best predictor of social capital level in American states is the distance to the Canadian border because states closer to the Canadian border would have more social capital. The nineteenth-century system of slavery and the post-slavery reconstruction period institutionally destroyed social capital in regions further away from the Canadian border (Putnam, 2001). Therefore, the distance between firm headquarters to the closest Canadian border would have a negative association with social capital, satisfying the relevance criteria. There is also no prior theoretical argument or empirical evidence that links the instrument to SCP, satisfying the exclusion criteria. Since our SCP measure is constructed based on US suppliers from the Compustat customer segment files, this instrument is suitable for our research setup.

Table 3
Two-Stage Least Squared (2SLS) Regression Estimates Using US-Canada Border Distance as Instrumental Variable.

Dependent Variables	(1) Social Capital	(2) SCP
Fitted Social Capital		0.0540***
		(0.0086)
US-Canada Border Distance	−0.0019***	
	(0.0001)	
Constant	−20.4410***	0.4529***
	(0.3544)	(0.1697)
Observations	10,190	10,190
R-squared	0.7128	0.3430
Controls	YES	YES
Year FE	YES	YES
Industry FE	YES	YES
	Statistics	p value
Underidentification (Kleiberg-Paap) Test	130.521	0.0000
Weak Identification (Cragg-Donald) Test	130.954	

Note: This table reports the 2SLS regression estimates using the US-Canada border distance as the IV. Standard errors are adjusted for heteroscedasticity and clustered at the firm level. Robust standard errors are in parentheses. Significance at the 10%, 5% and 1% level is indicated by *, **, and ***, respectively.

Results in Table 3, column 1, present the first-stage regression estimates with the diagnostic tests, ensuring that the instrument is valid, and not weak. Column 2 reports the second-stage regression estimates, demonstrating that the positive association between social capital and SCP remains robust. The coefficient for the fitted social capital against SCP in model 2 remains statistically, significantly positive at the 1 % level.

3.3. Subsample analysis

The degree of supply chain interactions varies across different industries. Demand management and supplier relationship management are critical factors in manufacturing sector supply chains. In contrast, service sector supply chains are characterized by variations and uncertainties in outputs due to extensive human labor involvement (Ellram et al., 2004; Sengupta et al., 2006). However, with the rise of outsourcing, fierce competition between suppliers makes it easier for the customer to gain bargaining power (Benjaafar et al., 2007; Wang et al., 2015). Within the manufacturing sector, durable goods manufacturers require more frequent after-sales services and have more unique demands for their suppliers to fulfill than nondurable manufacturers, thereby benefitting more from higher SCP (Banerjee et al., 2008; Saccani et al., 2007). Therefore, we investigate the heterogeneity in the level of bargaining power gained by firms through regional social capital across their industry classifications.[9]

We re-estimate our baseline regressions for the three industrial subsamples of firms. Results from Table 4 demonstrate that the positive association between social capital and SCP is statistically significant for

[8] Our results remain consistent with different specifications of the uninterpolated NRCRD social capital data.

[9] We separate the firms among durable goods (primary SIC from 3,400 to 3,990) and non-durable goods manufacturers (primary SIC from 2000 to 3,390), and the remaining ones are classified as nonmanufacturing, service sector firms.

Table 4
Subsample Analysis - Firms from the Durable and Non-Durable Goods Manufacturing Sectors.

Industry	(1) Durable goods manufacturing sector	(2) Non-durable goods manufacturing sector	(3) Services sector
Social Capital	0.0210***	0.0053	0.0172*
	(0.0051)	(0.0096)	(0.0082)
Constant	−0.2033**	−1.8075***	−1.8126***
	(0.3892)	(0.2517)	(0.3407)
Observations	2129	2419	5642
Adjusted R-squared	0.5814	0.4890	0.5369
Controls	YES	YES	YES
Year FE	YES	YES	YES
Industry FE	YES	YES	YES
Chow-test p-value		0.0145	0.0025

Note: This table reports the subsample analysis results with regard to social capital on supply chain power. Model-1 considers the sample of firms from the durable goods manufacturing sector (primary SIC from 3400 to 3990). Model-2 considers the sample of firms from the non-durable goods manufacturing sector (primary SIC from 2000 to 3390). Model-3 considers the remaining firms from the services sector. Chow-test p-values indicate that the social capital coefficients reported in models 2 and 3 are statistically different than that reported in model 1, respectively. Standard errors are adjusted for heteroscedasticity and clustered at the firm level. Robust standard errors are in parentheses. Significance at the 10%, 5% and 1% level is indicated by *, **, and ***, respectively.

the durable goods manufacturers and the service sector firms.[10] Between the two groups, the effect is noticeably stronger for durable goods manufacturers. However, for the nondurable goods manufacturers, the effect is statistically insignificant. These results demonstrate the presence of heterogeneity in the positive association between social capital and SCP across industries with varying sourcing needs.

4. Conclusion

In this study, we empirically investigate how social capital can assist firms in achieving competitive advantage by gaining higher bargaining power over their suppliers. Our results indicate that firms headquartered in high social capital US counties are preferred by suppliers, leading to the formation of customer-supplier ties that increase the firm's SCP. This positive effect is more pronounced for firms in the manufacturing durable goods and services sector.

Declaration of competing interest

On behalf of all authors, the corresponding author states no conflict of interest.

Data availability

Data will be made available on request.

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Appendix 1: Variable Definitions

Variable	Formula/derivation	Data Source
Social Capital Variables		
Pvote	Percentage of voters who voted in presidential elections	NRCRD
Respn	Response rate to the Census Bureau's decennial census	NRCRD
Nccs	Sum of tax-exempt non-profit organizations divided by populations per 10,000	NRCRD
Assn	Sum of social organizations divided by populations per 100,000	NRCRD
Regional Variables		
County Population	Natural logarithm of the population (in millions) of a county during a year	US Bureau and Economic Analysis (BEA)
Population Density	Natural logarithm of the ratio of the county population to the land area of the county	US Bureau and Economic Analysis (BEA) and US Census Bureau
County Income Per Capita	Natural logarithm of median household income per capita in the county	US Bureau and Economic Analysis (BEA)
Supply Chain Power Variable		
NUMSUPP	Logarithm of one plus the number of suppliers who identified the customer as a major customer (capturing 10% of supplier's total sales)	Compustat customer-segment dataset
SDISPERSION	$SDISPERSION_{it} = 1 - \sum_{s=1}^{N}\left(\frac{SUPP_{st}}{TOTALSUPP_{it}}\right)^2$ Where $SUPP_{st}$ is the total dollar value of inputs sourced by firm i from supplier s in period t and $TOTALSUPP_{it}$ is the total dollar value of inputs sourced by firm i in period t, and N is the number of different suppliers in firm i's supply chain in period t.	Compustat customer-segment dataset
MKTPOWER	We first calculate the Lerner index as operating profits (before depreciation, interest, special items and taxes) over sales. Then we define $SPOWER_{it}$ as: $SPOWER_{it} = 1 - \sum_{s=1}^{N}\left(\frac{SUPP_{st}}{TOTALSUPP_{it}} \times LINDEX_{st}\right)$ Then, we define MKTPOWER as log (1 + $SPOWER_{it}$). Where, $\frac{SUPP_{st}}{TOTALSUPP_{it}}$ is the fraction of input sourced from supplier s by firm i in period t, $LINDEX_{st}$ is the Lerner index of supplier s in period t, and N is the total number of suppliers firm i has in its supply chain in period t.	Compustat customer-segment dataset

(*continued on next page*)

[10] Chow-test p-values indicate that the social capital coefficients reported in models 2 and 3 are statistically different than that reported in model 1, respectively.

(*continued*)

Variable	Formula/derivation	Data Source
Supply Chain Power (SCP)	SCP is constructed as the first principal component based on a principal component analysis (PCA) using NUMSUPP, SDISPERSION and MKTPOWER. The PCA output is then normalized (mean = 0 and standard deviation =1).	Author constructed
Firm-level Variable		
Ln (Assets)	Natural logarithm of total assets	Compustat
Tobin's Q	(Market value of equity + book value of debt)/total assets	Compustat
Book Leverage	Long-term (total) debt + current (total) liabilities/total assets	Compustat
ROA	EBITDA/total assets	Compustat
Asset Tangibility	Net property, plant and equipment/total assets	Compustat
Current Ratio	Current assets/Current liabilities	Compustat

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