Does buyers' dependence translate into financial performance?

An empirical analysis of manufacturer-service provider relationships

Ornella Benedettini
Department of Mechanics, Mathematics and Management, Polytechnic University of Bari, Italy

Andy Neely
Institute for Manufacturing, University of Cambridge, UK

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The role of external service providers

❖ It is often unviable for a servitized manufacturer to perform internally all the services related to its products

❖ External service providers, more or less independently, provide product-related service components

PURPOSE

❖ We draw on the theoretical lens of *Relational Embeddedness* to explore how the quality of inter-firm relationships with external service providers affects the financial performance of servitized manufacturers
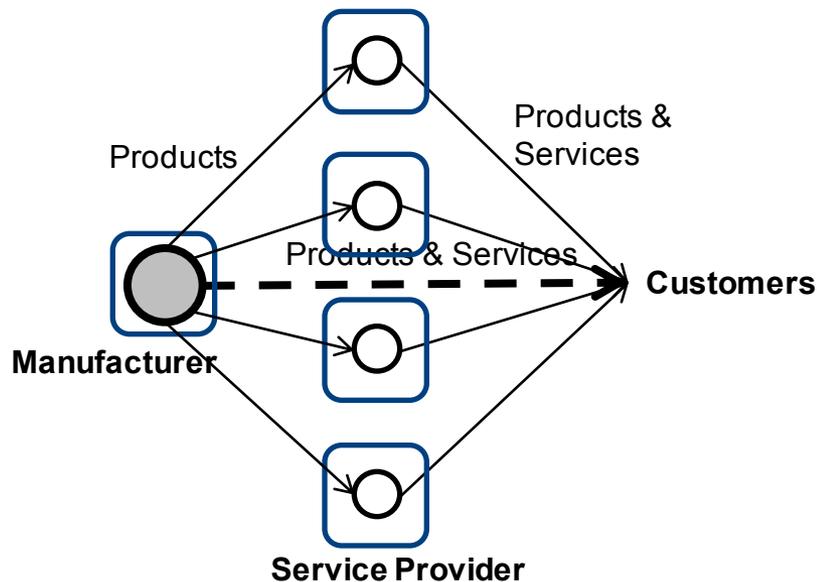
Service Provider's Relational Embeddedness ➡ Manufacturer's Financial Performance

Focus on *Dependence*: key dimension of Embeddedness

Manufacturer-service provider relationships

❖ Focus on service providers that operate in downstream channels (e.g. distributors, system integrators)

Supplier-buyer relationship
between manufacturer and service provider
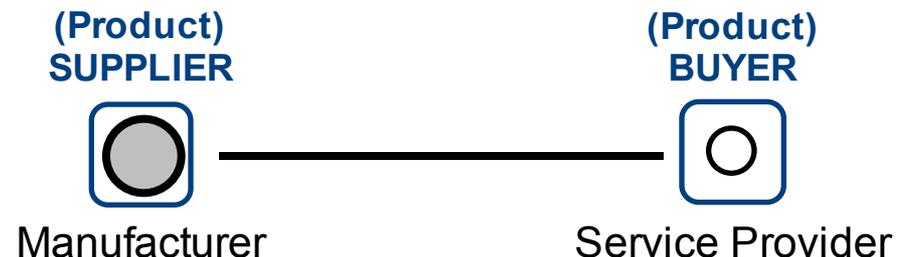
Relational Embeddedness and Dependence

Characteristics of embedded relationships (Uzzi, 1996)

TRUST	FINE-GRAINED INFORMATION SHAR.	JOINT PROBLEM SOLVING
Non-obligating exchanges of information, behavioural transparency, communication openness, willingness to engage in more risky business interactions, etc. (Villena et al., 2011)	Accuracy, detail, interpretability of information exchanges (Uzzi, 1997; Gulati and Sytch, 2007) ➔ Better understanding of resources, environment, customer needs (Gulati, 1998; Bernardes, 2010)	Routines of negotiation ➔ Reduced conflicts, common frameworks for action (Bernardes, 2010; Villena et al., 2011)

❖ Higher levels of dependence lead to a stronger relational attitude towards trust, information sharing and joint problem solving (Uzzi, 1996; Narayandas and Rangan, 2004; Gulati and Sytch, 2007; Petersen et al., 2008; Kim and Wemmerlöv, 2015)

❖ Dependence as a proxy for relational embeddeddness is supply chain research (e.g. Krause et al., 2007; Gulati and Sytch, 2007; Kim and Henderson, 2015)

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Effects of service providers' dependence

"BRIGHT SIDE" OF DEPENDENCE

- ✦ Incentive for the service provider to share information that enhances external knowledge available to the manufacturer and to contribute directly to the manufacturer's innovation processes (Bernardes, 2010; Villena et al., 2011)

- ✦ Incentive for service provider's cooperative behaviour, flexibility, and willingness to share risks and specialised investments with the manufacturer (Gulati and Sytch, 2007; Matthyssens and Vandenbempt, 2008; Kim, 2017)

- ✦ Reduced operational friction and lower monitoring costs (Gulati and Sytch, 2007; Lanier et al., 2010; Kim and Wemmerlov, 2015; Kim, 2017)

"DARK SIDE" OF DEPENDENCE

- ✦ Few or no links to firms outside the relationship may provide too much isolation from external developments (Uzzi, 1997; Anderson and Jap, 2005; Noordhoff et al., 2011)

- ✦ Concerns about avoiding conflicts may prevent firms from providing feedback to counterparts, hindering inter-firm learning and ability to detect changes (Villena et al., 2011; Kim and Henderson, 2015)

- ✦ Possible "isomorphism" (Uzzi, 1997; Villena et al., 2011)

- ✦ Transfer of too much information may create confusion and lower effective decision making (Villena et al., 2011)

Hypothesis Development

A service provider's dependence initially improves the manufacturer's financial performance.

However, as the dependence of the service provider increases, the rate of benefits for the manufacturer slows down because a number of drawbacks progressively set in.

There should be a threshold at which these drawbacks offset the benefits, and beyond which the performance of the manufacturer begins to decline.

HYPOTHESIS:

In a supplier-buyer relationship involving a servitized manufacturer and a third-party provider of product-related services, the service provider's dependence has an inverted U-shaped relationship with the manufacturer's financial performance

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Initial Sample

❖ **2015 Compustat Customer Segment Files**

  ✧ U.S. Public companies with at least one "*major*" customer (buyer)
  ✧ Types and names of major customers
  ✧ Annual revenues generated from each major customer

Supplier-buyer relationship		
MANUFACTURER	—	**SERVICE PROVIDER**
Supplier		Buyer

❖ **Initial sampling frame**

  ✧ 10318 supplier-buyer relationships involving a manufacturing supplier (20-39 SIC code range)

❖ **Supplier-buyer relationships removed if:**

Sample size

  ✧ Buyer of "MARKET" or "GEOREG" types — ➔ 5382
  ✧ Buyers of "GOVDOM", "GOVFR", "GOVLOC", "GOVSTATE" types — ➔ 5137
  ✧ Buyer's identity not disclosed — ➔ 2656
  ✧ No sales data — ➔ 1666

Sample Inspection

❖ Standard & Poor's Capital IQ Database

✧ Suppliers' and customers' names matched to registered names in Capital IQ
✧ Manual correction of cases of inaccurate customer name identification
✧ Supplier-customer relationships removed from sample if a match could not be found in Capital IQ

❖ (Manual) examination of Capital IQ business descriptions

✧ **SUPPLIERS ⬌ SERVITIZED MANUFACTURERS**

Suppliers required to: (i) offer one or more of the service categories identified by Benedettini et al. (2017) or Rabetino et al. (2015)

✧ **BUYERS ⬌ PROVIDERS OF SERVICES RELATED TO THE MANUFACTURER'S PRODUCT(S)**

Buyers required to: (i) offer one or more of the service categories identified by Benedettini et al. (2017) or Rabetino et al. (2015) (ii) offer one or more services related to the manufacturer/supplier's product

Examples

Supplier-buyer relationships **excluded** from the study sample

SUPPLIER	BUYER
APPLIED MATERIALS Inc. Applied Materials, Inc. provides manufacturing equipment, services, and software to the semiconductor, display, and related industries worldwide... The Semiconductor Systems segment develops, manufactures, and sells a range of **manufacturing equipment used to fabricate semiconductor chips or integrated circuits**... The Applied Global Services segment provides integrated solutions to optimize equipment and fab performance and productivity, including spares, upgrades, services, remanufactured earlier generation equipment, and factory automation software for semiconductor, display, and other products...	**TAIWAN SEMICONDUCTOR MANUFACTURING Co.** Taiwan Semiconductor Manufacturing Company Limited., together with its subsidiaries, engages in the computer-aided design, manufacture, packaging, testing, sale, and marketing of **integrated circuits, color filters, and other semiconductor devices** primarily in Taiwan. It manufactures masks and electronic parts; sells solar related products; wholesales and retails electronic materials; and researches, develops, and tests RFID systems. The company is also involved in customer service and technical supporting, marketing and engineering supporting, and investment activities.
SUNPOWER Corp. SunPower Corporation researches, develops, manufactures, and delivers solar solutions worldwide… The company provides solar power components, including panels and other system components. It also offers commercial rooftop and ground-mounted solar power systems, residential mounting systems, and power plant systems, as well as **utility-scale photovoltaic power plants**. In addition, the company offers operations and maintenance services, including remote monitoring, and preventative and corrective maintenance services, as well as rapid-response outage restoration services. Further, it leases solar power systems to residential customers…	**MIDAMERICAN ENERGY HOLDINGS Co.** Berkshire Hathaway Energy Company, through its subsidiaries, generates, transmits, stores, distributes, and **supplies energy**. The company generates energy from coal, natural gas, hydroelectric, wind, solar, geothermal, and nuclear resources... The company also offers residential real estate brokerage services; integrated real estate services, including mortgage originations and mortgage banking; title and closing services; property and casualty insurance; home warranties; relocation services; and other home-related services.

Examples

Supplier-buyer relationships **included** in the study sample

SUPPLIER	BUYER
FORTINET Inc. Fortinet, Inc. **provides cybersecurity solutions** for enterprises, service providers, and government organizations worldwide. The company offers FortiGate physical and software licenses that provide various security and networking functions, including firewall, intrusion prevention, anti-malware, virtual private network, application control, Web filtering, anti-spam, and wide area network acceleration; FortiManager product family... *Further,* **it offers security subscription, technical support, training, and professional services**.	**EXCLUSIVE NETWORKS Ltd.** Exclusive Networks Ltd. **distributes cyber security, networking, and infrastructure solutions**. It offers Cyber Attack Remediation and Mitigation, an integrated solution platform that brings together vendor technologies in a end-to-end solution so that reseller partners can enable their enterprise customers to identify, contain, respond, remediate, and mitigate the impact of security breaches; and Disruptive Enterprise Mobility, a solution framework that blends the best-of-breed capabilities of the mobility and cyber security technologies. The company also provides **professional and support, global logistics and field, financing and leasing services**.
ACTIONS SEMICONDUCTOR Co. Actions Semiconductor Co., Ltd., a **semiconductor company**, designs, develops, and markets system-on-a-chip (SoC) products and solutions worldwide. The company offers integrated platform solutions, including SoCs, firmware, software development tools, and reference designs for manufacturers of portable media players and smart handheld devices, such as Bluetooth audio and music devices, tablets, and OTT boxes... In addition, it **offers semiconductor product testing services, as well as trades in SoC products**.	**RICHPOWER ELECTRONIC DEVICES Co.** RichPower Electronic Devices Co., Ltd. engages in the **distribution of semiconductor and electronic components**. The company specializes in PC, networking, communications, multimedia, automotive, and consumer electronics applications... The company also provides **product development, technical support, and system-level hardware and software integration services**.

Hypothesised Variables

❖ **Service Provider's Dependency**
(Krause et al., 2007; Kim and Henderson, 2015; Kim, 2017)

✧ **SP_DEP** = $\dfrac{\text{Service provider's annual purchases from the manufacturer}}{\text{Service Provider's annual cost of goods sold}}$

Mean-centred to reduce collinearity effects between direct and quadratic term in the model (Cohen et al., 2003)

❖ **Manufacturer's Financial Performance**
(Patatoukas, 2012; Kim and Henderson, 2015)

✧ **ROA** = Net Income / Total Assets
(Overall Financial Performance)

✧ **ROS** = Net Income / Total Sales
(Profit Margin on Sales)

✧ **ATO** = Total Sales / Total Assets
(Asset Productivity in Generating Sales)

Du Pont Analysis

ROA

ROS   ATO

Reasons behind company financial performance (Soliman, 2008)

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Control Variables and Data Collection

❖ Control Variables

(Kim and Henderson, 2015)

◇ **Mnf's Industry (IND)** = Two-digit SIC code

◇ **Mnf's Size (SIZE)** = Total assets (natural logarithm)

◇ **Mnf's Market Share (SHARE)** = Total sales / Industry's total sales

◇ **Mnf's Sales Growth (SG)** = Annual growth of sales

◇ **Mnf's Financial Leverage (LEV)** = Total assets / Total equity (last year)

Manufacturer (firm / industry)

◇ **SP's size (SP_SIZE)** = Total assets (natural logarithm)

◇ **SP's Market Share (SP_SHARE)** = Total sales / Industry's total sales

Service Provider (firm)

❖ Data Collection

Supplier's annual purchases from the manufacturer

✔ **Compustat Segment Files**

Remaining data

✔ **Compustat Annual Files**

Missing data

✔ **Capital IQ** (accounting data)

✔ **Mergent Online** (SIC codes)

➔ **Final Sample: 193 Manuf. – Serv. Prov. relationships**

Model Development

❖ **Multilevel model**

(manufacturer - service provider dyads nested within manufacturers' industry)

◇ L-R Test. P-value > 0.05 for each of ROA, ROS and ATO ➔ OLS approach with industry dummies (Garson, 2014)

❖ **Outliers**

◇ Cook's distance procedure. Three observation with Cook's distance > 1 ➔ Removed from sample (Cook and Weiseberg, 1982; Cohen et al., 2003)

❖ **Multicollinearity**

◇ Largest VIF = 5.37 < 10 ➔ Unlikely that multicollinearity would distort model results (Tabachnick and Fidell, 2007)

❖ **Heteroskedasticity**

◇ Robust Standard Errors ➔ Heteroskedasticity and modest departures from other OLS assumptions allowed (Stock and Watson, 2003)
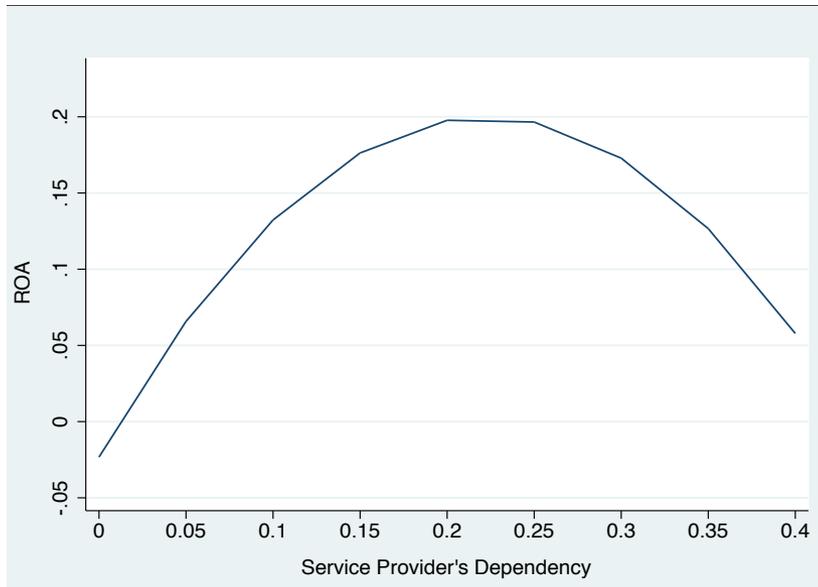
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Regression Results

	ROA		ROS		ATO	
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Firm-level Controls						
SIZE	0.018**	0.010	0.028***	0.199**	-0.150***	-0.170***
SHARE	0.654	0.624	0.440	0.399	0.494	0.405
SG	0.012	0.014	-0.070	-0.068	-0.177*	-0.171
LEV	0.005	0.006	-0.004	-0.003	0.004	0.008
SP_SIZE	0.013	0.036	-0.010	0.012	-0.042	0.011
SP_SHARE	-0.033	-0.093	-0.070	0.012	0.492*	0.354
Industry-level Controls			Omitted due to space limitations			
Explanatory Variable(s)						
SP_DEP		**1.866**		**2.181***		**4.935***
SP_DEPsquared		**-4.510**		**-6.299***		**-13.706***
Intercept	-0.271	-0.417	-0.066	-0.207	2.520	2.186
R^2	25.47%	27.59%	18.43%	20.58%	53.03%	54.77%
Adjusted R^2	17.62%	19.02%	9.83%	11.17%	48.08%	49.41%
F-statistic	1.77**	1.91**	2.19***	2.50***	30.81***	25.53***
Change in R^2 rel.to controls		2.12%		2.15%		1.74%
F-statistic for change		2.4*		3.66**		4.10**
Observations	190	190	190	190	190	190

SIZE = manufacturer's size; SHARE = manufacturer's market share; SG = manufacturer's sales growth; LEV = manufacturer's financial leverage; SP_SIZE = service provider's size; SP_SHARE = service provider's market share; SP_DEP = service provider's dependency (mean-centred variable)

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$ (two-tailed tests)

Side annotations:

Al low levels of dependency, the effect on performance is positive

Non-linear, concave downward relationship between dependency and performance

Model correctly specified

Dependency effects significantly improve prediction of all 3 dependent variables

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ROA and service provider's dependency

Predicted ROA against SP_DEP

❖ Inflection point at approximately 0.2.

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Contribution

❖ Responds to call for research that develops and tests theory regarding how external actors impact on servitization strategies

❖ Evidence of diminishing returns of service providers' dependence on a manufacturer's financial performance (in terms of ROA, ROS and ATO)

❖ While managers should understand the importance of close relationships with external service providers, they should also be careful to maintain an adequate level of dependency with them to maximise the benefits and minimise the liabilities

❖ Supply chain management research provides interesting theories to investigate how servitized manufacturers can best design inter-firm relationships with external actors