WORK IN PROGRESS

Bargaining Power as a Source of Competitive Advantage: Empirical Evidence from Medical Devices

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Abstract

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1 Introduction

In medical device markets, different hospitals often pay different prices for the exact same model of device. This is a common feature of many business to business markets, where prices are negotiated between buyer-supplier pairs, and at least since Porter (1980), business strategy has looked at cost differentiation, product differentiation, intensity of competition, and buyer/supplier bargaining power as key drivers of firm profitability in such markets. But how much do each of these factors matter in a given context, such as medical devices? When one hospital pays a lower price than another for the same device, is it because the manufacturer’s cost of supplying that hospital is lower, because the hospital likes the device less, because the hospital has better access to substitute models, or because the hospital just negotiates a better deal? Having quantitative answers to these questions is an important input for firm strategy formulation and government regulatory decisions.

These are all empirical questions, but because we rarely have direct data on supplier costs, buyer willingness to pay, and buyer/supplier bargaining power, answering them requires a combination of formal modeling and empirical estimation. In this paper I draw on a recent literature of formal models in strategy as well as empirical tools from industrial organization economics to develop and estimate a structural model of how value is created and divided between buyers and suppliers in a medical device market. The model allows me to estimate buyer (hospital) willingness to pay, supplier (device manufacturer) opportunity cost, and bargaining power between buyers and suppliers. The bargaining power estimates show that: (1) prices are determined via bargaining rather than price setting by the buyer or supplier, (2) bargaining power varies significantly across firms, and (3) on average, a one standard deviation change in bargaining power translates into a $X\%$ change in profits, proving that bargaining power can be an important source of competitive advantage.

Estimating a formal, structural model provides two main advantages in this context. The first is that adding the model to the data allows me to separately identify buyer willingness to pay, seller opportunity costs, and buyer/supplier bargaining power, using detailed but available data on prices and quantities. Without a model, estimating a construct such as bargaining power simply could not be done. The second advantage is that the parameters of the model are “structural” in the sense that they will not change with a change in the competitive envi-
The advantages of estimating a structural model do come at the cost of making additional assumptions regarding the behavior of firms. Two ways to mitigate this cost are to: (1) use detailed data and institutional knowledge about the market in question, and (2) use flexible modeling assumptions and many robustness checks. For this reason I focus on the market for a single medical device, the coronary stent. This market is an example of business to business sales where hospitals produce the product of stenting (angioplasty) procedures and the medical device manufacturers supply the necessary inputs for the procedures, the most important being a coronary stent. Stents are widely considered the first “blockbuster” medical device, with $6 billion in revenue on over 3 million units sold globally each year. Their importance has also lead to the fact that stents have the best and largest body of detailed data available in the medical device industry.

The proprietary data set used in this study is from a survey of coronary catheterization labs at a sample of US hospitals, listing quantities sold and prices paid for each stent model available at the individual hospital level. With this data, I can use standard demand estimation techniques to determine each hospital’s willingness to pay for each model of stent. The fact that price is negotiated presents some unique circumstances regarding the potential endogeneity between price and unobserved hospital level preferences. To my knowledge, this paper provides the most in-depth discussion of this identification issue in the literature to date.

For cost and bargaining power estimates there is no direct data available, so I follow an “indirect inference” approach, estimating costs and bargaining power by combining the demand estimates with a model of how prices emerge via competition and bargaining. The model I use is related to the recent strategy literature, beginning with Brandenburger and Stuart (1996), that formalizes Porter’s ideas using cooperative game theory, namely transferable utility (TU) games in characteristic function form and the Core solution concept\(^2\). One of the attractive facets of this approach is that the Core models competition in a very general way, specifying a

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1 This lack of policy-invariance in reduced form econometrics, and its potential for generating misleading advice, is often called the “Lucas critique” after the influential arguments in Lucas (1976).

2 Subsequent papers in this literature include MacDonald and Ryall (2004), Brandenburger and Stuart (2007), and Chatain and Zemsky (2007).
set of potential outcomes, and the final allocation within the Core is often interpreted as being a result of bargaining. My empirical context requires using a different model, one that is still flexible in modeling both competition and bargaining, but also allows for nontransferable utility (NTU) and explicitly incorporates bargaining power. In an appendix, I show that in many of the TU cases studied previously, my model actually nests the pricing function predicted by the Core, providing a link between my approach and that of the theoretical literature as well as a way to modify my approach for TU empirical settings.

While demand estimation and indirect inference methods are now common tools in empirical industrial organization, they have been little used in cases where buyers and suppliers both have market power and prices emerge via bargaining. Usually because of data limitations, most empirical papers involving bargaining have been forced to assume a level of bargaining power that is fixed and constant across firms. The only exception I know of, and the paper closest to mine in approach is Yurukoglu (2008). He uses the same model I do, but the different types of data and context in his study leads him away from the challenges I face in estimating willingness to pay and costs. In particular, this paper is the first I know of to outline the challenges in identifying and estimating costs and bargaining power when no direct data is available on either.