Where Do Client-Specific Scope Economies Come From? A Revealed Preference Analysis

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Abstract

Cross-selling – selling multiple products or services to a buyer – is a commonly followed practice in business-to-business markets. It can create value by enabling the emergence client-specific economies of scope. In this paper, I exploit revealed preferences in the organization of buyer-supplier relationships to investigate the sources of client-specific economies of scope. I use data from the UK corporate legal market to estimate the relative importance of cost, product line expertise and client-specific scope economies in value creation. I find that scope extensions are usually related to a decrease in value creation, suggesting the existence of negative spillovers between product lines. I also find evidence of a large opportunity cost of terminating a relationship, consistent with the existence of a large fixed cost of creating a relationship. This effect is large enough to justify scope extensions in spite of negative spillovers between product lines.

Key words: value-based strategy, client-specific scope economies. buyer-supplier relationships, cooperative game theory.

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1. Introduction

This paper focuses on buyer-supplier relationships spanning several products or services. It seeks to understand how one-stop-shopping strategies create value in a business-to-business context. In many industries, suppliers are interested in selling multiple products or services to buyers and buyer-supplier relationships involve multiple lines of business. For instance, investment banks often establish relationships with clients to supply them with multiple services to their clients. Technology-based firms such as Cisco and IBM are offering a set of products and an array of services that seek to integrate the different products for their customers.

There are several possible, and not mutually exclusive, rationales for such strategies. Their goal can be to economize on the cost of creating and maintaining buyer-supplier relationships. They can also be motivated by the need to closely collaborate with a buyer to realize synergies between different products and services. In both cases, they seek to realize client-specific scope economies, which arise when there are benefits to make one supplier provide different products or services to one buyer.

Client-specific scope economies draws on mechanisms very different from those exploited by classic diversification strategies, which seek to exploit economies of scope stemming from a common productive asset and which do not need products or services to be sold to the same buyers. Some research has sought to understand more the consequences of client-specific scope economies on firm scope decisions (Siggelkow, 2003; Chatain and Zemsky, 2007). However, little is known empirically about the respective importance of the different mechanisms leading to the emergence of client-specific economies of scope. This lack of knowledge stands in sharp contrast with the prevalence of one-stop-shop strategies in many industries and represents a blind spot within the strategy literature that has been long interested in the causes of firm diversification.

In this paper, I draw on the logic of the value-based approach to estimate the relative contributions of willingness to pay, cost and client-specific economies of scope to value creation in buyer-supplier relationships. I use a revealed preference framework based on the recent contributions of Fox (2007, 2009) to estimate a model of value creation in the relationships between large corporate clients and law firms in the UK in 2002-2006. In this empirical

context, anecdotal evidence points to a non-trivial role for client-specific economies of scope as many buyer-supplier relationships span several areas of work.

This model of value creation is consistent with the first principles underlying the cooperative games that have been recently used in strategy to analyze business strategy from a value-based perspective (Brandenburger and Stuart, 1996, 2007; MacDonald and Ryall, 2004). This implies that the parameters of the value creation function can be used as inputs to cooperative games that can be used to analyze the relationship between value creation and value capture under competition.

The estimation strategy relies on the comparison of actual and counterfactual allocations of the buyers' legal practice areas to suppliers. This comparison provides a set of inequalities that are used to recover the underlying value creation function: actual allocations should create more value than counterfactual allocations, up to an unobserved error term. A maximum score estimator uses this set of inequalities to recover the parameters of the underlying value creation function.

The results suggest that, in the setting of the study, client-specific economies of scope are related to the relationship-specific investment. At the same time, there is evidence of diseconomies of scope associated with scope extension. This implies that buyer-supplier relationship spanning multiple services happens in spite of negative marginal returns from increasing scope, conditional on the existence of a relationship. From a value maximizing perspective, it is however often optimal to extend the scope of a supplier because the loss of value associated with the scope extension is still less than the cost of creating a new relationship with a different supplier. Interestingly, the diseconomies of scope effect are of a smaller magnitude than the effect of capabilities, which implies that higher product-line expertise will be associated with wider scope. Plugging these estimates into cooperative games, it is possible to examine various "what if" competitive situations and give clear recommendations to managers regarding the best ways to achieve an advantage and capture more value.

The paper proceeds as follows. In Section 2, I present the base model of value creation and a set of necessary conditions for equilibrium that will be used in the empirical analysis. Section 3 presents the empirical context, the data, and the details of the estimator. The

empirical results are presented and discussed in Section 4 and I show examples of applications in Section 5. The paper ends with a discussion of the results and thoughts on future work.

2. Value Creation in Buyer-Supplier Relationships with Client-Specific Economies of Scope

2.1. Client-Specific Scope Economies

Economies of scope arise when it is more economical to produce several product together in one firm than independently (Panzar and Willig, 1981). The existence of economies of scope is typically seen at one of the main reasons firms diversify into new business and produce different products.

Economies of scope are generally seen as stemming exclusively from the internal operations of a firm. For instance, economies of scope can be the due to the sharing a productive asset across different product markets (Teece, 1982), or to spillover between different research and development activities (Henderson and Cockburn, 1996). In both instances, economies of scope arise without any interactions with final customers.

In contrast, client-specific economies of scope arise when it is more economical for a firm to produce or deliver several products or services to the same buyer rather than to different buyers (Chatain and Zemsky, 2007). Paralleling the mechanisms underlying usual, production side, economies of scope, there are at least two manners in which client-specific economies may arise.

The first is the existence of fixed cost to making business with a client. This represents a productive asset which, once created, justifies the expansion of the client-specific scope of the supplier's operations, rather than finding another supplier, in order to avoid the expenses associated with the creation of the relationship. From the suppliers' point of view, it is more economical to sell another product or service to an existing client than to find another client for whom it will be necessary to incur another fixed cost. From a buyer's point of view, if is equally more attractive to avoid the cost of a search for a new supplier if it is time consuming to evaluate and vet.

The second rests on the existence of positive spillovers among the different lines of business that are simultaneously sold to a client. For instance, if the delivery of different products or

services need to be coordinated, it may be cheaper, or may lead to higher quality, to do it through the same supplier if this improves the coordination of the

The best policy for a client or for a supplier can differ markedly depending on which mechanism is at play, or on the relative strength of each effect. For instance, if positive spillovers are strong, a supplier may find it best to focus on its coordination and integration abilities in order to improve its position. If, on the contrary, the main factor leading to economies of scope is a fixed cost of creating a relationship, a supplier's best course of action would be to entrench itself once a relationship is created. It is therefore important to be able to empirically tease out these different sources of client-specific scope economies.

2.2. Empirical model

This section describes a simple model of value creation in buyer-supplier relationships. We will concentrate on value creation as an input for cooperative games and use the value creation model to derive a set of necessary conditions for competitive equilibrium.

The main characteristic of the model is that it allows buyers to have needs in different, yet related, areas. These area are related in that they belong to the same broad class of product of services. For example, these could different legal services (M&A, Employment, Litigation, ...) or different IT-related services (manufacturing, accounting, payroll applications, website management...). Correspondingly, suppliers can simultaneously provide several lines of product or services to the same buyer.

To fix ideas, consider, for example, the set of legal needs and legal services suppliers that are used by British Airways in 2005. Table 7.1 provides a good picture of the complexity of the buyer-supplier interface. British Airways was employing 6 different law firms to serve needs across 12 different areas of legal service. There are many different possible combinations of suppliers and areas. From a buyer point of view, the decision to match a supplier to a particular area is not trivial because of the large number of possible combinations. If we assume that each supplier could potentially provide services in any area and that the client needs only one supplier by area, there would be up to 12^6 or about 3 million combinations of area and suppliers. Reality is even more complex as we see that British Airways is sometimes using two law firms in the same area (e.g., Employment is covered by both Addleshaw

Goddard and Baker & McKenzie).

Another interesting feature is that suppliers tend to provide multiple lines of services. This raises the possibility that the value of a service delivered in one area can be influenced by whether the supplier is also supplying in a different area. There is therefore room for potential client-specific economies of scope thanks, for instance, to the possibility of economies of coordination across different product or service areas. Such coordination could enhance the value created by a supplier in addition to its specific expertise in a given area.

It is possible to put together the ideas of areas-specific value creation ability and client-specific economies of scope in a formal model of value creation as follows. The value created by supplier i for client k in the set of areas $A_{i,k}$ can be written:

$$V_k(A_i) = \sum_{a \in A_{i,k}} WTP(i,a) - \sum_{a \in A_{i,k}} C(i,a) + \sum_{n=1}^{N} S(n) + \mu_k + \sum_{a \in A_{i,k}} \lambda_{ak} + \sum_{a \in A_{i,k}} \varepsilon_{aik}.$$

This formula includes drivers of value creation that are directly observable or for which proxies can be find. The willingness-to-pay for supplier i's offering for products or services in area a is $WTP(i,a)$. The cost of delivery of supplier i for this area is $C(i,a)$. Turning to potential synergies, $S(n)$ represents the marginal change in value creation linked to an increase of client-specific scope from $n-1$ to n. Hence, $\sum_{n=1}^{N} S(n)$ is the total change in value creation associated with a client-specific scope of n.

Besides the observable elements, the formula makes room for a series of unobserved elements of value creation. There is a client fixed effect, μ_k, a set of client-area fixed effects, λ_{ak}, and finally an error term ε_{aik}. The presence of the client-area fixed effect allows for a form of horizontal differentiation in client tastes. The error term ε_{aik} allows for unobserved differences in value creation at the client-area-supplier level. As it will be made clear in the empirical analysis below, the fixed effects μ_k and λ_{ak} will cancel out while the maximum score estimator will require few assumptions on the distribution of the ε_{aik}.

The value creation involves both buyers and suppliers that interact in a market. Their interaction can be seen as an assignment game (Shapley and Shubik, 1971) whereby buyers and suppliers with different tastes and abilities are negotiating over value capture and matching to each other. In this logic, the observed matching of players is the one that is

ensuring the highest value creation possible. As the observed matching is maximizing value creation, comparing it to counterfactual matches can give us some information about what matters for value creation. This is because counterfactual matches are creation less value than the observed one. It is important to note that it is not necessary to assume that the matching between buyers and suppliers that is observed at the level of the market is globally optimal, in the sense that it is maximizing value creation. One can instead concentrate on a set of necessary conditions that are implied by weaker concepts of equilibria that do not require global optimality. In particular, the observed matching may only be compatible with a weaker or myopic form of optimization in that agent optimize around the most salient or easily analyzed constraints without necessarily accounting for more complicated constraints.

In this analysis, I will concentrate on a narrow set of counterfactuals matches. This set includes the smallest discrete reallocation possible of areas from the observed matching of suppliers to client-areas. This is consistent with a weak form of optimization at the level of each client whereby buyers take the set of relationships as given but do not allow for obvious (i.e., involving only one modification at a time) inefficiencies to arise.

I start from an observed matching (allocation) of a buyer's areas to its suppliers, and make the following thought experiments to create counterfactuals. I take each actual pairing of supplier to an area, and replace the supplier by another supplier that is currently serving the client in a different area. Holding the rest of the allocation of areas to suppliers constant, one can compare the value created by the discrete allocation of area a to the actual supplier i, holding other allocations constant, to the value created by the counterfactual allocation of area a to supplier j.

Formally, denote $mv_{a,i,k}$ the marginal value created by supplier i with client k in area a given that it is serving the client in the set of areas $A_{i,k}$ which comprises $N_{i,k}$ areas (i.e., $N_{i,k} = |A_{i,k}|$). By assumption, $a \in A_{i,k}$. We can write the marginal value created by the actual supplier as:

$$\begin{aligned} mv_{a,i,k}^{Actual} &= V_k(A_{i,k}) - V_k(A_{i,k} \setminus \{a\}) \\ &= WTP(i,a) - C(i,a) + S(N_{i,k}) + \mu_k + \lambda_{ak} + \varepsilon_{aik}. \end{aligned}$$

Note the impact of the marginal client-specific economies of scope on value creation ($S(N_{i,k})$).

The counterfactual created by substituting supplier i by supplier j for area a would create a marginal value of:

$$\begin{aligned} mv^{CF}_{a,j,k} &= V_k(A_{j,k} \cup \{a\}) - V_k(A_{j,k}) \\ &= WTP(j,a) - C(j,a) + S(N_{j,k}+1) + \mu_k + \lambda_{ak} + \varepsilon_{ajk}. \end{aligned}$$

Again, by assumption, $a \notin A_j$. In this counterfactual allocation, there is an extra client-specific economy of scope represented by $S(N_{j,k}+1)$ since supplier j would have a wider client-specific scope than actually realized.

Optimality of the allocation implies the following necessary condition:

$$mv^{Actual}_{a,i,k} > mv^{CF}_{a,j,k},$$

where i is the actual choice of supplier and j a counterfactual choice. Holding all the other allocations constant, optimality implies that substituting a supplier in one area by another supplier cannot lead to increase of value creation.

For concreteness, panel A of Table 7.2 gives an example of a buyer's observed choices where the buyer is using three suppliers to provide services in four different service areas. For each observed choice of a supplier at the area level (e.g., area 1 is served by supplier 1) one can list the counterfactuals where the same area is served by another supplier. Panel B of Table 7.2 shows all possible pairs of observed and counterfactuals area-level matches. Each pair of observed and counterfactual matches can be used to generate a necessary condition for the stability of the observed matching of client needs to suppliers.

This set of necessary conditions involves the smallest possible deviations from the observed matching of areas (tasks) to suppliers. The deviations are the simplest to implement and the closest to the actual choice. They are therefore most likely to be close to binding and informative about the factors underlying value creation.

Note that these necessary conditions only imply local optimality, in the sense that the smallest discrete deviations from the equilibrium are not profitable. However, they do not

by themselves imply global optimality. The observed matching can be locally optimal, but it may be that some less obvious counterfactuals can create more value. In any case, the maximum score approach will produce consistent estimates of the parameters, even if only a subset of potential choices is analyzed.

When the model is taken to the data, we expect to see the following:

- Positive coefficient on the variable that is a proxy for WTP.
- Positive coefficient on the variable associated with a transition between a client-specific scope of zero and a scope of one ($S(1)$), reflecting the existence of a fixed cost of entry. As will be discussed later, this coefficient can only be partially identified.
- The impact on value creation of higher levels of client-specific scope positive up to a point reflecting positive spillover among speciality areas, yet decreasing returns at some point. That is, $S(n) > 0$ for $n < n_O$ and $S(n) \leq 0$ for $n \geq n_O$ where n_O is the width of client-specific scope that maximizes spillover among speciality areas.

The UK corporate legal market offers features that are very close to this model of value creation. The next section offers some context on this market and details on the data that will be used in the empirical analysis.

3. Context and Data

3.1. The UK Corporate Legal Market

The empirical context is the UK corporate legal market in the years 2002 to 2006. The corporate clients (i.e., the buyers) are among the largest 250 publicly traded corporations in the UK[1] and the suppliers are large British and international law firms.

The data on buyer-supplier relationships come from a survey conducted by Client Report, an industry trade magazine targeted at general counsels. The survey was addressed to the general counsels of the corporations belonging to the top 250 largest market capitalization in the London stock market and enjoyed a very high response rate. General counsels gave the

[1] More precisely, they are among the top 250 market capitalizations of the London stock exchange.

list of their main legal advisers and the legal areas in which they use them. Table 7.1 shows one of these lists, detailing the legal supplier base of British Airways in 2005.

Over the 2002 to 2006 span, there is a total of 1,229 answers, each constituted by the set of law firms working for a client, and the areas of law in which the law firms are involved for this client, for a total of 7,291 year-client-firm-area observations. Note that sometimes client use several firms for services in the same area (e.g., as in Table 7.1). The set of clients that answer the survey changes over time due to changes in market capitalization. In total, 357 different clients are mentioned in the survey, alongside with 294 different law firms.

In this setting, clients typically simultaneously manage relationships with several law firms across several areas of services. According to the Client Report survey, clients were using an average of 3.76 law firms in a given year over the period. The trend was toward using more law firms. The average number of law firms per client was 3.17 in 2002 but raised steadily each year to reach 4.25 in 2006 (T-test of difference in mean is significant at $P < 0.0001$). Client needed advice in 4.48 areas of law in average. Moreover, 35.8% of client-law firm relationships spanned more than one area of law in a given year. That is, more than a third of the law firms were cross-selling for any given client. These 35.8% of client-law firm relationships that involved cross-selling accounted for 59.2% of all the area level observations. In other words, at the finest level of observation (the area), a majority of sourcing decisions are taken against a backdrop of cross-selling.

Moreover, the development of a specialized legal press had increased transparency and fuelled clients' efforts to streamline their relationships with their providers of professional services. When in the past a client would have found hard to identify which law firms could supply some specialized legal services, the availability of guides and league tables since the mid 1990's makes it now very easy to find alternatives.

Clients also been more and more questioning the relationships they have with law firms and the fees they pay them. The past years have seen an increasing number of beauty contests with big consumers of legal services putting in place formal procedures to negotiate rates and select law firms into "panels". Those "panels" are lists of preferred law firms that apply negotiated fees. To be selected into those panels, law firms have typically to undergo a beauty contest in which they have to demonstrate their competencies and their knowledge

of the client.

This suggests that corporate clients are careful at choosing and maintaining relationships with their supplier. Even if relationships are maintained from one year to the other, they are nevertheless scrutinized and evaluated regularly.

In addition to fine-grained data on the span of buyer-supplier relationships, this setting offers useful data regarding the capabilities of suppliers. Chambers and Partners, the parent firm of Client Report, produces yearly recommendations for law firms in multiple areas of work, which will be used as an indicator of willingness-to-pay. Publicly available financial data on the top law firms allow constructing a proxy for cost of production. I review these sources of data in turn.

Rating for willingness-to-pay were derived from Chambers and Partners' guides to the UK Legal Profession, published yearly. This guide presents ranking of recommended firms in over 60 areas of law. This guide has been consistently published every year since 1990 and is acknowledged as one of the two leading provider of information about the UK legal market. The guide is a result of six months of research (January to June) by a team of 30 lawyers and legal journalists. Firms are ranked within tiered lists. According to Chambers and Partners, the rankings are meant to reflect "technical legal ability, professional conduct, client service, commercial awareness/astuteness, diligence, commitment, and other qualities that the client considers relevant" (Ghosh, 2005). I use the rankings to construct a zero to one variable, with one corresponding the highest ranking and zero corresponding to the lowest ranking or to not being listed.

To proxy for the cost of providing services, I use financial information available for the top 100 UK law firms and top 25 foreign law firms in London. This information was compiled from the yearly league tables provided by the trade publications Legal Business and The Lawyer. I construct a ratio of cost per lawyer, obtained by dividing the total cost of a firm by its number of practicing lawyers, including partners and non-partners. The largest part of a law firm's cost base consist in the compensation of its personnel. The opportunity cost of the salaried lawyers can be proxied by their salaries while, on the short run, the opportunity cost of partners, who are committed to the firm, is zero. The ratio of total cost to total number of lawyers can therefore be understood as a proxy for the short run opportunity cost

of the firm.

While examining buyer-supplier relationships in a given year, I use the previous year's information on ranking and cost. This information is equally available to all agents. Moreover, supplier quality and cost positions are medium- to long-run decision variables, contrary to price, which can be more easily changed.

Data on cost and WTP is not available for all suppliers mentioned in the survey. When data on quality was missing, I assumed that this was equivalent to being on notch below the lowest rank in the ranking. When data on cost was not available, I dropped the observations for which the cost data is missing. This meant dropping data for 175 law firms, corresponding to 1,957 ties out of the 7,291 original observations at the year-area-client-law firm level. The 175 law firms that are dropped are too small to belong to the top 100 firms of the market by sales.

The remaining 119 law firms on which the analysis is performed are the largest and most prominent in the market. To have a sense of the relevance of this population, one can note that in 2005 the 100 largest UK based law firms had a combined turnover of £ 9.6bn.[2] Moreover, 21.7% of UK solicitors work in firms with 81 or more partners (UK Law society, 2004). A firm with this number of partners would be placed somewhere between the 25th and the 50th rank in the ranking by revenue. By the same token, 37% of UK lawyers practice in firms with 26 or more partners while firms in the 90th – 100th bracket of the ranking have 28 to 38 partners. The top 100 law firm ranking therefore captures a large share of the corporate legal business conducted in the UK.

Once these observations are removed, the average number of law firms considered per client is slightly lower (3.93 in average), and the proportion of ties that are part of law firm-client relationships involving cross-selling is slightly higher (62.1%). Figure 7.1 presents an histogram of the number of area-level ties depending on the width of the span of the client-law firm relationship. Table 7.3shows the descriptive statistics and correlation table for the main variables. The unit of the cost per lawyer variable is in million pound sterling (GBP) per year.

From the data at the tie level, I generate pairs of actual and counterfactual ties, which

[2]Fiscal year ending 30 March 2005.

will be used for estimating the parameters of the model. Following this approach from the UK legal market data, I create 17,457 inequalities, each one including an observed match of supplier to a client's area and one counterfactual match involving another supplier working with the client in another area.

4. Estimation and Results

4.1. Estimator

The The estimation is based on work by Fox (2007) and consists of a maximum score estimator (Manski, 1975) which attempts to find parameters that maximize the number of inequalities derived from the necessary condition developed in Section 2. This estimator requires only limited assumptions on the distribution of the error term ε_{ajk}. The main assumption is that of rank ordered probability of choice. This assumption requires that, when comparing two alternatives, the one with the highest value net of the error term has a higher probability of being selected. The estimator is consistent even when it is only made over a subset of the choices available (Fox, 2007). This point makes it particularly attractive for our study as it is in practice impossible to look at all possible counterfactuals. It is also shown that this estimator performs well in small sample when the logit model is misspecified (Fox, 2007). Finally, this estimation approach makes it particularly easy to include a client- and an area-fixed effects, as shown in Bajari, Fox and Ryan (2008), which allows to explicitly address unobserved heterogeneity at the client level.

Rewrite the marginal value expressions to include parameters to be estimated as:

$$mv_{a,i,k}^{Actual} = \beta WTP(i,a) - C(i) + \gamma_{N_{i,k}} D(N_{i,k}) + \mu_k + \lambda_{ak} + \varepsilon_{aik}, \tag{4.1}$$

$$mv_{j,k}^{CF} = \beta WTP(j,a) - C(j) + \gamma_{N_{j,k}+1} D(N_{j,k}+1) + \mu_k + \lambda_{ak} + \varepsilon_{ajk}. \tag{4.2}$$

These expressions are slightly different from those in Section 2 in a number of ways. Due to data availability, I assume that cost is similar across all areas served or potentially served by a supplier. Moreover, the coefficient on cost is assumed to be equal to -1. The willingness-to-pay component is now $\beta WTP(i,a)$ with β one parameter to estimate. The

scope economies part of the expression are now of the form $\gamma_n D(n)$ where $D(n)$ is a dummy indicating that scope is less or equal to n and γ_n a parameter to estimate.

We seek to find a set of parameters $\Theta = \{\beta, \gamma_0, .., \gamma_n\}$ that maximizes the objective function:

$$Q(\Theta) = \sum_{k=1}^{N_k} \sum_{a=1}^{A_k} \sum_{i,j \in S(k), j \neq i} 1[mv_{i,k}^{Actual}(\Theta) > mv_{j,k}^{CF}(\Theta)].$$

Within the consideration set $S(k)$ which includes all suppliers of client k , all combinations of actual and counterfactual allocations of suppliers to area are formed and compared given parameters β,γ. An indicator function takes a value of one if, for parameters β,$\gamma_0, .., \gamma_n$, the inequality $mv_{i,k}^{Actual} > mv_{j,k}^{CF}$ is true. The function $Q(\Theta)$ sums these indicator functions over areas and clients.

This function is a step function and will be maximized using a differential evolution algorithm (Storn and Price, 1997) that permits finding global maxima. To compute confidence intervals, I will use a subsampling (Politis, Romano and Wolf, 1999) approach that is consistent for the maximum score estimator. Subsampling differs from bootstrapping in that it involves drawing subsamples of observations from the distribution without replacement.

4.2. Results

4.2.1. Maximum Score Estimation

Table 7.4 presents the results of the analysis of the UK legal market data using the maximum score approach. The coefficient on the Cost per Lawyer variable is equal to -1 by assumption.[3] It is used to scale the other coefficients. Confidence intervals were calculated by using a subsampling procedure that rerun the analysis on 100 subsamples from the full data set. Each subsample was of size equal to 25% of the full sample and was created by randomly drawing without replacement clients and the corresponding inequalities from the full sample. Subsamples are constituted on the basis of clients rather than client-law firm ties, because the sample size could be increased by adding more clients. Both the upper and lower bound

[3] In a logistic regression, coefficients are scaled according to the variance of the logistic distribution. Here, as there are no parametric assumptions on the error term, coefficients are scaled in relationship to the absolute size of the one of the coefficients.

of the confidence intervals are reported because they are generally not symmetrical around the estimated coefficient.

As explained above, all analyses are implicitly a client-area-year fixed effect since comparisons are made within client-area-year groups. Unobserved heterogeneity in the supplier side is relegated to the error term, upon which only very limited assumptions are made. In particular, not specific distributional form is assumed. Only the rank ordered property is assumed.

Model 1 includes the proxies for cost and willingness to pay. The coefficient on the WTP proxy is positive and significant but of an absolute size smaller than the cost per lawyer parameter. With only cost and WTP, the model is able to correctly predict 76.0% of the inequalities. Computation in Mathematica on a 2007 vintage PC took 11.7 seconds for producing the estimates and 279.2 second for the subsampling procedure.

Model 2 includes cost per lawyer and the economies of scope dummies. None of the coefficients are significant and the 98% confidence intervals are very wide. In spite of the increase in the number of variable, this model only predicts correctly 71.9% of the inequalities.

Model 3 brings together cost, WTP and client-level scope dummies. The capability coefficient is equal to 4.98 and is significant. The dummy for scope change between 0 and 1 is also positive (5.42) and significant. In contrast the dummies for scope change at higher levels are either negative and significant (respectively -1.57 and -1.24) or close to zero (-0.87) and not significant. With this specification, 86.0% of the inequalities are satisfied.

Models 4 and 5 are including additional dummies for change in client-specific scope at higher scope levels. In spite of the increase in the number of variables, the fit is almost unchanged compared to Model 3: a proportion of 86.1% of inequalities are satisfied in both Models 4 and 5. The general pattern of coefficient values is similar to that of Model 3, with positive coefficients of the same order of magnitude for the WTP variable and the zero to one scope dummy, and negative or close to zero values for the other scope change variables.

The interpretation of the coefficient on the value associated with a change of client-specific scope from zero to one deserve some elaboration as this coefficient is only partially identified. Specifically, the value reported in the tables is only a lower bound, not a point estimate, in contrast to the value reported for the other variables. This is due to the fact that the

thought experiment that is at the basis of the estimation only includes current suppliers. To identify the zero to one dummy coefficient, the estimator take a current supplier with a scope of one, makes the experiment of transferring the area to another supplier and finds the set of coefficient on WTP, cost and scope dummies that make the observed outcome create more value than the counterfactual. By doing so, we are always reducing the scope from one to zero. To get an upper bound, we would need to perform an experiment that increases a firm's scope from zero to one. It is impossible to perform this experiment given the way we have constructed the consideration set of the client by restricting it to the set of current suppliers. Figure 7.2 is showing the shape of the scope function for different values of the zero to one variable using the score function of Model 3 and holding the other variables at the value that maximizes the score function. We see the score function plateauing after 5.42,meaning that all values of the coefficient beyond this point are equally maximizing the number of inequalities that are satisfied.

A careful way to interpret the coefficient on the zero-to-one dummy is to see it as a measure of the benefit of incumbency, net of cost and WTP effect. What the coefficient represents is the value that a client puts on not severing a tie with a current supplier, net of cost and WTP considerations. This may include both the value of the client-specific knowledge of the supplier but also the cost associated with searching for an alternative.

4.3. Alternative analysis: Conditional logit

It is possible to analyze the data with a conditional logit instead of the maximum score estimator. To do this, we can simply list all the alternatives available to a client for fulfilling its needs in one area, holding its other choices constant. The dependent variable is a dummy representing whether a supplier was chosen. The independent variable representing the level of client-specific scope has to be adjusted to represent the client-specific scope of the supplier excluding the area currently considered.

Following this approach implies assuming that the error terms are following an extreme value distribution, which in turn implies the independence from irrelevant alternatives assumption. A priori, these assumptions are not necessary warranted in this setting as multiple stable equilibrium may coexist.

Table 7.5 shows the result of the analysis. To compare coefficients with the maximum score analysis, one has to divide them by the absolute value of the coefficient corresponding to the cost per lawyer variable. Fortunately, this absolute value is very close to one in Models 2 and 3.

The pattern is very similar to that of the maximum score estimates, with a few noteworthy differences. First, the standard errors reported tend to be much narrower. This is due to the combination of the parametric assumption on the error term and the large sample size. The maximum score estimate does not use parametric assumptions and is hence much more conservative.

Second, the conditional logit gives a very high coefficient to the zero-to-one scope dummy, and yields a point estimate while the maximum score gave a coefficient with a lower absolute value that represented only a lower bound. Intuitively, we have a point estimate from the logit estimator because the first order condition of the likelihood maximization are equalities. In contrast, the moment conditions underlying the maximum score estimator are inequalities, which are not necessarily enabling point identification if the underlying comparison do not give both a lower and an upper bound to the parameter of interest.

Third, the coefficient on cost is positive, while it was set as negative by assumption in the maximum score estimation, and bordering on significance.

These results are indicative of the tradeoffs involved with using an estimation method that make no parametric assumptions on the error term. The conditional logit produces results that may seem to be too sharp. At the same time, to the exception of the cost coefficient, the overall results are not very different from the maximum score estimate. This may suggest that the actual decision making of the players involved is not far from being made piecemeal, one area at a time, with relatively little regard for more complex counterfactuals.

4.4. Conclusion of the Empirical Analysis

The analyses presented above suggest that in this setting the sole source of client-specific scope economies is the existence of a fixed cost of creating a relationship. There is no evidence of synergies related to the combination of difference services. To the contrary, there is evidence of continuing handicap associated with expanding scope, up to a point after

which the negative effect is vanishing. This suggest that scope extensions are associated with additional fixed costs rather than positive spillovers, or at least that any positive spillover is overwhelmed by the increased in fixed costs for low levels of client-specific scope.

5. Applications

The semiparametric methods that are used in the main estimation exploit a set of necessary conditions implied by the equilibrium of a game while making little parametric assumptions on unobservables (Fox, 2009).[4] These methods have not been applied in the strategy field, to the exception of Mindruta's (2009) study of the matching between scientists and firms.[5] They seem particularly suited to applications in the value-based framework because the mathematical inequalites used for parameter estimation are directly implied by the game theoretic solution concept of the core, which is itself defined in terms of mathematical inequalities. To be sure, the inequalities used to generate the estimation are in principle consistent with a broad family of models as they represent necessary conditions for optimality that are quite weak. However, they are markedly closer to the spirit of the cooperative game used by the value-based stream of research than other empirical methods.

For instance, among the few empirical studies that have sought to make a direct connection to the value-based framework, Besanko, Gupta and Jain (1998) estimate a structural model of logit demand and back out estimates of willingness-to-pay (WTP) and cost for several brands of yoghurt. They establish a link between value creation, and profits and market share. In particular, they show that different combinations of WTP and cost were available to achieve a competitive advantage on this market. Their study follows a "structural" approach whereby the estimation methods accounts for the optimizing behavior of firms and customers. However, they rely on a model of competition that is distinct from the cooperative game framework put forth by Brandenburger and Stuart (1996). Notably, in keeping with their business-to-customer context, they assume that firms are setting prices rather

[4] This contrasts with other structural methods that need explicity assumptions on the shape of distribution of unobservables and need to solve explicitly for equilibrium as opposed to only using necessary conditions implied by equilibrium.

[5] They have however, started to be applied to empirical studies in marketing and economics for the estimation of parameters of demand functions (Bajari, Fox, and Ryan, 2008) and the study of the matching between athletes and teams (Yang, Shi and Goldfarb, 2009).

than negotiating with customers. Moreover, they observe prices and market shares (but not individual customers), from which they back out product characteristics. By comparison, in an empirical estimation relying on inequalities, it is not be necessary to observe prices or any kind of monetary transfer. However, fine grained data on the matching of buyers and suppliers, as well as their individual characteristics, combined with the assumption of efficient bargaining, is necessary to uncover the implied parameters of the value creation function.

A natural way to use the empirical estimates of the factors driving value creation to better understand competition in the UK corporate legal market is therefore to use them in conjunction with simple cooperative games. I now analyze a few fictional situations involving clients and suppliers in the UK legal market. The goal is to show how the estimates from section 4 can be used to provide concrete advise to firms involved in competitive interactions.

When client have new needs, this offers an opportunity for existing suppliers, but also a new competitive ground. Factoring in both capability and scope can help understand better for whom, and to what extent, the new opportunity can be profitable. Consider the example depicted in Table 7.6. So far, the client has had needs in three areas of business (in columns 1 to 3) and now needs services in area 4 (column 4). It is currently using two suppliers (suppliers, 1 and 2, in rows). Each cell of the table gives the WTP and Cost of a supplier's work in a given area. An X designates the areas for which a supplier is effectively serving the area. For simplicity I assume that all the error terms in equations 4.1 and 4.2 are equal to zero. In this example, Supplier 1 is serving the client in area 1, while Supplier 2 is serving the client in both area 2 and 3. Notice that this arrangement is value maximizing assuming that the cost of getting to know the client is sunk. Cost variables are set at identical values across supplier so that they do not affect decisions. The WTP values for Supplier 1 and 2 are, for the moment, left at unspecified values WTP_1 and WTP_2 respectively.

Given current scope and capabilities, which supplier can expect to be better placed to profitably serve the client in area 4? Compare the increments of value that each supplier would be able to create if it were to serve area 4, in addition to those it already serves, using rounded values of the estimates from Model 3 of Table 7.4.

Supplier 1's incremental value created is superior to that of supplier 2 if and only if:

$$\beta WTP_1 - Cost_1 + \gamma_2 > \beta WTP_2 - Cost_2 + \gamma_3,$$
$$\beta WTP_1 - Cost_1 - \beta WTP_2 + Cost_2 > \gamma_3 - \gamma_2.$$

The combined WTP and cost advantage of Supplier 1 over Supplier 2 ($\beta WTP_1 - Cost_1 - \beta WTP_2 + Cost_2$) should be more than the difference between the increase in client-specific scope economies (diseconomies, in this case) associated with a scope increasing to 3 for Supplier 1 and to 2 for Supplier 2 (i.e., $\gamma_3 - \gamma_2$).

Replacing the symbols by their corresponding values the condition can be rewritten as:

$$WTP_1 - WTP_2 > \frac{-1.53 + 1.73}{4.98}$$
$$WTP_1 - WTP_2 > 0.04$$

This gap in WTP can be compared to the standard error of 0.30 for the WTP variable in the sample. The comparatively lower increase in diseconomies of scope (1.53 vs. 1.73) that Supplier 2 would have to deal with is only giving a slim advantage. Unless the gap in WTP between the two supplier is relatively high, the client will be able to extract a lot of value but putting the two suppliers against each other.

Now modify the example so that Supplier 2's scope is equal to three (instead of two). Now, the capability advantage required so that Supplier 1 is creating more value is:

$$WTP_1 - WTP_2 > \frac{-0.66 + 1.73}{4.98}$$
$$WTP_1 - WTP_2 > 0.21$$

That is a much more higher hurdle to overcome. At a that level of client-specific scope, Supplier 2's cost of scope expansion (-0.66) is much lower than Supplier 1's (-1.73), which, translated in capability terms, become a more substantial 0.21. Because it has a wider client-specific scope and that the diseconomies associated with scope extension are decreasing,

Supplier 2 is to some extent

Turning to the client side, the estimates can be used to shade light on how clients can structure their supplier base in order to maximize not only value creation, but also value capture.

Consider the example of a client that has needs in two areas, and is considering whether to have one supplier or two suppliers in its supplier base. Table 7.7 shows the characteristics of the two suppliers. The client has to balance two considerations. On the one hand, using two suppliers will reduce each supplier's added value and allow the client to extract more value. On the other hand, if the supplier cannot extract enough value, it will not be motivated to make the investment to enter in the first place.

This can be interpreted as a biform game whereby in the first stage the suppliers make a fixed investment before being able to transact with the client and, in the second stage, bargain over the value they are able to create. In such situation, the relative bargaining power of the client can be represented by an index α while the suppliers power is $1 - \alpha$.

The two suppliers in Table 7.7 are symmetric. The value that each alone can create is:

$$\begin{aligned} v(B,1) &= v(B,2) = \beta(WTP(1) + WTP(2)) - 2 \cdot Cost + \gamma_2 \\ &= 4.98 \cdot (1 + 0.75) - 2 \cdot 0.5 - 1.73 \\ &= 5.99 \end{aligned}$$

If there is only one supplier, and $\alpha = 0.5$, the value will be equally shared between the buyer and the supplier, so each captures 2.98 units of value.

With two suppliers, the value created is increased in two respects: they deal with the area they are the best at, and they do not have to incur a penalty for increasing they scope to 2.

$$\begin{aligned} v(B,1,2) &= 4.98 \cdot 2 - 2 \cdot 0.5 \\ &= 8.96 \end{aligned}$$

Each supplier's added value is hence $v(B,1,2) - v(B,1) = v(B,1,2) - v(B,2) = 2.98$.

Assume $\alpha = 0.5$. Then their value capture is equal to 1.49 (since $2.98 \times 0.5 = 1.49$). The client captures the rest of the value, to the amount of 5.98 units of value ($8.96 - 2 \times 1.49 = 5.98$). The buyer clearly has an interest in having two suppliers instead of one (value capture is 5.98 instead of 2.99). At the same time, the existence of diseconomies of scope is helping suppliers by increasing their added value, and hence their prospects of value capture. Indeed, the added value with diseconomies of scope is 2.98, while it would stand at 1.25 ($2.98 - 1.73 = 1.25$) without diseconomies of scope. Given that there are costs of creating a relationship, the diseconomies of scope have actually the effect of helping the client attract suppliers, as they can expect to capture enough value. For instance, with a cost of entry that would be equal to 1 unit of value, a supplier will not find it profitable to establish a relationship if there is already another supplier. Indeed, the expected value capture would be equal to $(1-\alpha)AV = 0.5 \times 1.25 = 0.625 < 1$. With the diseconomies of scope, it is profitable for the supplier to establish a relationship, which in turn makes the buyer better off, not only because of the increase in competition, but also because of the comparative increase in efficiency due to the lack of diseconomies of scope.

6. Discussion and Conclusion

This paper studies client-specific economies of scope in the context of buyer-supplier relationships in the UK corporate legal market. Client-specific scope economies are of interest for business strategy because their existence can shape the span of buyer-supplier relationships by favoring buyers able to supply different lines of business. Client-specific economies of scope matter above and beyond product line capabilities to determine the extent of value creation in a buyer-supplier relationship. There are two mechanisms through which client-specific scope economies may arise. The first is the existence of fixed costs associated with the creation, and extension, of client relationships. The second is the existence of spillovers across work in different areas which leads to increasing returns.

To investigate how client-specific scope economies influence value creation, I set up a model of value creation buyer-supplier relationship that includes both client-specific scope and product line capabilities. This model is motivated by the emerging literature on value-based strategies in business strategy. I use this model to generate a set of necessary conditions

for the local optimality of the observed patterns of client-specific scope. Confronting a set of necessary conditions for local equilibrium derived from the model to data from the UK corporate legal market, I estimate the relative magnitude of different components of value creation. To do this, I use a maximum score estimator that allows making minimal assumptions on unobservables and that includes fixed effects at the client-year and client-area-year level.

The results of the model estimation suggest the existence of substantial opportunity cost to sever a relationship, which is consistent with the existence of large fixed cost of relationship creation. Increasing scope is also associated with significant diseconomies, which suggests that scope extensions need costly investment, even when the supplier already has a relationship with the buyer in another area. However, the diseconomies of scope seem to be decreasing for higher levels of scope until they become close to zero. This suggests that there is a weak form of spillover across lines of business that provides a limited amount of increasing returns. These results speak to the literature on diversification by shedding light on the mechanisms governing the emergence of a special form of economies of scope.

In addition to the substantive findings, this paper provides a example of how the value-based approach can be used to analyse data, and how the estimates can be used to analyze situations out of the sample. With parameters estimated from "real" life, simple cooperative games can be analyzed to understand the challenges faced by the different players. For instance, it is possible to quantify the tradeoffs between value creation from capability and from client-specific scope, which allows to understand the relative strength of players in different scenarii.

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7. Tables and Figures

Client: British Airways	
Law Firm	Area of Legal Service
Addleshaw Goddard	Commercial
Addleshaw Goddard	Employment
Addleshaw Goddard	TMT
Baker & McKenzie	Employment
Bristows	IP
Gates & Partners	Aviation
Gates & Partners	Insurance
Slaughter and May	Corporate
Slaughter and May	Finance
Slaughter and May	Projects
Slaughter and May	Tax
Wragge & Co LLP	Commercial
Wragge & Co LLP	IP
Wragge & Co LLP	Litigation
Wragge & Co LLP	Property

Table 7.1: British Airways's Legal Suppliers, 2005. Source: Client Report's survey of FTSE 250 General Counsels

Panel A: Observed Matches of Supplier and Areas

Supplier	Area
1	1
1	2
2	3
3	4

Panel B: Pairs of Observed and Counterfactual Matches

Observed Allocation		Counterfactual Allocation	
Supplier	Area	Supplier	Area
1	1	2	1
1	1	3	1
1	2	2	2
1	2	3	2
2	3	1	3
2	3	3	3
3	4	1	4
3	4	2	4

Table 7.2: Observed Area Allocation and Pairs of Observed and Counterfactual Allocations

	Variable	Mean	S.D.	Min	Max	(1)	(2)	(3)
(1)	Client-Specific Scope	2.22	1.31	1.000	9.000	1.00		
(2)	Cost per Lawyer	0.16	0.04	0.053	0.474	0.05	1.00	
(3)	WTP	0.69	0.30	0.000	1.000	-0.03	-0.05	1.00

Table 7.3: Descriptive Statistics of Ties Data

	(1)	(2)	(3)	(4)	(5)
Method	Max. Score	Max. Score	Max. Score	Max. Score	Max. Score
Variables					
Cost per lawyer	-1.00	-1.00	-1.00	-1.00	-1.00
	[N/A]	[N/A]	[N/A]	[N/A]	[N/A]
WTP	0.64		4.98	3.23	2.95
	[0.04, 0.67]		[4.17, 7.64]	[-0.09, 4.32]	[1.26, 3.69]
Marginal Benefit of Changes in Client-Specific Scope					
0 to 1		7.00	5.42	3.03	3.70
		[-8.13, 10.61]	[3.64, 7.73]	[-3.89, 3.61]	[-0.19, 4.86]
1 to 2		-0.48	-1.57	-1.73	-1.30
		[-1.20, 21.68]	[-2.47, -0.86]	[-2.81, -1.05]	[-1.99, -0.79]
2 to 3		-0.39	-1.24	-1.53	-1.09
		[-1.50, 15.55]	[-2.09, -0.52]	[-2.74, -1.12]	[-1.79, -0.68]
3 to 4				-0.66	-0.21
				[-1.52, -0.29]	[-0.9, 0.35]
4 to 5					-0.25
					[-1.38, 0.54]
3 and more		0.34	0.28		
		[-2.59, 2.56]	[-0.02, 1.43]		
4 and more				-0.87	
				[-2.66, -0.46]	
5 and more					-0.39
					[-1.51, 0.30]
No. Inequalities Satisfied	13270	12553	15019	15032	15034
Total Inequalities	17457	17457	17457	17457	17457
Proportion of Inequality Satisfied	76.0%	71.9%	86.0%	86.1%	86.1%
Evaluation Time (sec.)	11.7	86.5	309.8	347.3	321.0
Subsampling Time (sec.)	279.2	3307.8	6091.6	7546.1	8891.7

Subsampled Confidence Intervals (95 %) in Brackets
Analysis Includes Year-Client-Area Fixed Effects
Coefficient on the Cost Variable is Superconsistent

Table 7.4: Results of the Maximum Score Estimation

Method	(1) Cond. Logit	(2) Cond. Logit	(3) Cond. Logit
Variables			
Cost per Lawyer	0.500	1.104*	1.074
	[0.554]	[0.648]	[0.657]
WTP	3.254***	3.231***	3.229***
	[0.065]	[0.080]	[0.080]
Marginal Ben. of Changes in Client-Specific Scope			
0 to 1		20.448***	20.399***
		[0.119]	[0.577]
1 to 2		-0.606***	-1.531***
		[0.105]	[0.575]
2 to 3		-0.408***	-1.331**
		[0.105]	[0.575]
3 to 4		0.164	-0.762
		[0.113]	[0.577)
4 to 5			-1.057*
			[0.566]
5 to 6			-0.603
			[0.598]
6 to 7			-0.915
			[0.658]
7 to 8			-0.126
			[0.740]
Observations	19009	19009	19009
Groups	4254	4254	4254
Log likelihood	-4632	-2925	-2921
Pseudo R-squared	0.288	0.550	0.551

Robust standard errors, clustered by client-year-area, in brackets

*** p<0.01, ** p<0.05, * p<0.1

Table 7.5: Conditional Logit Analysis

		Client's Areas						
		Current Areas						New Area
Suppliers		1	Selected	2	Selected	3	Selected	4
Supplier 1	WTP	1.0	X	0.2		0.0		WTP_1
	Cost	0.5		0.5		0.5		0.5
Supplier 2	WTP	0.0		0.4	X	1.0	X	WTP_2
	Cost	0.5		0.5		0.5		0.5

Table 7.6: Implications for Suppliers of New Client Need

		Client's Area	
Suppliers		1	2
Supplier 1	WTP	1.0	0.75
	Cost	0.5	0.5
Supplier 2	WTP	0.75	1.0
	Cost	0.5	0.5

Table 7.7: Choice of Supplier Base

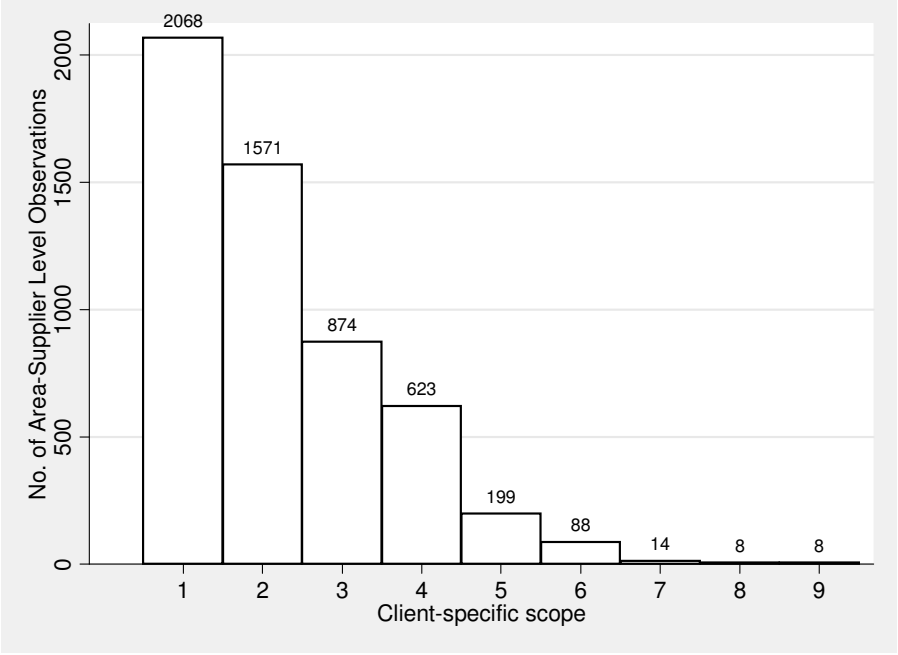

Figure 7.1: Number of Area-supplier-client observation by width of client-specific scope

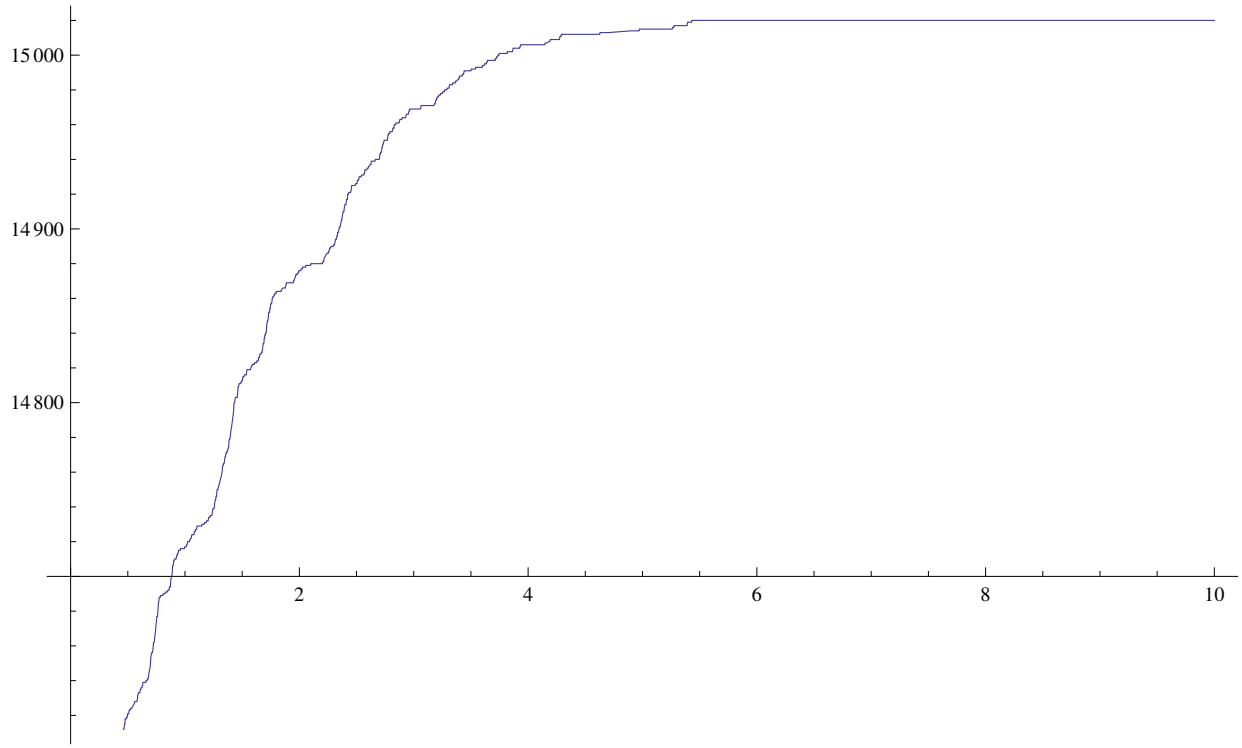

Figure 7.2: Score function from Model 3 for different value of the coefficient on the zero-to-one scope dummy, holding other coefficients at the value that maximizes the score