MES in Input Use and Sub-Additive Bargaining Costs:

A Micro-Foundation for the RBV Recommendations on the Scope of the Firm

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Abstract

In a model with advantages of specialization and sub-additive bargaining costs, we reconstruct the RBV recommendations about corporate diversification: That firms with excess capacity of a productive resource should diversify into new activities that that are "related" in the sense that they use the resource in question with minimal loss of advantages of specialization. .On the issue of governance, we argue that the resource should be used by employees, rather than independents contractors, when any practical contracts between worker and ideally should be renegotiated more frequently.

I. Introduction

From its earliest incarnations (Penrose, 1959; Wernerfelt, 1984) a central implication of the Resource-Based View of the firm (RBV) was about the scope of the firm: If a firm has excess capacity of a productive resource, it will have a cost advantage in new activities that that are "related" in the sense that they use the resource in question. (Since firms not doing this would have to pay to get the resource in question.) It has thus often been suggested that the RBV is a theory of the firm. (Most prominently by Conner, 1991). However, the problem with this argument is that it lacks a micro-foundation.

The Argument

The foundation proposed here is based on the existence of a minimum economic scale (MES) in the use of inputs along with sub-additive bargaining costs. The simplest application is at the level of an individual employee. Suppose that workers experience gains from scale (specialization) in a service, a business, or both. So you are more efficient at plumbing if you do more of it, more efficient at providing general repair services for the building at 50 Main Street if you do it more, and even more efficient if you specialize in both plumbing and #50. So using the worker in the latter role achieves MES. However, depending on the service, not all businesses need plumbing often enough to occupy a full time specialist. The idea is then that a firm can combine several businesses that are “similar” in the sense that working for one makes you more efficient at working for the other. If you cannot do plumbing for 50 Main St. on a full time basis, it may still be good to split your time between plumbing at #50 and plumbing at #60. (At least compared to doing plumbing and carpentry or doing plumbing in two very different buildings.)

The solution to this assignment problem still leaves open the question of governance: Should the worker be independent, should he be an employee in one business and a contractor in the other, or should he be an employee in both? To address this question, we follow Wernerfelt (2015) postulate the existence of sub-additive bargaining costs. If adaptations (changes in the plumber’s ideal activities) are needed with sufficiently high frequency, it is most efficient for him to work under a blanket contract in which the “boss” has the right to demand any adaptations she sees fit. In other words, he should be an employee and the two businesses should combine into a single two-business firm. So firms will diversify into businesses that are “related” in two ways: They need the same kinds of labor services and they are similar in the sense that the workers loose little efficiency going from one to the other.

Because the above argument is one of static equilibrium, it does not feature excess capacity and reactions to it. However, it is not hard to make that connection. Depending on how big the advantages of specialization are, a firm may find it profitable to hire a specialist even if it cannot use him in that capacity 100% of the time. (Assuming that the rents are shared between the worker and the firm.) Such a firm will be “good at” the type of services provided by the specialist. If it becomes aware of a new business that meets the two criteria for relatedness, it could well be profitable to add that business to its scope. So a firm that is good at plumbing will (i) be in businesses that use plumbing and are otherwise similar, and (ii) be likely to expand into more businesses like them to the extent that it has excess plumbing capacity. Note that the argument does not depend on the specialist being efficient in an absolute sense, nor on match quality.

While it is possible that maintenance could be a resource for a real estate firm, most applications of the RBV invoke considerably more complex resources. However, most resources can be thought of as originating in groups of employees - a firm may employ a team of scientists or marketers who can work particularly efficiently by specializing in its businesses. The MES argument could readily be expanded to cover such cases if one makes the reasonable assumption that the team in question has a minimum efficient scale. The argument is slightly different in cases, such as loyal customers, in which the resource consists of a name and the associated beliefs of non-employees. First, the use of these resources also have a natural MES: You can only sell so many items to loyal customers and it is not possible to put a brand name on everything (Sappington and Wernerfelt, 1985). Second, any such resource applies better in some businesses than in others, and it is this definition of distance ("relatedness"), rather than that based on the productivity of the individual worker (or group of workers) that determine where the resource will be used. So the firm will want to leverage the resources by using them to sell more kinds of products or services, up to a point, in businesses where the beliefs matter. Third, they may be used "inside" or "outside" the firm, and this choice will again depend on how often the different uses have to be adapted. (For example, a brand name may be licensed or used by employees.) So with distance properly defined, the scope of the firm is also in this case determined by MES of input use and the frequency of adaptation.

Related Literature

The theory of the firm used in the present paper is based on Wernerfelt (2015). The basic idea is that employment contracts give the "boss" the right to demand any one of a large set of services (issue an order) without further negotiation, much as in Simon (1951). So the agreement covers a lot of possible services but is postulated to be less than proportionately costly to negotiate.[1] On the other hand, if needs change infrequently, the parties might want to defer some bargaining costs by engaging in item-by-item negotiations on an "as needed" basis. This "sequential contracting" arrangement is considered in the original papers, but we here focus on the employment vs. market choice.

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[1] In Wernerfelt (2015), this is supported by an implicit contract, but we here assume that the boss is given the right decide through a contract.

More generally, the argument bears a closer relationship to the classical literature on the division of labor. Based on assumptions about MES effects resulting from gains of specialization and indivisibilities, Smith (1965), Stigler (1951), and Rosen (1978) introduce the idea that firms expand to take advantage of gains from specialization. Specifically, we argue that adaptation is costly, and that specialization is the outcome of attempts to economize on adaptation. It is this connection between advantages of specialization and costs of adaptation that allows us to make the linkage to the optimal scope of the firm.

Plan of the Paper

We formulate the base model in Section II, look at an example in Section III, and analyze the model in Section IV. We then characterize the optimal scope of the firm in Section V, and discuss the extent to which it mimics the RBV recommendations in Section VI. Most proofs are relegated to the Appendix.

II. Base Model- Fixed Firm Size

The model covers two time periods, $t = 1, 2,$ and payments are not discounted. There is a set S of services with generic element s, a set W of workers with generic element w, a set E of entrepreneurs with generic element e, and a set B of businesses with generic element b. All four sets are finite and businesses, operated by entrepreneurs, produce output by using workers to perform services. At the start of each period, in a publicly observed randomization, nature divides the entrepreneurs into $|S|$ equally sized sets such that $|E| / |S|$ entrepreneurs will *need* each service in that period.[2] If a needed service is performed by a worker it results in one unit of output, valued at v. A worker can perform any service, but only one per period and production cannot be expanded by performing a needed service more than once, or by performing an unneeded service. All players are risk neutral.

[2] For convenience, we abstract from integer problems (effectively assuming that $|E|$ is a multiple of $|S|$).

In this Section, each entrepreneur has one business (so $|B| = |E|$ for now) and we will say that entrepreneur *e* needs the service that her business needs. It is natural to think of the entrepreneurs as collecting this information, but for now we simply assume that it becomes available at the start of each period. The numbers of workers and entrepreneurs would be endogenous in a general equilibrium model, but we simply assume the relevant markets clear such that $|W| = |B|$.

We endow the model with two frictions: A tradeoff between adaptation and specialization and bargaining costs.

Adaptation versus Specialization.

Production costs depend on an action being adapted to the unique characteristics of the business and the service. We model changes and costs of mal-adaptation in a very simple way. The *type* of business *b* is summarized by its address ε_b, and that of service *s* is summarized by ε_s. No two businesses have the same ε_b and these values are distributed according to a discrete uniform distribution with support on $|B|$ points in $[-\beta, \beta] \subset R$, where it is understood that the extreme types are $-\beta$ and β. Similarly, no two services have the same ε_s and their values are drawn form a discrete uniform distribution with support on $|S|$ points in $[-\varphi, \varphi] \subset R$. All types are public information.

While modelled in one dimension, we think of ε_b as reflecting the competitive environment of business *b* by indicating the best way, in terms of quality, speed, reliability, appearance etc., to perform any service in *b*. Similarly, ε_s can be thought of as indicating the best technology (tools, degree of mechanization, computerization, etc.) with which to perform *s* for any business.

When performing service *s* at business *b* in period *t*, worker *w* ideally wants to adapt to both *s* and *b*, and we model the advantages of adaptation as reduced costs. Specifically, whenever *w* performs *s* for *b* in *t*, the way he works can be summarized by his *approach*, $(a_{wst}, a_{wbt}) \in R^2$, and his effort costs will be $c + |a_{wst} - \varepsilon_s|^\alpha + |a_{wbt} - \varepsilon_b|^\alpha$ in period *t*, where $\alpha > 1$.

We capture the cost of adaptation by assuming that *w* cannot adapt in every period, but has to use fixed approach in the sense that $a_{ws1} = a_{ws2} \equiv a_{ws}$ and $a_{wb1} = a_{wb2} \equiv a_{wb}$. These decisions, which place workers on the $(\varepsilon_s, \varepsilon_b)$ grid, have to be made before business needs for the first period are known. Since an individual business almost certainly will not need the same service in both periods, we will see that a worker best can reduce his expected cost by specializing in a specific business *b'* or a specific service *s'*. So adaptation is difficult and this gives rise to advantages of specialization.

Bargaining cost.

Prices are determined in assemblies that we will call *bargaining bins.* A bargaining bin specifies two sets $(S', B') \in \{0, 1\}^{|S|} \times \{0, 1\}^{|B|}$. By selecting the bin (S', B'), workers and entrepreneurs intend to negotiate a binding contract specifying a single price in exchange for which any of the workers will perform any service in S' for any business in B'. Prominent examples of bargaining bins are (s', B), (s', b'), (S, b') and $(\varnothing, \varnothing)$. We will later associate the first three with global markets, sequential contracting, and employment. Local markets are of type (s', B') but all workers' approach a_{wb}'s and all firms' types e_b's lie in the same subset of $[-\beta, \beta]$. Each worker and each entrepreneur can go to at most one bin per period.

We put no restrictions on the games played inside the bargaining bins except that their outcomes meet three natural conditions: (i) All efficient trades are consummated. (ii) If equal numbers of entrepreneurs and workers arrive at a bargaining bin, they all get strictly positive net payoffs. (iii) Otherwise, players on the long side of a bin get zero payoffs. Both workers and entrepreneurs incur *bargaining costs* $K(|S'|, |P'(S', B')|)/2$, where $|P'(S', B')|$ is the number of worker-entrepreneur pairs in the bin.[3] The function $K(,)$ is increasing and sub-additive in the first argument and decreases, at a decreasing rate, to zero, as the second argument grows.[4]

Strategies.

The strategy of an entrepreneur has two components: In each period she selects a bargaining bin as a function of her type and need in the period $([-\beta, \beta] \times S \rightarrow \{0, 1\}^{|S|} \times \{0, 1\}^{|B|})$. The bin with

[3] If the bin is unbalanced, *P'* is the set of players on the short side.

[4] While this clearly is an unusual premise, it is not unreasonable: Most people prefer not to bargain, but if they have to, would rather bargain once over a $300 pie than 30 times over $10 pies. From a theoretical perspective, this is consistent with the rent-seeking literature (Tullock, 1967). More directly, Maciejovsky and Wernerfelt (2011) report on a laboratory experiment in which bargaining costs are found to be positive and sub-additive.

“no services” is selected in period *2* if a price covering that period’s need has been agreed upon in period *1*.

The strategy of a worker has three components: At the start of period *1* he decides on his approach and in each period he then selects a bargaining bin consistent with his approach ($[-\beta, \beta] \times [-\varphi, \varphi] \rightarrow \{0, 1\}^{|S|} \times \{0, 1\}^{|B|}$). The bin with “no services” is selected in period *2* if a price covering all relevant second period services has been agreed upon in period *1*. Summarizing, the sequence of events is as follows:

0. Entrepreneurs are randomly and permanently matched with businesses. All ε_b, ε_s are realized and publicly observed.

In period *1*:

1. Workers choose an approach (a_{ws}, a_{wb}).
2. Business needs for period *1* are realized and publicly observed.
3. Entrepreneurs and workers distribute themselves into bargaining bins and negotiate as indicated. Entrepreneurs and workers in each bin are randomly matched. Workers perform the agreed upon services.

In Period *2*:

4. Business needs for period *2* are realized and publicly observed.
5. Entrepreneurs and workers may distribute themselves into bargaining bins and negotiate as indicated. Entrepreneurs and workers in each bin are randomly matched. Workers perform the agreed upon services
6. All payoffs are distributed.

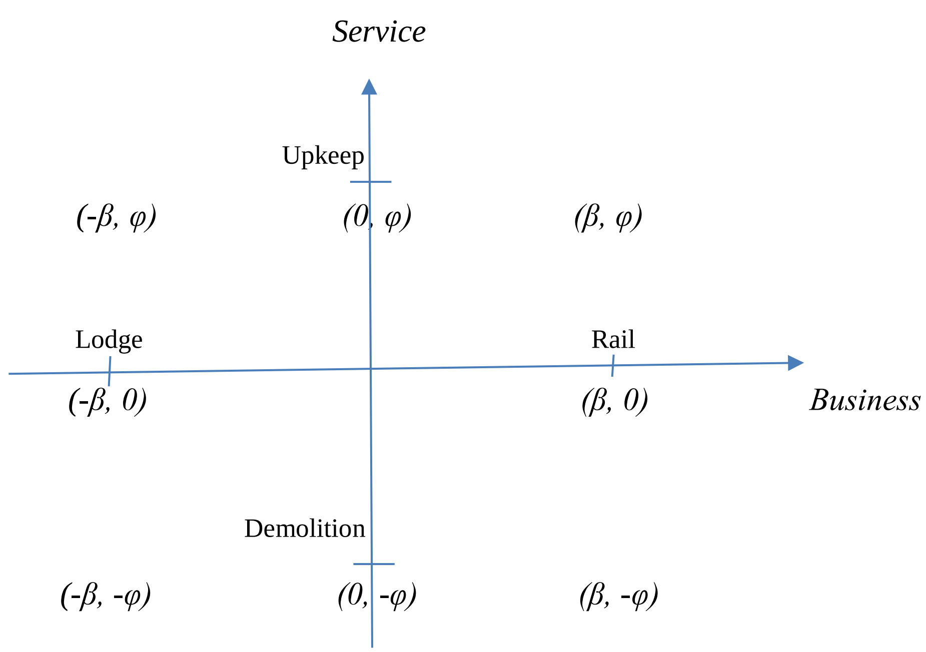
The model is unusual in the sense that some elements that normally are given a lot of attention (such as price determination and small numbers inefficiencies) are entered in reduced form, while things that normally are treated as exogenous (such as the size of markets and the allocation of workers to entrepreneurs) are endogenous. We therefore go through a simple example to allow the reader to become familiar with its workings.

III. Example

We consider an economy with two businesses and two services (and thus two entrepreneurs and two workers). The business types are $-\beta$ and β, while the service types are φ and $-\varphi$, respectively. To fix ideas, we will refer to the businesses as Lodge (left) and Rail (right), the services as upkeep (up) and demolition (down), and the workers as Smith and Jones. The economy is illustrated in Figure 1.

Figure 1

A Two Business - Two Service Economy



(i) Suppose first Smith chooses the approach $(0, \varphi)$, while Jones chooses $(0, -\varphi)$. Because we have assumed that each service is needed by an equal number of businesses in every period, one will need upkeep and the other will need demolition.[5] If Smith works for the business that needs upkeep (type φ), his effort costs are $c + |0 - \beta|^{\alpha} + |\varphi - \varphi|^{\alpha} = c + \beta^{\alpha}$. Similarly, if Jones works for the business that needs demolition, his effort costs are $c + \beta^{\alpha}$. If Smith and the business needing upkeep goes to one bargaining bin while Jones and the business needing demolition goes to another, each player has bargaining costs $K(1, 1)/2$.

To see that the above can be an equilibrium, we use symmetry and look at a period in which Lodge's realized need is upkeep, while Rail needs demolition. Starting backwards with the bins: Given the approaches $(0, \varphi)$ and $(0, -\varphi)$, if Smith goes to a bargaining bin for contracts to do upkeep for either business, Lodge will want to go there as well. Jones then can do no better than going to a bin for contracts to do demolition for either business, and Rail will join him there. Coming to the approaches: If Smith chooses $(0, \varphi)$, Jones can get costs $c + \beta^{\alpha} + K(1, 1)/2$ by choosing $(0, -\varphi)$. Any other choice will give him higher effort cost sand the same bargaining costs. For example, if Jones located at $(0, \varphi)$ as well, he would get negative payoffs from competing to serve Lodge and effort costs $c + \beta^{\alpha} + (2\varphi)^{\alpha}$ if he were to serve Rail.

(ii) Suppose analogously that Smith chooses the approach $(\beta, 0)$, while Jones chooses $(-\beta, 0)$. If Smith works for Rail (type β), his effort costs are $c + |\beta - \beta|^{\alpha} + |0 - \varphi|^{\alpha} = c + \varphi^{\alpha}$. Similarly, if Jones works for Lodge, his effort costs are $c + \varphi^{\alpha}$. By reasoning similar to that above, this can also be an equilibrium.

Coming next to the question of efficiency: Depending on the relative sizes of β and φ, one of these two equilibria have lower effort costs than any other. The bargaining costs are the same if one period contracts are written, but in case (ii) the players also have the option of writing an (employment style) contract in which the worker, in return for a fixed payment, agrees to perform whichever service the entrepreneur asks. The costs of this would be $K(2, 1)$, which is greater than $K(1, 1)$, but the advantage is that the parties can use the same contract in the second period and thus save on bargaining costs then. Because $K(\,)$ is sub-additive, $K(2, 1) < 2K(1, 1)$,

[5] This assumption is obviously not very palatable in small economies.

and the equilibrium in (ii) is more efficient when this contract is written.[6] In sum, the equilibrium in (ii) is more efficient than that in (i) iff $2\varphi^{\alpha} + K(2, 1) < 2\beta^{\alpha} + 2K(1, 1)$.

More generally, it is easy to see that no other approaches give lower average effort costs. Since bargaining costs cannot be lowered either, we see that there are regions in the parameter space in which the equilibria in (i) and (ii) are weakly more efficient than any others.

We now look at the questions of efficiency and equilibrium in a much more general setting.

IV. Analysis

The model has a lot of equilibria because there are many ways to balance the bargaining bins. However, we will be looking for the most efficient sub-game perfect equilibria.

We now define and discuss two particularly interesting classes of equilibria:

Definition: *An Employment relationship is the contract negotiated in a bargaining bin in the class (S, b'), selected by the entrepreneur b' and one worker with approach* $(0, \varepsilon_b')$.

Workers only work for entrepreneurs in whose businesses they are specialists. On the other hand, since they are not specialists in the services they are asked to perform, they can do no better than using the mean approach and thus incur adaptation costs. Because the parties engage in bilateral negotiation over a single price for any service in S, they also incur bargaining costs $K(|S|, 1)$ in period *1*. The expected total (worker plus entrepreneur) costs per period are $c + \sigma_S + K(|S|, 1)$, where $\sum_{j=-\varphi}^{\varphi}(1/|S|)|j|^{\alpha} \equiv \sigma_S$. Workers and entrepreneurs who trade services in an Employment relationship will be called *employees* and *firms*, respectively.

Definition: *A Global Market is a bargaining bin in the class (s', B), selected by the* $|E|/|S|$ *entrepreneurs needing s' in t and* $|E|/|S|$ *workers with approach* $(\varepsilon_s', 0)$.

[6] In Wernerfelt (2015) future costs are discounted such that Sequential Contracting is efficient when needs change infrequently.

Since $|E|/|S|$ is large, there are few if any bargaining costs in global markets and workers only perform services on which they are specialists. In this case the workers are not specialists in the businesses of the entrepreneurs for whom they work and thus incur adaptation costs from using the mean approach. The expected total (worker plus entrepreneur) costs per period will be $c + \sigma_{Bg} + K(1, |W|)$, where $\sum_{j=-\beta}^{\beta}(1/|B|)|j|^{\alpha} \equiv \sigma_{Bg}$.

The above is called "Global Market' because it involves players of all types. In reality, however, most markets have only "Local" participants. Since the forces determining the optimal size of Local Markets have interesting similarities to those driving the optimal scope of the firm, we will now characterize the former.

To define a Local Market, it is helpful to label the business types who need a particular service *s'* in a particular period *t* from lowest to highest as *1* through $|B|/|S|$ and use ε_{bjt} to denote the type of the j'th of these businesses. Furthermore, $a_{bim} = Argmin\ E_{\varepsilon}\sum_{j=i}^{m+i-1}(\frac{1}{m})|\varepsilon_{bjt} - a_b|^{\alpha}$ is the ex ante most efficient approach by a worker who services numbers *i* through *i+m-1* of these businesses and $\sigma_{Bim} = E_{\varepsilon}\sum_{j=i}^{m+i-1}(\frac{1}{m})|\varepsilon_{bjt} - a_{bim}|^{\alpha}$ are the expected adaptation costs associated with this approach.[7]

Definition: *A Local Market of size m is a bargaining bin in the class (s', B_m), selected by m entrepreneurs who need s' and have adjacent types numbered i through i + m - 1 where* $i \in \{1, 2,.., |B|/|S| - m+1\}$, *as well as m workers whose approach equal* (ε_s', a_{bim}).

The bargaining costs are $K(1,m)$ and total costs per period equal $c + \sigma_{Bim} + K(1, m)$.We will henceforth use the term *m-Local Market* to denote a Local Market of size *m*.

Note that a Global Market simply is a $|B|/|S|$ - Local Market. However, depending on how $K(1, m)$ and σ_{Bim} vary with *m*, a Local Market with $m < |B|/|S|$ may be more efficient. The tradeoff is clear: Smaller Local Markets (lower values of *m*) allow a better fit between workers' approaches and business types, but suffer from higher bargaining costs. For example, if bargaining costs are very large for $m = 1$, but otherwise zero, *2*-Local Markets are more efficient than Global Markets.

[7] These depend on *i* because the type distribution is bounded. If $2i + m = |B|/|S| + 2$, the bounds are equally far away from *i* and *i+m-1* and $a_{bim} = 0$.

To look at the optimal size of the Local Market, we first establish that it is interesting to look at firms and Markets in the model, we define "Employment equilibrium" and "*m*-Local Market equilibria" as subgame perfect equilibria in which all trades in the economy take place in these two bargaining bins.

LEMMA: *There exists regions in [v-c, β, φ, $|B|/|S|$, K(,)] where the Employment equilibrium and, for any m > 1, m-Local Market equilibria are weakly more efficient that all other sub-game perfect equilibria of the economy*.

Proof: See Appendix.

Consistent with intuition and casual observation, (Local) Markets are better when the gains from service-specialization are larger, when gains from business-specialization are smaller, and when costs of bilateral bargaining are larger.

OBSERVATION: *The size of the most efficient Local Market, m*, minimizes* $c + \sigma_{Bim} + K(1, m)$. *It is larger when businesses are less diverse, when maladaptation is cheaper, when there are more businesses per service in the economy, and when multilateral bargaining costs grow by a constant factor*.

Proof: See Appendix.

Examples of the first three dimensions may be the degree of differentiation in the market, the distances between businesses, and the difficulties of comparing jobs.

V. The Scope of the Firm

So far, we have kept entrepreneurs' sizes exogenously fixed such that each of them has one business and thus needs one service and one worker in every period. We now look at situations in which each entrepreneur is active in several businesses, defining the scope of her firm as the number of businesses she is responsible for staffing. To make this efficient, we need to define bargaining costs for such situations and make a different assumption about distribution of needs over businesses. Specifically, we need to assume that businesses of similar types sometimes need the same services. We will explain the new assumption through a series of analyses.

Bargaining cost.

The definition $K(|S'|, |P'|)$, which we used in the base model, assumes that bargaining costs are influenced by the number of worker-entrepreneur pairs in the bin. When, as there, each business is operated by a different entrepreneur, the second argument represents the effect of competition. This is no longer the case when negotiation concerns a job in any of several businesses are operated by a single entrepreneur. Using B_e as the set of businesses operated by an entrepreneur, We will therefore define $k_1(|S'|, |B_e|, |P'(S', B')|)$ as the total bargaining costs associated with a contract in which the worker agrees to perform any of S' services in any of B' businesses owned by a single entrepreneur. We assume that $k_1(\ )$ is increasing and sub-additive in the first two arguments, with growth in either eventually converging to zero. So while $K(|S'|, 1) = k_1(|S'|, 1, 1)$, $k_1(|S'|, |B'|, |B'|) \geq K(|S'|, |B'|)$.

The distribution of needs.

Suppose that an entrepreneur has two businesses, b' and b'', and assume that b' first needs service s' and then s'', while b'' first needs s'' and then s'. Two employees can then choose service approaches that make one a service-specialist on s' and the other a service-specialist on s''. Furthermore, they can use the mean business type as their business approach, such that $a_{1s} = \varepsilon_{s'}$, $a_{2s} = \varepsilon_{s''}$, and $a_{1b} = a_{2b} = (\varepsilon_{b'} + \varepsilon_{b''})/2$. If $\varepsilon_{b'}$ and $\varepsilon_{b''}$ are random draws, total expected two-period costs are $2c + \sigma_B + k_1(1, 2, 1)$ per worker, and there are no gains in adaptation costs. However, if $\varepsilon_{b'}$ and $\varepsilon_{b''}$ are close to each other, say adjacent, $2|\varepsilon_{b'} - (\varepsilon_{b'} + \varepsilon_{b''})/2|^{\alpha} < \sigma_B$. So depending on the relative magnitudes of $k_1(1, 2, 1)$ and $K(2,1)$, the larger firm may well be more efficient.[8]

Motivated by this example, we will assume that an entrepreneur can find any number of adjacent businesses, call n, and a set of γn services each of which will be needed by one of the businesses

Now label the businesses in the economy in order of increasing types such that $\varepsilon_b = -\beta + 2\beta(b-1)/(|B|-1)$. To keep things simple, we assume that the $(1-\gamma)n$ non-specialists are hired as employees and that the employment contracts are negotiated on a one-by-one basis. If we consider a firm of the kind described above, the total two period payoffs are then

[8] To the extent that the entrepreneur collects information about the needs, one could imagine that she would incur higher costs/use helpers in a larger firm, but we will not consider that here.

$$(1) \qquad n[v - c - (1-\gamma)k_1(S, n, 1)/2 - \gamma k_1(1, n, 1)/2 - (1-\gamma)\sigma_S/2]$$
$$- \beta\textstyle\sum_{b=1}^{n} |n+1-2b|^{\alpha}/(|B|-1).$$

To evaluate the behavior of this expression as *n* grows, it is easiest to consider steps of size 2. Since $k_1(1, n, 1)$ eventually will be constant for large *n*, the first term in the expression will exhibit roughly linear growth. In contrast, every time *n* goes up by *2*, the sum in the second term will add a larger and larger component at each extreme. The second term will thus exhibit more than linear growth and the marginal gains from growing the firm will eventually decline.[9]

So we have shown:

PROPOSITION: *The optimal scope of the firm is a set of adjacent businesses. It is increasing in profitability (v-c) and the extent to which the same services are needed in adjacent businesses (γ). It is decreasing in the diversity of businesses in the economy (β), the bargaining costs associated with employment in multi-business firms ($k_1(S, n)$), and the magnitude of adaptation costs (α).*

The result suggests that costs increase with the extent of inter-industry diversification, in line with empirical results (Montgomery and Wernerfelt, 1988; Wernerfelt and Montgomery, 1988). They also suggest that a firm enter businesses that, on important attributes, are as similar as possible to those the firm already is in (Montgomery and Hariharan, 1991; Atalay, Hortacsu, and Syverson, 2014).

VI. Conclusion

The determinants of the scope of firms can be described in terms of a simple tradeoff between bargaining inefficiencies and adaptation costs (advantages of specialization). We will now argue that the central normative implications of the model are strongly reminiscent of those stressed in the literature on the RBV. The argument is simple and we will make it in three bullet points.

[9] Note that the sum in *(1)* reduces to $|B|\sigma_B$ when $n = |B|$. So the assumption suggests that, except for differences in bargaining costs, a single economy – wide firm performs exactly as the same set of single business firms.

(i) The concept of excess input capacity, which is so central to the RBV recommendations about diversification, is predicated on the existence of lumpiness, or more generally MES, in utilization of the input (the "resource").

(ii) Contingent on a resource, we can define concept of distance (inverse "relatedness") between two businesses (industries) by the extent to which the resource loses efficiency if it is put to use in both businesses as opposed to in just one of them.

(iii) In each business, the resource can be used by employees or non-employees ("rented out") depending on the frequency with which a contract would have to be renegotiated.

Apart from reconstructing the RBV recommendations about diversification, this micro-foundation makes at least two more nuanced predictions: That the definition of relatedness depends on a resource, and that not all resources have to be leveraged "inside" the firm.[10]

[10] The RBV literature often seems to use a universal concept of relatedness and typically assumes that any resource is leveraged "inside" the firm.

APPENDIX: PROOFS

LEMMA: *There exists regions in [v-c, β, φ, $|B|/|S|$, K(,)] where the Employment equilibrium and, for any m>1, m-Local Market equilibria are weakly more efficient that all other sub-game perfect equilibria of the economy*.

Proof: Using that all unbalanced bargaining bins give the long side zero payoffs**,** there clearly exists an equilibrium in which all active bargaining bins are Employment. Furthermore, if we assume that $|B|/|S|$ is a multiple of *m* (which we can do since we are concerned with existence only), then for any *m>1* there exists an equilibrium in which all active bargaining bins are *m*-Local Markets. For future reference we also recall from the text in the body of the paper, that the per period per worker costs of Employment, Global Markets, and *m*-Local Markets are

(A1) $$c + \sum_{j=-\varphi}^{\varphi}(1/|S|)|j|^{\alpha} + K(|S|, 1),$$

(A2) $$c + \sum_{j=-\beta}^{\beta}(1/|B|)|j|^{\alpha} + K(1, |W|),$$ and

(A3) $$c + E_{\varepsilon}\sum_{j=1}^{m+i-1}\left(\frac{1}{m}\right)|\varepsilon_{bjt} - a_{bim}|^{\alpha} + K(1, m),$$

respectively.

Looking first at Employment, it is clear that costs will be weakly lower than those in any other equilibrium as $\varphi \to 0$ and $K(|S|, 1) \to 0$.

It is more involved to make the case for *m*-Local Markets. Since *m* can take a finite number of values, there is clearly one, call *m**, for which *(A3)* is minimized. Now assume that φ is very big while β is very small. So it is very expensive to switch from one service to another and the most efficient equilibria involve service specialists.

Fix a value of *m*, say *m'*, and consider the approaches $a_{bim} = Argmax E_{\varepsilon}\sum_{j=1}^{m+i-1}\left(\frac{1}{m}\right)|\varepsilon_{bjt} - a_{bim}|^{\alpha}$ in *(A3)*. These depend on *i* because the type distribution is bounded by $-\beta$ and β. If $2i + m = |B|/|S| + 2$, the bounds are equally far away from *i* and *i+m-1* and $a_{bim} = 0$, or the mean of the prior type distribution in the Local Market consisting of the *m'* middle types. However, close to the bounds, the optimal approaches are not equal to the prior means in the corresponding Local Markets and the expected loss may be larger. Suppose therefore, that $|B|/|S|$ grows very large relative to *m'*. In this case two things happen: The fraction of Local Markets in which the approaches differ from the above-mentioned means by more than a set amount declines (since fewer are close to the boundaries) and the distances in all Local Markets shrink (as we are holding β fixed). So by letting $|B|/|S|$ grow, we can make the term $E_\varepsilon \sum_{j=1}^{m+i-1} (\frac{1}{m}) | \varepsilon_{bjt} - a_{bim} |^{\alpha}$ arbitrarily small. If we also assume that $K(1, m) = 0$ for $m \geq m'$ and positive for $m < m'$, no other subgame perfect equilibrium can be more efficient than the *m'*-Local Market equilibrium. Q.E.D.

OBSERVATION: *The size of the most efficient Local Market, m*, minimizes* $c + \sigma_{Bim} + K(1, m)$. *It is larger when businesses are less diverse, when maladaptation is cheaper, when there are more businesses per service in the economy, and when multilateral bargaining costs grow by a constant factor.*

Proof: The formula is derived in the text. Using standard super modularity arguments, the first three comparative statics come from the directions in which the corresponding derivatives of σ_{Bim} vary with *m*, and the last from λ in $\lambda K(1, m)$. Q.E.D.

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