**EMPLOYMENT, MARKETS, CONTRACTS, AND THE SCOPE OF THE FIRM**

by

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**Abstract**

We look at the economic functions of firms, markets, and contracts, and characterize the optimal scope of the firm. Governance structures appear as equilibria and are compared in terms of production costs - determined by a tradeoff between standardization and adaptation, - and bargaining costs – sometimes incurred when new prices have to be agreed upon. Under natural conditions, employment, markets, or sequential contracting weakly dominate all other equilibria. As firms become larger, gains from standardizing come at the cost of increasingly poor adaptation, ultimately bounding their scope. The model rests on standard assumptions, is consistent with the managerial literature on the scope of the firm, and makes predictions based on factors that do not play a role in contemporary theories of the firm.

**I.** **INTRODUCTION**

The advantages of specialization and the role of markets in supporting it have played a central role in economic reasoning at least since Adam Smith. A more recent, but still old stream of work has compared employment and contracts in terms of their adaptive properties (Coase, 1937; Simon, 1951). We draw on both of these traditions to develop a unified theory in which different governance structures emerge as equilibria. Specifically, we find conditions under which employment, markets, or sequential contracting weakly dominate all other equilibria, characterize the types of services, entrepreneurs, and workers for which each is most efficient, and give an explicit formula for the optimal scope of the firm.

To get an intuitive sense of the argument, suppose that a business needs a worker for a specific service. (For example, an apartment building has to have a bannister fixed.) We will be interested in two aspects of the situation: Which experiences should the ideal worker have, and how should the parties agree on compensation? As the demands of a job vary with the business and the service, gains from specialization mean that workers who have experience with either will do better. (Carpenters and superintendents, respectively, are examples of these two types of workers.) The ways in which compensation can be agreed upon depend on the type of worker best used. Service-specialists will work for a new business in every period and have the ability to sell their labor in a larger market. Business-specialists will work for the same business in every period and can thus be on a single long term - or a series of short term contracts. Since bilateral bargaining is costly, the relative attractiveness of these two types of contracts depends on the frequency with which needs change.

While adaptation is good, change is costly. Workers are best when they can approach every task in a standard way: Consistently going for the same objective such as high speed, low cost, or perfection. So the most efficient workers will perform the same service for the same business in every period: Perfect adaptation to both service and business with no changes from period to period. This creates incentives to grow the business to the point where it can employ such service-specialists (as when very big landlords have their own carpenters). If the opportunities for such growth are limited, some “different but similar” businesses can combine and use a service-specialist whose standard way of doing things is imperfectly adapted to the businesses, but still not too far off.[[2]](#footnote-2) (Property companies with a mixed portfolio of real estate.) The scope of the firm is determined by the point at which the resulting mal-adaptation becomes too severe.[[3]](#footnote-3) (It may not be appropriate to use the same approach to carpentry in a barn and a high end office building.)

The argument is simple and yet different from those in the recent literature. First, it does not depend on non-standard assumptions such as behavioral biases, bounded rationality, heterogeneous beliefs, or the distinction between observability and verifiability.[[4]](#footnote-4) Secondly, the predictions of the model turn on forces that play limited roles in economic theories of organization: Markets are preferred over bilateral trading for services that are in less demand and require less local learning, while employment is more efficient than sequential contracting when needs change more frequently. Third, the considerations involved in determining the optimal scope of the firm are the same as those highlighted in the managerial literature on the subject.

We first look at a model in which services, workers, and businesses are statistically identical and all trades thus are governed in the same way. We find weak conditions under which three classes of equilibria, suggestively labeled as the “Market”, “Employment”, and ”Sequential Contracting”, weakly dominate a large class of alternatives. (1) In the “Market” equilibrium, entrepreneurs trade with service-specialists who can meet their needs at low costs. The Market functions without bargaining costs, but a since workers have to be ready to serve many different entrepreneurs, their standard way to approach a service may be quite poorly adapted to some customers. (2) In the “Employment” equilibrium, an entrepreneur-worker pair agrees once-and-for-all on all components of a trading relationship. So there is only one round of bargaining, but since the worker has to be ready to perform many very different services, his way of doing things may fit some of them rather badly. (3) In the ”Sequential Contracting” equilibrium, the two players agree to maintain a relationship for a while, but renegotiate each time the entrepreneur needs a new service. Used instead of Employment when adaptations are infrequent, it is subject to the same pros and cons. In particular, the worker becomes a business-specialist.

The paper links the classical literature on the division of labor with some strands of the modern literature on the theory of the firm. The former literature has considered the effects of specialization and indivisibilities (Smith, 1965; Stigler, 1951; Rosen, 1978, 1983), and Becker and Murphy (1992) introduce the idea that firms expand to take advantage of gains from specialization. However, to the best of our knowledge, the present paper is the first to identify the optimal governance structures in a model with advantages of specialization.[[5]](#footnote-5) Compared to the works of Oliver Williamson (e.g. 1985), the paper relies on a much smaller set of forces, all of which can be given a standard micro-foundation.[[6]](#footnote-6)

The contrast between the perspective proposed here and other micro-founded theories of the firm is sharpest for large firms. We bound the scope of the firm by showing that it eventually becomes too unfocused and thus loses the advantages of standardization. This has more face validity than many other proposals. For example, a merger between two Fortune 500 firms should give rise to more costs than one more person having poor incentives (Grossman and Hart, 1986) or one more employment contract needing to be negotiated (Wernerfelt, 2014).

Unlike the Property Rights Theory, the argument here treats vertical and horizontal integration as driven by two different forces. The model defines the firm by the employment relationship and one firm is part of another if one top-manager is an employee of the other. The prediction is then that the attractiveness of vertical integration depends on the frequency with which needs change and the relative advantages of business- and service-specialization.

There role of asset ownership is also different*.* The present analysis does not depend on assets or holdup, but the nature of the employment relationship has direct implications for asset ownership. Specifically, one could argue that the boss should own most productive assets since his decisions typically are the main determinant of their rates of depreciation.[[7]](#footnote-7)

In terms of topic, Spulber (2009) is the closest analogue to the present paper. He defines firms and markets differently, but the aim is the same: To develop a theory in which they appear endogenously. Spulber’s theory depends on the existence of transactions cost but admits all kinds and does not depend on their exact make up. For example, he defines the firm as an entity that maximizes a different objective and thus behaves differently from other actors in the economy. The question raised in the present paper, whether workers are employees, is of secondary importance and the theory just needs employees to be used whenever it is cheaper (Spulber, 2009, p. 247). We are here interested in understanding when it is cheaper to use employees. So the two theories are complementary in the sense that we here look at the components of transaction costs while he looks at their implications. On a more methodological level, the present paper is driven by differences in costs of adaptation and standardization across periods, while Spulber’s argument can be made in a static model.

We formulate a workhorse model and use it justify the focus on Markets, Employment, and Sequential Contracting in Section II. In Section III, we look at different kinds of heterogeneity and characterize the market and employment sectors of an economy. The optimal scope of the firm and the allocation of talent in the economy are characterized in Sections IV and V, while further research is discussed in Section VI. All proofs are relegated to the Appendix.

**II. WORKHORSE MODEL – FIXED FIRM SIZE**

The model covers three time periods, *t = 0, 1, 2,* though period *0* is used for initialization only. A unit payment in period *2* is worth *δ ∈ (0, 1)* in period *1,* and we will interpret larger values of *δ* to imply that changes are more frequent*.* There is a set *S* of services with generic element *s,* a large set *W* of workers with generic element *w,* a set *E* of entrepreneurs with generic element *e*, and a set *B* of businesseswith generic element *b.* All players are risk neutral. Entrepreneurs use workers to perform services thereby producing output in different businesses. In each period, every business *needs* a single service which, if performed by a worker, results in one unit of output, valued at *v.* In this Section, each entrepreneur has one business (so │*B*│*=*│*E*│ for now) and we will say that entrepreneur *e* needsthe service that her business needs. 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*│*=*│*E*│. Workers and entrepreneurs are randomly paired up in period *0.* We endow the model with two frictions: A tradeoff between adaptation and standardization and bargaining costs.

*Adaptation versus Standardization.* 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. Production costs depend on an action being adapted to three factors: The unique characteristics of the business, those of the service, and the action taken in the previous period. So to efficiently provide a specific service for a specific business, a worker has to adapt to both and at the same time try to make use of his experiences from previous periods.

We model changes and costs of mal-adaptation in a simple, yet rich, way. Specifically, at the start of each period, nature randomly divides the entrepreneurs into │*S*│ equally sized sets such that │*E*│ /│*S*│ entrepreneurs will need each service in that period. The unique characteristics of business *b* are summarized in the random variable ε*b ∈ R,* and those of service *s* are summarized byε*s∈ R*. These variables are drawn from distributions with zero means and variances *σB2* and *σS2*, respectively. To perform service *s* at business *b* in period *t*, worker *w* has to decide on a *level, qwt ∈ R,* and his effort costs will be *c + (qwt–* ε*b –* ε*s)2* in the period*..* However, if the worker *standardizes* in the sense that *qw1* = *qw2* = *qw,* his effort costs will be *c\* + (qw –* ε*b –* ε*s)2* in the second period.[[8]](#footnote-8) So optimally chosen standardization results in lower total costs unless the businesses and/or services differ a lot between periods *1* and *2*. To keep the exposition uncluttered, we focus on cases in which workers always standardize by assuming that *c\* < c –MAX {σB2, σS2}(1 +δ )/ δ.[[9]](#footnote-9)* We also assume that *c + σB2* *< v,* which will imply that production is ex ante profitable.

While a worker has to decide on the level at which to standardize in the first period, he typically cannot choose the optimal level because the future needs of individual entrepreneurs are ex ante unknown. Combined with the fact that the ε*b* andε*s* vectors are ex ante unknown, this means that he has to rely on expectation rather than actual values. However, any worker who has worked for *e* will know ε*b*in all of *e*’s businesses (here just one) in the next period. Similarly, if a worker has performed service *s* for any business*,* he will know ε*s* in the next period*.[[10]](#footnote-10)* So a worker can reduce adaptation costs by specializing on a single business or a single service. Workers knowing a *(*ε*s*, ε*b)* pair will be called *service-specialists* on service *s* and *business-specialists* on business *b*.

*Remark.* We can interpret *σB2* and *σS2* as advantages of business- and service-specialization, respectively. They can be seen as costs of learning about new businesses or services, or they can be seen as costs of mal-adaptation. Suppose that a worker expects to perform service *s’* in business *b’* in period *1* and that he expects to perform the same service, but for a new business *b”*, in period *2.* If he standardizes at *qw = 0 +* ε*s’*, his expected total effort costs will be *c + δc\* + (1 + δ)σB2.* Similarly, if he expect to perform a new service *s”* for the same business in period *2,* hemay standardize at *qw =* ε*b’ + 0,* and have expected total effort costs *c + δc\* + (1 + δ)σS2.* ▄

*Bargaining cost.* The players may make binding agreements specifying that a particular price will be paid for an individual service or more generally for any service in a subset of *S.* Since *S* is so big that a complete contingent claims contract is infeasible, we make the extreme assumption that contracts can specify a single price only. The terms of all agreements are reached through bargaining. When a set of entrepreneurs and a set of workers bargain, we will say that they are in the same *bargaining bin.* For example, a bargaining bin can contain all service-specialists on *s* and entrepreneurs needing *s* or it can contain a single entrepreneur and the worker who is a business-specialist in her business. As mentioned above, the members of a bargaining bin may agree on a single price covering any element in a set on services. Each player comes into the bargaining bin wanting to negotiate a price for a certain set of services and he or she will negotiate with all other players who come into the bin wanting negotiate over the same set. We make the following assumption about bargaining outcomes: If equal numbers of entrepreneurs and workers bargain over a price, the outcome gives each of them the same expected payoff.[[11]](#footnote-11) Otherwise, players on the long side of the bin get zero payoffs.

If negotiations are bilateral, both worker and entrepreneur incur *bargaining costs*. These costs are sub-additive in the cardinality of the set covered by the price. Let *S’* be a subset of *S.* If a worker-entrepreneur pair makes an agreement of the form “I will pay you this for any one of the services in *S’*”, each incur bargaining costs *K(*│*S’│)/2*, where *K(*│*S’│)* is positive, increasing, sub-additive, and reaches its maximum*¯K* at│*SK│*< │*S│*.[[12]](#footnote-12) It will be convenient to use *K* to denote *K(1)*. To rule out a perhaps less interesting case in the following, we assume that *(1/4+ δ)σB2 > δK.*[[13]](#footnote-13)

*Institutions*. Papers studying institutions in bilateral trade (such as employment and contracts) typically search for the most efficient mechanism and proceed to postulate that it is chosen. Since we here have embedded bilateral trades in a larger market, we can make refine the argument a bit and describe the institutions as equilibria.

When │*W*│*=* │*B*│*=*│*E*│, the strategy of an entrepreneur has the following components:[[14]](#footnote-14)

- A first period entrepreneur sorting rule *S → {1, 2, .. │E│}* which places the entrepreneur in a bargaining bin as a function of her first period needs.

-A first period contracting rule *{1, 2, .. │E│} → {0, 1}│S│* specifying the set of services for which she will negotiate a price.

- A second period entrepreneur sorting rule *S → {1, 2, .. │E│}* which places the entrepreneur in a bargaining bin as a function of her second period needs.

-A second period contracting rule *{1, 2, .. │E│} → {0, 1}│S│* specifying the set of services for which she will negotiate a price.

The strategy of a worker has the following components (assuming that he is standardizing):

-A first period worker sorting rule *E x S → {1, 2, .. │E│}* which places the worker in a bargaining bin as a function of his period *0* assignment.

-A first period contracting rule *{1, 2, .. │E│} → {0, 1}│S│* specifying the set of services for which he will negotiate a price.

-A rule *R2→R* specifying the level at which he standardizes his services as a function of his period *0* assignment.

-A second period worker sorting rule *E x S → {1, 2, .. │E│}* which places the worker in a bargaining bin as a function of his period *1* assignment.

-A second period contracting rule *{1, 2, .. │E│} → {0, 1}│S│* specifying the set of services for which he will negotiate a price.

The sequence of events is as follows:

1. Each entrepreneur is randomly and permanently matched with a business. Workers and entrepreneurs are randomly matched. All ε*b*, ε*s* are realized.
2. Business (entrepreneur) needs for period *0* are realized. Workers learn the ε*b* of the business with which they are matched and the ε*s* of the service it needs.

In period *1*:

1. Business needs for period *1* are realized.
2. Entrepreneurs and workers distribute themselves into bargaining bins.
3. The players in each bin may negotiate a price applying to any element in a set of services.
4. Entrepreneurs and workers in each bin are randomly matched.
5. Workers choose the levels *qw* on which they standardize.
6. Workers perform the agreed upon services and learn the associated ε*b*, ε*s*.

In Period *2*:

1. Business needs for period *2* are realized.
2. Entrepreneurs and workers may distribute themselves into bargaining bins.
3. The players in each bin may negotiate a price applying to any element in a set of services.
4. Entrepreneurs and workers in each bin are randomly matched.
5. Workers perform the agreed upon services (and learn the associated ε*b*, ε*s*).
6. All payoffs are distributed.

Note that there are a lot of equilibria because a player will earn no surplus if he or she uses a different strategy than everybody else. (Since all the deviations result in zero payoffs because the deviator either does not trade or enters a bargaining bin on the long side). However, we will be looking for the most efficient sub-game perfect equilibria.

Four types of costs are incurred in this model (assuming that all workers standardize): Costs of lost production, costs of not being a specialist in a particular business or service, and bargaining costs. Production is lost when workers are idle, adaptation/learning costs are incurred to the extent that workers change to different entrepreneurs and services, and bargaining costs are incurred if worker-entrepreneur pairs stay together.

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

*An equilibrium is a Market if all bargaining bins consist of │E│ entrepreneurs needing the same service as well as │E│ workers who are service-specialists on it, and the members negotiate a price for that service only.* There are no bargaining costs in markets and workers only perform services on which they are service-specialists. On the other hand, since they are not specialists in the business of the entrepreneurs for whom they work, they incur adaptation costs. Specifically, if the service characteristic is ε*s*, the worker will standardize on *qw =* ε*s +0* and the expected value of total costs will be *c + δc\* + (1 + δ)σB2*. We will use the term *professionals* as shorthand for workers who sell their services in the Market equilibrium.

*An equilibrium is Employment if all period 1 bargaining bins consist of one worker and the entrepreneur for whom he worked in period 0, and the members negotiate a single price for all services.* (So there is no need to ever bargain again.) In this case, workers only work for entrepreneurs in whose businesses they are specialists. So the workers incur bargaining costs*¯K* in period *1.* The expected total (worker plus entrepreneur) costs are *c+ δc\* + (1 + δ)σS2 +¯K*. Workers and entrepreneurs who trade services in the Employment equilibrium will be called *employees* and *firms,* respectively.[[15]](#footnote-15)

*An equilibrium is Sequential Contracting if all bargaining bins consist of one worker and the entrepreneur for whom he worked in period 0, and the members negotiate a price for the service needed by the entrepreneur in the current period.* This is similar to Employment except that the members of a bargaining bin negotiate twice, but each time over a price for a single service. The expected total costs are *c + δc\* + (1 + δ)(σS2 + K)*. Workers who sell their services in the Sequential Contracting equilibrium will be called *contractors*.

**PROPOSITION 1:** *There exists three regions in [σB2, σS2,¯K, K, δ] where Markets, Employment, and Sequential Contracting are weakly more efficient that all other sub-game perfect equilibria*.

**Proof:** See Appendix.

Consistent with intuition and casual observation, the Market is better when the gains from service-specialization are larger, when gains from business-specialization are smaller, and when bargaining costs are larger. Employment is better than Sequential Contracting when trade is frequent.[[16]](#footnote-16) This is illustrated in Figure 1 below.

Figure 1

Most Efficient Equilibria by Frequency of Change and Relative Gains from Specialization

*σB2 – σS2*

*Sequential Contracting*

*Employment*

*Market*

*δ*

Some possible empirical implications of this are that professionals are more likely to perform services requiring more education, that less work will be performed inside firms in areas where differences between firms are smaller, and that needs subject to frequent change are more likely to be met by employees.

Since the workhorse model is based on ex ante identical services, workers, and entrepreneurs, all workers will use the same strategy as will all entrepreneurs. We now introduce different kinds of heterogeneity to look at economies with both market and employment sectors.

**III. COMPOSITE EQUILIBRIA**

We label Market, Employment, and Sequential Contracting as *elementary equilibria* and look for the most efficient *composite equilibrium* to govern an economy with heterogeneous services, workers, and/or entrepreneurs*.* To keep things simple,we assume that *(1+ δ)K >¯K* and thus focus on the choice between Market and Employment. In a *composite equilibrium with Market and Employment* each worker chooses an elementary equilibrium in which to sell his services and each entrepreneur decides which services to source from which elementary equilibrium.

The workhorse model can be enriched with many different types of heterogeneity, and we will only look at a few. To balance supply and demand while keeping the model simple, we make strong distributional assumptions. However, given those, the proofs are simple and thus omitted. Suppose, for example, that half of all services have high learning costs,*¯σS2*, while the other half have low learning costs, *σS2*, where *σB2* < *σS2 +¯K/(1 + δ)* <*¯σB2.* If half of all businesses only need high learning cost services and the other half only need low learning cost services, the former will use employment and the latter will use the market. Similar arguments can be made for heterogeneous *σS2* and *δ.* So we have:

**FINDING 1:** *Suppose that σS2, σB2, and δ differ between services and businesses: Under appropriate distributional assumptions, the Market is used for those services for which service-specialization is more important than business-specialization and Employment is used for frequently changing services.*

Similarly if these parameters differ appropriately between workers:

**FINDING 2:** *Suppose that σS2, σB2, and δ differ between workers and businesses: Under appropriate distributional assumptions, the Market is used by workers for whom gains from service-specialization are more important than gains from business-specialization and Employment is used by those who can finish services quickly.*

While these results are very similar to those in Proposition 1, we can get a new insight by looking at simultaneous heterogeneity in the demand for services and the efficiency of workers. For example, suppose that equal numbers of workers (│*W*│ /│*S*│) learn each *εs* in period *0,* while demand in periods *1* and *2* differs between services. For example, suppose that *SL* is two-thirds of all services and assume that half of the businesses only need services from *SL* while the other half only need services from *S\SL.* Suppose furthermore that workers have different costs such that cost *cw* differs randomly between different *w*s. The market price for low demand services would then reflect only the costs of the more efficient service-specialists, and thus be lower than that for high demand services. This will make it more attractive for entrepreneurs to source from the Market.

**FINDING 3***: Assume that demand differs between services and businesses and that costs differ between workers: Under appropriate distributional assumptions, the needs for the services with smaller demand will be met in the Market, while services with the higher demand will be performed by Employees.*

We can look at the effects of trade by comparing our economy with one in which workers and entrepreneurs are isolated into two clusters that are unbalanced in the sense that the number of entrepreneurs with a certain need and the number of service-specialists on that service are different. In this case, some service-specialists in the two-cluster economy cannot sell their expertise in the market in every period and instead have to perform a variety of different services as employees. So trade agreements may lead to more Market governance.

**FINDING 4**: *If barriers between initially unbalanced clusters are reduced, weakly more workers become professionals and weakly fewer remain employees.*

Beyond increasing specialization, trade also affects the elementary equilibria through which workers sell their labor. Specifically, the making of tariff agreements and the emergence of trains, cars, and electronic communication should cause a shift towards market governance.

**IV. 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. To keep the formulae uncluttered, we assume that *δ = 1*.

Suppose that an entrepreneur has two businesses, *b’* and *b”,* such that *b’* first needs service *s1* and then *s2*, while *b”* first needs *s2* and then *s1.* Two employees, a service-specialist on *s1* and a service-specialist on *s2*, can standardize on the mean business characteristic, *qe* = ε*s* + *(*ε*b’ +* ε*b”)/2.* If ε*b’* andε*b”* are random draws, expected total costs are *c + c\* + σB2 +¯K* per worker, but as │ε*b’ -* ε*b”│*→ 0, costs decrease to *c + c\* +¯K*. So we can define “similarity” by the difference between the ε*b*s, to get:

**FINDING 5**: *Entrepreneurs prefer to enter businesses that are as similar as possible.*

To find the optimal scope of firms, it is convenient to look at a case with a continuum of businesses in which the ε*b*s are uniformly distributed on *[0, 1].[[17]](#footnote-17)* We assume that the needs of the businesses are balanced in the sense that an entrepreneur can meet all needs from *n* businesses by hiring *n* service-specialists as employees, where *n∈ [0, 1].*

**PROPOSITION 2:** *The entrepreneur maximizes profits at n = MIN{2½(2v – c – c\* -¯K)½, 1}and the optimal scope is an interval.*

**Proof:** See Appendix.

As an entrepreneur grows her enterprise, her businesses become less similar, eventually eroding the efficiency advantages.

*Remark.* While the arguments made here rely on different forces than those used in recent theories of the firm, they are consistent with the managerial literature on corporate diversification. In particular, the incentives to expand and yet stay in businesses that are as similar as possible are reminiscent of prescriptions from the very influential “Resource-Based View of the Firm” (Barney, 1991; Wernerfelt, 1984). One cornerstone of this literature is that firms should expand their scope to leverage excess capacity of productive resources - thereby eliminating this excess. In Edith Penrose’s (1959) original formulation of this idea, the excess capacity is tied to the time of individual managers; much like the above argument is driven by the efficiency gains from fully utilizing service-specialists as employees. The other cornerstone of this literature is that firms should be concentrating on “what they are good at”, and thus stay in similar businesses.

Taking the correspondence further, one could possibly think of the decision to standardize on the mean business characteristic, *qe* = ε*s* + *(*ε*b’ +* ε*b”)/2,* as the “management strategy” of the firm. This is often articulated in broad guidelines such as “Do what helps the brand the most” (Gucci), “Quality is job one” (Ford), or “What would Sam have done?” (Wal-Mart). If followed, these guidelines systematically bias actions in a particular direction and allow the workers to follow efficient standard operating procedures. ▄

If *v* is determined by the cost of generalist employees, *2v - c - c\** can be seen as a measure of the gains from specialization. Since the scope of the firm is larger when these gains are larger, the model turns on its head Adam Smith’s famous intuition about gains from specialization and markets.

The results suggest that costs decrease with volume within an industry, but increase with the extent of inter-industry diversification, in line with empirical results (Hortacsu and Syverson, 2007; Atalay, Hortacsu, and Syverson, 2013; 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).

**V. THE ALLOCATION OF TALENT**

Assume that some workers benefit more from specialization than others, such that worker *w’*s period *2* cost when standardizing, *cw\*,* is drawn from a distribution with support *[c\*, c\* + 1],* and consider a specific service*.* The total two-period costs if *w* is a service-specialist employee, a generalist employee, and a professional are *c + cw\*+¯K, 2c +2σS2+¯K,* and *c + cw\* + 2σB2,* respectively*.* The social return to lower *cw\** is the same for service-specialist employees and professionals, but*,* the former create more surplus when*¯K < 2σB2*. Since the stronger worker types can offer entrepreneurs more, the most (second most) efficient workers will work as service-specialist employees and the second most (most) efficient group will then be market professionals, if *¯K < (>) 2σB2.* In any case, generalist employees come last.

More completely, for this model we have

**FINDING 6:** *There exists an equilibrium in which*

1. *If¯K < 2σB2, entrepreneurs use service-specialist employees when possible.*
2. *If¯K > 2σB2, entrepreneurs use professionals when possible.*

The first part of this prediction appears to contrast with that of Garicano (2000). In his model, legal skills are ordered along a single dimension and the best lawyers perform the most difficult services. If we make the additional assumption that the most difficult problems come up infrequently, the best lawyers will work as professionals rather than in firms. In the present model, there are entrepreneurs with full-time needs for each skill. Assuming that condition *(a)* holds, service-specialist employees will be the best lawyers in areas of law in which many firms use them. However, in those branches of law in which only very large firms can sustain service-specialists as employees, the best lawyers work in law firms. (See also Finding 3.)

The Finding could be applied to an individual worker and used to make predictions about career paths. It explains why more focused firms employ service-specialist labor, such as lawyers and plumbers, while more diverse firms hire professionals on a case-by-case basis.

**VI. CONCLUSION**

We have characterized the use of markets, employment, and sequential contracting, as well as the services, workers, and entrepreneurs for which each is most efficient. Many of the predictions are easily testable and factors like the advantages of specialization, the frequency of change, the magnitude of demand, and the size of firms, are particularly interesting since they do not appear in contemporary economic theories of organization. On the other hand, the factors determining the optimal scope of the firm are strongly reminiscent of those stressed in the management literature.

In terms of future research, the workhorse model is deliberately very simple and can easily be extended in any number of directions. One could, with very little effort, look at multiple categories of needs, complementarities between needs, investments in physical assets, investments in skill, and incomplete information. A more difficult, but seemingly doable, extension is to cast the model in a general equilibrium setting.

A less direct extension would be to look at the economy’s ability to absorb various shocks. The fixed up front cost of employment makes it less responsive to demand than the market (Rosen, 1968). Anticipating problems in case of a negative shock, entrepreneurs may thus be reluctant to invest in hiring, preferring instead to fill in with professionals. The workhorse model in the present paper cannot be used to investigate this in any detail, but it is conceivable that a suitable extension could contribute some foundations to the study of labor demand over the business cycle.

**APPENDIX: PROOFS**

**PROPOSITION 1:** *There exists three regions in [σB2, σS2,¯K, K, δ] where Markets, Employment, and Sequential Contracting are weakly more efficient that all other sub-game perfect equilibria*.

**Proof:** We first show that we can confine attention to two types of bins: Those with one pair in which the worker is a business-specialist in the business, and those with *│E│* pairs in which the workers are service-specialists in the service needed by the entrepreneurs.

*Unbalanced*bargaining bins, with unequal numbers of workers and buyers, are inefficient, since they imply that some production is lost and *v – c >* *σB2.* Among balanced bins in which all entrepreneurs have the same need, those in which all workers are service-specialists on that service weakly dominate all others, and such bins with less than *│E│* pairs do not perform better those bins with *│E│* pairs. The performance of a mixed balanced bin, consisting of entrepreneurs with different needs and corresponding numbers of service-specialists, is the same as that of a set of smaller bins constructed by breaking up the mixed bin according to entrepreneur needs. Finally, bins in which all workers are business-specialists in all businesses can at most have one pair.

This implies that we can look at six classes of equilibria with the following numbers of pairs in (period*1*, period *2*): *(│E│, │E│), (│E│, 1), (1, │E│), (1, 1), (│E│, 0),* and *(1, 0).*The first, fourth and sixth of these are Markets, Sequential Contracting, and Employment, respectively. We can find values of *σM2, σS2,¯K, K,* and *δ* such that either of these is more efficient than the others. The second, third, and fifth classes are inefficient because the workers can do no better than standardizing on the period *0* realizations *qw =* ε*s/2,* ε*b/2,* and ε*s/2,* respectively.Depending on theε*s,* ε*b*, this leads to expected costs of at least *c + δc\* + (1/4 + δ)σS2 +(1+ δ)σB 2 + δK, c + δc\* + (1 + δ)σS2 +(1/4+ δ)σB2 + K,* and *c + δc\* + (1/4 + δ)σS2 +(1+ δ)σB2,* respectively *.* Using that *(1/4+ δ)σB2 > δK*, these costs are higher than those in the Market, Sequential Contracting, and the Market, respectively.

Existence is easy to prove. Since all services, workers, and entrepreneurs are ex ante identical, each type of player will use only one strategy. Any unilateral deviation (participating in the “wrong” bargaining bin or refusing to negotiate) will lead to zero payoff. The non-negativity of equilibrium payoffs follows from *v >c + σB2* and the fact that equilibria only are used if their costs are weakly lower than those in the Market, *c + δc\* + (1 + δ)σB2.*

Q.E.D.

**PROPOSITION 2:** *The entrepreneur maximizes profits at n = MIN{ 21/2(2v – c – c\* -¯K)1/2, 1}and the optimal scope is an interval.*

**Proof:** Consider an entrepreneur who wants to expand from the business for which ε*b* *= 0*. If this entrepreneur expands untilε*b = n*, it will be optimal for her to standardize at *qw = n/2,* and her profits will be *2nv - ∫n[c + c\* + 2(n/2* *- eb)2 + ¯K]d*ε*b = 2nv – [c + c\* +¯K]n - n3/6.* This is maximized at *n = 21/2(2v – c – c\* -¯K)1/2.*

If the scope is not an interval, the variance can be reduced by dropping the extreme businesses in favor of connecting the support.

Q.E.D.

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1. \* MIT Sloan School of Management, Cambridge, MA 02142, [bwerner@mit.edu](mailto:bwerner@mit.edu). This paper was started while the author visited the Department of Economics at the University of Copenhagen, whose hospitality is gratefully acknowledged. It reflects discussions with Tore Ellingsen, Bob Gibbons, Oliver Hart, Michael Rauh, John Roberts, and Steve Tadelis, as well as comments by seminar audiences at Berkeley, Chicago, CBS, Harvard, Imperial College, IIOC, MIT, NBER, Stockholm School of Economics, Toronto, and the University of Copenhagen. The usual disclaimer applies. [↑](#footnote-ref-1)
2. For example, Newell justified its acquisition of Rubbermaid based on, among other things, anticipated cost savings stemming from the fact that the two companies used the same sales channels (Bain & Co, 2013). [↑](#footnote-ref-2)
3. For example, DaimlerChrysler discussed the divestment of its financial services unit, Debis, in this way (Milwaukee Journal Sentinel, p. 39, April 5, 1999). [↑](#footnote-ref-3)
4. C. f. Maskin and Tirole, 1999. [↑](#footnote-ref-4)
5. Gibbons, Holden, and Powell (2012) and Legros and Newman (2013) also look at the interaction between firms and markets, though not on the contrast between employment and bilateral contracting. [↑](#footnote-ref-5)
6. The model uses a reduced form representation of sub-additive bargaining costs, but these can be micro-founded on standard assumptions. One possible such micro-foundation starts with two-sided incomplete information. While this often leads to strategic bargaining costs (Myerson and Satterthwaite, 1983), these are typically not sub-additive. However, if we allow bargainers to engage in costly attempts to learn the private information of their opponents, the resulting search costs may well be sub-additive. So in the region in which bargainers chooses to search, we can have complete information bargaining with sub-additive bargaining costs, just as assumed here (Wernerfelt, 2014). Of course, the use of such contracting/bargaining costs have other recent precedents in the literature (Bajari and Tadelis, 2001; Matouschek, 2004). [↑](#footnote-ref-6)
7. This is tested in Simester and Wernerfelt (2005). [↑](#footnote-ref-7)
8. An alternative formulation is that total costs equal *2c + (qw 1–* ε*b1–* ε*s1)2+ (qw 2–* ε*b2 –* ε*s2)2+β(qw 1– qw2)2*. However, the analysis and the results are more transparent under the present formulation. [↑](#footnote-ref-8)
9. This allows us to focus on equilibria in which workers standardize right away. [↑](#footnote-ref-9)
10. To keep the formulae simple, we assume that they forget after that. [↑](#footnote-ref-10)
11. So there is no holdup in the model. [↑](#footnote-ref-11)
12. 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. [↑](#footnote-ref-12)
13. See discussion in Appendix. [↑](#footnote-ref-13)
14. Instead of deriving the governance structures as equilibria, we could label them mechanisms and assume that players can commit to any one of them. This gives qualitatively identical results. [↑](#footnote-ref-14)
15. Consistent with common terminology, Employment is a relationship in this model (Bartling, Fehr, and Schmidt, 2013). Linking to the famous example of Alchian and Demsetz (1972), the relationship between a boss and an employee is one in which a single wage has been agreed upon on a once-and-for-all basis, while a buyer in a grocery store is confronted with new market prices in every period. [↑](#footnote-ref-15)
16. This is tested by Novak and Wernerfelt (2012) [↑](#footnote-ref-16)
17. The reader will have no problem generalizing this to more general distributions although the answer then varies across the support. [↑](#footnote-ref-17)