

Duman, Alper

Working Paper

Comparative Analysis of Organizational Forms in the Software Industry and Legal Services

Working Papers in Economics, No. 09/03

Provided in Cooperation with:

Department of Economics, Izmir University of Economics

Suggested Citation: Duman, Alper (2009) : Comparative Analysis of Organizational Forms in the Software Industry and Legal Services, Working Papers in Economics, No. 09/03, Izmir University of Economics, Department of Economics, Izmir

This Version is available at:

<https://hdl.handle.net/10419/175904>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.

Working Papers in Economics

**COMPARATIVE ANALYSIS OF ORGANIZATIONAL FORMS
IN THE SOFTWARE INDUSTRY AND LEGAL SERVICES**

Alper Duman, Izmir University of Economics

**Working Paper No. 09/03
May 2009**

**Izmir University of Economics
Department of Economics
Sakarya Cad. No: 156
35330, Balçova Izmir
TURKEY**

**Comparative Analysis of Organizational Forms in Software
Industry and Legal Services**

Abstract

Law firms are expected to be controlled by the workers because given the difficulty of monitoring labor, the transaction cost would be very high and the essential human capital investment would be lacking in a firm controlled by the capital suppliers. Expectations are confirmed by the data. However, following the same reasoning one can easily suggest that software firms should also be controlled by the labor suppliers given the similar difficulty of monitoring labor and essential human capital. As in a law firm, the software firm uses very generic capital such as offices, computers and programming languages. Moreover, the human capital of the software developer is indispensable and highly firm specific. While we observe widespread worker control in terms of partnerships in legal service industry, the majority of the software firms are not controlled by the labor suppliers: instead they are controlled by the capital suppliers.

Keywords: Organizational forms, Asset specificity
JEL Classifications: D21, D23

Alper Duman

Department of Economics
Izmir University of Economics
Izmir, Turkey 35330
e-mail: alper.duman@ieu.edu.tr

1 Introduction

Firms have different organizational forms which can be classified in various ways. One common classification takes control rights as the essential key. Accordingly firms can be controlled by a subset of different input suppliers. Inputs include labor, physical assets, financial assets, raw materials, land or any other resource which may be owned by an individual or a group.

As Gregory Dow (2003) puts it clearly, at the beginning of the twenty first century after more than two hundred years of scientific inquiry, economists still do not have a good theory to explain why firms are usually owned and controlled by the capital suppliers but not the labor suppliers. Even worse, up until the last decades economics did not take this fundamental issue as seriously as the subject deserves ¹.

According to the prominent figure of transaction cost theory, Oliver E. Williamson, some firms, mainly professional firms (law firms, accounting firms, investment banking, consulting) involve negligible investment in firm-specific physical assets and are expected to be appropriately organized as worker-controlled partnerships (Williamson, 1985). Property rights theory exemplified by Hart and Moore (1990) and Hart (1996) indicates that where individuals possess knowledge which is critical to the firm, they should be encouraged to invest in their proprietary knowledge by sharing in the ownership of the firm and participating directly in the decision-making process. In their words, an agent who is indispensable to the generation of surplus should have ownership right and highly complementary assets should be owned together.

Law firms are expected to be controlled by the workers because given the difficulty of monitoring labor, the transaction cost would be very high and the essential human capital investment would be lacking in a firm controlled by the capital suppliers. Expectations are confirmed by the data. However, following the same reasoning one can easily suggest that software firms should also be controlled by the labor suppliers given the similar difficulty of monitoring labor and essential human capital. As in a law firm, the software firm uses very generic capital such as offices, computers and programming languages. Moreover, the human capital of the software devel-

¹Robert Gibbons (2003: 754) writes for 200 years, the basic economic model of a firm was a black box: labor and physical inputs went in one end and output came out the other, at a minimum cost and maximum profit. Most economists paid little attention to the internal structure and functioning of firms and other organizations.

oper is indispensable and highly firm specific. While we observe widespread worker control in terms of partnerships in legal service industry, the majority of the software firms are not controlled by the labor suppliers: instead they are controlled by the capital suppliers.

1.1 Software and Legal Services: Posing the Puzzle

Computer software is a stored, machine-readable code that instructs a computer to carry out specific tasks. There are three basic types of computer software: (1) operating systems such as Windows, UNIX or Linux, (2) application tools such as accounting or inventory programs or (3) application solutions such as spreadsheets (i.e. Excel). All three of these basic types of software can be provided in either standard/packaged or custom form (Mowery, 1996).

The development process of software consists of requirement analysis, system design, detailed program design, coding, testing and installation as well as redesign and repairs referred to as maintenance. Yet these phases are usually more iterative than sequential, and often unpredictable in time and costs, because the productivity of individual programmers tends to vary substantially and depends on elements difficult for management to control, such as personal talent and experience with particular application and programming languages. Software producers may thus encounter budget and schedule overruns as a rule rather than the exception, especially when attempting to build large complex systems with new components being tested for the first time.

Most of the software programmers would hold that their jobs resemble fine arts rather than engineering². Undoubtedly, the lawyers would argue that being a good lawyer requires as much creativity as the job of software programmers do. For organizations such as firms, what matters is the cost of providing incentives for these highly transaction specific human capital owners. In turn that cost depends on the cost of monitoring the performance of the workers. By performance we mean the quality and the quantity of the workers effort. For a principle such as an employer of a law firm or a software firm, it may be very costly to monitor the agents. She will never be sure of a software programmer who seems to be contemplating: she might be daydreaming as well as visualizing a module that turns out to be critical for

²See for example Valverde and Sole (2003) and Glass (1996) to appreciate some of the subtleties of software programming.

the entire software project. The monitoring problem may be as acute for the legal service firms as in the case of software firms. A lawyer spending considerable amount of time in the library might be just killing time as well as preparing hard for a case³. Alchian and Demsetz (1972: 788) share our point:

[W]atching a mans activity is not a good clue to what he is actually thinking or doing with his mind[I]t is difficult to manage and direct a lawyer in the preparation and presentation of a case[D]etailed direction in the preparation of a law case would require in much greater detail that the monitor prepare the case himself.

Yet while a substantial fraction of legal service firms are organized as worker controlled enterprises in terms of partnerships, the bulk of the software firms are investor owned and controlled capitalist corporations (see Table 1 below). Given the importance of hard-to-monitor transaction specific human capital assets in both sectors, the dominant organizational form in the software industry seems to be puzzling.

In a more general setting Legros and Newman (1996) demonstrate that when wealth constraints are binding (borrowing is costly) choice of organizational form will depend on the distribution of wealth. They argue that with enough inequality technically inefficient organizational forms may be chosen. Similarly, Bowles and Gintis (1996) show that distribution of wealth and assignment of control rights are mutually determining. Their main point is that when agents become wealthier they become less risk averse and save more to self-finance their projects. Alternatively they can use their saving as an equity stake when they engage in a credit relation if in doing so they can alleviate the problems in the credit market for the sector requiring higher capital per labor.

A related study by Nickerson and Silverman (2003) explains the choice of organizational form in the inter-state trucking industry focusing on three

³At a first glance, billable hours may seem to be a good proxy for performance and hence decrease severity of the labor monitoring problem in law firms (See Hansmann. 1990). If billable hours are good proxy for performance, then the lawyers can be monitored easily. Thus we would expect a governance structure for the law firms in which control is exercised by capital suppliers rather than by the labor suppliers. The software developers are required to report the code they have written at the end of a working day, the number of code lines is then used to gauge their performance (See Cusumano. 1995). Compared to the billable hours this method of monitoring labor lacks reliability in associating the link between effort and output since thousands lines of code might be equivalent to a simple module consisting a few lines to serve for a particular function (see Glass, 1995).

types of asset specificity: the need to manage coordination across hauls, the need to safeguard firm-specific investments in reputation and the need to employ idiosyncratic vehicles. They try to give an answer to the puzzling observation that truck drivers predominantly work for companies in spite of their generic capital, i.e. trucks. In this paper we will try to explain this puzzling fact by focusing on network externalities and transaction specific capital requirements characterizing the software market, but not the legal services market. The paper is organized as follows. The next section discusses briefly the partnerships and governance costs. The third section introduces a model to formulate the analysis. The fourth section discusses some empirical evidences supporting the argument. The fifth section is an extension on customized software and the last section concludes by pointing out some implications for the open source software movement.

The studies on the organizational forms in general take the institutional environment as fairly stable and look for a subset of parameters such as tax rates applied to different organizational forms and technology that would influence the choice of organizational form. Organizational forms available to professional service firms vary in a range from the simple general partnership (GP) form that had been the prevailing standard for centuries, to a multitude of choices, including the professional association (PA), the professional corporation (PC), the limited liability partnership (LLP), and the limited liability corporation (LLC). The only meaningful difference between the GP and LLP is that in the LLP, partners are liable only for partnership debts resulting from their own conduct or the conduct of someone under their supervision. In the GP all the partners are fully liable no matter what. It is important to acknowledge the peculiar institutional framework in which the legal service firms operate. Although the participants of the firms have substantial flexibility in choosing the organizational form, they are also constrained in some important senses. First, even if they choose to adopt the professional corporation form, the dominant shareholders should be the lawyers working in the firm. Secondly, the legal framework for LLC and LLP was recently established. The argument is that via organizational inertia, firms stay as partnerships although the corporation form might be better suited.

Another caveat which calls for attention is the employment of non-partner lawyers in the legal service firms be they in partnerships or corporations. In this paper we pick these two industries to illustrate the fruitfulness of our theoretical approach rather than to make the claim that we can reveal the factors that fully explain the choice of organizational forms in these industries. We pick them because (1) in terms of labor process they can be argued to be sub-

Table 1: Organizational Forms in Software and Legal Services

NAICS code	Sector	Corporations	Partnerships	Sole Proprietorships
54111	Offices of Lawyer			
	in Numbers	39.9	47.51	12.28
	in Receipts	40.16	47.54	12.3
	in Payroll	57.45	34.04	6.38
	in Employment	46.86	37.24	15.48
51121	Software Publishers			
	in Numbers	92.14	3.28	4.28
	in Receipts	98.54	0.81	0.32
	in Payroll	98.66	0.75	0.34
	in Employment	97.6	1.09	0.9

stantially similar, (2) they are based on human capital-intensive professional services and (3) they substantially differ in terms of the transaction-specific capital requirements. Nevertheless we have to acknowledge two additional caveats. First, we lump all the law firms and all the software firms together and use a stylized firm to compare and contrast the organizational forms dominant in the sector. However we are aware that upper-tier legal service firms, that offer legal advice and consulting services to large corporations work, and organize differently than the lower-tier small law firms. The same qualification goes for the software firms. Large software firms often adopt complex organizational forms and manage labor processes differently than the small, customized software-oriented software firms (Cusumano 1991). Secondly, we do not delve into the specific analysis of the work organization either in the legal service firm or in the software firms. What we emphasize is the generic nature of physical capital and firm specific nature of human capital required in both sectors.

2 Partnerships and Governance Structures

2.1 When do we expect Partnerships?

Although there does not exist a commonly accepted reason for why partnerships are observed in some industries but not others, several studies relate to this question. Alchian and Demsetz (1972) focused on the incentive aspects

of profit-sharing and the role of productivity measurement in determining organizational form. They argue that professionals such as lawyers will be less likely to be organized as traditional capitalist firms. Their reasoning depends on the precarious link between the feasibility of monitoring effort and the performance of the lawyers. At first glance, partnerships resonate with professional services. As Martin Gaynor and Paul Gertler (1995) claim, the partnership form is apt to split fixed costs and spread risk due to uncertainty. Professionals often make significant investments in their human capital, and due to the lack of capital and insurance markets for these assets, these investments carry substantial risks. In order to partially insure themselves against uncontrollable shocks, professionals form partnerships and share the revenues.

Jonathan Levin and Steven Tadelis (2002) on the other hand suggest that when the quality of a service is harder to evaluate by the market, this service is more likely to be supplied by partnerships. In its oversimplified version, their argument states that since partners would have to sacrifice the average product of their labor instead of the marginal product as in the case of corporations, they would care more about their reputation. They employ this insight to explain why law firms happen to be partnerships ⁴.

In a related study Carr and Matthewson (1990) point out that when suppliers of a service are more knowledgeable than their clients, by creating joint specific (brand name) capital that is at risk and by peer-monitoring partnerships commit themselves to deliver their professional services honestly. Partnerships, according to them, dominate sole proprietorships when cases are rather complex, meaning that the clients could not monitor the law firm easily. Henry Hansmann (1988; 1996) claims that worker ownership in terms of partnerships or cooperatives may be the chosen organizational form where the governance costs could be effectively minimized. He argues that in law firms, partners are selected to form a homogenous group with homogenous interests and in most cases equal pay policy is adopted to contain the possibility of conflict in decision-making processes within the organization. Joseph Farrell and Suzanne Scotcher (1998) also provide a model of partnerships with a tendency for the partners to assort themselves homogeneously according to similar ability levels. Eugene Kandel and Edward Lazear (1992) extend the homogeneity argument to show that group level norms, such as guilt and shame which can be internalized through peer pressure, can emerge

⁴However, they surprisingly argue that software is a product that can be relatively easy for the market to assess the quality without explaining why that might be so.

relatively easier if the partners are homogenous.

Partnerships have difficulty raising investment capital partly because their assets are intangible and highly mobile. Both Levin and Tadelis (2002) and Hansmann (1996) claim that the need to raise capital in recent decades has forced partnerships in some sectors such as advertisement, consulting and investment banking to convert themselves into corporations. In Table 2.2 below we have summarized the main factors influencing the choice of organizational form in general and the choice among a partnership and a corporation in particular.

2.2 Overall Governance Costs

It is argued by the Transaction Cost Theory that the control and ownership of firms should go to the agents who could save the most in governance costs, which would be incurred if they were employed in organizations owned by others. These governance costs can be manifold, but essentially they originate from the transaction specificity of assets and agency costs arising due to monitoring and contracting problems. Owners and controllers have to pay high agency costs to employ difficult-to-monitor and transaction specific assets.

Total governance costs may cover both the transaction costs and the production costs. Frequently it is hard to distinguish the two (Bowles, 2004). Suppose investor owned capitalist firms try to minimize the governance costs. They can either seek lower agency costs for the difficult-to-monitor, transaction specific unit labor or they can substitute capital for the high agency cost labor. Therefore the elasticity of substitution among high agency cost capital and high agency cost labor remains a critical issue.

Furthermore, the total costs may not be solely determined among the agents within the firm. Assume that reputation, brand name or advertisement is essential because the quality of the product is not standard and is hard to be specified by customers; then the governance costs related with marketing (i.e. agency costs of transaction specific advertisement) should also be included in order to answer the question of who would be owners and controllers of the firm. As we will discuss later, the network externalities in software indeed make the governance costs associated with advertisement and marketing the decisive factor in the choice of organizational form. We do not mean that advertisement or investment in brand name and marketing in legal services are not important. Simply due to the nature of the market

Table 2.2: A Brief Categorization of the Arguments

A. Firm Structure		Effect on the Partnerships	Main Causal Link
	A.1. Negligible Physical Assets	+	Decrease the need for external finance
	A.2. Proprietary Knowledge generating Surplus	+	Increases the Governance Costs (Agency Costs of Labor) in Corporations
	A.3. Wealth Constraints	-	Puts extra costs due to lack of collateral
	A.4. Network Externalities and TSC Requirements	-	With A.3. increases the Agency Costs of Capital
	A.5. Heterogeneity	- ?	Increases the Governance Costs (Collective Decision-Making)
B. Characteristics of the Product			
	B.1. Variability in Input Costs	+/-	Partnerships are more flexible
	B.2. Non-standard	+	Partnerships signal quality
	B.3. Difficulty of Assessing Quality by the Market	+	Partnerships internalize the Reputation
	B.4. Networking	-	Increases the TSC requirements
C. Characteristics of Labor			
	C.1. Difficulty of Monitoring	+	Increases Governance (Agency Costs of Labor) in Corporations
	C.2. Risky Human Capital	+	Partnerships provide Insurance
	C.3. Objective Function	-	If net income per worker is maximized then partnerships will be smaller or larger than the optimal size
D. Characteristics of the Industry			
	D.1. Competitiveness	+	Increases the Importance of Reputation (given equal total unit costs)
	D.2. Outsourcing	+	Decreases the need for external finance
	D.3. Networking in Public Goods	+	Decreases TSC requirements

in legal services, usually localized and based on personal networks, the associated governance costs are miniscule compared to those associated with the software case. The quality and the success of the law firms can be judged easily by the market participants as a by-product of the past services or by the common knowledge of reputation. The observation of the success rate in the relevant cases in the past might be more important for corporate clients of the large law firms. Individuals choose their lawyers by asking their peers or their friends, who might know a signal about the expected quality of the services.

3 A Framework for Analysis

3.1 A Simple Benchmark Model

As we have argued, the dominant organizational form in the software industry, namely the investor owned corporation, poses an empirical puzzle for economists. Since the physical capital used for production of software goods and services is generic and contractible¹, the first-best outcome can be achieved if the workers (in our case software programmers) could optimize the production function by varying their effort level and the level of capital, which they can lease or own. There arises the question about the adequate objective function of a worker managed cooperative or a partnership. The literature is divided. One group asserts that the natural objective function would be maximization of net income per partner. Others argue that the workers would simply maximize the net surplus, which gives equivalence in terms of strategic behavior with the capitalist firm. The choice of objective function matters for the input demand decisions. If one takes the former, net income per partner, as the goal there appear counter intuitive results: the worker controlled firms decrease their demand for labor when the price for its product rises and increase their demand for labor when the price for its product falls. However, the latter objective function makes more sense and it corresponds to the empirical reality more closely. Following the general discussion of organizational equilibria in Ugo Pagano and Robert Rowthorn (1996), let's assume two different organizational forms, an investor owned capitalist corporation (C) and a worker controlled partnership (P) defined by the identity of their ultimate control groups² (Dow, 2003). They are assumed to be competing in the same institutional setting, employing the same technology and facing the same output and input market conditions. Then their respective per unit net revenues (normalizing output prices to 1) would be:

$$\Pi_C = Q(k, K, l, L) - rk - RK - wl - (W + H)L$$

$$\Pi_K = Q(k, K, l, L) - rk - RK - wl - (W + H)L$$

where Q is a common production function, Π is net profits, superscripts C and P indicate a capitalist firm and a partnership respectively, r is rental price in the generic capital goods market and w is the competitive wage set by the market for generic labor; K and L denote the amounts of transaction-specific, hard-to-monitor capital and labor assets required in the production activity and R and W are competitive input prices for the former and for the latter. Z and H , accordingly, reflect the respective agency costs (the additional cost). Z is the additional cost of using transaction-specific capital if the capital suppliers do not control the firm and H is the additional cost to use hard-to-monitor labor if the labor suppliers do not control the firm.

The concept of difficult-to-monitor is introduced by Alchian and Demsetz (1972). If the owners of the firm own the capital employed in the organization, then they have an incentive to take care of their capital. When user-induced depreciation is difficult to monitor, the possibility of careless use makes the rental of difficult-to-monitor capital more expensive than its ownership. A possible remedy would be that the workers/partners instead of renting the capital goods may borrow credit to buy the capital goods. However, since difficult-to-monitor capital is less valuable as collateral than easy-to-monitor capital (mainly because it is generally more difficult to liquidate in case of bankruptcy) it will be more expensive to rent the difficult-to-monitor capital than the easy-to-monitor capital. This extra cost can be seen as a proxy for Z .

Nevertheless, note that the critical issue is the extra cost that a worker controlled firm bears relative to the investor controlled firm. On the one hand we can argue, as Alchian and Demsetz do, that workers would have a better incentive structure take care of their capital and this would offset at least partially any higher cost of borrowing for the worker controlled firm that has difficult-to-monitor capital. On the other hand the creditor might prefer to deal with only a few people as the CEOs of the investor controlled firms instead of the collective body of worker-partners (Gintis 1989). That would add a premium to the real cost of debt finance for the worker controlled firms.

Hansmann (1990) argues that where capital is needed to purchase firm-specific assets it may be very costly or impossible for a worker-owned firm to obtain the necessary capital by borrowing it on the market. The problem is

that the creditors expose themselves to the threat of opportunistic behavior by the worker-owners, who have an incentive to appropriate for themselves the amounts that are borrowed by simply distributing the credit as raises in wages and then declaring bankruptcy. Without physical assets that can be pledged as security to the lenders, there may in fact be no feasible way in which the owners can commit themselves not to behave in such an opportunistic fashion. Again the issue of the adequate objective function plays a decisive role in this context. If the objective function is chosen as maximization of net income per worker, there may be an incentive for the existing workers to loot the firm of its capital goods because of the time horizon problem. As the incumbent workers could not benefit from the income accruing from their investment when they retire or lose their jobs for any reason in the future, they would have an incentive not to invest optimally or if investment is made, to reap the benefits immediately by over-using the capital or simply selling the capital goods before they leave the firm.

On the other hand if the capital is generic as in the case of transportation firms where much of the capital is invested in vehicles that are easily resold, worker ownership in terms of self-employment frequently appears. Investment banking also requires substantial capital per worker but the firms assets are highly fungible and therefore a substantial amount of worker ownership in the form of partnerships can be observed, at least up to the recent decades. There are no common definitions of asset specificity or agency costs. Menard (2004) for example defines specificity of assets as the value of investments that would be lost in any alternative³. Pagano and Rowthorn (1996) refer to the specificity of assets as a measure of the difficulty of employing the resources in other organizations.

As is apparent from the unit net revenue functions, when the capital suppliers own and control the firm they could save the agency costs due to the transaction-specific, hard-to-monitor capital assets, (K). Symmetrically, when the labor suppliers own and control the firm they could save the agency costs due to the transaction-specific, hard-to-monitor human capital assets, (L). For the generic labor and capital assets, both types of firms have to bear the market determined factor prices⁴. Given a competitive market for control and ownership rights of the firms⁵, the fundamental insight of the Coase Theorem suggests that the suppliers of the factor who could save the highest opportunity costs by avoiding the associated agency costs will acquire the ownership and control rights of the firm in consideration. With some rearranging of 3.1 and 3.1 we can see that investor owned corporations will prevail if

$$ZK - HL > 0$$

And alternatively partnership will be dominant organizational form if

$$HL - ZK > 0$$

Now it can be shown that for any standard production function and for any set of generic factors with market determined prices ($w, W, r, R, l; k, l$), there exists at least one pair of (H, Z) of agency costs that makes multiple organizational equilibria exist.

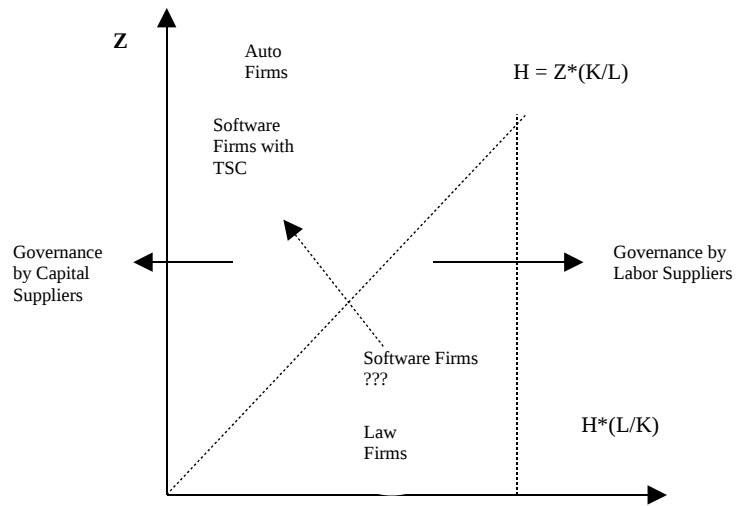
For our case of legal services and software, it is perfectly plausible that the transaction-specific, hard-to-monitor assets would be human capital assets. After all, lawyers and software programmers use computers, books and offices, which are easily redeployable general assets. Transaction-specific and hard-to-monitor assets would be the ability, intellectual capacity and the creativity of lawyers and software programmers. In a sense, this simple model reflects the predictions of transaction cost theory or property rights school on the choice of organizational forms.

From equations 3.1 and 3.1 we can get a line (see Figure 2.1 below) which divides the space of high agency cost of transaction-specific-capital and high agency cost of labor times the labor-capital ratio. We would expect partnerships to the bottom-right of the line and capitalist firms to the top-left. By its seemingly generic capital requirements and critical high agency costs of labor software firms may be located near the law firms at the bottom-left. However, as we argued, given the imperfect capital markets and wealth constraints, the software developers face substantially higher agency costs (Z) due to the transaction specific capital requirements, such as advertisement. Graphically they move to the top-left section as indicated by the arrow (see Figure 2.1 below).

3.2 Transaction-Specific Capital Due to Network Externalities

We will now underline the fact that although in the software market there are certain demand and supply network externalities that force firms to bear the high agency costs of transaction specific capital, law firms do not face such costs.

Figure 2.1: Locating Organizational Forms



As we have mentioned in the introduction, software products and services come in various forms along a continuum of customized products and services to mass-market prepackaged products¹. The latter form constitutes the bulk of the software market, accounting for more than 80 percent of all revenues within the sector (45 billion dollars in 1997 according to Economic Census). What distinguishes prepackaged software is its characteristic of being a network good. Network goods are characterized by increasing returns to scale, by lock-in and especially by supply and demand externalities. The last feature implies that consumers behavior is not only affected by the price but also by their expectation of the size of the network in which the same product will be used (Katz and Shapiro, 1986; Economides, 1995). Advertisement in a network good market influences the expectations of the potential consumer with regards to the future network size. As Ionnas Economides (1995) and Luca Grilli (2002) show, given consumers independent preferences there exists a threshold level of advertisement that will guarantee a critical mass in terms of the size of the consumer network. Thus, start-up firms as well as established software firms should take the advertisement effect into account. It is no surprise that Microsoft spent almost 1 billion dollars to promote Windows operating system in 1995 (Chwe, 2001: 81). We note that advertisement is only one possible indicator of asset specific capital. Research and Development expenditures, brand name premium, an index of the value of the tacit knowledge embodied in the firm or a ratio of residual transaction specific capital (after all the generic capital is deducted from the overall capital stock) to labor expenses would all be proxies for the share of transaction specific capital. Unfortunately, these data are very hard to reach and are most of the time not very reliable. If our conjectures hold for the single case of advertisement then the likelihood of confirming our conjectures with the complete can be argued to be considerably higher.

In the industrial organization literature there are well known arguments on how advertisement as an endogenous sunk cost acts as an effective entry barrier (Kessides, 1986; Sutton, 1992). Coupled with the widespread network externalities in the software market, we simply show that the transaction specific nature of advertisement would increase Z , the high agency costs, sufficiently to impede the viability of partnerships.

Advertisement can be thought as a transactions specific capital (Mocnick 2001), therefore as long as the investor-owned corporations could save the high agency costs of transaction specific capital, any productive efficiency advantage of worker owned firms could be more than offset by the capital

cost disadvantage. The critical factor is that worker owned firms would be credit rationed or credit constrained, and thus would have to pay a differential cost on the loans they take for investing in transaction specific capital such as advertisement².

A recent example from India provided by Banerjee and Duflo (2001) demonstrates how it is more costly to borrow with intangible transaction specific assets. However, the problem, they point out is not peculiar to the developing country framework. Indian bankers in the 1980s and early 1990s were puzzled by how they could justify lending to software companies, since their only real assets were their software engineers and their work-in-progress was lines of program codes on the computers. Another example of the effect of transaction specific capital requirements on credit constraints is provided by a study by Nickerson and Silverman (2000). They explain why self-employment is not the dominant organizational form in the trucking industry; they find that econometrically advertisement has a significant effect on the choice of being employed in a capitalist firm.

When the workers/partners are wealth constrained³, they can only borrow by posting collateral. However, the major part of the expenses they will have to make is transaction specific such as advertisement: the higher the transaction specificity the lower the value of collateral. It is straightforward to show theoretically that as the value of collateral decreases the unit cost of borrowing increases⁴ (Banerjee 2001, Bowles 2004).

4 Discussion

4.1 Advertisement and Organizational Forms in Service Sectors

The straightforward way to test our claim would be to gather advertisement share data for sectors and check whether those with less advertisement or transaction specific capital expenses also have substantial number of partnerships. We use the Economic Census Data of 1997. First from the data on legal form of organization we extract the distribution of organizational forms for some service sectors according to SIC code specification. Then we match these figures with the shares of advertisement expenses in total expenses. We expect a negative relationship between the ratios of partnerships to corporations on the one the hand and the relative share of advertisement in total expenses on the other hand. The Figure 2.2 (see below) confirms our

Table 3: Asset Specific Capital

Firms	Year	Advertisement Expenses in total Expenses	Advertisement Expenses in total Sales
Legal Research Center	1999	19	9
	2000	17.7	8.3
	2001	12.6	6
Microsoft	2000	47	4.8
	2001	70	5.4
	2002	30	4.8

expectations.

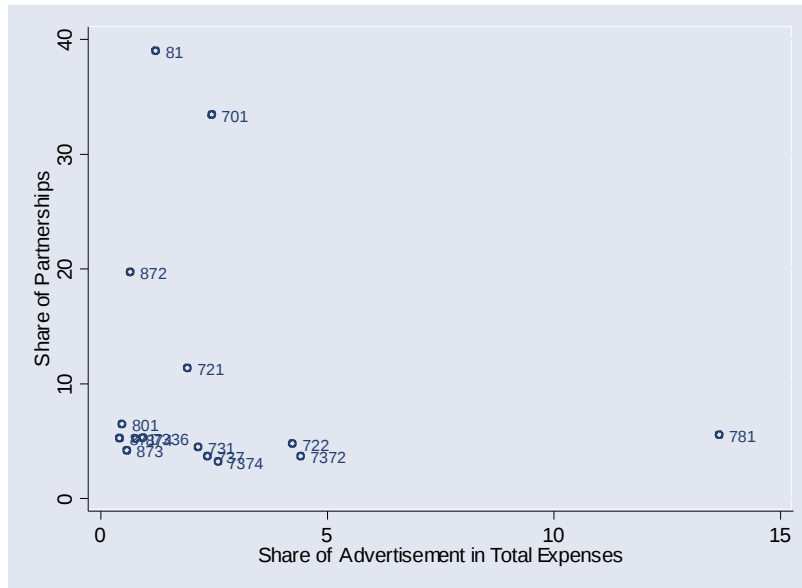
The outlier in terms of the high relative share of advertisement is as expected the Motion Picture sector (with SIC code of 781). The other two outliers lie on the axis of partnerships share: Legal Services (81) and Hotels and Motels (701). There is a negative non-parametric rank correlation coefficient (measured as Spearman's Rho) at a value of between the two variables, although the confidence interval is not within conventional levels. When the outliers are excluded (see Figure 2.3 below), we can say that the share of advertisement in total expenses and the fraction of partnerships are negatively correlated with a 95 percent confidence level (the value of the coefficient is 0.30). The very small size of our sample makes further econometric analysis very difficult.

4.2 Firm-Level Comparison

In order to have a grasp on the relative share of transaction specific capital costs related with advertisement, we compare a software firm with a law firm. We accept the charge that Microsoft may not be a typical software firm but we use it to illustrate our point in a dramatic way. Robert Hall et al (2003) for example mentions that over the years 1995 through 2002, Microsoft spent 22 percent of its revenue on sales and marketing.

As it is apparent, the relative share of advertisement expenses for Microsoft is dramatically greater than of the Legal Research Center, a law firm. We picked the Legal Research Center not as a typical firm in the legal services industry. It can be considered to be one of the big law firms. This strengthens our point because if the share of advertisement expenses in such a firm is considerably lower than of the software firm, we would confidently expect that it would be more so in a typical law firm which is localized and

Figure 2.2: Advertisement and Organizational Forms (Whole Sample)



Source: Author's Calculations

advertises by word of mouth. As long as the software firms have to bear these transaction specific capital expenses, the partnerships would be disadvantaged in raising sufficient capital and in reaching a critical network size to compete with the capitalist firms.

4.3 Documenting Network Externalities

Succi et al (1999) argues that network externalities play a major role in the profitability of a software product. There are indeed empirical studies specifying the effects of network externalities on the behavioral patterns of software firms and customers. Erik Brynjolfsson and Chris Kemerer (1993), in an econometric study of network externalities in the microcomputer software market, find that installed base (the network size) could be treated on a par with intrinsic product quality in affecting the market value of the spreadsheets¹. The study finds that a one percent increase in a products installed base was associated with a 0.75Neil Gandal (1994) confirms that network externalities exist in the PC software market by examining the effect of LOTUS compatibility of various spreadsheets on the valuation of the customers and finds significant network effects. Both studies suggest that further research should examine the strategic behavior of software firms to determine the extent to which they invest in installed base by increasing advertisement. They indicate that different firms may have to choose different strategies depending on the constraints on their finances.

5 Implications

5.1 Customized Products and Services: Software as Consultancy

The above model and the discussion imply that when there exists a market niche of customized software products or services in which network externalities and thus advertisement does not play a major role, we would expect more firms owned and controlled by their workers.

In such a situation the problem boils down to the R and D question: is it more efficient for the firms (or customers) to have in-house R and D or to outsource R and D projects (Aghion and Tirole, 1994)? If the latter is more efficient, there are a priori advantages for the worker owned firms such as partnerships or cooperatives to carry out those outsourced R and D

projects. Philippe Aghion and Jean Tirole (1994: 1206) argue that

[R]esearch will be more likely conducted in an integrated structure if (a) capital inputs are substantial relative to intellectual inputs in contrast, when intellectual inputs dominate as for software and biotechnology, research will often be performed by independent units; (b) the customer has more bargaining power *ex ante*, say because of intense competition among potential research teams and (c) the customer has a deep pocket.

For the customized software niche markets, although (a) may favor worker owned research teams, (b) and (c) would hamper the relative advantage of such firms.

5.2 Open Source Software

One consequence of our model and argument can at least partially shed some light on the puzzling Open Source Software movement. Free distribution of open source software corresponds to the cheapest and most effective advertisement strategy (in terms of influencing the expectations of the users of the size of the market) for the worker owned firms. Once the software is adopted by the critical network size, the customized maintenance, and production teams organized as partnerships or cooperatives could carry out consultancy and updating services¹. They would perform more efficiently than the investor owned corporations. Ironically Microsoft used this strategy to eliminate a real competition in the browser market when it bundled its web browser (Explorer) with its operating System (windows): it simply made impossible that its rival Netscape reach a critical network size.

5.3 Why not Benetton-Style Outsourcing?

If advertisement is the issue to be solved why not a private for-profit firm emerges, outsource the software projects, and then market them by its brand name as Benetton has done for the textile sector? We think the answer lies again in the differences of the nature of the products. Casual wear textile products are standardized and hence it has been relatively cheap for Benetton to specify the characteristics and control the quality of the product of its many suppliers. In other words, after having committed to make advertisement and marketing campaigns for particular products, Benetton would not feel the pressure of hold-up threat due to the lack of quality. A software marketing firm on the other hand could not specify and control the quality of a particular product with such ease as Benetton has enjoyed for decades.

Commuffo et. al. (2001) confirms our insight arguing that:

However, in the apparel industry, time compression does not depend so much on the tailoring phase as on the supply of raw materials. Therefore over the years, Benetton has gradually increased upstream vertical integration to consolidate its textile and thread suppliers. Today, Benetton's main supplier of raw materials – which guarantees that it will provide 60 percent of the woven fabric, 90 percent of cotton knit fabric and 90 percent of carded and combed wool – is 85 percent controlled by Benetton itself. Both upstream vertical integration and partnership relationships with external suppliers have made it possible for Benetton to exercise quality control over textiles and thread sooner. The materials then can be sent directly to workshops and external producers without further controls, reducing transport costs and production-lead times overall.

6 Conclusion

We have showed that legal services differ from software in an important aspect. Software products generally require substantial amounts of advertisement, which is transaction specific due to the network externalities. High agency costs associated with such transaction specific capital inhibit evolutionary fitness of the worker controlled (and owned) firms, such as partnerships and cooperatives. In an ideal world with perfect credit markets anyone could borrow at the ongoing real interest rate. Then software developers could lease or borrow to acquire the firm-specific difficult-to-monitor capital goods necessary for advertisement and reputation concerns. Doing so, they could enjoy fully the benefits of saving the high agency costs of their difficult-to-monitor labor. Thereby, the likelihood of partnerships displacing the capitalist firms increases. In social welfare terms the outcome might be more efficient because in the case of partnerships the high agency costs of capital as well as the high agency costs of labor would be avoided. In the reverse case of capitalist firms, due to the nature of software development process and inalienability of firm specific human assets (just like in legal services), the high agency costs of labor will remain even if the high agency costs of difficult-to-monitor capital can be saved. If and only if the process of software development is standardized and hence labor of software developers become generic and easy-to-monitor high agency cost of labor would disappear.

7 REFERENCES

Alchian, Armen A. and Harold Demsetz. 1972. Production, Information Costs, and Economic Organization, *American Economic Review*, 62 (5): 777-795.

Aoki, Masahiko. 1994. The Contingent Governance of Teams: Analysis of Institutional Complementarity, *International Economic Review*, 35 (4): 457-465.

Aoki, Masahiko. 2001. *Towards a Comparative Institutional Analysis*. MIT Press.

Banerjee, Abhijit and Duflo, Ester. 2002. Do Firms Want to Borrow More? Testing Credit Constraints Using a Directed Lending Program, MIT, Department of Economics Working Paper.

Banerjee, Abhijit and Esther Duflo. 2002. Reputation Effects and the Limits of Contracting: A Study of Indian Software Industry, *The Quarterly Journal of Economics*, 115(3): 989-1017.

Banerjee, Abhijit, Dilip Mookherjee, Kaivan Munshi and Debraj Ray. 2001., Inequality, Control Rights, and Rent Seeking: Sugar Cooperatives in Maharashtra, *Journal of Political Economy*, 109 (11): 138-190

Ben-Ner, Avner. 1988. The Life Cycle of Worker-Owned Firms in Market Economies, *Journal of Economic Behavior and Organization*, 10: 387-313.

Bonaccorsi, Andrea and Christina Rossi. 2002., Why Open Source Software Can Succeed, LEM Working Paper Series, 2002/15, http://www.lem.sssup.it/WPLem/files/2002_15.pdf.

Bowles, Samuel and Herbert Gintis. 1996. The Distribution of Wealth and the Viability of the Democratic Firm, in U. Pagano and R. Rowthorn eds. *Democracy and Efficiency in the Economic Enterprise*. New York: Routledge, 82-97.

Bowles, Samuel. 2004. *Microeconomics: Behavior, Institutions and Evolution*. New Jersey: Princeton University Press

Bynjolfsson, Eric and Chris F. Kemerer. 1996. Network Externalities in

Microcomputer Software: An Econometric Analysis of the Spreadsheet Market, *Management Science*, 42 (12): 1627-1647.

Camuffo, Arnaldo, Pietro Romano, and Andrea Vinelli. 2001. "Back to the Future: Benetton Transforms Its Global Network." *MIT Sloan Management Review* 43.1 (Fall 2001).

Carr, J., and F. Matthewson, F. 1990. The Economics of Law Firms: A study in the legal organization of the firm, *Journal of Law and Economics*, 33: 307-330.

Cusumano, Michael A. 1991. *Japans Software Factories*. New York: Oxford University Press.

Dow, Gregory 2003. *Governing the Firm: Workers Control in Theory and Practice*, Cambridge: Cambridge University Press.

Dow, Gregory. 1993. Why Capital Hires Labor: A Bargaining Perspective, *American Economic Review*, 83 (1): 118-134.

Dow, Gregory. 2002. The Ultimate Control Group, *Journal of Economic Behavior and Organization*, 49 (1): 39-49.

Economic Census. 1997. <http://www.census.gov/epcd/www/econ97.html>.

Economides, Ionnes. 1996. The Economics of Networks, *International Journal of Industrial Organization*, 14 (2): 1-36.

Farell, Joseph and Suzanne Scotchmer. 1988. Partnerships, *The Quarterly Journal of Economics*, 103 (2): 279-297.

Gandal, Neil. 1995. Competing Compatibility Standards and Network Externalities in the PC Software Market, *The Review of Economics and Statistics*, 77:4, 599-608.

Garicano, Luis and Thomas N. Hubbard. 2004., Hierarchies, Specialization, and Increasing Returns to Knowledge: Theory and Evidence from the Legal Services Industry, mimeo <http://gsbwww.uchicago.edu/fac/thomas.hubbard/research/pape>

Gaynor, Martin and Paul Gertler. 1995., Moral Hazard and Risk Spreading in Partnerships, *RAND Journal of Economics*, 26 (4): 591-613.

Gibbons, Robert. 2003. Team theory, garbage cans and real organizations: some history and prospects of economic research on decision-making in organization, *Industrial and Corporate Change*, 12 (4): 753-787.

Gintis, Herbert. 1989. Financial Markets and the Political Structure of the Enterprise, *Journal of Economic Behavior and Organization*, 1: 311-322.

Glass, Robert. 1995., *Software Creativity*. New Jersey: Prentice Hall.

Grilli, Luca. 2002. "Start up Problem in a Network Good Market: The Use of Advertising by a Monopolist Provider", University of Siena, Department of Economics, Working Paper No. 345.

Gun, Laixiang. 2002. Introduction: Adaptive Efficiency and Evolving Diversity of Enterprise Ownership and Governance, *Journal of Comparative Economics*, 30 (2): 754-758.

Hall, Robert E., Jimmy Royer and Marc Van Audenrode. 2003. Potential Competition and the Prices of Network Goods: Desktop Software, mimeo <http://www.stanford.edu/~rehall/PotentialCompetition4-29-03.pdf>.

Hamilton, Barton H., Nickerson, Jack A. and Owan, Hideo. 2003. Team Incentives and Worker Heterogeneity: An Empirical Analysis of the Impact of Teams on Productivity and Participation, *Journal of Political Economy*, 111 (31): 465-497.

Hansmann, Henry. 1988. Ownership of the Firm, *Journal of Economics and Organization*, 4 (2): 267-304.

Hansmann, Henry. 1990. When Does Worker Ownership Work? ESOPs, Law Firms, Codetermination, and Economic Democracy, *The Yale Law Journal*, 99 (8): 1749-1816.

Hansmann, Henry. 1996. *The Ownership of Enterprise*. MA: Harvard University Press.

Hart, Oliver and John Moore. 1990. Property Rights and the Nature of the Firm, *Journal of Political Economy*, 98 (6): 1119-1158. Hart, Oliver. 1995. *Firms, Contracts, and Financial Structure*. New York: Oxford University Press.

Holmstrom, Bengt. 1991. A Future of Cooperatives: a corporate perspective, *LTA*, 4: 404-417.

Kandel, Eugene and Edward P. Lazear. 1992. Peer Pressure and Partnerships, *Journal of Political Economy*, 100 (4): 801-817.

Katz, Michael and Carl Shapiro. 1986. Technology Adoption in the Presence of Network Externalities, *Journal of Political Economy*, 94 (4): 822-841.

Kessides, Ionnis. 1986. Advertising Sunk Costs, and Barriers to Entry, *The Review of Economics and Statistics*, 68 (1): 84-95.

Lamoreaux, Naomi R. 1988. Partnerships, Corporations, and the Theory of the Firm, *American Economic Review*, 88 (2): 66-71.

Langlois, Richard N. 2003. The Vanishing Hand: the changing dynamics of industrial capitalism, *Industrial and Corporate Change*, 12 (2): 351-385.

Lazear, Edward. 1999. Globalization and the market for team-mates, *Economic Journal*, Vol. 109 (4): 15-40.

Legros, Patrick and Andrew Newman. 1996. Wealth Effects, Distribution, and the Theory of Organization, *Journal of Economic Theory*, 70: 312-341.

Levin, Jonathan and Steven Tsadelis. 2005. Profit sharing and the Role of Professional Partnerships, *The Quarterly Journal of Economics*, 120 (1): 131-172.

Levin, Jonathan and Steven Tsadelis. 2002. A Theory of Partnerships, Department of Economics, Stanford University, mimeo.

Massachusetts Software Council. 1997-98. *The Complete Guide to the Massachusetts Software and Interactive Industry*. Boston.

Mocnik, Diajana. 2001. Asset Specificity and a Firms Borrowing Ability: an Empirical Analysis of Manufacturing Firms, *Journal of Economic Behavior and Organization*, 45 (6): 69-81.

ickerson, Jack A. and Brian Silverman. 2003. Why Arent All Truck

Drivers Owner-Operators? Asset Ownership and the Employment Relation in Interstate For-Hire Trucking, *Journal of Economics and Management Strategy*, 12 (1): 91-118.

Nyssens, Marthe and Bruno Van der Linden. 2000. Embeddedness, cooperation and popular-economy firms in the informal sector, *Journal of Development Economics*, 61: 175-204.

Pagano, Ugo and Robert Rowthorn. 1996. The Competitive Selection of Democratic Firms in a World of Self-Sustaining Institutions, in U. Pagano and R. Rowthorn eds. *Democracy and Efficiency in the Economic Enterprise*. New York: Routledge, 116-145.

Pencavel, John. 2002. *Worker Participation*, New York: Russell Sage Foundation.

Sutton, John. 1991. *Sunk Costs and Market Structure*, MIT Press.

Valverde, Sergi and Richard V. Sole. 2003. Hierarchical Small Worlds in Software Architecture, Santa Fe Institute Working Paper 03-07-044 <http://www.santafe.edu/research/07-044.pdf>.

Williamson, Oliver E. and Scott E. Masten (eds). 1999. *The Economics of Transaction Costs*. Edward Elgar Publishing.

Williamson, Oliver. 1985. *The Economic Institutions of Capitalism: Firms, Markets, Relational Contracting*, New York: The Free Press.

Williamson, Oliver. 1998., *The Institutions of Governance*, *American Economic Review*, 88 (5): 75-79.

Williamson, Oliver. 2000. "The New Institutional Economics: Taking Stock, Looking Ahead," *Journal of Economic Literature*, 38, 595-613.