Contracts, Ownership, and Industrial Organization: Past and Future*

Patrick Legros[†]
Université libre de Bruxelles (ECARES) and CEPR
Andrew F. Newman[‡]
Boston University and CEPR

August 20, 2014

Abstract

We review the formal literature in industrial organization that incorporates organizational models of the firm into the analysis of industry behavior. Although many insights have been generated, this "organizational industrial organization" is still in its early stages: a complete theory of the relationship between organizational design and traditional IO variables such as price, quantity or welfare has yet to be developed. We show how the insights emanating from the incomplete contract literature can be used to address these questions and others of interest to both IO and organization economists: endogenous heterogeneity; the role of liquidity and surplus division in organizational design; the relationship between product price, industry supply and organizational choices; the response of industry supply to shocks in fundamentals.

[†]Professor, Université libre de Bruxelles (ECARES), 50 avenue F.D. Roosevelt, C.P. 114- 04, 1050 Bruxelles, Belgium. Email: plegros@ulb.ac.be.

[‡]Professor, Boston University, Department of Economics, 270 Bay State Road, Boston, MA 02215, USA. Email: afnewman@bu.edu.

1   Introduction

In his iconic textbook Scherer (1980) offered a description of industrial organization (IO) with which most economists would still agree:

> [IO is] concerned with how productive activities are brought into harmony with society's demands for goods and services through some organizing mechanism such as a free market, and how variations and imperfections in the organizing mechanism affect the degree of success achieved by producers in satisfying society's wants. (p.1)

A decade later, the *Handbook of Industrial Organization* was more specific, referring to its subject as "the broad field within microeconomics that focuses on *business behavior* and its implications both for market structures and processes, and for public policies..." (p. xi, our emphasis).

In view of these definitions, an outside observer might be surprised by the very primitive view of the business firm — the "neoclassical black box" — that continues to dominate the field, particularly considering the explosive growth in the theory and evidence about firms that followed the work of Williamson (1971, 1975); Grossman and Hart (1986); Hart and Moore (1990) and others. Instead, when assessing how business behavior affects prices, quantities, productivity, welfare and other economic outcomes, IO economists have overwhelmingly identified the "imperfection in the organizing mechanism" with market power.[1] Yet *imperfections within firms*, the subject of Organizational Economics, are also a very natural source of imperfection in the organizing mechanism, and it is striking how small a role these have played in answering the central questions of IO.

Why should this be? To some extent, it appears to be an historical accident. Charismatic economists like George Stigler dismissed behavioral and organizational approaches to the firm because of their lack of formal modeling and poor empirical validation (Perelman, 2011); this favored market power as the root of all distortion.

---

[1]The many IO textbooks that have been written in the last thirty years typically follow the same plan. The author acknowledges that the received view of the firm is an abstraction, that it is actually nonsense to talk of the "behavior of a firm": after all only individuals can have behavior, and a 'firm' is a place where different stakeholders have conflicting interests, where contracts are incomplete (the term seemed to have appeared in textbooks in the 70s). After emphasizing that the assumption of a firm as a cost-minimizing single decision maker is empirically invalid, as well as theoretically suspect, and after reviewing more modern theories of the firm and managerial behavior (often taking up 10% of book's pages), the rest of the textbook then abruptly ignores all of this, and the theory and empirics of industrial performance are developed on the basis of neoclassical firms.

Oligopoly theory, fueled by game-theoretic advances, led to significant theoretical and empirical agendas for IO researchers and also found a natural audience among policy makers, who had justifiable antitrust concerns about rising industries such as information technology or recently deregulated ones such as airlines. For tractability, this approach was mainly based on the neoclassical, cost-minimizing firm-as-production-function. In the already complex environment of oligopoly, richer organizational considerations were rarely introduced, and when they were they were mainly viewed as instruments for securing a competitive advantage.[2]

In parallel to this formal oligopoly literature, the transaction cost approach (TCE) descended from Klein et al. (1978) and Williamson (1975) introduced incomplete contracting ideas into IO and led to a large empirical literature that validated the role of contracting imperfections as a source of distortion. But the lack of formalization continued to limit the influence of contracting ideas in academic IO (e.g., Joskow, 2010). Grossman and Hart's seminal property-rights-theoretic article (1986), which at long last introduced a formal way to discuss firm boundaries and showed how ownership of assets and the allocation of control affects firm performance, led a wave of formal theorizing about the internal organization of firms that continues to this day.

Despite this wealth of literature, the connection between organizational economics and IO variables like prices and quantities is infrequently explored, as is the effect of organizations on consumer welfare or other measures of industry performance. For several reasons the time has come to develop an "Organizational Industrial Organization" (OIO) that embeds incomplete contracting ideas into IO. Such an agenda will articulate how control-right allocations, firm boundaries, and other elements of internal organization can be the main determinants of firm conduct and market performance, whether or not there is market power in the industry.

– The methodological criticisms of the '40s-'60s are no longer valid. We are equipped with robust and rich organizational theories, and datasets quantifying organizational variables (e.g., vertical integration, delegation) are becoming available. In fact, recent empirical work in industries as diverse as airlines, concrete, and trucking emphasizes the relation between ownership structures and prices or performance.

– Another empirical IO literature documents persistent heterogeneity in firm performance within as well as across industries and countries (Syverson, 2011).

---

[2] The major exception was a literature, which we survey in section 2.1, that maintained a skeptical stance on the proposition that competition necessarily leads to distortion-free performance.

2

This begs for explanation, something that neoclassical firm models are ill equipped to provide. Organizational economics seems to provide hope for coherence on this issue; indeed, it has long maintained that understanding heterogeneity is one of, if not *the*, central question of the field.[3] But it is difficult to see how one can address organizational and profitability differences without embedding multiple organizations in a market, the essence of the OIO approach.

– The force of public opinion and policymakers' concerns have shifted in response to new economic realities. Recent industry failures, including the corporate accounting scandals of the 2000s; plane crashes in the US; lead-painted toys from China; and, most devastatingly of all, the global financial crisis have been ascribed to unaccountable managers, misaligned ownership structures or outsourcing – in short organizational design flaws – rather than to monopoly power. Much of this criticism is focused on areas where the firms themselves face significant competition. Indeed, managers often blame competitive pressures when they are brought to account for their organizations' failures.

– Nascent efforts at developing an OIO already suggest that market conditions or industrial structure matter for organizational design. At the same time, organizational design will affect the productivity of firms, hence eventually the total industry output, the quality of products and information about this quality for consumers. Organizational design matters for consumers, hence for IO.

The survey comprises two main parts. In a first, we will review two of the main questions that have been addressed by papers introducing organizational considerations into IO. These past efforts have dealt with the disciplining effect of market competition for incentive provision and the use of organizations as strategic variables. In a second part, we will argue that an organizational approach to IO provides new insights about endogenous heterogeneity, price and quantity variables as well as consumer welfare even in the simplest competitive market setting. Furthermore, in that part we will also show how IO matters for organization theory.

---

[3] "How easy it is for an inefficient manager to dissipate the differentials on which profitability rests, and that it is possible, with the same technical facilities, to produce with a great variety of of costs, are among the commonplaces of business experience which do not seem to be equally familiar in the study of the economist" (Hayek, 1945, quoted in Williamson, 1990).

2   Organizations & IO: Questions from the Past

In the 1980s, the parallel advances in oligopoly and contract theory provided fertile ground to revisit questions asked in the 1960s, in particular about the disciplining effect of the market on managers (Machlup, 1967). The first part of this section discusses the literature on this and related questions. Though limited in terms of the organizational design elements it considered – principally managerial compensation schemes were studied – what became clear from that work is that simple intuitions such as Machlup's, that competition always improves managerial discipline, are only partially correct, because they ignore the endogeneity of organizational design. Incentive provision may complement the disciplining effect of the market. But incentives may also substitute for the market: for instance, when demand is low, managers may work harder to avoid bankruptcy, but shareholders may then be less willing to provide strong incentives to managers. Both theoretical and empirical work suggest that, unlike in the neoclassical case, there may be a non-monotonic relationship between competition and managerial effort provision.

These results are significant for their implication that it is not generally possible to study neoclassical firms and hope that the resulting behavior and response to shocks or changes in the environment will replicate that of organizational firms. Hence, some form of OIO modeling is needed in order to assess industry performance, particularly if one is interested in organizational design elements beyond compensation schemes, such as delegation or ownership structure.

The second broad topic that has received significant attention so far in the literature is the use of organizational design as an instrument for gaining market power. The classic IO policy question of the effects of mergers, both vertical and horizontal, figures most prominently here. A smaller literature observes that with separation of ownership and control, financial contracting will matter, both internally to the firm and strategically in its interaction with other firms. We review these literatures in the second part of this section.

Our broad conclusion will be that relatively few organizational variables have been considered so far, and that we are therefore short of having a broad understanding of the relationship between the organization of firms and industry variables like prices and quantities, or consumer welfare.

2.1   Does Competition Matter for Organizations?

In the early 1980s, the main theoretical apparatus for studying internal organization was the principal-agent (P-A) model and this is perhaps why the analysis of

Machlup's conjecture has taken place mainly in the framework of incentive provision, a "firm" being simply a P-A relationship. We first review the main theoretical arguments suggesting an effect of the degree of competition on incentive provisions. We then consider applications of these ideas to different questions in IO, such as spatial competition and industrial policy. The applications underscore the non-monotonic relationship between competition and incentive provision.

2.1.1 The Non-monotonic Theoretical Relationship Between Competition and Incentives

As Nalebuff and Stiglitz (1983a,b), Harris and Holmström (1982) show, competition allows relative performance evaluation in agency problems. The owner is better off since he obtains more information and incentive schemes are stronger, but effort change is non-monotonic because it depends on the cost of implementing incentive schemes (e.g., on the underlying distribution of signals). This type of yardstick competition generally requires significant information about the individual performance of other firms, as well as knowledge of the characteristics of the other firms in order to filter relevant information from the market.

Hart (1983) considers a situation where managers have high or low productivity and can exert effort to achieve profit targets. He introduces an index of competition by assuming that in addition to managerial firms, neoclassical firms are present in the market. For neoclassical firms, productivity is observable; this implies that neoclassical firms produce a high output level when productivity is high and a low output level when productivity is low. If there is cost correlation across firms, when the managers' type is high, the presence of neoclassical firms will increase the supply in the market and therefore put downward pressure on prices, making it more difficult for managers to hide their type, eventually leading them to exert more effort.

The product market price transmits information about the fundamentals of the economy. While Hart (1983) shows that there is indeed a positive effect of competition (measured by the mass of neoclassical firms in the market) on effort provision, Scharfstein (1988) shows that the opposite result can be achieved if we abandon the assumption of infinite risk aversion made in Hart (1983): in this case, a lower product market price may actually make the monetary transfer to the manager costlier, and lower effort provision becomes optimal for owners.

Schmidt (1997) departs from yardstick competition or cost correlation, and, as in the corporate finance literature (e.g., Aghion and Bolton, 1992), considers a model where owners may decide to close down the firm and bankruptcy creates an opportunity cost for managers — the loss of private benefits for instance. Effort of the

manager takes the form of a reduction in the probability that the cost of production is high; more effort makes it less likely that profits are low. Owners observe the cost realization and a signal about the market environment; they can therefore compute the expected profit of the firm if they decide not to liquidate. A low cost will lead to positive profits, but a high cost will lead to negative profits if the signal is low enough. Therefore, there is bankruptcy only if there is high cost and the signal is low. Anticipating this, the manager chooses his effort, trading off his cost of effort and the private loss from bankruptcy. In this framework, more competition implies a higher probability of bankruptcy (e.g., a first order stochastic shift in the signal distribution).

Contrary to Hart (1983) and Scharfstein (1988) who focus on an insurance-incentive tradeoff, Schmidt (1997) considers risk neutral managers with limited liability and focuses on a rent extraction-incentive tradeoff. Depending on the outside option of the manager, the individual rationality (IR) condition may or may not bind in the optimal contract. When the IR condition binds, the owners are forced to provide more attractive compensation to the manager in order to meet his outside option; in turn this leads to higher effort provision. By contrast, when the individual rationality constraint does not bind, the owners do not need to compensate the manager for the increasing risk of bankruptcy since he is already getting a rent. If the difference between the expected profits with low and high costs decreases when there is more competition, the marginal benefit of high effort decreases from the owner's point of view. This rent reallocation effect of competition may then induce the owners to implement a lower effort for the manager.

The essence of the link between competition and incentives can be captured in the following simple example, where we abstract from competition *per se* and represent the firm's environment, which it views as exogenous, by a parameter π that varies positively with demand or the market price or inversely with the degree of competition. Consider a "firm" (principal-agent relationship) in which the agent exerts effort $a \in [0, 1]$ at quadratic cost $G(a) = a^2/2$, has a zero outside option, and is protected by limited liability. There are two periods; effort generates a *high* or *low* signal at the end of the first period; the probability of the high signal is a. A high signal indicates that the output in the second period will be 1, a low signal that it will be 1/4. Beside effort, there are no other costs of production. Therefore the profit from production is π after a high signal and $\pi/4$ after a low signal.

At the beginning of period 2 the principal may *liquidate* the unit and obtain a value of L for its assets; to simplify, this liquidation value is independent of π. If the firm continues to produce in the second period, the agent obtains a private benefit

6

of B, which is also independent of π.[4]

A wage contract in the first period is a pair $(0, w)$ of wages contingent on the signal observed; by limited liability wages must be non-negative, and standard arguments show that 0 is the optimal wage in case of a low signal; w, to be determined is the wage following a high signal.[5] If $\pi < L$, the firm will be liquidated independently of the signal; hence the principal sets $w = 0$, the agent exerts effort $a = 0$ and there is no output produced. There are therefore two possible regimes with positive production in the second period:

– If $L < \pi < 4L$, the firm is liquidated only after a low signal. In this case, the expected utility of the agent is $U^A = a(w + B) - G(a)$ and that of the principal is $U^P = a(\pi - w) + (1 - a)L$. The agent's optimal effort level is $a = w + B$: Substituting $w = a - B$ in the principal's utility, we have $U^P = a\pi + (1 - a)L - a(a - B)$ which is maximized at $\frac{\pi - L + B}{2}$, but because we have $w = a - B$, limited liability together with $a \leq 1$ imply that the optimal choice of effort for the principal is $a^*(\pi) = \min\left\{\max\left\{\frac{\pi - L + B}{2}, B\right\}, 1\right\}$.

– If $\pi > 4L$, the firm is not liquidated after either signal and the expected utility of the agent is $U^A = aw + B - G(a)$. The agent will get the private benefit for any signal and therefore his optimal effort is $a = w$. It follows that $U^P = a(\pi - a) + (1 - a)\pi/4$ while $U^A = \frac{a^2}{2} + B$. Hence the unconstrained optimum for the principal is $a^*(\pi) = \frac{3\pi}{8}$ if $\pi \leq 8/3$ and is $a = 1$ if $\pi \geq 8/3$.

For prices between $\pi = L$ and $\pi = 4L$, incentives are already provided by the threat to liquidate in case of a low signal: high incentives for effort provision may be easily provided because the minimum effort the agent would take is equal to B. By contrast, for prices higher than $\pi = 4L$, incentives must be provided by high wages, which come out of the profits of the principal, simply because he cannot punish the agent by committing to liquidate. If the private benefit is large enough relative to the liquidation value, the effort level may be non-monotonic with respect to π, consistent with the results in the literature where liquidation threat is endogenous to the degree of competition. For instance if $B = 1, L = 1/2$, effort is equal to zero for $\pi \leq 1/2$, to 1 for $\pi \in (1/2, 2)$, to $3\pi/8$ for $\pi \in (2, 8/3)$ and to 1 for π greater than $8/3$. We will see in section 3 that this non-monotonicity in effort has non-trivial consequences for the industry supply.

---

[4]Since B is not contractible and the agent has no wealth, there is no scope for renegotiation: the agent cannot "bribe" the principal for not liquidating the firm.

[5]Note that because incentives for the agent are the strongest when the firm is liquidated in the low state, the principal has no reason to try to commit not to liquidate the assets when the signal is l.

2.1.2 Applications

P-A firms in Spatial Oligopolies Raith (2003) analyzes a free entry oligopoly model on a Salop circle where firms are P-A relationships in a linear-normal-exponential environment: the principal is risk neutral, the agent is risk averse with CARA utility, profits are shared linearly and the cost realization has a normal distribution with a mean decreasing with effort. As is well known, in such a setting riskier signals about the agent's effort result in weaker incentives being provided. Empirical work on this link is in fact less assertive on this point (e.g., Lafontaine and Slade, 2007 who collect the empirical evidence; see also Prendergast (2002) and Ackerberg and Botticini, 2002). Raith's model reconciles the empirical results by emphasizing two types of risks that have opposite influence on effort provision. First, there is the usual agent's risk in principal-agent models implying that a noisier environment makes incentives less powerful. However, there is also a firm's risk, since the variance of profits is also a function of the shocks. More risk may deter entry, increasing profitability for the incumbents and therefore encouraging them to provide higher powered incentives. Taking both effects into account may yield non-monotonicities similar to those found by Schmidt (1997) or Scharfstein (1988).

Industrial Policy Aghion et al. (1997) point out that organizational firms — subject to agency problems — are affected in an opposite way than neoclassical firms by industrial policy or competition policy (see also Aghion et al., 1999). For instance, competition policy (assumed to lead to an increase in the number of firms) will tend to decrease the R&D effort of neoclassical firms – the Schumpeterian effect – but will lead to an increase in the effort of organizational firms – the Machlup effect we have discussed previously. This suggests that property right considerations may indeed change the way industrial policy should be conducted. However, ownership boundaries are exogenous in this work, which may limit the robustness of the policy conclusions.

2.1.3 Evidence

The agency approach and the theoretical ambiguity between competition and different aspects of organization have inspired a significant amount of empirical research (see the recent book Aghion and Griffith, 2008 for a survey of that literature). For example, Nickell et al. (1997) finds that competition and corporate governance may be substitutes. Guadalupe and Wulf (2010) finds that increasing competitiveness following a trade reform resulted in significant "flattening" of reporting structures inside firms as well as higher powered executive pay. Cunat and Guadalupe (2005,

2009) obtain similar findings, using changes in exchange rates to show that the power of executive pay schemes increases with the degree of competition. Variation in takeover regulation allows Giroud and Müller (2009) to uncover a positive relationship between competitiveness (Herfindahl index) and cost performance. In contrast to these "monotonic" empirical findings, which possibly reflect insufficient data variation, Aghion et al. (2006) provide evidence that the degree of vertical integration may have an inverted-U relationship with the level of product market competition.

2.1.4   What Have We Learned?

A common theme in these papers is that changing market conditions, like a downward pressure on prices, may increase effort provision *assuming that the incentive scheme is kept constant* but may also discourage the owners, or whoever is responsible for defining the incentive scheme, from offering strong incentive schemes. If the latter effect is strong enough, it may overturn the benefits of competition for the provision of effort in organizational firms. It is therefore the *endogeneity of incentive schemes* that introduces non-monotonicity into the relationship between competition and organizational design.

This last point is of fundamental importance to the development of a more general Organizational IO, one that goes beyond models of the firm as a P-A relationship. For instance, vertical and lateral integration, which surely are among the leading candidates for OIO treatment, may be subject to similar theoretical non-monotonicities. A more general message from the literature we have reviewed so far is that external forces shape organizational choice, and one may have to look outside the firm in order to understand how it is organized.

2.2   Ownership, Internal Organization and Contracts as Strategic Variables in Oligopolies

Because internal organization has an effect on a firm's performance, it also affects the best responses of firms in strategic settings and could be construed as yet another tool in firms' strategic portfolios, along with prices, capacity, advertising, or R&D investments, etc. For instance, one may be tempted to think of internal organizational choices that are output-enhancing as a commitment to be a more aggressive competitor, very much as a cost-reducing investment is a commitment to produce more.

Part of the literature has looked at the problem of using delegation as commitment in oligopolies. However, it has also been pointed out that because delegation

decisions, like other aspects of organizational design, are endogenous, and in particular flexible and renegotiable, they may have limited commitment value. Hence internal organization should not be treated at the same level as other variables like R&D or capacity building. This makes OIO quite challenging in oligopoly settings and also begs the question of whether internal organization would matter in the absence of market power.

Another strand of literature addresses the possibility of commitment through financial contracts. There, debt may serve as a foreclosure instrument in imperfectly competitive settings. But as the corporate finance and macro literatures make clear, the importance of debt extends far beyond its role in bolstering market power.

Ownership rights may also create commitment, particularly when ownership is understood as in Grossman-Hart-Moore (GHM) to be coupled with the right to make decisions, including the right to design the organization and incentive scheme: the owner can then commit to decisions that are sequentially rational for him or her, subject to potential renegotiations. However, ownership may also restrict the ability not to interfere with other agents' decisions, which constrains the design of internal organization, in particular delegation of tasks (Aghion and Tirole, 1997; Baker et al., 1999).[6]

Independently of their theoretical roles as commitment devices, delegation and debt have received little attention from industrial policy makers. Not so for integration, which attracts immediate scrutiny by antitrust authorities. We review the literature on integration as a foreclosure instrument in the second subsection. Here, as in the literatures on delegation and debt, imperfect competition is a key element of the analysis, and this begs the question of whether integration decisions could be "inefficient" in competitive settings.

2.2.1 Strategic Commitment Devices: Delegation and Debt

Delegation Following an influential paper by Fershtman and Judd (1987) (see also Vickers, 1985; Sklivas, 1987), a series of papers has considered the possibility that owners delegate strategic decisions to managers while at the same time controlling

---

[6]For instance, lack of ownership may limit the desire of inventors to share their idea with a financier or an expert for fear of being expropriated. Biais and Perotti (2008) argue that joint ownership by the inventor and the expert serves as a commitment to share information and for the expert not to steal that information. However, this commitment value disappears for "really good" ideas. Also in the context of R&D, Aghion et al. (2008) argue that differences in control rights allocations between the private and the public sector effectively create a boundary between fundamental or early stage research and development or later stage research and serves as a commitment device for scientists to pursue their own interests for fundamental research.

these decisions by using incentive schemes.[7] Fershtman and Judd (1987) consider incentive schemes in a Cournot oligopoly where the variable part is a convex combination of the profit π_i and the sales S_i made by the firm; that is, the manager's compensation is proportional to $\alpha\pi_i + (1-\alpha)S_i$. For simplicity, consider a duopoly. After each firm's owners choose α_1, α_2, managers then choose their individual quantities q_1, q_2. The owners then can choose whether to observe quantities but yardstick competition is not allowed. One reason for delegation could be the managers' superior information about the demand level, something they will learn after incentive contracts are agreed upon.

In this framework, if $1 - \alpha$ is positive, a manager will be more aggressive in increasing sales; by contrast if $1 - \alpha$ is negative, managers will want to reduce sales. However, if firm 1 has $1 - \alpha_1 < 0$, the owners of firm 2 will want to provide sales incentives ($\alpha_2 < 1$) to their manager in order to push firm 1's manager to decrease his quantities further; anticipating this, firm 1's owners should provide sales incentives to their manager for otherwise they will lose market share. Hence, in the equilibrium of the incentive game between owners, both α_i are less than one. It follows that the commitment to an incentive scheme prior to quantity choices of managers eventually leads to higher output levels and lower profit levels for the owners than when there is no delegation. The authors also consider environments with differentiated goods or uncertainty about costs; in the latter case they can show that as the number of firms becomes large, equilibrium incentive schemes converge to $\alpha = 1$, that is managers behave in a profit-maximizing way.[8]

Fershtman and Judd (1987) endogenize the behavior of firms in choosing profit maximization or sales maximization, and therefore complete the literature of the 60s that assumed rather than derived a non-profit maximizing behavior of firms. However, their analysis begs the question of commitment of owners to incentive schemes. Indeed, the explicit assumption of observability of incentive schemes by all firms and the implicit assumption that owners do not renegotiate the contract with managers are de facto creating commitment but are often strong assumptions (see Dewatripont, 1988; Caillaud et al., 1995 for the possibility of using contracts as pre-commitments when renegotiating contracts cannot be prevented).

In an incomplete contract framework, if ex-ante contracts cannot be made con-

---

[7]This idea of using contracting with third parties to commit to actions is also present in Brander and Lewis (1986)

[8]Reitman (1993) has shown that when managerial contracts can also include stock options, Cournot outcomes can be restored. On the role of managerial compensation and stock options for dynamic competition see Spagnolo (2000) who shows, theoretically, that deferred stock options facilitate collusion since they effectively make the managers more patient.

tingent on future state realizations, delegation rights must be independent of the state realization (by assumption) while ownership provides more flexibility ex-post, in particular on whether individual divisions should be delegated the right to decide in a particular state. The *decision to delegate* is therefore a function of the ownership structure and the "owner" may prefer to wait to delegate than to commit to do so in the initial contract (if commitment is possible). This is a point that is well understood in the applications of incomplete contracting to corporate finance (e.g., Aghion and Bolton, 1992; Dewatripont and Tirole, 1994), but that is somewhat obscured in simple models since issues of delegation are brought in from an internal organization perspective while issues of (ownership) integration are brought in from a boundary of the firm perspective. This link may be more apparent when there are many dimensions on which to decide[9] or when there is a dynamic relationship between owners and managers. For instance, legal rights can be transferred to another party for some dimensions only or an agent may retain the ability to take non-contractible actions that affect the quality of the final product independently of ownership (see Legros and Newman, 2008 for a model along these lines).

In imperfectly competitive markets, Wickelgren (2005) shows that the owner may want to create competition between two divisions that produce differentiated products. This balances effort incentives versus internal price competition, leading to a situation similar to what would happen with non-integration and yardstick competition for managers. Alonso et al. (2008) assume commitment to decision rights allocations in a model where a unique price has to be set for two divisions producing differentiated products with linear demand functions and where managers have private information about the level of the demand. If there is delegation, the right to choose the price is given to the manager facing the flattest demand function, but delegation arises only if the slopes of the demand functions are sufficiently different.

Commitment to delegation therefore supposes that the owners have protected the manager to whom they delegate from interfering with his decisions. This could be done by transferring the legal right to make decisions on the asset (which is very close to ownership). It could also be done for incentive compatibility reasons.

Lafontaine and Slade (2007) is one of the few papers considering ownership as a strategic variable. This is done in the specific context of franchising, where the owner of an intangible asset (e.g., the McDonald brand) benefits when franchisees make specific investments. They show that the owner may want to have independent franchisees in order to provide a yardstick to evaluate the performance of franchises he owns. This is one rationale for what we will call soon "endogenous heterogeneity" in organizational forms.

---

[9]Or as in Tadelis (2002) when the "design" is complex and requires ex-post adjustments.

Returning to the issue of commitment, Aghion and Tirole (1997); Baker et al. (1999) articulate two different mechanisms by which an owner may indeed commit not to overturn decisions made by an employee if there is delegation. In Aghion and Tirole (1997), it is because the employee may have (endogenously) better information and they show that in some instances it is better to give an agent 'real authority' than to give him 'legal or formal authority': real authority means that decisions made by the agent will not be overruled by the principal, while formal or legal authority means that the principal cannot intervene in the decision made by the agent. The cost of giving formal authority to the agent is the loss of control when the principal knows that the decision taken is not the right one, the benefit is that it increases the incentives of the agent to acquire information. In Baker et al. (1999), commitment not to interfere with decisions made by agents under delegation is sustained through relational contracting and they show when this is better than the legal commitment generated by divestiture.

Finally, outside regulation as corporate governance guidelines may constrain the internal organization of firms and the possibility to mitigate the conflict of interests between different stakeholders. There is a recent literature on the role that corporate governance may play and its relation to competition (see for instance, Vives, 2000; Allen and Gale, 2000). Some 'natural experiments' (Bertrand and Mullainathan, 2003; Giroud and Müller, 2009) suggest that managers are indeed pursuing a 'quiet life': after regulation that prevents takeovers or sales of assets, there seems to be a significant increase in input costs, including workers salaries, and therefore managerial discretion seems indeed to be a source of cost inflation in firms. The results in Giroud and Müller (2009) suggest that the effect is more pronounced in less competitive industries (as measured by the Herfindahl index),[10] but they do not seem to control for the potential changes in internal organization or incentive schemes that may have followed the regulatory change.

Debt   Jensen and Meckling (1976) have highlighted the agency cost of debt: borrowers will tend to discount low profit realizations and may therefore engage in projects that have a negative present value. Yet, as we have seen in section 2.1, increasing the risk of bankruptcy may also serve as a disciplining device for managers in agency models and Grossman and Hart (1982) show that debt can be used as a bonding device in principal-agent models since the risk of bankruptcy increases in the case of low profit realizations. In an influential paper Brander and Lewis (1986)

---

[10]The use of the Herfindahl index for measuring the intensity of competition is borrowed from the Cournot model but is not necessarily a good measure for other market structures, or as Farrell and Shapiro (1990) have argued when assets can be traded.

13

argue that there is a nontrivial relationship between the debt-equity ratios and the performance of a duopoly: on one side, debt will induce firms to discard profits in low states that lead to bankruptcy and therefore pursue strategies that increase the profit levels in the good states but, on the other side, firms will pursue strategies that give them a competitive advantage and drive out of the market other firms which have a high debt-equity ratio. This leads to more aggressive behavior in Cournot oligopolies and less aggressive behavior in Bertrand oligopolies, but in both cases the profit increases with the use of debt.

While the result that debt makes oligopolistic firms more aggressive has been challenged by different authors, both theoretically and empirically.[11] the general idea that financial structure has consequences for the strategic behavior of firms is an important message for IO (see the recent survey by Lyandres, 2006).

In this literature, financial contracting would have no role to play absent market power. By contrast, Bolton and Scharfstein (1990) make financial contracts a necessary instrument of entry by firms: entrepreneurs may need to borrow to invest in capital expansion or plant creation. Financial contracting is imperfect because repayment cannot be made contingent on output realizations. While the costly state verification problem prevents financial contracting in a static framework, when there is more than one period the threat of closing the firm if it claims to have low output can generate incentives for repayment. In this framework, finance has an active role to play, whether or not there is market power, but in the latter case, finance leads to a rationale for predation. Indeed, if another firm in the industry does not need

---

[11]As Showalter (1995) shows, the effect of debt on strategic behavior depends not only on the substitution or complementarity of the strategic variables but also on the type of uncertainty firms face. Brander and Lewis (1986) consider demand uncertainty, and Showalter (1995) shows that with cost uncertainty firms become *less aggressive*. Faure-Grimaud (2000) considers endogenous financial contracts and shows that the Brander and Lewis (1986) effect of debt making firms more aggressive competitors is offset by the cost of financial instruments in a Cournot oligopoly. Povel and Raith (2004) also consider endogenous debt contracts and introduce an expected cost of liquidation that is increasing in the amount of default: this makes the equity holder liable for low profit states and reduces the agency cost of debt, which would suggest that firms with debt may be less aggressive. Jacob (1994) shows that issuing long term debt may be an instrument for collusion: since contrary to Brander and Lewis (1986) firms are engaged in a long term competition, high profit realizations make the firm less aggressive since the opportunity cost of competitive wars, following deviations from collusion, is larger. The difference of results is illustrative of the different predictions in oligopoly theory when one goes from a static analysis to a dynamic analysis: in general, 'bad' equilibrium outcomes in a static setting, like more aggressively in setting low prices, help in a dynamic context since they provide a credible punishment in the case of deviations.

On the empirical side, Chevalier (1995) uses supermarket data and shows that an LBO announcement has a positive effect on the market value of competitors, suggesting that debt softens competition; see also Dasgupta and Titman (1998).

14

to borrow for entry, because it has "deep pockets", it may engage in predation by increasing the probability of low output levels and therefore forcing the other firm into bankruptcy for lack of debt repayment. Optimal financial contracts now balance this threat of predation and the agency problem due to the state verification problem. This paper is representative of the literature combining finance and IO (see also Fudenberg and Tirole, 1986, Katz, 1991).

In section 3.3, we will discuss something that the literature rarely addresses, which is the use of side-payments needed to reallocate surplus in contractual negotiations, including the transfer of ownership rights. Broaching it directly opens up novel issues concerning the relationship between liquidity distribution and organizational choices in an industry.

2.2.2   Using Integration to Foreclose Competitors

Policy makers long suspected that mergers might be motivated primarily by the firms' desire to enhance their market power. While the argument is not difficult to grasp in the horizontal case, the theoretical case for vertical foreclosure resisted formal treatment for a surprisingly long time. Arguably, by the time it was successfully broached, the Chicago School, bolstered in part by arguments for the productivity benefits of vertical integration advanced by Klein et al. (1978); Williamson (1971, 1975, 1985), had succeeded in allaying antitrust authorities' fears, for the merger guidelines with respect to vertical integration had become fairly lax. Nevertheless the theoretical cases are worth examining, because they hint at how a full OIO analysis of the simultaneous determination of market structure and firm boundaries may proceed.

Hart and Tirole (1990) provide one of the first formal treatments of the role of integration as a foreclosure instrument. In their basic model, two downstream firms $D1$, $D2$ sell a homogenous product under constant returns and can produce one unit of output for each unit of input they buy. Contracts between an upstream firm U and a downstream firm for the provision of input levels can be in two-part tariffs, thereby eliminating the traditional IO "double marginalization" motive for integration, and it is not possible to for a downstream firm to write contracts preventing the upstream firm from selling to another downstream firm, to abstract from exclusive dealing (later this assumption is relaxed when they compare integration to exclusive dealing). Nevertheless contracts are incomplete, in that there is a large number of possible input types and uncertainty over which one will be appropriate to trade, making it too costly to write contingent trade and pricing contracts. Allocating control over assets is therefore the only way to influence ex-post behavior, in particular, pricing

15

of the input.

When the two downstream firms are separate units, even a monopoly upstream seller cannot obtain more profit than is generated under Cournot competition. Indeed, for any quantity of input q_1 purchased by D_1, the monopolist U maximizes his revenue from selling inputs to $D2$ by offering that firm $q_2 = B_2(q_1)$, the best response of $D2$ to q_1; anticipating this, $D1$ will be willing to pay at most $\pi_1(q_1, B_2(q_1))$ to U. If $D2$ has the same expectations, it is optimal for U to offer the Cournot quantities to the downstream firms. If however U integrates with $D1$, the merged entity will internalize the profit made by $D1$ and therefore will prefer to sell the monopoly quantity and not to supply $D2$: integration generates commitment not to sell to the other downstream firm. As Hart and Tirole argue, the commitment generated by integration is superior to that of exclusive contracting clauses because it allows for greater flexibility. For instance, if there is another, less efficient, upstream supplier $U2$, an integrated firm $(U1, D1)$ can compete with $U2$ to serve $D2$, something that an exclusive contract would not allow. A 'contingent' contract that would limit the quantities sold to $D2$ may also be difficult to implement in practice since it requires a high degree of information.[12]

They generalize their model to allow for fixed costs of entry or operation by upstream and downstream firms and profit sharing in case of integration. They show that more efficient firms have more incentives to integrate, which in turn leads to a "bandwagon" effect that leads the other upstream-downstream pair to integrate as well: since the profits of the non-integrated downstream firm decrease, absent integration, this firm may exit; it is then in the interest of the other upstream firm to integrate with it and share the costs of investment in order to rescue its market.

In other variants of the basic model, Hart and Tirole consider situations where each upstream firm has a fixed capacity upstream ("scarce supplies") or downstream ("scarce needs"), while each D_i needs only one unit of input. Integration modifies the bargaining positions of the parties: integrated firms have a higher bargaining power since they benefit from 'supply assurance' and therefore the non-integrated firms will tend to have lower profits and lower incentives to invest.

The analysis highlights the importance of endogenizing rather than assuming commitment and entry, as was done in the literature. For instance, in the symmetric case where the upstream firms have the same marginal cost of production, Ordover et al. (1990) show that integration is beneficial, in contrast to the results in Hart and Tirole (1990). This is because the ability of the integrated firm to commit

---

[12]See McAfee et al. (1989); Marx and Shaffer (2004) for an analysis of the possibility of commitment through non-discrimination clauses. See also Segal (1999, 2003) for a general analysis of contracting with externalities.

not to supply to the other downstream firm eliminates competition between the upstream firms to supply to the other downstream firms, eventually benefitting both the integrated firm and the other upstream firm.[13]

Bolton and Whinston (1993) show that in a multilateral situation integration may serve the dual role of protecting a party from opportunism ex-post but also reinforce market power of the party with scarce resources. Suppose that each of $D1, D2$ needs a unit of input but that U has a single unit to distribute. Downstream firms make investments x_1, x_2 at cost $c(x_i)$. The willingness to pay of consumers for a product can be either high, and equal to $v_H(x)$ or low and equal to $v_L(x)$, where $\max_x v_L(x) < \min_x v_H(x)$.

The demand realizations are perfectly correlated: with equal probability demand realizations are $(v_H(x_1), v_L(x_2))$ or $(v_L(x_1), v_H(x_2))$. Allocating the input to the downstream firm facing the highest willingness to pay of consumers is efficient and total welfare is $\frac{1}{2}v_H(x_1) + \frac{1}{2}v_H(x_2) - c(x_1) - c(x_2)$. Therefore the marginal incentives for investment of the firms are $c'(x_i) = \frac{1}{2}v'_H(x_i)$. With non-integration, each downstream firm will compete for the input à la Bertrand and therefore the highest value firm will pay the second highest value; hence conditional on having the highest value the net surplus of downstream firm D_1 is $v_H(x_1) - v_L(x_2)$ and his expected payoff is $\frac{1}{2}(v_H(x_1) - v_L(x_2)) - c(x_1)$ implying the same marginal incentive to invest as in the social optimum. Hence investment levels with non-integration are efficient.

But while non-integration leads to efficient investment levels, it is not always stable, since the upstream firm and a downstream firm may strictly gain by integrating. Suppose that $U, D1$ integrate; the vertical structure has a surplus of $v_H(x_1)$ with probability $1/2$ (in this case $D2$ does not produce) and a surplus of $v_L(x_1)$ with probability $1/2$ ($D2$ purchases the input from the vertical structure at the opportunity value of $v_L(x_1)$). Hence the expected surplus of the vertical structure is $\frac{1}{2}(v_H(x_1) + v_L(x_1)) - c(x_1)$: the marginal incentive to invest increases by $v'_L(x_1)/2$

---

[13]The literature has embraced the idea that integration facilitates commitment. For instance, O'Brien and Shaffer (1992) consider the case of a single upstream producers and downstream firms competition à la Bertrand (hence avoiding the usual 'double marginalization' motive for integration). They assume that the upstream firm cannot commit to re-contracting and therefore that retail prices will be smaller than under integration, even if the upstream firm can choose two-part tariffs, providing a new rationale for vertical restraints linked to contract incompleteness. Alexander and Reiffen (1995) identify the strategic values of different price and non-price vertical restraints, as well as the role of external enforcement mechanisms, like regulation. Schmitz and Sliwka (2001) assumes that the supplier of a good can invest to enhance quality, which will increase the value to the buyer and also the residual value of the asset in case bargaining fails, and in a degree of specificity, which also enhances the value of the good to the buyer but decreases the residual value in case of failure of bargaining. Integration depresses incentives to invest but increases specificity, while non-integration has opposite effects.

with respect to non-integration. Note that the incentives to invest of $D2$ are the same as with non-integration since he has the same expected surplus function. However, because the investment of $D1$ increases, the equilibrium value of $D2$ decreases (and by a larger amount than the equilibrium payoff to the vertical structure increases since investment choices are not first best).

These papers combine two effects present in the literature: an efficiency motive for integration (see Lafontaine and Slade, 2007 for a survey of the literature) and market foreclosure or raising rivals' cost strategic considerations. Empirically, it is difficult to disentangle the two effects; for instance, highly concentrated markets are prone to foreclosure effects but are also often also characterized by relation specific investments, implying therefore also an efficiency role for integration (see the discussion of the different results in the empirical literature in Joskow, 2010).

3 OIO: Questions for the Future

Despite the long history of contact between theories of the firm based on incomplete contracting and IO, the two areas are far from integrated, so to speak. One view would be that this is just fine: organizational considerations are brought in when they are most naturally needed, as for merger activity or for understanding when vertical integration may lead to foreclosure. Complementary to this view is the position that incorporating richer views of the firm into models of market power will make things much more complicated without adding much new insight beyond what one could obtain by maintaining this "arm length relationship" between Organizational Economics and Industrial Organization.

What these positions fail to address is whether the imperfections inside firms that make organizational design relevant can *by themselves* generate insights, explanations, and testable implications that are not predicated on market power. To test the waters, we shall assume away market power altogether, and consider an environment of price-taking competition. The exercise shows that incomplete contracting can shed light on at least the following basic questions:

- **How does organizational design affect the most basic economic quantities** of interest to IO economists, namely prices, quantities and consumer welfare?

- **Can market conditions affect organizational design** in the absence of market power, and if so how?

- **Can we explain heterogeneity** of organizational forms with its accompanying productivity differences among firms?

- **Can OIO provide a practical proving ground** for competing organizational theories?

- **How does an organizational industry differ from a neoclassical one** in the way it absorbs and propagates shocks to fundamentals?

- **What are the policy implications** of the answers to the above questions?

Neither space, nor the present state of knowledge, permit complete discussion of answers to all of these questions. But recent models in the literature and the rudimentary representations and extensions that we present here provide grounds for optimism that these questions can be usefully addressed.

3.1   An OIO Example

Consider as a building block the model of Hart and Holmström (2010) (HH) where final goods are produced with two complementary inputs; call them A and B. Input suppliers are an indivisible collection of assets and workers, overseen by a manager. During the course of the relationship, ex ante non-contractible production decisions will have to be made. The important point is that these decisions need to be coordinated to enhance output: it is not so important what decision is chosen in each unit, as long as it fits what is happening in the other.[14] The organizational problem arises from a conflict of interest over what decision is optimal. For instance, if A represents product development and B manufacturing, then product designs that are easy for A to develop may be difficult for B to manufacture, and vice versa. This could be an effect of the nature of technology, the result of past training and experience, a concern over reputation, or even a difference in beliefs about the best course of action (i.e., "vision").

Thus, if each retains control over his own decisions (which is interpreted as non-integration), there will tend to be poor coordination: if the two managers were to maximize profit by picking perfectly matched actions, each would want to deviate by moving (at least slightly) in his preferred direction. The coordination problem can be "solved" via integration. HH depart from G-H in a second way here, by

---

[14]In contrast to Grossman and Hart (1986), HH assume that ex-post bargaining with unlimited side transfers is not feasible since agents use contracts as reference points and would feel aggrieved if they do not get the best outcome under the initial contract.

assuming that integration involves a sale of assets not to one of A, B but rather to a third-party professional manager who then acquires decision rights over both A and B. The professional manager is concerned only about the enterprise's revenue and will therefore have incentives to maximize it by perfectly coordinating decisions. The problem is that this imposes costs on the A and B managers in terms of private benefits.

Note the potential significance of this model in light of some recent empirical work by Atalay et al. (2012). They survey intra-firm shipping data for US manufacturers. The surprising finding is that among domestic firms, very few of the inputs produced by one subsidiary are shipped to other subsidiaries of the same firm, implying that vertical integration does not comprise single supply chains (for multinational firms, the traditional picture, wherein one subsidiary produces an input that is consumed by the next firm in the chain, does seem to hold up). Rather, the picture of vertically integrated firms that emerges is that of a portfolio of input suppliers, with each subsidiary selling to its own market, in which the common owner provides certain (unmeasured) managerial services. While these findings are controversial, if true, they may cast some doubt on the empirical relevance of the holdup problem as a major determinant of firm boundaries, at least among US domestic manufacturers.

The HH model is consistent with these findings, and indeed with Atalay et al.'s own explanation for vertical integration as a conduit for (unobserved by them) managerial services. Several suppliers that are related because they produce complementary goods but are not actually transacting with each other might nevertheless benefit from services that conform to a single style or fit a common standard, say for brand recognition, marketing and distribution, logistics and so on. But it is harder to see how a hold-up problem could arise or spot adaptation decisions would need to be made if the input produced by A is not actually being shipped to B in equilibrium. This does not mean, of course, that hold-up problems are irrelevant. But incomplete-contract models articulated around a tradeoff between coordination of decisions versus private costs of these decisions may provide a reasonable and simple benchmark model for performing market analysis.

We now embed the basic model in a product market setting, along the lines of Legros and Newman (2013).[15] Consider a market composed of a large number of

---

[15]Earlier attempts to explain the pattern of outsourcing in industries when there is incomplete contracting include McLaren (2000) and Grossman and Helpman (2002). Both papers proceed in the Williamsonian tradition where integration alleviates the hold-up problem at an exogenous fixed cost. McLaren (2000) observes that when the market for specialized inputs thickens, there are fewer opportunities for hold-up and therefore a greater tendency for non-integration. This generates strategic complementarities between organizational choices and the possibility of multiple vertical industry equilibria. It also predicts that globalization, interpreted as market thickening, leads to

HH-style enterprises (A, B), each of which takes the market price P for the (single) product as given. The price is determined endogenously in the model via a market clearing condition, and A's are willing to participate as long as they have a non-negative payoff. There are three non-contractible production "styles", L, M, or R that can be adopted in each unit. If they make the same choice, the quantity produced is 1. If their choices differ by one (e.g., $\{L, M\}$)) the output is $\lambda < 1$, by two ($\{L, R\}$) it is λ^2. A's costs of L, M, R are 0, c, C, while B's are C, c, 0 where $2 < \frac{C}{c} < \frac{1+\lambda}{\lambda}$.

A contract between an A and a B specifies an ownership structure, i.e., whether the enterprise is integrated or not, and a fixed (independent of output but not necessarily of the ownership structure) transfer that A receives from B which is just large enough to induce A to participate (Legros and Newman, 2013 considers general contingent sharing rules).

Under non-integration, A and B choose their production decisions simultaneously once the fixed transfer has been made. Since the transfer is fixed, it has no effect on decision making, and we can therefore represent the payoffs in the post-contracting subgame by the matrix (A is the row player, B the column player)

$$\text{Player } B:$$

	L	M	R
L	$0 \ , P - C$	$0 \ , \lambda P - c$	$0 \ , \lambda^2 P$
M	$-c \ , \lambda P - C$	$-c \ , P - c$	$-c \ , \lambda P$
R	$-C \ , \lambda^2 P - C$	$-C \ , \lambda P - c$	$-C \ , P$

Player A : (rows L, M, R)

A's dominant strategy is to play L, and it is straightforward to verify that since the parametric assumptions on λ, C, and c imply $\frac{C-c}{1-\lambda} < \frac{C}{1-\lambda^2} < \frac{c}{\lambda(1-\lambda)}$, B plays R when $P < \frac{C}{1-\lambda^2} \equiv \hat{P}$ and L when $P \geq \hat{P}$, yielding payoffs for B of $\lambda^2 P$ if $P < \hat{P}$ and $P - C$ if $P \geq \hat{P}$. Note that in this equilibrium A has a payoff of zero and therefore the transfer he receives is equal to zero.

Under integration, a professional manager with zero opportunity cost, whose payoff is increasing in income but is indifferent about L, M, and R, purchases the assets via fixed transfers, thereby acquiring control of decisions and access to the revenue stream, which he maximizes. Since he is indifferent among $(L, L), (M, M)$, (R, R), we assume that he picks the efficient choice, which is (M, M), as $2c < C$.

non-integration and outsourcing. Grossman and Helpman (2002) develop similar tradeoffs in a monopolistic competition model with search frictions, and studies how parameters such as demand elasticities and search efficiency affect the choice of ownership structure. It also addresses the heterogeneity question, but in contrast to what we show below, it finds simultaneous presence of integration and non-integration in an industry to be nongeneric.

Since A would incur a cost of c under integration, the transfer B pays is equal to c, and B's payoff is $P - 2c$. This exceeds B's payoff under non-integration when fully conceding to A (i.e., playing L), which is $P - C$. However, as we have seen, B does not always want to concede under non-integration. If $P - 2c < \lambda^2 P$, or $P < \frac{2c}{1-\lambda^2} \equiv P^* < \hat{P}$, then under non-integration, the managers play (L, R), and B therefore prefers non-integration. But if $P \geq P^*$, then integration is preferred by B to non-integration, regardless of how it is played in equilibrium. Thus, *the choice of ownership structure depends on the market price.*

The reason for this result is very simple: at low prices ($P < P^*$), non-integration is not well coordinated and produces little, but this is of little consequence to the managers because extra output generated by integration valued at a low price would not offset the private costs. At moderate prices ($P^* < P < \hat{P}$), the gain in revenue from more efficient production is worth the higher private cost of integration. And at the highest prices, ($P > \hat{P}$), integration is chosen not because it is more productive in terms of output, but because it imposes lower private costs on B who would otherwise concede fully to A.

Observe that when when $P \geq \hat{P}$, the "transaction cost" associated with non-integration, that is, the cost of transacting across firm boundaries, is C, which is generated only from private costs. However, when $P < \hat{P}$, the transaction cost is $(1 - \lambda^2) P$, which results from lost output. Thus, *the nature as well as the size of the cost of transacting in the supplier market depends on the price in the product market.* Meanwhile transacting within firm boundaries (integration) always generates a private cost of $2c$. Since transaction costs depend on the price, so does the least-cost ownership structure, which as we noted above is integration when $P > P^*$ and non-integration when $P < P^*$.

We turn now to the market equilibrium. Observe that an individual enterprise's supply correspondence is $\{\lambda^2\}$ for $P < P^*$, $\{1\}$ for $P > P^*$, and $\{\lambda^2, 1\}$ for $P = P^*$. Suppose that an industry is composed of a large number (continuum with unit measure) of enterprises just like this one. Then the industry supply will also be $\{\lambda^2\}$ for $P < P^*$ and $\{1\}$ for $P > P^*$, and will be $[\lambda^2, 1]$ for $P = P^*$.

This "organizationally augmented" supply (OAS) curve embodies not only the usual price-quantity tradeoff, but also the organizational design: as we move along the supply starting at $P = 0$, we have non-integration for $P < P^*$ and integration for $P > P^*$. Moreover, at $P = P^*$, managers are indifferent between the two ownership structures. Since any mix of non-integrated and integrated firms would make managers happy at this price, the supply is "horizontal" there. See Figure 1, where we have also added a standard demand curve.

Note that the cost of production which is simply the managers' private costs is

22

represented by the area under the supply curve: under non-integration $(P < P^*)$ it is zero and under integration it is $2c$, which is equal to $(1 - \lambda^2)P^*$.

In the figure, we have also indicated the supply when firms are "managerial," in the sense that managers accrue only $\mu < 1$ of the revenue, with the rest accruing to shareholders. In this case, non-integration is chosen for $\mu P < P^*$, integration for $\mu P > P^*$. It follows that the supply curve is now an "upward translation" (dashed in the figure) of the original supply. But cost is represented as before, by the area under the $\mu = 1$ supply.
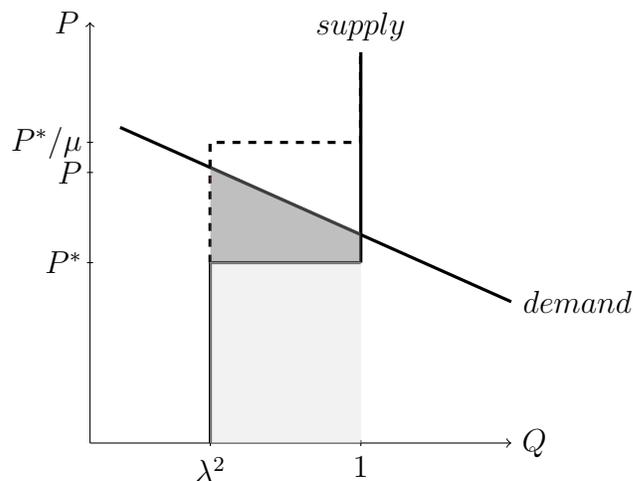

Figure 1: The Organizational Augmented Supply Curve $(\mu < 1)$

The competitive market equilibrium condition, quantity supplied = quantity demanded, then determines not only price, but also the ownership structures of all the enterprises. Thus in industry equilibrium, ownership structure determines supply while simultaneously demand determines ownership structure. We can now begin to provide answers to some of our questions:

– **Market conditions affect organizational design.** When demand is low, the enterprises will be non-integrated. When it is high they will be integrated. Thus, just as in the vertical foreclosure literature discussed in section 2.2, *there is a positive correlation between integration and the price level.* However, here the causality runs the other way, from prices to integration.[16]

---

[16]Mindful of this reverse causality, Alfaro et al. (2014) exploit variation in "most favored nation"

– **Organizational design affects industry performance.** This is implicit in the very shape of the OAS: since non-integrated enterprises produce less than integrated ones, the choice of ownership structure has bearing on industry output and equilibrium price. In fact,

– **Competitive equilibrium ownership structures need not maximize welfare.** As long as there is separation of ownership and control ($\mu < 1$), the market equilibrium is not generally surplus efficient. *The welfare loss is greater the more elastic is the demand*: this is the opposite of the relationship between demand elasticity and deadweight loss for a neoclassical monopoly. This suggests that corporate governance and policies to regulate it will have implications for *consumers* and industry performance.

– **Productivity-relevant organizational heterogeneity is endogenous.** For a "generic" set of demand curves the equilibrium price will be P^* and there will be simultaneously some integrated firms and some non-integrated enterprises. Thus even though every enterprise is fundamentally identical, there is *heterogeneity of organization and concomitant heterogeneity in performance* (output).

Heterogeneity of performance among firms has attracted an enormous amount of attention in several literatures, including IO and OE (see e.g., Gibbons, 2006, 2010; Syverson, 2011), and thus it is worthwhile investigating whether and to what extent ownership structure might account for it. On the qualitative side, the model suggests that endogenous differences in ownership structure may go part way toward explaining heterogeneity. On the quantitative side, the model also suggests that the degree of heterogeneity is clearly sensitive to demand: for low or high enough demands, there is uniformity of ownership structure, but in between most common measures of organizational or productivity variation would vary continuously with demand. Whether this or other organizational IO models could account for a substantial proportion of observed performance variation remains to be seen.

The endogenous heterogeneity result is a simple consequence of market clearing where there is a discontinuity in individual supply due to the performance differences of the two ownership structures.[17] Indeed, it is the performance difference that is responsible for the (genericity of) equilibrium heterogeneity: without it, the supply

---

import tariffs, which increase prices but are arguably exogenous to vertical integration, to show that price levels do affect the level of integration; at least within the range of variation of their data, their results show a positive relationship between integration and price, as in this model.

[17]Another explanation for heterogeneity in organizational forms, also based on the inherent discreteness of integration choices, is offered by Gibbons et al. (2012), which views equilibrium het-

would be continuous and there would be no reason for firms not to have identical ownership structures.

3.2 OIO as a Proving Ground for Organization Theory

While pertinent, the HH model is only one of many organizational models one could consider when trying to develop an OIO. Other models of organizations will tend to generate different relationships between IO variables, such as prices and quantities, and organizational variables, such as the degree of integration. In other words, one may have different Organizationally Augmented Supply Curves for different organizational models. We now provide two examples in which the predicted relationship among organizational and industry performance variables differ from the monotonic ones generated by the model in the previous subsection.

3.2.1 A Non-Monotonic Relationship Between Price and Integration

As a first illustration, consider the previous model but assume now that integration entails a loss of productivity, which we represent by supposing that output under integration is $\sigma < 1$ times the output under non-integration, given the same production choices. This could be a reduced-form representation of a number of organizational costs that have been discussed in the literature, including costs of communication within hierarchical organizations (see the survey by Dessein, 2013); perfunctory managerial behavior in the face of HQ authority (as in the contractual literature on aggrievance, e.g., Hart and Moore, 2008); influence activities by the managers trying to persuade the neutral HQ to decide things their way (Milgrom, 1987); resource diversion by HQ itself; or many of the costs of integration cited by Williamson (1985).

This loss affects only integration, and surplus in this case is $\sigma P - 2c$. It is then straightforward to verify that when $P < \hat{P} \equiv \frac{C}{1-\lambda^2}$, integration dominates only if $P > P_0 \equiv \frac{2c}{\sigma-\lambda^2}$, and when $P > \hat{P}$, integration dominates only if $P < P_1 \equiv \frac{C-2c}{1-\sigma}$. It turns out that $P_0 < \hat{P}$ if and only if $\hat{P} < P_1$, and this happens whenever σ is not too small:

$$\sigma > \lambda^2 + (1-\lambda^2)\frac{2c}{C}.$$

In this case, the organizational choice is not monotonic in price, since integration is chosen only when $P \in [P_0, P_1]$. Moreover, integration no longer outperforms non-integration (in terms of profit, revenue or output). This raises the possibility that there can be "too much" integration as well as too little, even in a perfectly competitive environment: if managers and HQ claim only a share μ of revenue, as discussed above, then for prices in between $\hat{P}/\mu$ and P_1/μ, there is integration even though non-integration produces more output.

Beyond generating non-monotonicity in organizational forms with respect to prices, this example highlights the importance of the managerial market in explaining organizational forms and industry performance. If σ is interpreted as "managerial skill," more skilled HQs increase the range $P_1 - P_0$ of prices in which integration occurs. The determination of ownership structure, particularly the degree of heterogeneity, may then be related to the supply of managerial talent.

3.2.2 A Non-Monotonic Industry Supply

In the example in section 2.1.1 there is a tradeoff between the strength of incentives provided by the market and the provision of incentives within the firm, which affects the effort level of the agent. Suppose that π coincides with the market price P, and consider the special case of a private benefit of $B = 1$ and a liquidation value of $L = 1/2$. If the price is lower than $1/2$, the firm is always liquidated and the agent has no incentive to exert effort. If the price is in the interval $(1/2, 2)$, the firm is liquidated only if there is a low signal, making the agent willing to exert effort even if he does not have a wage incentive. When the price is greater than 2 however, the principal cannot commit to liquidate the firm, and incentives have to be provided via contingent wages. But such wages are costly for the principal, and for prices close to 2 he will not want to provide full incentives to the agent; as the price increases, the principal strengthens incentives. This creates a non-monotonicity in effort level, but more telling a non-monotonic industry supply curve, as illustrated in Figure 2.

Embedding this simple principal-agent model into a market generates novel theoretical effects at the industry level. More importantly, the example suggests that empirical estimation of supply curves may offer a way to falsify specific organizational models.

3.3 Surplus Division and Financing Asset Purchases

Trading assets requires making compensatory transfers, but as we saw in section 2.2.1, agency problems or incomplete contracting make financing of ex-ante transfers through debt or other financial contracts costly. Lump sum transfers are almost
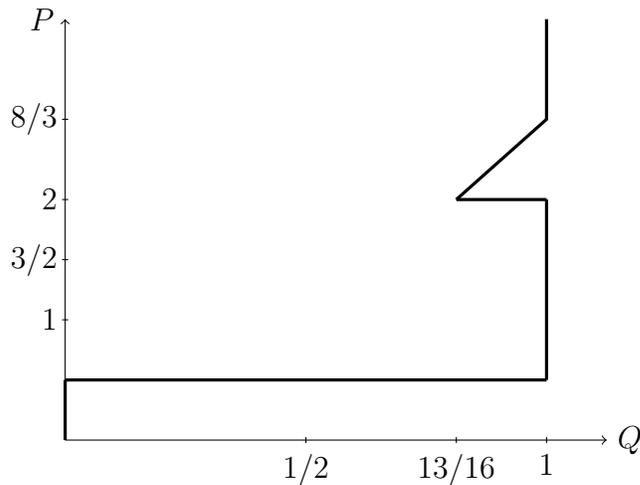
Figure 2: A Non-Monotonic Industry Supply

universally more desirable. This is not a problem if enterprises have large amounts of cash, which is a strong assumption in most settings. This raises the question of what happens in the general case when cash endowments are small relative to the value of the transactions.

As we detail below, cash endowments have often played an important role in the literature, because cash facilitates the emergence of "efficient" organizations. However, because the analysis is often cast in a partial equilibrium framework (the role of cash for a given relationship), it ignores the change in the bargaining positions of the parties when *other* firms have different cash endowments. After a review of the literature we will turn to a model in which the distribution of cash has consequences for the organization of the industry. In particular "more cash" on average does not necessarily imply "more efficient contracting" on average.

3.3.1 The Role of Cash Endowments in the Literature

Limited cash endowments is a central assumption in the corporate finance literature: it is one of the main reasons for an entrepreneur to engage into financial contracts. The literature has emphasized that some forms of financing may have better incentive effects than others, as in the debt versus equity comparison in Jensen (1986).

Organizational design involves assigning control rights and pecuniary payoffs in particular patterns. It was the chief insight of Aghion and Bolton (1992) to recognize

that the same is true of financial contracts. For instance, debt and equity contracts have different ways of bundling ownership rights with return streams. Equity holders keep control of the firm's assets as long as they can repay the debt, in which case they obtain the residual stream of profits. If they cannot repay the debt, creditors obtain control, as well as the residual value, of the assets. Since control rights and return streams generate distinct incentives, debt and equity contracts may be dominated by financial securities that bundle control and return stream rights in other ways (e.g., Dewatripont and Tirole, 1994). The literature on financial contracting, which is surveyed in Bolton (2013), shows that in general, even the best designed financial security will be less efficient than a cash transfer.

In agency settings, it is well understood that agent's limited liability creates a rent extraction motive for the principal. For instance, even if the surplus maximizing ("first best") effort is implementable, the principal may choose to implement a smaller effort in order not to give rents to the agent. When the outside option of the agent is large however, this rent extraction motive is disciplined, since the principal will need to give a sufficient share of the surplus to the agent. As we have seen earlier in the model of Schmidt (1997), whether the rent extraction motive is present has implications for whether the degree of product market competition covaries with the degree of managerial incentive provision. Hence, both the cash holdings and the bargaining positions (outside options) of the parties matter. While cash holdings can be observable, the bargaining positions of the stakeholders in the firm are more difficult to assess and they are often a function of what happens outside the firm, in particular on what other firms do. This makes an OIO approach important for identifying the effects of limited cash holdings.

Beyond its effect on incentives in principal-agent models, the rent extraction motive also influences organizational choices and their efficiency. For instance, when the outside option of the agent is low, the principal may favor investing in a costly monitoring technology in order to avoid (or reduce) the moral hazard problem and paying rents to the agent, while when the outside option is high, the principal foregoes monitoring because the necessarily high expected wage he pays already provides incentives (Acemoglu and Newman, 2002; Legros et al, forthcoming). In an incomplete contract framework, integration decisions may be a nontrivial function of the cash holdings of the parties, and, as the moral hazard example suggests, of their bargaining positions.[18] This suggests that ownership allocation may be coupled with

---

[18]De Meza and Lockwood (1998) show that in the Grossman and Hart (1986) model, if agents have outside options at the negotiation stage, many of the results are qualitatively different. For instance, ownership should not necessarily go to the agent whose investment is the "most important". See also Chiu (1998) who shows that *not having* ownership may increase investment incentives. The

additional constraints on the use of the assets or on the design of the renegotiation process,[19] and that the macroeconomy, or any shock that may change the value of outside options, will affect ownership allocation and the performance of firms.

In an application to R&D ventures, Aghion and Tirole (1994) show theoretically how cash constraints distort contracting and allocation of property rights to parties involved in joint R&D efforts: if the research unit is cash constrained and does not have a strong bargaining power, the customer will not be willing to transfer ownership of the unit, despite the performance gain.

These papers focus on one relationship, assuming specific bargaining positions of the different parties. As we have argued, this limits the scope of positive analysis since bargaining positions are in general endogenous, reflect the organizational choices of other firms, and also reflect the distribution of cash endowment: in an equilibrium of the industry, bargaining positions and organizational choices are jointly determined. An illustration of this point is the role that the distribution of liquidity endowments may have on contractual choices in moral-hazard settings.[20]

3.3.2 Surplus Division and the Spillover Effects of the Cash Distribution

Let us go back to a situation similar to that in Grossman and Hart (1986) and suppose that under non-integration the parties have non-contractible payoffs $v_i^N, i = A, B$ while under integration, and transfer of property rights to A they have $v_i^I, i = A, B$, where $v_A^I > v_A^N, v_B^I < v_B^N$, then the owner of the B asset is willing to relinquish ownership only if A is able to perform a transfer of $v_B^N - v_B^I > 0$. As long as both A and B have enough cash, or can borrow from the financial market without distorting ex-post decisions it follows that A and B will choose the ownership structure that maximizes the total surplus: that is, integration arises only if $v_A^I + v_B^I > v_A^N + v_B^N$. However, if either A or B has limited cash holdings, debt financing for the

---

difference with Grossman and Hart (1986); Hart and Moore (1990) is that they 'bundle' outside options and threat point in the ex-post bargaining while Chiu (1998) follows the bargaining literature tradition that views the outside option as the payoff to the agent if he *quits* the bargaining table while the threat point is the (discounted) payoff the bargainer obtains *before* negotiation is terminated. Having ownership leads to a high outside option and the bargaining process specifies that when the outside binds (that is the outside option is greater than the on-going payoff) the player obtains his outside option. This implies that having a high outside option, hence having ownership, weakens incentives to invest.

[19] As in Aghion et al. (1994).

[20] See Banerjee and Newman (1993) for an early illustration of this point in a model where a principal has to decide whether to invest in a monitoring technology for his agent or not. The role of the distribution of cash endowments for organizational choices in an industry is emphasized in Legros and Newman (1996).

purchase of assets will be distortionary since the debt repayment tends to reduce the marginal return from decisions, and the surplus efficient ownership structure need not emerge.[21] We assume for simplicity that debt is so distortionary that it is not used for ex-ante transfers.

In order for B to agree to integration it must obtain a lump sum transfer of at least $t^* = v_B^N - v_B^I$. If this is the only relationship in the industry, then as the cash holding of firm A increases, integration is more likely: the size of the surplus generated in the industry is increasing in the cash of firm A. This is the usual "partial equilibrium" intuition one gets from corporate governance: cash in the relationship creates a *positive contracting externality.*

Suppose now that there are two assets A_1, A_2 and that the owners of these assets have different cash holdings $l_1 \leq l_2$. Assets are identical in terms of their productive capacity: as long as an asset A_j is combined with an asset B, the payoffs are given by v_A^k, v_B^k, $k = I, N$. If an asset A_j is not in a relationship with an asset B, his payoff is equal to zero. Because there are two assets of type A, one of them will be left unmatched; since $l_1 \leq l_2$, the owner of A_1 is at a competitive disadvantage and will be left unmatched. Assuming that $l_1 \leq v_A^N$, the most that this owner can offer to the owner of B is $v_B^N + l_1$, and this is therefore what B will want to obtain in order to be in relationship with A_2. Hence, $v_B^N + l_1$ is the outside option of B in a relationship with A_2 while the outside option of A_2 is zero.

A_2 would prefer to have integration, but B will be willing to accept integration only if he receives a transfer t_2 from A_2 satisfying $v_B^I + t_2 \geq v_B^N + l_1$, that is, if $l_2 \geq t_2 \geq t^* + l_1$, where the left inequality is the cash constraint for the owner of A_2. As l_1 increases, the condition is less likely to be satisfied. For instance, starting from a situation where $l_2 = t^* + l_1$, increasing l_1 by 2δ and increasing l_2 by δ will lead to a violation of the condition; more cash in the industry will lead to non-integration. Similarly, a redistribution of liquidity from l_2 to l_1 will also lead to non-integration. This is a new role for cash: cash in the industry may create a *negative contracting externality* on firms, even if they all benefit from cash injection. Note that as l_1 increases, A_2 effectively loses market power in its relationship with B; as a result A_2 is less likely to have power inside the firm, and surplus division within the firm should be more equal, leading eventually to different organizational choices.

This example illustrates two important points, the first one being well understood in contract theory, the second rather less so.

---

[21]Bolton and Whinston (1993) also show that if we consider more than three parties, the "efficient" ownership structure may fail to arise even if parties can make ex-ante lump-sum payments as long as payments for re-allocation of property rights cannot be made contingent on future sales of assets.

Surplus Division With finite cash endowments, the organizational choice does not necessarily maximize total surplus because it depends on the distribution of surplus.

Spillovers While cash helps improve contracting in a given relationship, it may generate negative externalities on other relationships because it affects the distribution of surplus.

In the remainder of this subsection, we discuss these two effects in greater depth.

3.3.3   Surplus Division in U.S. Trucking

In the above example, the role of an increase in l_1 is to shift the terms of trade between the As and the Bs. There are other ways to generate such a shift, for instance by introducing better opportunities for the As in other industries. The recent history of the trucking industry provides an illustration.

In the 1980s and 1990s the trucking industry in the US experienced a shift away from drivers who owned their own trucks toward employee drivers. This organizational change has been attributed to various technological developments, such as the introduction of "on-board computers" (OBCs), which offered both better monitoring of driver actions and greater flexibility in dispatching, permitting more efficient use of trucks (Baker and Hubbard, 2004). By the early 2000s, the prevalence of owner operators and use of OBCs had stabilized. But more recently, the industry has begun to shift some control back to drivers. Between 2004 and 2006, carriers began offering drivers such "perks" as the right to travel with spouses or to outfit their cabs with satellite televisions. Since drivers decide whether and when to exercise these rights, they constitute an increase in their control. The question is why there has been a shift of control allocations in trucking without an apparent technological shift.

A possible answer comes from the observation that an important alternative employment for truckers is construction, which experienced a boom in the early 2000s. Thinking of the drivers as the A's, and the construction-cum-trucking firms as the B's, the increase in the outside options of drivers from the construction boom implies they more surplus in trucking, and the question is how the transfer from firm to driver is accomplished.

The obvious solution would have been to raise the drivers' wages, which would correspond to increasing cash side payments. However, trucking as well as construction are notoriously cash-strapped industries, with invoice payments coming long after workers have been paid and services rendered. An alternative is to increase the

size of drivers' contingent shares, but this is costly both because it reduces the incentives of other members of trucking firms, and because it imposes more risk on drivers. Borrowing to increase the wage bill is similarly (in fact, likely more) costly, as we have discussed. This leaves control rights as the least costly means of transferring surplus from firms to drivers.[22]

3.3.4 Spillovers

In Section 3.3.2 it was shown that shocks to some firms (A_1) may lead to reorganization in *other* firms (B-A_2), even if those firms have experienced no shocks. This is because of a spillover effect: through the market, shocks to some firms are transmitted to others, possibly inducing them to re-organize. As we saw, the distribution of liquidity, and not just its average level, may have an important role to play in the determination of an industry's organizational structure.

Even if there is no effect on the organization of firms, the distribution of liquidity will affect the ability of the private sector to channel funds to entrepreneurs.[23] One of the exciting avenues for future research would be to couple the imperfections in the financial market with the endogenous determination of the organizations of firms.

Shocks to cash holdings are not the only source of organizational spillover effects. Referring again to the model is Section 3.3.2, suppose there is a technological shock to asset A_1, which becomes more productive: under both forms of organization the payoffs to both asset holders increase by δ. By contrast, asset A_2 is not subject to a shock. Then, if $l_1 + \delta < l_2$, the outside option of B is now $v_B^N + l_1 + \delta$. Hence, if $l_2 \in (t^* + t_1, t^* + t_1 + \delta)$, in the relationship (A_2, B) there would have been integration before the productivity shock but after the shock there will be non-integration. We would observe a change in organization for the relationship (A_2, B) despite the fact

---

[22]Legros and Newman (2004), a working paper version of Legros and Newman (2008), contains a model that generalizes the one in Section 3.3.2 and shows that with risk neutral As and Bs, (1) adjusting contingent sharing rules is less distortionary than using debt to finance a side payment and (2) transferring control or ownership of assets is less distortionary than adjusting sharing rules over a wide range of divisions of the surplus. With risk averse As, the appeal of control transfers over share adjustments is likely to be even greater.

[23]For instance, Holmström and Tirole (1997) analyze the effect of credit crunches when firms have different liquidity endowments. Firms with large liquidity can borrow from an (uninformed) capital market, but firms with less liquidity — hence less collateral — have to borrow from intermediaries using a costly monitoring technology. Credit crunches affect low-liquidity firms' ability to borrow, increasing the cost of monitoring and the spread in interest rates paid by high- and low-liquidity firms. Their results are consistent with stylized facts, in particular the fact that the 1990-1991 change in bank lending is correlated with a change in the equity value of the banking sector. See also the recent book Holmström and Tirole (2011) for a survey of the literature on this point.

that its technology is unchanged: *it is the change in technology of other firms that leads to the re-organization of the firm.*

In some cases the re-organization of some firms in the industry following technological shocks may *absorb* the potential gains from increased productivity. Since the newly non-integrated enterprise produces less than it did before, the net output of the industry is smaller than it would be had organization been exogenous. Legros and Newman (2013) provides an example in which uniform shocks (say a 10% productivity increase for every firm) leads to a 10% increase in industry output, while a doubling of the productivity of 10% of the firms, by lowering the price and inducing the remaining firms to switch from integration to non-integration, results in *no* increase in industry output, something that would be exceedingly difficult to obtain with neoclassical (or even exogenously organizational) firms. This kind of "re-organizational dampening" may manifest itself as "mismatch" between technology and organization (since technology inside the organization is not wholly responsible for organizational form), and may account for some empirical puzzles, such as the missing productivity gain from information technology that was widely discussed in the 1990s (Brynjolfsson et al., 2002).

4 Conclusion

Twenty-five years ago, Holmström and Tirole (1989) wrote an extensive survey on the theory of the firm, and covered most of the aspects present at this 2011 conference. A sign of the success of the incomplete contract paradigm is the fact that it is no longer practical to write a survey of the theory of the firm that would encompass all of the dimensions covered in 1989. In particular, corporate finance, internal organization, and applications to industrial organization, international trade, are receiving specific treatments: the tremendous growth in knowledge over the last twenty five years has resulted in considerable specialization and dis-integration, as it were. What recent theory and empirics suggest, however, is that a fuller understanding of the positive and normative consequences of firm boundaries and other organizational variables calls for more re-integration. Section 3 goes one way in this direction, and provides some answers as to why an Organizational IO warrants further development. Generally, organizational choices matter for scale, scope and performance of firms, and equilibrium often requires heterogeneity in these choices, even across firms with seemingly identical characteristics. The organization of a single firm depends on how all other firms are organized, because that affects the bargaining positions of asset holders when they negotiate integration decisions. Sometimes this dependence leads to "re-organizational dampening" of technological innovation, which results in little

or no gain in industrial productivity.

There are many aspects of industrial organization that we do not consider in this survey, either because they would require a survey of their own or because they have yet to be addressed in the literature. For an example of the first, we have not reviewed the literature on regulation and procurement, topics which are clearly important domains of application of the incomplete contracting paradigm, given the role that the state can play in opening markets to competition, in regulating competition or in engaging in contracting relationship with the private sector.[24] For an example of the second, a unified theory of industrial market structure and ownership structure is high on the agenda but has yet to emerge.

References

Acemoglu, Daron and Andrew F. Newman (2002) "The Labor Market And Corporate Structure," *European Economic Review*, Vol. 46, pp. 1733–1756.

Ackerberg, Daniel A and Maristella Botticini (2002) "Endogenous Matching and the Empirical Determinants of Contract Form," *Journal of Political Economy*, Vol. 110, pp. 564–591.

Aghion, Philippe and Patrick Bolton (1992) "An Incomplete Contracts Approach to Financial Contracting," *Review of Economic Studies*, Vol. 59, pp. 473–94.

Aghion, Philippe, Mathias Dewatripont, and Patrick Rey (1994) "Renegotiation Design with Unverifiable Information," *Econometrica*, Vol. 62, pp. 257–282.

——— (1997) "Corporate Governance, Competition Policy And Industrial Policy," *European Economic Review*, Vol. 41, pp. 797–805.

——— (1999) "Competition, Financial Discipline and Growth," *Review of Economic Studies*, Vol. 66, pp. 825–852.

Aghion, Philippe, Mathias Dewatripont, and Jeremy C Stein (2008) "Academic Freedom, Private-Sector Focus, and The Process Of Innovation," *The RAND Journal of Economics*, Vol. 39, pp. 617–635.

---

[24]Incomplete contract setting has been applied to procurement or public-private partnerships (see Hart et al., 1997; Hart, 2003; Dewatripont and Legros, 2005; Iossa and Martimort, 2008); to the allocation of ownerships in a regulatory setting, with public production by a private firm (Besley and Ghatak, 2001); to the provision of pure or impure public goods (Francesconi and Muthoo, 2011).

Aghion, Philippe and Rachel Griffith (2008) *Competition And Growth: Reconciling Theory And Evidence*: Cambridge.

Aghion, Philippe, Rachel Griffith, and Peter Howitt (2006) "Vertical Integration and Competition," *The American Economic Review*, Vol. 96, pp. 97–102.

Aghion, Philippe and Jean Tirole (1994) "The Management of Innovation," *The Quarterly Journal of Economics*, Vol. 109, pp. 1185–1209.

——— (1997) "Formal and Real Authority in Organizations," *The Journal of Political Economy*, Vol. 105, pp. 1–29.

Alexander, CR R and David Reiffen (1995) "Vertical Contracts as Strategic Commitments: How are They Enforced?," *Journal of Economics Management Strategy*, Vol. 4, pp. 623–649.

Alfaro, Laura, Paola Conconi, Harald Fadinger, and Andrew F. Newman (2014) "Do Prices Determine Vertical Integration?," *NBER Working Paper No. 16118*.

Allen, F and D Gale (2000) "Corporate Governance and Competition," in Xavier Vives ed. *Corporate Governance*, Cambridge University Press.

Alonso, Ricardo, Wouter Dessein, and Niko Matouschek (2008) "Centralization versus Decentralization: An Application to Price Setting by a Multi-Market Firm," *Journal of the European Economic Association*, Vol. 6, pp. 457–467.

Atalay, Enghin, Ali Hortaçsu, and Chad Syverson (2012) "Why Do Firms Own Production Chains?."

Baker, George, Robert Gibbons, and Kevin J Murphy (1999) "Informal authority in organizations," *Journal of Law, Economics, and Organization*, Vol. 15, pp. 56–73.

Baker, George and Thomas Hubbard (2004) "Contractibility and Asset Ownership: On-Board Computers and Governance in US Trucking," *Quarterly Journal of Economics*, Vol. 119, pp. 1443–1479.

Banerjee, Abhijit V. and Andrew F. Newman (1993) "Occupational Choice and the Process of Development," *The Journal of Political Economy*, Vol. 101, pp. 274–298.

Bertrand, Marianne and Sendhil Mullainathan (2003) "Enjoying the Quiet Life? Corporate Governance and Managerial Preferences," *Journal of Political Economy*, Vol. 111, pp. 1043–1075.

Besley, Timothy and Maitreesh Ghatak (2001) "Government versus Private Owner-ship of Public Goods*," *Quarterly Journal of Economics*, Vol. 116, pp. 1343–1372.

Biais, Bruno and Enrico Perotti (2008) "Entrepreneurs And New Ideas," *The RAND Journal of Economics*, Vol. 39, pp. 1105–1125.

Bolton, Patrick (2013) "Corporate Finance, Incomplete Contracts, and Corporate Control," *Journal of Law, Economics, and Organization*, Vol. 30, Supplement 1, pp. i64–i117.

Bolton, Patrick and David S Scharfstein (1990) "A Theory of Predation Based on Agency Problems in Financial Contracting," *The American Economic Review*, Vol. 80, pp. 93–106.

Bolton, Patrick and M Whinston (1993) "Incomplete Contracts, Vertical Integration, and Supply Assurance," *The Review of Economic Studies*, Vol. 60, pp. 121–148.

Brander, James A. and Tracy R. Lewis (1986) "Oligopoly and Financial Structure: The Limited Liability Effect," *The American Economic Review*, Vol. 76, pp. 956–970.

Brynjolfsson, Erik, Lorin M. Hitt, and Shinkyu Yang (2002) "Intangible Assets: Computers and Organizational Capital," *Brookings Papers on Economic Activity*, Vol. 2002, pp. 137–181.

Caillaud, Bernard, Bruno Jullien, and Pierre Picard (1995) "Competing Vertical Structures: Precommitment and Renegotiation," *Econometrica*, Vol. 63, pp. 621–646.

Chevalier, Judith (1995) "Capital Structure and Product-Market Competition: Empirical Evidence from the Supermarket Industry," *The American Economic Review*, Vol. 85, pp. 415–435.

Chiu, Y Stephen (1998) "Noncooperative Bargaining, Hostages, and Optimal Asset Ownership," *The American Economic Review*, Vol. 88, pp. 882–901.

Cunat, Vicente and Maria Guadalupe (2005) "How Does Product Market Competition Shape Incentive Contracts?," *Journal of the European Economic Association*, Vol. 3, pp. 1058–1082.

——— (2009) "Globalization and the Provision of Incentives inside the Firm: The Effect of Foreign Competition," *Journal of Labor Economics*, Vol. 27, pp. 179–212.

Dasgupta, Sudipto and Sheridan Titman (1998) "Pricing Strategy and Financial Policy," *The Review of Financial Studies*, Vol. 11, pp. 705–737.

De Meza, David and Ben Lockwood (1998) "Does Asset Ownership Always Motivate Managers? Outside Options and the Property Rights Theory of the Firm," *The Quarterly Journal of Economics*, Vol. 113, pp. 361–386.

Dessein, Wouter (2013) "Incomplete Contracts and Firm Boundaries: New Directions," *Journal of Law, Economics, and Organization*, , Vol. 30, Supplement 1, pp. i13–i36.

Dewatripont, Mathias (1988) "Commitment Through Renegotiation-Proof Contracts with Third Parties," *The Review of Economic Studies*, Vol. 55, pp. 377–389.

Dewatripont, Mathias and Patrick Legros (2005) "Public-Private Partnerships: Contract Design And Risk Transfer," *EIB papers*.

Dewatripont, Mathias and Jean Tirole (1994) "A Theory of Debt and Equity: Diversity of Securities and Manager-Shareholder Congruence," *The Quarterly Journal of Economics*, Vol. 109, pp. 1027–1054.

Farrell, Joseph and Carl Shapiro (1990) "Asset Ownership and Market Structure in Oligopoly," *The RAND Journal of Economics*, Vol. 21, pp. 275–292.

Faure-Grimaud, Antoine (2000) "Product Market Competition And Optimal Debt Contracts: The Limited Liability Effect Revisited," *European Economic Review*, Vol. 44, pp. 1823–1840.

Fershtman, Chaim and Kenneth L. Judd (1987) "Equilibrium Incentives in Oligopoly," *American Economic Review*, Vol. 77, pp. 927–940.

Francesconi, Marco and Abhinay Muthoo (2011) "Control Rights in Complex Partnerships," *Journal of the European Economic Association*, Vol. 9, pp. 551–589.

Fudenberg, Drew and Jean Tirole (1986) "A ''qSignal-Jamming" Theory of Predation," *The RAND Journal of Economics*, Vol. 17, pp. 366–376.

Gibbons, R (2006) "What The Folk Theorem Doesn't Tell Us," *Industrial and Corporate Change*, Vol. 15, pp. 381–386.

Gibbons, Robert (2010) "Inside Organizations: Pricing, Politics, and Path Dependence," *Annual Review of Economics*, Vol. 2, pp. 337–365.

Gibbons, Robert, Richard Holden, and Michael Powell (2012) "Organization and Information: Firms' Governance Choices in Rational Expectations Equilibrium," *Quarterly Journal of Economics*, Vol. 127, pp. 1813–1841.

Giroud, Xavier and Holger M Müller (2009) "Does Corporate Governance Matter In Competitive Industries?," *Journal of Financial Economics*, Vol. 59, pp. 312–331.

Grossman, Gene and Elhanan Helpman (2002) "Integration versus Outsourcing in Industry Equilibrium," *The Quarterly Journal of Economics*, Vol. 117, pp. 85–120.

Grossman, Sanford and Oliver Hart (1982) " Corporate Financial Structure and Managerial Incentives," in John McCall ed. *The Economics of Information and Uncertainty*, 107–140, NBER, UMI: Cambridge.

Grossman, Sanford J and Oliver D. Hart (1986) "The Costs and Benefits of Ownership: A Theory of Vertical and Lateral Integration," *The Journal of Political Economy*, Vol. 94, pp. 691–719.

Grossman, Sanford J and Joseph E. Stiglitz (1980) "On the Impossibility of Informationally Efficient Markets," *The American Economic Review*, Vol. 70, pp. 393–408.

Guadalupe, Maria and Julie Wulf (2010) "The Flattening Firm and Product Market Competition: The Effect of Trade Liberalization on Corporate Hierarchies," *American Economic Journal: Applied Economics*, Vol. 2, pp. 105–127.

Harris, Milton and Bengt Holmström (1982) "A Theory of Wage Dynamics," *The Review of Economic Studies*, Vol. 49, pp. 315–333.

Hart, Oliver (1983) "The Market Mechanism as an Incentive Scheme," *The Bell Journal of Economics*, Vol. 14, pp. 366–382.

———— (2003) "Incomplete Contracts and Public Ownership: Remarks, and an Application to Public-Private Partnerships," *The Economic Journal*, Vol. 113, pp. C69–C76.

Hart, Oliver and Bengt Holmström (2010) "A Theory Of Firm Scope," *The Quarterly Journal of Economics*, Vol. 125, pp. 483–513.

Hart, Oliver and John Moore (1990) "Property Rights and the Nature of the Firm," *The Journal of Political Economy*, Vol. 98, pp. 1119–1158.

———— (2008) "Contracts as Reference Points," *Quarterly Journal of Economics*, Vol. 123, pp. 1–48.

Hart, Oliver, Andrei Shleifer, and Robert Vishny (1997) "The Proper Scope of Government: Theory and an Application to Prisons," *The Quarterly Journal of Economics*, Vol. 112, pp. 1127–1161.

Hart, Oliver and Jean Tirole (1990) "Vertical Integration and Market Foreclosure," *Brookings Papers on Economic Activity. Microeconomics*, Vol. 1990, pp. 205–286.

Hayek, Friedrich (1945) "The Use Of Knowledge In Society," *American Economic Review*, Vol. 35, pp. 519–530.

Holmström, Bengt and Jean Tirole (1989) "The theory of the firm,": in R. Schmalensee and R. Zillig, eds, *Handbook of Industrial Organization*, 61–133. Amsterdam: Elsevier.

———— (1997) "Financial Intermediation, Loanable Funds, and the Real Sector," *The Quarterly Journal of Economics*, Vol. 112, pp. 663–691.

———— (2011) *Inside and Outside Liquidity*: The MIT Press.

Iossa, Elisabetta and David Martimort (2008) "The Simple Micro-Economics of Public-Private Partnerships," *CEIS Working Paper No. 139*.

Jacob, Glazer (1994) "The Strategic Effects of Long-Term Debt in Imperfect Competition," *Journal of Economic Theory*, Vol. 62, pp. 428–443.

Jensen, Michael C (1986) "Agency Costs of Free Cash Flow, Corporate Finance, and Takeovers," *The American Economic Review*, Vol. 76, pp. 323–329.

Jensen, Michael C and William H Meckling (1976) "Theory of the Firm: Managerial Behavior, Agency Costs, and Ownership," *Journal of Financial Economics*, Vol. 3, pp. 305–360.

Joskow, Paul L. (2010) "Vertical Integration," *Antitrust Bull.*, Vol. 55, pp. 545–586.

Katz, Michael L. (1991) "Game-Playing Agents: Unobservable Contracts As Precommitments," *The RAND Journal of Economics*, Vol. 22, pp. 307–328.

Klein, Benjamin, Robert Crawford, and Armen A Alchian (1978) "Vertical Integration, Appropriable Rents, and the Competitive Contracting Process," *Journal of Law and Economics*, pp. 297–297.

Lafontaine, Francine and Margaret Slade (2007) "Vertical Integration and Firm Boundaries: The Evidence," *Journal of Economic Literature*, Vol. 45, pp. 629–685.

Legros, Patrick and Andrew F. Newman (1996) "Wealth Effects, Distribution, and the Theory of Organization," *Journal of Economic Theory*, Vol. 70, pp. 312–341.

———— (2004) "Competing for Ownership,"Technical Report DP 148, Boston University, IED.

———— (2008) "Competing for Ownership," *Journal of the European Economic Association*, Vol. 6, pp. 1279–1308.

———— (2013) "A Price Theory of Vertical and Lateral Integration," *The Quarterly Journal of Economics*, Vol. 128, pp. 725–770.

Legros, Patrick, Andrew F. Newman and Eugenio Proto (forthcoming) "Smithian Growth Through Creative Organization," *Review of Economics and Statistics*, published online on 29 October 2013, doi: 10.1162/REST_a_00421.

Lyandres, Evgeny (2006) "Capital Structure and Interaction among Firms in Output Markets: Theory and Evidence," *The Journal of Business*, Vol. 79, pp. 2381–2421.

Machlup, Fritz (1967) "Theories of the Firm: Marginalist, Behavioral, Managerial," *The American Economic Review*, Vol. 57, pp. 1–33.

Marx, Leslie M. and Greg Shaffer (2004) "Opportunism in Multilateral Vertical Contracting: Nondiscrimination, Exclusivity, and Uniformity: Comment," *The American Economic Review*, Vol. 94, pp. 796–801.

McAfee, R Preston, John McMillan, and Michael D Whinston (1989) "Multiproduct Monopoly, Commodity Bunding, and Correlation of Values," *The Quarterly Journal of Economics*, Vol. 104, pp. 371–383.

McLaren, John (2000) ""Globalization" and Vertical Structure," *American Economic Review*, Vol. 90, pp. 1239–1254.

Milgrom, Paul Robert (1987) "Employment Contracts, Influence Activities and Efficient Organization Design," *Journal of Political Economiy*, Vol. 96, pp. 42–60.

Nalebuff, Barry J. and Joseph E. Stiglitz (1983a) "Information, Competition, And Markets," *The American Economic Review*, Vol. 73, pp. 278–283.

——— (1983b) "Prizes And Incentives: Towards A General Theory Of Compensation And Competition," *The Bell Journal of Economics*, Vol. 14, pp. 21–43.

Nickell, Stephen J., Daphne Nicolitsas, and Neil Alistair Dryden (1997) "What Makes Firms Perform Well?," Vol. 41, pp. 783–796.

O'Brien, Daniel P. and Greg Shaffer (1992) "Vertical Control with Bilateral Contracts," *The RAND Journal of Economics*, Vol. 23, pp. 299–308.

Ordover, Janusz A., Garth Saloner, and Steven C. T3 Salop (1990) "Equilibrium Vertical Foreclosure," *The American Economic Review*, Vol. 80, pp. 127–142.

Perelman, Michael (2011) "Retrospectives: X-Efficiency," *The Journal of Economic Perspectives*, Vol. 25, pp. 211–222.

Povel, Paul and Michael Raith (2004) "Financial Constraints And Product Market Competition: Ex Ante vs. Ex Post Incentives," *International Journal of Industrial Organization*, Vol. 22, pp. 917–949.

Prendergast, Canice (2002) "The Tenuous Trade-Off between Risk and Incentives," *The Journal of Political Economy*, Vol. 110, pp. 1071–1102.

Raith, Michael (2003) "Competition, Risk, and Managerial Incentives," *The American Economic Review*, Vol. 93, pp. 1425–1436.

Reitman, David (1993) "Stock Options and the Strategic Use of Managerial Incentives," *The American Economic Review*, Vol. 83, pp. 513–524.

Scharfstein, David (1988) "Product-Market Competition and Managerial Slack," *The RAND Journal of Economics*, Vol. 19, pp. 147–155.

Scherer, F. M. (1980) *Industrial Market Structure And Economic Performance*, Boston: Houghton Millin Company, second edition edition.

Schmidt, Klaus (1997) "Managerial Incentives and Product Market Competition," *Review of Economic Studies*, Vol. 64, pp. 191–213.

Schmitz, Patrick W and Dirk Sliwka (2001) "On Synergies and Vertical Integration," *International Journal of Industrial Organization*, Vol. 19, pp. 1281–1295.

Segal, I (1999) "Contracting with Externalities," *Quarterly Journal of Economics*, Vol. 114, pp. 337–388.

——— (2003) "Collusion, Exclusion, And Inclusion In Random-Order Bargaining," *Review of Economic Studies*, Vol. 70, pp. 439–460.

Showalter, Dean M. (1995) "Oligopoly and Financial Structure: Comment," *The American Economic Review*, Vol. 85, pp. 647–653.

Sklivas, S D (1987) "The Strategic Choice Of Managerial Incentives," *The RAND Journal of Economics*, Vol. 18(3), pp. 418–452.

Spagnolo, Giancarlo (2000) "Stock-Related Compensation and Product-Market Competition," *The RAND Journal of Economics*, Vol. 31, pp. 22–42.

Syverson, Chad (2011) "What Determines Productivity?," *Journal of Economic Literature*, Vol. 49, pp. 326–365.

Tadelis, Steven (2002) "Complexity, Flexibility, and the Make-or-Buy Decision," *The American Economic Review*, Vol. 92, pp. 433–437.

Vickers, John (1985) "Delegation and the Theory of the Firm," *The Economic Journal*, Vol. 95, pp. 138–147.

Vives, Xavier (2000) "Corporate Governance: Does It Matter?," in Xavier Vives, ed., *Corporate Governance: Theoretical and Empirical Perspectives*, 1–21. Cambridge, University Press.

Wickelgren, Abraham L (2005) "Managerial Incentives And The Price Effects Of Mergers," *Journal of Industrial Economics*, Vol. 53, pp. 327–353.

Williamson, Oliver E. (1971) "The Vertical Integration Of Production: Market Failure Considerations," *The American Economic Review*, Vol. 61, pp. 112–123.

——— (1975) *Markets and Hierarchies: Analysis and Antitrust Implications*: Free Press.

——— (1985) *The economic institutions of capitalism: Firms, markets, relational contracting*: The Free Press.

——— (1990) "Mergers, Acquisistions and Leveraged Buyouts: an Efficiency Argument," in Lucian A Bebchuk ed. *Corporate Law and Economic Analysis*: Cambridge University Press, p. 7-26.