Capabilities: Structure, Agency and Evolution

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Final draft for *Organization Science* Special Issue

January 30, 2011

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Abstract

This paper examines conceptual issues and reviews empirical results bearing on the relationship between research approaches emphasizing organizational capabilities and those based in transaction cost economics (TCE) – or in "organizational economics" more generally. Following a review of conceptual fundamentals – what capability is, and why organizations differ in capability – it assesses recent progress toward an integration of the capabilities and transaction-cost approaches, primarily in the context of the analysis of vertical structure and related phenomena. This review suggests that progress has been substantial, and that the key elements of a promising dynamic synthesis have been identified. The paper then considers issues that call out for attention if further progress is to be achieved. The first of these is the role of agency, which must be seen in expansive terms (relative to standard economic rationality) if its evolutionary significance is to be fully appreciated. The second is the role of structure, or more specifically industry architecture, which affects capability development by way of its effect on the feedback that firms receive. After drawing on the recent financial crisis for an illustration of these ideas, the paper considers the rise of interest in "business models" as a useful field of application, and concludes with a discussion of the role of organizational economics (beyond TCE). We argue that, whatever the theoretical perspective at the level of the firm, analyses must reach above that level to grasp the important causal forces affecting capability development, firm boundaries, and structural features more generally.

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I. Capabilities and economics: From trade to integration?

One of the most important developments in the field of management during the last 15 years has been the increased attention paid to the concept of organizational capability – denoting the firm-specific and time- and space-contingent ability to perform a particular productive activity. During the 1990s, the importance of the differences between firms was re-articulated and re-emphasized (Nelson1991). Two decades later we have come to take the heterogeneity of organizations and their capabilities as given – at least within the field of management (Helfat 2003), as opposed to economics. As our understanding of heterogeneity, firm-specific capabilities, and their evolution grew, links emerged with work in organizational and, in particular, institutional economics. The last decade in particular has seen a substantial growth in research that develops and refines work in Transaction Cost Economics (TCE), using it to explain empirically important phenomena such as cycles of integration and dis-integration, the strategic choice of some firms to adopt permeable boundaries, and the struggles to define the boundaries and institutional setup of sectors -- from agriculture to movies and financial services. Research has also sharpened our view of the process through which capabilities are shaped and developed.

We have moved well beyond the view that TCE and capability theories are rivals for the same explanatory ground. Not only has the complementarity of the two approaches been recognized and substantiated empirically, but it now appears that the key elements of a dynamic synthesis are in hand. In this synthesis, capabilities and structures (firm boundaries, the division of labor) co-evolve according to an intelligible economic logic – but it is a logic that may not be completely understandable within the framework of standard economic theory.

The quest for "integration" proposed in the call for this special issue might suggest on the one hand a demand to build bridges and resolve conceptual discords, or on the other, the need to address the phenomena more effectively and comprehensively. While the former cause is not unworthy, it is the latter we espouse. Accordingly, we suggest that proposals for integration should be explicated and defended in terms of how they will improve, or extend, the reach of causal explanation.

The term "organizational economics" embraces at least two quite disparate lines of inquiry: TCE in the Coase-Williamson tradition, and the various applications of "rational actor" theorizing at the organizational level. The former is much more fully developed in terms of complementary empirical work, and its relationship to the capabilities approach is much better defined, so TCE is our primary focus here. However, we do discuss the problems and opportunities of the rational-actor approach later in the paper.

This paper offers both a selective literature review / evaluation and theory development, illustrated by examples. We start with an overview of the elementary building blocks: the empirics and concepts of capabilities – the origins of heterogeneity, the evolution of capabilities, and the nature of the comparative institutional approach in TCE – then assess progress to date in integrating the capabilities view with TCE. We then offer a framework to help understand capabilities and their context. First, we argue that the shaping role of agency must be understood to extend well beyond the theoretical confines of maximization and rationality. Our view is that economics-based analyses often mis-specify and under-estimate not only inertial properties, but also the agency-related forces of change in an economic system. Second, we explain how structure both shapes, and is further shaped by, the capabilities of actors in an economic system. Our focus is on how structure determines the *feedback* that will drive the system's dynamics. Thus, we highlight the role of context and higher-level causal forces, which cannot be comprehended simply by looking at the level of

individual agents. Next, we provide an illustration of our conceptual framework, taking as an example the recent financial crisis. We conclude with a discussion of future research directions, and finally assess the promise of organizational economics research, outside TCE, for our understanding of capabilities.

II. Capabilities, heterogeneity, and the comparative approach of TCE

The notion of capability

Although organizational capabilities have been the focus of a surge of attention in the literatures of management and organization studies over the past decade or two, the concept has a long history. In the economics literature, Richardson (1972) may have been the first to employ it in relation to the study of firm behavior, and very much in its present sense. In an essay that anticipated later work on inter-firm alliances, networks and supply chains, as well as capabilities, he pointed out a key limitation of the production function construct used in standard economics: "It abstracts totally from the roles of organisation, knowledge, experience and skills, and thereby makes it the more difficult to bring these back into the theoretical foreground in the way needed to construct a theory of industrial organisation." (p. 888) He went on to label the effect of knowledge, experience, and skills with the term "capabilities", and then developed the implications of "…the fact that … organisations will tend to specialise in activities for which their capabilities offer some comparative advantage." (loc. cit.).[1] Coincidentally, it was also in 1972 that Nelson and Winter gained NSF support for their research proposal, and the first published manifestation of their collaboration appeared the following year under the title "Toward An Evolutionary Theory of Economic Capabilities" (Nelson and Winter 1973).

[1] Richardson put forward Coase's classic "Why firms?" question (Coase 1937) in his own way, and referenced Coase, but said that he took a different view. The reference to Coase seems *pro forma*. Nelson and Winter were evidently unaware of Richardson, whose concerns were close to theirs.

There is a strong unifying thread in the long history of "capabilities" as a term -- the emphasis on *what an organization can actually do*, and the importance of the distinction between that question and concepts such as "intentions," "incentives," "motivations," and variations of "having the recipe" (production function). As Richardson suggested, economics has long manifested a weak grip on the distinction between capability and these other concepts. This weakness, noted by Penrose (1959) [2] is critical in discussions relating to imitation, learning, diffusion of innovations, replication, intellectual property, and other rubrics under the broad heading of "knowledge transfer". In a way, this persistent weakness is surprising: what separates a recipe or an intention from a capability is, in a broad sense, investment – and economists have done a lot of thinking about investment. Standard price theory offers the distinction between the short run and the long run, with the former (a) established by prior investments in plant and equipment, and (b) powerfully shaping subsequent decisions about output level and product mix. It might seem that it is not such a long step to recognize that various investments in organizational learning are also needed for the firm to establish capabilities, and in a variety of ways these investments further strengthen the shaping power of "short run" circumstances.

Taking that step does, however, open the door to a lot of significant complications. To take even the conventional "short run" of the textbooks seriously is to recognize how profoundly the course of the economy is shaped by the hand of the past – that is, by mechanisms of path dependence. For example, the economic context of any particular time *t* is strongly shaped by sunk investments already in place at that time – including many that might no longer be profitable *ex ante* (cf. Sutton 1991). Of course, profitability calculations

[2] See her discussion at (Penrose 1959: 47-8, 53), emphasizing the role of experience as a limit to the efficient growth of the firm and, in effect, the importance of the tacit knowledge element in experience: "…experience itself can never be transmitted; it produces a change –frequently a subtle change –in individuals and cannot be separated from them" We would extend the statement by saying that the change is not only in individuals, but also groups and their routine interactions. See Kor & Mahoney (2004) for a discussion.

for *new* investments contemplated at *t* are also affected by the context at *t*; for example, an overhang of inefficient capacity in an industry may produce prices that are low enough to prompt a deferral of investment in new, efficient capacity. Thus it is hard to justify, in realistic economic terms, the argument that firms ultimately make an unconstrained "long run" choice from a menu of options (or technologies) available to all. Present position should be presumed to drive the forward-looking calculus.

From an evolutionary perspective, the rolling determination of the future out of the past seems like an obvious fact that should be taken for granted. But that is not the style of mainstream economics, which has always been accommodating towards fully static analysis, and today remains determinedly a-historical. In the final section of this paper, we briefly address the implications of this for the relationship between organizational economics and capability theorizing.

Origins of heterogeneity

Richardson's observation that capability differences underlie the division of labor among firms raises the question of why such heterogeneity exists. While the fact of heterogeneity is both acknowledged and influential in management research, it is too early to "declare victory" with respect to causal understanding of its origins, mechanisms and implications. And in the economic literature, some continue to see heterogeneity as a puzzle, apparently believing that ways of doing things should be identical in different firms, or at least equally effective. A departure from this presumed default case is considered to require some justification, such as the fact that the superior methods were only recently invented and are shielded from prompt imitation by secrecy or effective intellectual property protection-- or, as suggested in the call for this special issue, are due to transactional conditions.

Certainly these "exceptions" refer to causal mechanisms that are operative in the world. More fundamentally, though, one could turn the premise on its head: mechanisms that are intrinsic to the capability creation process itself are quite sufficient to explain heterogeneity; more specific reasons are not required. Thus, the popularity of the notion that heterogeneity is a puzzle is itself a puzzle. Why would anybody think that?

From the abundant evidence available at the personal level as well as in academic research, the prevalence of dispersion and diversity would seem to be the rule. Are all the drivers on the road at the same skill level? Do you often find that the worst exam paper and the best deserve the same grade? The sophisticates will complain of the absence of reference to statistical control in these simple questions. Point taken – but after we diligently control for the proverbial "everything in sight," what then is the picture? The answer, in our experience, is that convincing t-ratios are often seen, but a truly impressive R-squared with cross-sectional data is a rare thing – so rare as to be automatically suspect, in fact. Common practices in empirical management research provide indirect evidence of substantial heterogeneity. Firm fixed effects and lagged dependent variable on the RHS are commonplace specifications and often contribute the bulk of the explanatory power – but usually the focus is on the far less potent operations of other "independent" variables. In short, there is generally a lot of variation at the micro-level that is actor-specific, and that is difficult to explain statistically or to understand. Should we expect the case of organizational capabilities to be different?

In the case of capabilities, a good deal of thought, theory and modeling effort has gone into addressing the question of where the micro-level variation might be coming from. A point that is fundamental for capabilities (and more widely applicable too) is that when different actors confront "the same problem", their specific situations, available resources and self-perceived competencies guide their initial steps toward solutions. In a sufficiently simple

problem domain, with easy reconsideration available and a sufficiently sharp definition of "solution" agreed, divergent initial steps might not matter very much; all searchers might still arrive at the same destination. But such simple capability building probably does not deserve the name. In more complex cases, where "steps" involve costly and partially irreversible commitments, where initial steps in different directions open quite different vistas to view, where success is a matter of more or less and sooner or later, where local optima offer tempting stopping points – in such cases, initial divergences do not go away. Instead, they tend to become amplified and entrenched. They are sustained by a variety of mechanisms, both rational and behavioral. In particular, there tends to be a decline over time in objective possibilities for improvement via the transfer of methods among different units or organizations, as highly interactive systems are developed to a higher and higher state of tight coupling, with more and more carefully crafted interfaces linking formerly discrete, modular elements.

The general argument offered above is supported by contributions in several different literatures. As Nelson (1991) noted, detailed studies of technical advances repeatedly illustrate the theme of different capabilities emerging from "differences in perception about the feasible paths," (p 66), and such differences of view should certainly be expected under conditions of uncertainty. "It is virtually inevitable that firms will choose somewhat different strategies. These, in turn, will lead to firms having different structures and different core capabilities, including their R&D capabilities." (p 69) The credibility of this logic, and the evidentiary value of the examples, has been substantially enhanced by the development of the family of models portraying the organizational quest for superior effectiveness as a search process on a "rugged landscape" (Levinthal 1997, Winter et al. 2007). These models provide much insight into how complexity, path dependence and variety in initial conditions can generate populations of actors who find diverse answers to the same problem – with

concomitant diversity in payoffs achieved, within the limits that selection pressures allow. The models are of course "too simple," but considerable progress has been made toward illuminating more complex and more specifically organizational situations.

Empirical evidence on heterogeneity in skill and capability appears to be overwhelming. Virtually every study that has looked into the matter has found substantial heterogeneity, often to the bafflement of the authors, who have generally failed to explain away the variance, and note that even "seemingly similar enterprises" exhibit substantial and persistent performance differentials (see Gibbons, et al. 2010). Substantial performance differences have also been documented *within* firms, when comparing different plants (see Chew, et al. 1990). Econometric evidence looking at the distribution of efficiency of firms, in different national contexts, also confirms there is a very substantial and non-transitory performance differential (see Bloom and Van Reenen (2010) for a summary and references to a substantial body of relevant work; also, Disney, et al. (2003), Gibbons, et al. (2010)). Case-study evidence is entirely consistent with such views of pervasive heterogeneity (Clark and Fujimoto 1991, Garvin 1988).

Imitation (and competition) as homogenization

Given that there is little doubt about the existence of mechanisms that promote diversity as capabilities are initially created and improved, the explanation for the puzzling attachment to the "default case" may reside in a belief that there are homogenizing forces sufficiently powerful to undo the initial diversity – evidence to the contrary notwithstanding. An important factor may be the pervasive tendency to overestimate the effectiveness of imitation as a mechanism of knowledge transfer. (Following our practice elsewhere, "imitation" here refers to a knowledge transfer situation in which the source is not actively cooperating or assisting in the transfer.) Among economists, this tendency may be partly attributable to the influence of Kenneth Arrow, who stated in a classic paper that "…no amount of legal

protection can make a thoroughly appropriable commodity of something so intangible as information…" (1962: 615). In the strategy literature, a prominent example of this line of thinking is Porter's (1996) statement that "as rivals imitate one another's improvements… strategies converge and competition becomes a series of races down identical paths that no one can win. Competition based on OE (operational effectiveness) alone is mutually destructive…"

From Arrow we received a partial truth, for there certainly is a domain of "information" where his eloquent statement is relevant. In particular, there is symbolically recorded information of a highly modular nature (i.e., with relatively context-free validity and value), where the language of the symbolic record is known to the imitator. A valuable reaction path for a chemical process, recorded in chemical notation, would be a strategically significant example. However, the domain of "operations" to which Porter referred is, according to most reports, not like that at all. Rather, it is a domain fairly riddled with factors that sustain differences in the face of determined imitation efforts – tacitness, technical and social complexity, complementarities and interactions within the full organizational system, contextual factors that may be unrecognized even by the participants, constructive motivational forces grounded in organizational culture, and local organizational jargons that can leave the untutored listener quite clueless about what is going on.

In assessing the homogenizing force of imitation, it is important to remember that its significance often depends critically on quantitative aspects of precision and comprehensiveness, and on the costs of achieving them. It is undoubtedly true, as Arrow and Porter suggested, that there is inevitably a great deal of leakage of information about the workings of almost any capability; in some cases the leakages support the creation of something broadly analogous to the capability that is observed. In highly competitive contexts, however, "close" is not good enough, while "perfect and complete" may require too

big an investment in the imitation effort. The basic mechanisms generating heterogeneity then remain operative with respect to the details not captured, -- and importantly, also where the capability creation effort is aimed at a new context rather than at producing a head-to-head competitor for the original .

Heterogeneity, expressed in differences in capabilities, provides a setting for competition and evolutionary selection. The second mechanism of heterogeneity reduction comes through the relative decline (or market exit) of those with lesser capabilities, and the commensurate entry and growth of more capable players, leading to a convergence in the efficiency levels of capabilities in use, even if capabilities themselves do not converge. Yet this evolutionary process is imperfect and time-consuming: selection operates imperfectly; the signals from the environment (in terms of "what works" and "what doesn't") are noisy; there is a substantial "credit assignment" problem (Denrell et. al, 2004). Feedback is often not immediately forthcoming, and even when it comes, agency problems within organizations or between organizations and their shareholders mute its impact. So there are abundant theoretical grounds to expect the sorts of persistent differences in performance that the empirical evidence reveals (Bloom and Van Reenen 2010)

The comparative institutional approach of TCE

Having reviewed the conceptual building blocks of capabilities and heterogeneity, we now turn to TCE, as this is the area of organizational economics that has most actively engaged with capabilities and heterogeneity to date.

TCE's primary emphasis has been on understanding comparative institutional structure and questions of vertical scope – in particular, the question of whether firms should integrate or not. In so doing, TCE has led to a healthy and vigorous debate on the relative merits and shortcomings of different governance mechanisms. In narrowing down and operationalizing its research programme, TCE – and work that emanates from it – has made

some important methodological choices. First, it has focused on comparative institutional analysis, looking at the choice between competing ways to organize and coordinate economic activities – each "node" of these activities being taken as given. Second, it has focused on the micro-analytics of transactions: why firms make specific governance choices at the transaction level of analysis, one transaction at a time, *ceteris paribus.* This reliance on "*ceteris paribus*" presents an important issue, to which we will return. It suggests that causal explanation derives fully from transaction attributes, as opposed to either the context that shapes transactional choices and menus or the organizational factors that drive the skills and competencies of a firm, as both a productive and a transactional entity.

With the establishment of heterogeneity as an important empirical fact, work in the TCE tradition has acknowledged and incorporated inter-firm differences, while maintaining its analytical stance. As Williamson noted in 1999, "the traditional TCE query 'What is the best generic mode (market, hybrid, firm) to organize X?' [should] be replaced by the question 'How should firm A – which has pre-existing strengths and weaknesses (core competences and disabilities) – organize X?'" (Williamson 1999: 1103) In a similar spirit, Madhok (2002) argued that an individual firm's choice must depend not only on the characteristics of the transactional conditions, but also on its strategic objectives, the attributes of its own capabilities, and the governance context it has created. This proposal, adumbrated also in Argyres (1996), Argyres & Liebeskind (1999) and Leiblein & Miller (2003), among others, preserved the fundamental orientation towards the *ceteris paribus* choice, the emphasis on the microanalytic choice at the level of an individual organization, and the interest in comparative statics, even as it acknowledged the role of pre-existing heterogeneity and path dependence in governance choice. Such a methodological stance, valuable as it is in helping us understand the context for firms' calculus with respect to scope, does not address the causal structure of the system as a whole.

III. Synthesis and dynamic integration: progress to date

It is true that the literatures on capabilities and organizational economics (TCE in particular) developed in substantial isolation from each other for an extended period. At best, capabilities-based arguments were seen as possibly contributing in an additive fashion to those of institutional economists. Yet change has been in the works for more than a decade now. Indeed, we remarked on this positive development in an earlier paper (Jacobides and Winter 2005), and sought to extend that progress further by proposing "a theoretical framework that explains how capabilities co-evolve with transaction costs to set the menu of choices that firms face in an industry" (2005: 396). A number of more recent contributions have further explored the *dynamic* aspects of the interactions between capabilities and transactional considerations; and in that sense they have approached those interactions in a manner broadly consistent with our "co-evolutionary" framework. Here, we highlight key elements of the framework before turning to a review of some of the empirics.

Following the path of much evolutionary reasoning, we sketch the logical elements under two major headings. First there are the considerations that are largely "given" in the short run, and which jointly determine the conditions of "temporary equilibrium" in the system under consideration.[3] For the purposes of the earlier paper, which focused on the evolution of vertical scope, the "system" was an industry in which firm capabilities are heterogeneous across vertical segments. As is illustrated by some of the examples below, broader systems are subject to analysis with much the same approach. The distributions of capabilities and transacting practices, among firms that are heterogeneous in those respects, are among the short run "givens." The division of labor and the division of profits are among

[3] Of course, we do not posit that the system is every really in "equilibrium," however that might be defined. The point is that some causal mechanisms work much faster than others, and it is a helpful analytical strategy to recognize that the faster-moving ones deliver results that then define a context shaping the operation of the slower-moving ones.

the key outcomes of the system in the short run. (We insist that these are indeed *system* outcomes whose causal logic cannot be adequately illuminated by a single actor, *ceteris paribus* approach.)

The second major heading embraces the causal mechanisms that are, on the one hand, shaped by the context of short-run outcomes, and, on the other, determinative of the new and different short run that will follow. Selection forces reshape the distributions of capabilities and transacting methods, as the differential financial rewards of short-term operations shape both the feasibility and desired directions of firm-level investment decisions. Those rewards also condition revised perceptions of "what works" and where opportunity lies, affecting not only the participants previously active in the system, but also a variety of others – e.g., potential entrants.

Less straightforward causal mechanisms are, however, at the heart of the process of long-run change, which we consider here more explicitly. These can be succinctly described as involving the complementary and powerful effects of *agency* and, *structured feedback*, taking both terms in a broad sense. Agency in a broad sense means more than a careful, rational patrol of the boundaries of established opportunity sets; it involves the active quest for opportunities to break through those limits, by changing both technology and organization (or transaction governance). We use the term *structured feedback* to reference the set of diverse mechanisms by which the path of actual experience, distributed over the circumstances and activities of the actors, guides the course of agency. These mechanisms include those of problem instantiation and recognition, and the incentivizing of a variety of modes of search for problem solutions, as well as the more direct influences of experiential learning.[4] What agents find "rewarding", and what they will pursue, depends on what the

[4] Some agents also try to change the menu of options by reaching well beyond the guidance of experience, creating *imagined* futures they try to bring to fruition. But even these are but a small sub-set of the *imaginable* conditions and permutations, and structure plays an important selective role in this process of "menu evolution".

system around them rewards. In the domain of technological evolution, such mechanisms were well expounded by Rosenberg (1969). For example, agents seeking gains focus on what they see as the "bottlenecks" in the overall process, improving some areas and turning others into new "problems", bottlenecks to be solved.

In short, the actor-level allocations of problem-solving effort are endogenous in the evolution of the system.[5] This approach stands in contrast to research that portrays capability development as an abstract quest for "efficiency." We note that significant progress has been made in understanding these systemic forces to which we called attention, both at the level of the firm, and at the level of the sector.

At the level of the firm, analyses offered in recent years have departed increasingly from the "additive" consideration of capabilities and transactional features they drive scope. First, more explicit acknowledgment has been made of the context-constrained choices firms face – i.e., the fact that they must choose from a realistic menu of what their transactional partners (with given capabilities) can offer (see Ciarli, Leoncini, Motessor and Valente (2008), Jacobides (2008b), and Malerba et al (2008).) Second, research has shifted away from the empirical testing of one or more theories and towards narrower empirical puzzles such as the use of tapered integration mixed procurement (see Harrigan 1985, Parmigiani 2007).

The analysis of these puzzles has offered further ground of interaction between transactional and capabilities-based explanations. Bradach (1997) provides a fascinating analysis of franchise chains, which are partly owned and partly franchised. Investigating why this might be the case, he finds that this structure creates benefits through a "ratcheting" process (between owned and franchised units) and through a "two-way learning system".

[5] In our earlier paper on vertical scope, the message of the previous paragraph was implicit in our identification of four key mechanisms (1) selection amplifies the impact of capabilities on scope, through competition and imitation, (2) endogenous reductions in transaction costs arise from actors' efforts to realize the latent gains from such reductions, (3) changes in scope affect the capability development process (structured feedback), (4) capability development affects the roster of participants, including entrants from new sectors (Jacobides and Winter 2005: 399-406). In addition to spelling out the general mechanisms in some detail, we illustrated their working in accounts of the evolution of two sectors, U.S. mortgage banking and the Swiss watch industry.

Jacobides & Billinger (2006) extend the intuition by suggesting that boundary choices at the level of a firm must be viewed in systemic terms: Looking at one boundary choice at a time is not sufficient to explain the logic with which boundaries are set. Rather, one needs to consider actively how the architecture of boundary choices (which the authors term "vertical architecture") shapes capabilities – and drives incentives within an organization. Looking at a major textile firm, they suggest that firms choose their scope not only "on the margin", as a response to a cost-benefit calculus (where the "capability" part of the calculus is the result of past choices of scope); but also on the basis of the dynamic benefits that this choice confers, e.g., by retaining the option to outsource as a means of instilling some comparability and discipline, and keeping the epidermis of the organization "permeable", i.e. partly open. Santos, Abrunhosa and Costa's (2006) analysis of the footwear sector in Portugal presents similar findings, which are also corroborated by the quantitative study of Reitzig and Puranam (2009).

At the level of the sector, researchers have long been interested in the shaping influence that historical context of an industry's evolution exerts upon the scope choices of firms, by way of the menus of capabilities and transacting practices that are available. Early research by Silver (1984), reprised and amplified by Langlois (1988, 1992), and Langlois & Robertson (1989, 1995) considered how the early conditions of an industry often set the stage for historical trends toward a less integrated structure. The research establishes, for instance, that new sectors or technologies often start off being more integrated in key respects because the notionally available alternative of "the market" simply does not exist in the relevant sense -- i.e, a well-developed co-specialized market, with established contracting practices, in which suitably capable firms compete to deliver a required input. Jacobides (2005), studying the unbundling of mortgage banking in the US, considered how the dis-integrated structure emerged in a series of steps, mediated by the agency of firms seeking try to *reshape* their

transactional environments in the hope of reaping benefits by doing so. The research showed how firms with different knowledge bases, diverse skills and uneven growth rates, invested in the reduction of transaction costs and benefitted from the resulting alteration of the institutional structure of the sector.[6]

Not only has it been shown that capabilities and heterogeneity drive scope and even the transactional environment, there is also evidence supporting the feedback in the opposite causal direction. Scope and transaction governance considerations drive capabilities at the sector level. Cacciatori & Jacobides (2005), looking at the evolution of the construction sector in the UK, suggested that vertical scope shaped the process of knowledge accumulation. Further evidence is found by DiBiaggio (2007) for semiconductor firms, linking scope to innovation capabilities, and by Baldwin, Hienerth & von Hippel's (2006) analysis of the evolution of kayak designs. Fixson & Park (2008) provide compelling evidence on Shishanto and the bicycle industry, adding a strategic dimension in the shift from dis-integration to re-integration, combing the dynamics of capabilities, transactions, and market dominance.

Just as the novelty of the capabilities involved tends to compel integration in the early years of a sector, the exogenous appearance of new types capabilities can push a mature sector toward re-integration, as evidenced in automobiles (Langlois & Robertson, 1995) or Swiss watches after the appearance of the quartz movement technology (Jacobides & Winter, 2005). Alternatively, "systems integrators" may emerge to fill these capability gaps, creating a new institutional layout for the sector (Prencipe et al, 2005).

The scope of inquiry into sectoral organization has by now extended far beyond the traditional concern with governance arrangements at a single vertical interface. A recent

[6], Baldwin (2008) provides a detailed, and careful conceptual analysis of the process and conditions under which transactions emerge in the first place. This substantially advances the discussion of "mundane transaction costs" (Langlois 1992; 2006) that concerns itself with similar dynamics.

stream of literature under the banner of "industry architectures" (IA) (Jacobides, et al. 2006; Brusoni, et al. 2009) considers not just issues of vertical scope, but the broader questions of how firms pursue profit by trying to reshape the institutional rules and roles in their sector. Quinn & Murray (2009) provide an analysis of the change of food wholesale and retail practices in Ireland and the UK, showing how communities collaborated and competed to change the institutionally mandated arrangements between different parts of the value chain with substantial implications for profit distribution. Ferraro & Gurses (2009) offer a fascinating tale that documents how MCA and Lew Wasserman managed to redefine the IA of the movie and TV sector (by introducing new ways in which studios connected to actors, e.g.) to benefit Wasserman's firm and to exploit its capabilities. Tee and Gawer (2009) show how differences in IA in Europe and Japan hindered the adoption of DoCoMo's *i-mode*. Depeyre & Dumez (2009) consider how the state can shape both the IA and capabilities. Looking at the US defence industry, they consider how changes in procurement methods by the Pentagon changed the trajectory of US firms that were trying to further shape their environment.

Linking IAs with their ultimate impact, value appropriation, Dedrick et al. (2010) compare the value capture of notebook PCs and Apple iPods in global value chains, and Pisano & Teece (2007) prescriptively consider how firms can leverage IA to benefit from innovation. Adner & Kapoor (2010) consider how the structure within the photolithography value-adding chain affects the ability of firms to benefit from technological innovation, and Tae & Jacobides (2010) consider how the structure of the IA in computing and in cars drove the patterns of profit distribution within the sector, broadly defined. These studies, taken together, show how capability differences interact with IA (and the associated transactional environment) to shape both "who does what" and "who takes what"; and how firms actively try to manipulate IA to improve their fortunes. Cowhey et al's (2009) discussion of how firms

in the IT sector spent time and effort to ensure that the global regulatory and technological regime benefits them is a case in point. Firms'efforts to shape IA by lobbying (Szell, 2003) or norm-setting (Lee, 2010) do seem to be a pervasive feature of IA evolution.

These two emerging strands, which provide a first cut at integrating capabilities and transactional / institutional analyses at the level of a sector or a firm, have of late also started converging, opening promising paths of research. Santos & Eisenhardt (2009) have recently shown how entrepreneurs shape the nature of the markets they are engaged in so they can leverage their own capabilities. Velkar (2009), Pisano & Teece (2007) and Wigand, Steinfeld & Markus (2005) consider how the interplay of firm-specific interests and IA shape the creation of industry-wide standards.

Summing up, substantial progress has been made in the effort to understand the dynamic interplay of capabilities and TC and the resulting incentives, a number of cases have been examined carefully, and some specific causal arguments have been put forth – but not thoroughly tested. Wider vistas of institutional change, involving the institutions of governance above the level of the transaction, have been pointed out and partially explored. Much remains to be done, and interesting challenges lie ahead. Before turning to these challenges, we broaden the perspective and examine some major issues uncovered by the research thus far.

IV. Implications and theoretical interpretations

An important benefit from the work of the last ten years is that it has highlighted the theoretical issues that are central to the attempt to address the traditional questions of economic organization from a capabilities-based or evolutionary perspective. The issues thus highlighted are not, for the most part, new ones. But it is clear that, in the past, evolutionary thinking has found much more application in thinking about technological change than in thinking about organizational or institutional change (a fact that has its own evolutionary

explanation). Thus, for example, some of the historical patterns in the progress of particular technologies were noted and their sources explored from an early stage (Dosi 1982, Nelson and Winter 1977, 1982). On the other hand, the important topic of industry evolution was long neglected, and even less has been said about the evolution of firm boundaries or contracting practices until quite recently.

Familiar truths may require adjusted statement for a novel context. The economics of organization "problem" is sufficiently different from the technological change "problem" to demand at least some adjustments of the explanatory structure, and also some engagement with relatively unfamiliar issues. But economic organization does evolve, and it is not fundamentally more promising to imagine that it can be adequately addressed from a static viewpoint than it would be to imagine the same thing about technology. In this section, we consider some of the issues that particularly demand attention in light of the recent engagement with the problems of economic organization and the empirical findings summarized previously.

Rethinking incentives: Agency vs. rationality

Whether the focus is on technological change or organizational change, an evolutionary account gives incentives an important role. Yet these incentives – put more broadly, "agency" – appear to differ in nature from those highlighted by the analysis of profit-maximizing rational actors. This calls into question the identification of "rationality" with purposeful economic activity, and suggests that this may in fact obscure an important part of the role of incentives.

The point is well illustrated in the examples noted above. In them, economic actors are seen as attempting to reshape the selection environment to their advantage. The typical result is failure, which offers encouragement to the more passive actors, who regarded such

efforts as obviously foolhardy from the outset. The occasional successes, however, not only establish the foundation of great private fortunes, but become the sources of profound systemic transformations – just as Schumpeter said (1934/ 1911). Consider the previously cited example of Lew Wasserman and MCA (Ferraro and Gurses 2009), or for that matter, Bill Gates and Microsoft.

An important theoretical question posed by such examples is whether they are usefully thought of as manifestations of "economic rationality." They certainly do involve "agency" or "intentionality." The protagonists certainly draw on the energy of pecuniary motivation, otherwise known as "profit seeking." Although these attributes would suffice for many people to establish the affirmative answer on "economic rationality," there is a need for caution here. The formal rationality that is expounded in the textbooks and explored in the research efforts of many disciplines is essentially a story about getting the right answer to a given, sharply defined problem. In contexts where the actor's specific objectives might be unknown (e.g., attitudes toward risk might be unknown, even if the profit-seeking motive can safely be assumed), it basically becomes a story about the internal consistency of the different answers to a hypothetical set of related problems. This very influential understanding of rationality is enshrined in the large literature of axiomatic utility theory founded by von Neumann and Morgenstern (1945). On this view, if you discard consistency – meaning, fundamentally, the transitivity relation on preferences – you throw away rationality itself, as it is defined in economics and in other fields devoted to the practice of rational-actor theorizing.

If "consistency" captures the central aspect of entrepreneurship, then there is a reasonable foundation for an attempt to explicate organizational change by reference to familiar theories of economic rationality. If, however, the phenomena substantially transcend mere consistency, then there is need for a broader understanding of "agency" than the

standard account of rationality allows. Likewise, descriptive analysis based on the use of maximization and optimal rules (themselves open to interpretation as a peculiar heuristic or routine, as noted by Nelson and Winter (1982: 126-8)), may need to be discarded in favour of the more plausible satisficing heuristic, which does not necessarily yield similar results. To re-emphasize, there is no need to discard the idea that many of these entrepreneurs are out to make money, and go about it quite deliberately. That proposition is not in dispute (for what it is, a powerful generalization that admits occasional exceptions), and thus it is not a basis for discriminating between a behavioral/ evolutionary view of economic actors and the standard economic view based on rational choice. It is the differing levels of commitment to consistency (and the associated commitment to the use of optimization techniques within the bounds of a given, narrowly defined problem) that is the proper basis for that discrimination.

We argue that agency, in this broader sense, includes profit-seeking behavior that goes beyond what economics (or TCE) allows for. Its consequences include the creation of novelty, and it thus becomes a powerful shaping force for cumulative change, not just for the requirements of temporary equilibrium. While economists have long claimed a distinctive competence in understanding of how the self-interests of dispersed parties combine to yield economic order, the increasing formalization of theorizing has meant that the relatively complex aspects of political economy, institutional economics, and history have increasingly fallen out of the cognitive frame of the mainstream of the profession (as has been remarked by a great many observers before us). Incentives have been formalized, but also narrowed in a way that excludes important strategic aspects visible to real actors. Agents are often seen as maximizing on one dimension – for example, as trying to maximize profit within given, established constraints of their maximization problem.

As with any formalization, some of the conceptual richness and complexity of the decision environment is pushed out of sight to ensure an elegant and tractable analytical

structure. TCE improved the state of affairs by pointing out that if agents are truly selfish, they might be also expected to take opportunistic advantage of (inevitable) imperfections in contracts, implying a need for a variety of institutional mechanisms to govern their relationships. We would argue (as Smith, Keynes, Marshall, and indeed the vast majority of economists prior to Samuelson would) that agents also try to *change the nature of the optimization problem* – or, more plainly put, the nature of the choice setup. This is, of course, exactly the stance of creative engineers toward existing technology, and hardly anyone now affirms the adequacy of standard economic rationality for analysis in that domain.

The problem with formal rationality is that it ignores some very powerful incentives that operate in firms and sectors. Agents, drawing on their capabilities, try to change the environment to their advantage, in variety of ways. And in so doing they are affected by frames, cognitive bounds, and the way they perceive their environment; innovations involve changes in the way things are seen and perceived much as they depend on new "engineering" data. In the domain of organization, as in technology, it is innovation that we need to understand if we are to explain how we came to be where we are, and where we are likely to go next. The sources of innovation have been much studied, and of course the evidence supports the relevance of incentives and agency. It also supports, however, the importance of creativity, diverse sources of inspiration, "thinking outside the box," and, last but not least, serendipity (Denrell et al, 2003) – a mode of discovery that demands motivation but actively resists the *ex ante* specification of alternatives. To understand the role of agency in the evolution of the system, it is important to make more room for these aspects, and focus less on the problem of consistent choice among given and well-defined alternatives. The ability to imagine or design different ways of doing things is logically antecedent to the problem of choosing well among them, once they are well specified.

Structure, feedback, and evolution

An important element in shaping the nature of choices is structure – whether at the level of the individual, the organization, or the sector. As we have shown, the work carried out during this last decade has highlighted the merit of incorporating structure explicitly in the analysis of capabilities and evolutionary dynamics. Structure shapes the nature of the alternatives pursued by individuals. Within organizations, structure shapes the perceptions, frames, and expectations of what actors need to achieve. Whether these are administrative goals in a state bureaucracy, Key Performance Indicators in a business department of a large corporate structure, or objectives in an entrepreneurial venture, structures (the administrative divisions and other durable aspects of "command and control") have an important role in defining what the different sub-units of an organization undertake. Individuals do not respond to "problems" in the abstract; they respond in a manner consistent with the specific roles that are implied or explicated to them, depending on their position within a structure. They may well know that their roles engage only part of the organization's overall objectives, but structure shapes both their framing of a problem, and their incentives (Cyert and March 1963)). As Dewey (1933) pointed out, people choose on the basis of the alternatives and criteria that are put to them; and structure within an organization plays a powerful role in shaping both.

Similar remarks apply at a higher level, to the division of labor between different types of industry participants. Structure shapes feedback and thereby guides the process of capability development. This shaping effect arises from mechanisms known since Adam Smith's famous discussion of the division of labor. As we have argued above, these include all the mechanisms of structured feedback, including the identification of problems that are worth solving and the establishment of incentives for solving them. The signals provided by the environment regarding the effectiveness of established and contemplated courses of

action shape the types of activities an organization will undertake; and thus shape the process of capability development.

Feedback sets the context for the forces of agency, engaged in the attempt to reshape the very structure that generated the feedback signals. While structures evolve largely according to their own dynamic laws, and sometimes in unexpected ways, they also provide an entry point for deliberate change efforts. By changing structures (whether within organizations, or in sectors, through regulation, standards and industry-wide rules, or by even higher-level institutional innovations), behaviors can be modified and the evolution of capabilities redirected. Inquiry into this possibility should address both the cognitive elements inherent in the framing of any structural initiative or strategic choice and the role of feedback in shaping the subsequent evolution at both firm and industry levels. This constitutes an important agenda for future research.

Understanding capabilities

In sum, there are building blocks in place for a coherent and compelling approach to understanding capabilities and their evolution. The approach draws heavily on the insights accumulated in the economics discipline, and particularly in TCE research – but makes no direct use of the quasi-normative, actor-level apparatus of rational choice theory. Also, while it focuses on purposeful economic activity, it considers the broader role of agency, including changes to the context, as opposed to the narrower, consistency-based formalizations of economic rationality.

The first challenge is to understand the reasons why capabilities differ between (and even within) firms; and what mechanisms may exert a (often limited) pressure towards homogeneity through learning, imitation, and competition. The second required focus is on the structure within which capabilities evolve, and the feedback mechanisms that operate

both at the level of the organization (helping select the practices that organizations accept and reward) and at the level of the sector (since the division of labor affects the feedback mechanisms that shape action). It also affects the cognitive bounds that shape evolution via the perception of innovative opportunity, as was observed by Simon (1962), and partly discussed by Cyert & March (1963).[7]

The institutional rules and structures, including the property rights arrangements and regulatory systems in place at any point in time, are parts of the overall structure that affects both the operation of feedback and the direction of the evolution of capabilities. These structural aspects are important because they are significant parameters in the organizational and industry environment; but they are also endogenous features in the long-run process of industry evolution. That is, firms also shape and change institutional structures, including the specific forms of property rights.

Thus, to understand the evolution of capabilities, it is necessary first to understand the basic economics of the system, and the forces that shape agency. Structure, either at the level of the firm or at the level of the sector (or industry architecture), is important partly because it shapes the direction of effort (through incentives and informational flows); and partly because it focuses attention (acting as a basis for cognitive framing).

By acknowledging the role of context at each stage of the evolutionary process, this approach offers a deeper and stronger causal grounding that cannot be accessed if we examine only one agent or one transaction at a time. This does not mean we should not pay close attention to the mechanics of choice (or, more importantly, to the mechanics of action)

[7] More recent research linking structure and the division of labour with cognition includes includes Jacobides (2007), Kaplan (2008), Kaplan and Tripsas (2008), Trispas and Gavetti (2000); and Trispas (2009). In a forthcoming paper, Gavetti (2011) urges a prominent role for cognitive considerations in strategy analysis.

at the individual level – these are prime considerations. But it is the *context* that shapes them, and oftentimes in subtle ways; hence our emphasis on attending to the role of context.

V. Grounding in practice:

The etiology of the financial crisis as a conceptual laboratory

In considering directions of possible theoretical advance, it is important to seek integration of achieved insights, as premised in this special issue. It is also important not to become trapped in a straitjacket of analytical convenience, as we have argued above. It is quintessentially important, however, to confront phenomena of interest not only to scholars, but also to managers and policymakers. The usefulness of a proposed approach should be assessed in a realistic context. Here we take the recent near-meltdown of the financial services sector as an example and briefly describe how this episode both illustrates and illuminates the mechanisms discussed above.

The crisis affords considerable insight into the process of co-evolution of capabilities, boundaries, and scope that changed the architecture of the financial services sector, ultimately creating critical vulnerabilities. As we discuss at length elsewhere (Jacobides and Winter 2010), what changed in the sector was the division of labor. It changed through the interplay of the mechanisms discussed above, including the interaction of feedback mechanisms with firm-level agency.

At the center of the structural origins of the crisis in the US is mortgage banking, which was transformed from the 1970s onwards, and especially in the last decade, by the institution of a series of new markets along the previously integrated value chain. The first such market broke up the traditional mortgage banking value chain, separating the creation and servicing of a mortgage loan from providing the capital and holding the claim to that loan. The new secondary market for mortgage loans was facilitated by government policy, in

the interest of improving finance for housing. Its creation had far-reaching ramifications, beginning with encouraging the growth of mortgage banks – non-depository financial institutions specialized in the creation of mortgage loans. Subsequent developments included the growth of the specialized loan marketing function (mortgage brokers) and specialized loan-servicing organizations. Existing organizational capabilities were modified, and new ones created. These changes were largely responses, created by firm-level agency, to the opportunities offered in the emerging context, but they reshaped that context by fundamentally altering the prevailing incentives all along the chain. Ultimately – and with crucial amplification by several other causal factors – the changed incentives left "no one in charge" of protecting the quality of mortgage loans, and through that, the interests of the ultimate investors, and through that, the interests of the public at large.

Securitization, then, not only led to a new set of markets, but also framed different ways in which particular types of (new) industry participants could monetize the benefits from a loan. Along with the new division of labor came a new set of rules, as well as a new selection mechanism and new pragmatic definitions of what it meant to be "competent" in the various segments. The evolution of the system, constrained and modulated at every stage by existing routines and interaction patterns, was guided by locally intentional innovations. These served the perceived purposes of participant firms and their employees. New ideas were embodied in new capabilities, and if they passed the "local tests" of what made more sense (or more money in the short term), they spread, through selection and imitation. These innovations led to further modifications of contractual arrangements, as firms attended to changing the conditions around them. And as they did so, the sources of gain and benefit, and ultimately the feedback mechanism, changed. Loan originators, for instance, established a means to benefit from selling a loan to a warehousing bank, obtaining closing fees up front,

receiving a (somewhat risk-adjusted) payment – and further reducing their engagement with loan quality.

Also, consistent with our emphasis on context, these arrangements were shaped in particular conditions of demand and a particular macro-economic environment. The viability of the arrangements would only be put into question if specific feedback made a change necessary. Regardless of the views of industry participants with greater or lesser appreciation of the viability of these arrangements, innovations that were deemed to have a "positive" outcome (in terms of generating cash flow, and also generating revenues for the employees putting them together), became more prevalent. Even if participants strongly suspected that the loans would not ultimately perform, their behavior was overwhelmingly shaped by the actual feedback at hand (principally, measured growth of revenue and profit achieved through origination of loans and derived securities). As Chuck Prince, CEO of Citibank, famously said in 2007, "When the music stops, in terms of liquidity, things will be complicated. But as long as the music is playing, you got to get up and dance. We're still dancing".

The analysis above illustrates our second major point: that structure shapes feedback, and it is *feedback, not foresight, that drives the evolution of a system.* It also illustrates our third major contention: that *a change in structure, through a change in the feedback mechanism and the selection process, can shape collective outcomes.* The changes in the institutional structure led to a change in the nature and operation of feedback and the shared sense of what was more efficient; they did so by shaping incentives and honing cognition. What was painfully illustrated in 2008 was that endogenous changes in the structure and operation of complex sectors such as financial services can go through socially destructive periods, especially in contexts where success and failure do not become apparent immediately (loans will not show signs of stress, on average, before the cycle begins to turn).

And this can happen even when industry participants might understand how the system misdirects effort and attention.

The type of analysis sketched here is particularly important because it provides a complement to existing economic analysis – whether that taught in business schools, or discussed between economic analysts and academics. It provides a broader view of agency; considers both the emergence and evolution of heterogeneity and capability; and looks at how capabilities, at the level of institutions and, ultimately, industries, evolve and become selected. In doing so, it offers a glimpse of the systemic logic that has led to the biggest economic crisis in 80 years. The problem with "micro-foundational" agent-based analyses, as well as "*ceteris paribus*" comparative institutional analyses, is that they would miss precisely this point – i.e., they would not be able to capture the causal dynamics that operate at the level of the larger system. Sure enough, we could establish the factors that, on the margin, would make a bank in 2002 or in 2007 make and hold, or originate and distribute, a mortgage loan; and we might consider the level of competence of one individual bank as a correlate of its past decisions about scope. Yet this would not yield much understanding of *why* the system evolved this way, or what drove these dynamics. Neither would it help us see how a prevailing structure might lead, through the existing feedback mechanisms, to a better or worse individual and collective future.

Summing up, the explanatory challenge of the crisis reminds us that useful research cannot be guided purely by the quest for elegance, or by reliance on a narrow range of "approved" approaches to describing the nature and motivations of economic actors. We would even argue that research that bridges previously unconnected bodies of knowledge is not necessarily appealing *per se*. Rather, an integration becomes interesting when it advances an understanding of a new or different causal mechanism, and when it is attractive at the phenomenological level – i.e. it lets us consider important phenomena that have eluded

analysis to date. Such a phenomenological orientation is particularly relevant, or even (in our view) *mandatory*, given the current volatile environment.

VI. Looking ahead

In our literature review (Section III), we offered references to an impressive body of research that has addressed the dynamic interactions of capability and transactional considerations in the determination of significant features of economic organization. Our discussion has mostly emphasized that "a lot has been done." Here we emphasize that a great deal more could and should be done. Our claims of evidence for our proposed causal mechanisms carry a significant taint of "proof by selected example." While large sample statistical evidence of a relevant kind is intrinsically hard to come by in such a complex arena, research of that character would certainly be welcome. But careful study of a larger class of examples would also be welcome. Expansion of the set of examples very commonly turns up distinctions among cases that are of theoretical significance. Occasionally, apparent anomalies show up that directly challenge the theoretical underpinnings -- and it is the ability to cope with such challenges that is the fundamental test of a theoretical view. We propose, therefore, that any of the studies we have previously discussed is a viable model for research that would be new and interesting if carefully executed in a novel empirical arena – and interesting for its potential theoretical significance, as well as for any qualified support it might provide for existing theoretical views.

That said, the most promising segment of the research frontier features, in our view, the questions of interaction between relatively large-scale structural phenomena and agency at the level of individual actors. What are the firms doing in an effort to produce advantageous change in the institutional rules that control their positions in the system? There are numerous dimensions to activity of that kind, including the introduction of new contractual forms, new ways of governing supplier relations, participation in standard-setting

activities, and lobbying before regulatory and legislative bodies. While such questions are explored in the existing research literature, there are relatively few examples that pursue them at both levels, individual actors and institutional arrangements, with due attention to the inter-level causal linkage. There is also a need to supplement the perspectives from economics and management , on the one hand, with those provided by other social sciences, and law, on the other. For example, the phrases "regulatory capture" and "organizational fields" suggest important perspectives on some of the same phenomena that we would place under the heading "industry architechure."

New business models as structural innovations

Recent research interest in "business models" suggests another promising path into the interesting terrain of structure and agency. Over the last few years, several accounts of business models have come to the fore (see Zott & Amit, 2007; *Long Range Planning (special issue)*, April-June 2010; Zott et al, 2010, for a review). Motivated by the ever-expanding discussions in the practitioner world, academics have tried to make sense of the pervasive interest of business models, and also of the fact that they do not seem to sit comfortably with mainstream research in management. As Baden-Fuller and Morgan (2010: 159) observe, "The real world of firms is made up of very many enterprises that behave and are organised in very different, individualistic ways. In contrast, theories of firm behaviour tend to be very general. Business models operate at an intermediate level between these two poles". Thus, the interest in business models arises partly from the fact that standard theory does not illuminate the role of the structure of business activity – its industry architecture, to use our parlance.

Our theory review indicates that there is an emerging body of research that can usefully inform the growing business model discussions. For instance, while we concur with McGrath (2010) that firms can choose their "units of business", i.e. "the good or service that

appears on the invoice," we also contend that these choices are not entirely "free," as they are made within the context of an architecture. The MCA/Wasserman case (Ferraro & Gurses, 2009), or food retailing (Quinn & Murray, 2009) are cases in point. Analyzing the co-evolution of firm strategy and the institutional environment, as we advocate, can provide an analytically useful contrast between the industry-wide environment where firms operate, with its slowly-evolving conventions and architecture, and the firm-specific choices embodied in the business model on the other (cf. Teece, 2010: 173). Complementing research on individual models with the analysis of structure at the level of a sector could provide a better sense of both the drivers and the dynamics of the changing rules, the constraints that business models must satisfy.[8] This would also allow business model research to become more "socialized", less focused on the heroic depictions of successful firms, and more attuned to the dynamics of co-evolution between individual business models and the industry context that supports or rejects them.

As we consider the potential success and "sustainable advantage" of a business model, issues of capabilities and heterogeneity come sharply into the picture. "Business models", in principle, are imitable; once established (usually through the efforts and ingenuity and constant prodding of the entrepreneur or firm that came up with them), they can be emulated, with no such setup costs, by others. Hence it is quite plausible that a business-model innovation might change dramatically the dynamics of a sector, yet fail to reward the innovator. As usual, durable success depends on having something distinctive, be an element of superior skill, knowledge, or ability to implement (or even finance) the business model. It also depends on the ability fend off future efforts to change the structure yet again, a point that seems to be underemphasized in the business model literature. As we emphasized early in our paper, it is important to distinguish the "idea" from its manifestation

[8] See Johnsohn & Suskewitz (2009) on an interesting illustration on the role of industry-wide dynamics on fossil fuel and the need to take a systemic view of "business models" at the level of industry.

in concrete capabilities, and consider what it is that intervenes between the (potentially imitable) idea and the actual venture, and offers the prospect of sustained success.

In all, we argue that a more detailed consideration of the *context* of business models could contribute positively not only to the business models discussion itself, but also to understanding of the origin and evolution of capabilities. This view of business models gives rise to a number of potential questions that research can address, expanding not only our understanding of theory, but also of the real world. A particularly significant question is this: What exactly constrains the existing menu of business models? Are the difficulties of business-model innovation primarily related to shortcomings of the original creative insight, to their acceptance within a sector, or to the challenges of implementation – the long distance between the idea and its successful implementation? To address such questions, we will need, once again, to take heterogeneity seriously and consider how it relates both to business-model success and to the ability of the innovators to defend their newly found turf.

Organizational economics (outside TCE) and capabilities research

In this essay, we have addressed some basic issues raised by the proposal for stronger integration of organizational economics and organizational capabilities. As we noted at the start, the term "organizational economics" is used in this proposal to cover two quite disparate lines of inquiry: transaction cost economics and the use of rational-actor theorizing to illuminate the workings of organizations. Regarding the latter, our stance is not only that integration is possible, but that the enterprise is already well advanced. Certainly much remains to be sorted out, and the most important applications doubtless lie ahead, but it is already possible to see "how the story goes" and to recognize its promise. There are several reasons for the relative ease of integration of these two lines of thinking; certainly an important one is that both schools consider detailed micro-level accounts of particular cases as a type of evidence that is worthy of respect.

Regarding the possibility of integration with organizational economics in the narrower, rational-actor sense, our appraisal is less sanguine. The issues that we have highlighted in the capabilities context are fundamental, long-familiar, and pervasive in domains where the economics discipline faces of challenge of understanding the dynamics of complex social arrangements. The problem is posed by the analytical tractability barrier that either blocks the application of the rational choice tools entirely, forces abandonment of the quest for explanation above the individual-actor level (as we have stressed), or yields "solutions" involving ever-increasing departures from phenomenological realism. Whatever one thinks about "realism" as an issue of scientific methodology, it is quite clear that effective communication with other social scientists, managers, and policymakers is impeded by a thorough-going commitment to rational-choice formalisms. Among the lessons of the financial crisis is the point that the rare instances of practical use of such methods (here, the modelling of securities markets) do not necessarily yield durable success, if higher-level managers lack understanding of them.

In an article that provoked much controversy, Paul Krugman attributed the failure of economists to predict the crisis to the fact that they "mistook beauty, clad in impressive-looking mathematics, for truth." He subsequently commented that "… the temptation is always to keep on applying these extreme (neoclassical) simplifications, even where the evidence clearly shows that they're wrong. What economists have to do is learn to resist that temptation. But doing so will, inevitably, lead to a much messier, less pretty view." (Krugman 2009a, 2009b;). This again presents much the same basic issues set forth in our capabilities discussion, and undoubtedly reflects the same difficulties arising from the analytical tractability barrier.

Given increasing recognition of the subtlety of the problems faced by individual actors, and the increasing sophistication of the analytical tools used to explore those

problems, there is an increasing challenge for theoretical research that seeks to relate the behaviour of individual actors to causal forces operating at higher levels of analysis. In textbook economics, analysis of the optimizing behaviour of firms and consumers is followed by discussion of market-clearing – the endogenous determination of the prices that are the parameters of the environment for individual actors. Much valuable insight, both descriptive and normative, was obtained via that type of analysis, in both partial- and general-equilibrium settings. It is hard to find its counterpart in organizational economics, and full recognition of the importance of the issue is not commonplace. Undoubtedly this is because the theoretical problem is itself hard, especially in its dynamic version, and it will remain so.

The "good old days" of easy aggregation from the actor level to the market, industry, or economy level are clearly behind us. The question of the origins of heterogeneity is a basic one here. Models of the quasi-normative kind – characterizing a "right answer" to some organizational problem in some stylized environment – rarely provide a plausible point of entry for the variety in initial conditions that, almost certainly, is fundamental to the observed heterogeneity. That actor-level heterogeneity is, in turn, fundamental to the patterns observed at higher levels. Neither do such models make it easy to allow for the complex ways in which those initial differences become elaborated over time. Frequently, they do not even attempt the ever-lengthening stride to the next stepping stone of traditional economic analysis, where the concern is with how the individual actors relate to each other in the competitive context of a market, an industry, or a whole economy – and whether that works out, on the whole, for good or ill.

Emphatically, we do not want to be understood as denying the past contributions of basic economic analysis to understanding of capabilities, or the continuing and future prospects for valuable work of that kind. Such "basic" analysis has commonly involved rational-actor theorizing, and more so in recent decades than in the past. We note that team

theory (Marschak and Radner 1972) and its more recent revivals (Bolton and Dewatripont 1994, Van Zandt 2003) have important affinities to a capability-based view in that they consider different ways in which agents might be able to connect and organize to carry out some collective task, sometimes assuming away incentive issues to focus on coordination. These, and other models of organizational structure consider how different configurations of actors that take several different attributes (hierarchy, polyarchy, etc) lead to particular sets of outcomes ((Garicano 2000); Christensen and Knudsen, 2010). So in essence the differences between these configurations (and not just in the fact they belong to one organization) drive performance differentials; and in that, capability differences are at least partly explained by the structure in which agents are embedded. The interpretation of that structure as one of many possible equilibria for a game among organizational participants is also congenial and instructive (Gibbons 2006), linking game-theoretic equilibrium selection with incentives, performance differentials, and heterogeneity.

Many further examples along this line could be provided. In the future as in the past, analytical parables about highly stylized situations will be a powerful source of heuristic insights into more complex situations.[9] *Incorporation* of such insights in understanding of capabilities will be feasible and valuable, as it has been in the past. True *integration* is another matter, and it is not right around the corner. Parables will not suffice to engage the actual complexity of the phenomena, and analysis that does so will inevitably – as Krugman suggested in the case of macroeconomics – provide a "much messier, less pretty view."

In this paper, we have argued the importance of the multiple causal forces operating above the actor level, and also the reciprocal causation between the agency of individual

[9] Such parables can constructed under a variety of rules, certainly including those of rational choice modeling but also, for example, NK modeling of the kind pioneered by Levinthal (1997).

actors and the structure of the larger systems in which they operate. Useful insights into these important issues can likely be derived by many different methods. We have our views regarding which methods are likely to prove most effective in addressing these issues, but our strongest affirmations relate to the proposition that the higher-level forces are real and important. If our collective game is about understanding the real world, it is imperative that we keep those forces in view. In this paper, we have provided some concrete suggestions on how to build a research program that incorporates and investigates these forces and goes beyond the admonition to "consider dynamics and interactions", considering, in particular, the role of "business models" as a research area. We have also argued that, as we engage in this program, a phenomenological orientation would be crucial to ensure we have impact as a field, on strategy and policy alike.

Summing up, there is already a substantial amount of work that has developed around the intersection of capabilities and economics, both in terms of TCE and in terms of the use of formal models of rational economic action. The field has progressed substantially toward a dynamically integrated view, especially in the case of the insights of TCE. There appears to be even greater promise looking forward – especially if one considers the potential fields of application of this research, and its ability to assist decision makers in firms and policy positions alike.

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