1. The provenance of an economics of adaptation in long-term relationships

> When a law is made, the cunning that finds loopholes goes to work. One cannot deny that there is a certain slyness among younger players, a slyness which, when rules are written to prevent slyness, makes use of the rules themselves. (Kawabata 1951 [1981], p. 54, on the governance of *Go* tournaments)

When asked what the book is about, I say "long-term relationships". This piques everyone's interest. Everyone has experience with long-term relationships or with relationships that had the potential to persist for a long time. I then indicate that the book is about long-term commercial relationships – long-term contracts, partnerships, joint ventures, relationships within the firm, and implicit contracts. I also volunteer, however, that many of the concerns involved in maintaining personal relationships also show up in commercial relationships. A principal concern is exit: how do parties to an important relationship determine when to end a certain collaboration or to end their entire relationship? How do they manage the processes of wrapping up project-specific operations or their entire portfolio of operations? Insofar as parties can anticipate that breaking up can be hard to do, what processes might those parties commit to in advance for mitigating the costs of any prospective break-up? What processes can they set up for dividing assets, including intellectual properties, they had contributed to their collaboration or had developed through the course of collaboration, and how would they deal with knowledge assets to which it would be difficult to assign crisp property rights?

These are the types of questions that the designers of the long-running collaboration between Human Genome Sciences (HGS) and SmithKline Beecham (SKB) would have had to address. Human Genome Sciences was an early entrant in the business of identifying gene sequences. Indeed, HGS was established in 1992 in the same neighborhood as the National Institutes of Health in Rockville, Maryland, the same place where Craig Venter, a co-founder of HGS, had championed the development and application of particular, high-speed (shotgun) gene-sequencing technologies. Gene sequencing could advance genetic engineering – the engineering,

for example, of gene therapies that involve modifying DNA. Knowledge of gene sequences could also inform the design of drug therapies.

However, knowledge of gene sequences alone would not yield drug therapies or gene therapies. Human Genome Sciences would have to bring more capabilities into the firm – or be brought into another firm as when the pharmaceuticals firm GlaxoSmithKline absorbed HGS in 2012. Or HGS could do what it did before 2012: engage tight collaborations short of mergers with pharmaceuticals companies. Thus entered SKB in 1993, a large pharmaceuticals company that itself was ultimately absorbed in GlaxoSmithKline. The collaboration between HGS and SKB would join SKB's capabilities in designing and commercializing drugs with HGS's capabilities in identifying genes and characterizing gene expression.

The collaboration started in 1993 with a ten-year contract.[1] Making it work involved what amounted to a broad cross-licensing agreement by which each party would grant to the other rights of way to use technologies that were subject to patent or would be patented in the future. Such cross-licensing amounted to commitments not to sue for expropriation of intellectual property in the future. (Absent such commitments, one party might exploit threats to press claims of patent infringement or other expropriation of property rights as a way of gaining bargaining leverage over the counterparty. Anticipating such hazards, parties might be less likely to enter long-term collaboration in the first place.) Making the collaboration work also involved the delicate business of sharing know-how or tacit knowledge, for example, the artisanal knowledge in the heads of engineers, not amenable to patenting, with which engineers could abscond to another firm. More generally, the parties to collaboration would contemplate how to mitigate the leakage of know-how outside the bounds of their collaboration. On this count, the two parties agreed to impose some limits on personnel transfers. Specifically, SKB reserved the right to send two engineers to HGS facilities to work alongside HGS engineers. That is, the parties agreed that HGS would maintain a veto over proposals from SKB to send over more than two engineers. The parties also included a no-poaching clause according to which neither party would secure employment of former employees of the other party for at least a year after a given employee's departure. The parties set up production benchmarks (milestones) as well as deliberative processes, replete with voting mechanisms, for identifying and approving prospective research projects.

[1] All the information reported here derives from public versions of contracts HGS filed as exhibits to its Securities and Exchange Commission Form 10-Q dated August 20, 1996.

The prospect of approving projects, of course, contemplates the prospect of rejecting projects. More importantly, approval and rejection contemplates the prospect of (possibly bitter) disagreement. Hence, the principal purpose of deliberative processes: to enable parties to collectively make decisions and take action even in the face of messy, irreconcilable disagreement. Then there is the question of exit. Almost surprisingly, the contract contemplated very little in the way of a deliberative, bilateral process as regards the decision of one party or the other to exit. With some months' notice, one party or the other could exit. Rules were already in place to sort out the division of intellectual properties developed through the course of any one research project.

Whether or not HGS or SKB ever vigorously threatened exit to gain leverage in bilateral bargaining is not obvious, but, as it was, neither HGS nor SKB (nor SKB's successor, GlaxoSmithKline) exited the relationship. Even so, the original contract never exhausted its ten-year term. Instead, the agreement was periodically amended or superseded. It was amended mostly to enable the two parties to draw yet other parties into collaboration. These amendments pertained largely to extending rights of way to these other parties. Along the way, however, HGS entered bilateral relationships with other pharmaceuticals firms, but GlaxoSmithKline's acquisition of HGS in 2012 did more than a little violence to those relationships. It put an end to them, a result that may explain the lack of complete enthusiasm on the part of HGS management to merge with GlaxoSmithKline.

There will be much more of that in this book: violence to relationships, efforts to contain or channel that violence, and the intrinsic messiness of long-term relationships more generally. Indeed, Chapter 5 will take us to the Eastern Mediterranean in the fourteenth century, a time and place of much actual violence and dislocation. It was a time at which Venetian seafaring traders and their abundant competitors had to put up with war, plague, crusade, and piracy – in addition to the hazards that more ordinarily comprise the topics of economic research (agency hazards) – in order to generate the gains from trade that ultimately made Venice the queen of the Adriatic and a leading peer among peers in the Eastern Mediterranean. However, we are getting ahead of ourselves. The immediate purpose here is to ask, why the management of relationships has not been a more obvious and prominent topic of economic research until the last few decades? The broad answer advanced here is not new, but I assemble material not generally brought together in one place. The broad answer is that no role has yet emerged for a manager or management in formal economic theory. It is not obvious how to characterize what managers do. It gets worse. From the perspective of economic theory, it is not immediately obvious

how parties to long-term collaboration or even to short-term exchange could find themselves mired in disagreement. Among other things, it takes a lot of work and technical sophistication to characterize how parties who appear symmetrically informed could agree to disagree about where opportunities to realize mutual gains from exchange might reside.[2] How is it that collaborators could not jointly examine opportunities and find themselves agreeing on what projects to pursue?

One answer is that parties to prospective exchange are not symmetrically informed. Indeed, one function of deliberative processes would be to induce them to share what they know about prospective projects and thereby induce a common understanding about prospective gains from exchange. Yet, if talking things out were all that there were to deliberative processes, then the study of collaborative ventures might not be that interesting. But we can imagine that parties might yet perceive strategic advantages to withholding private information. The strategic manipulation of private information is an important topic and shows up in the chapters of this book, but there are much deeper issues. Specifically, theory is good at characterizing gains from exchange, but (1) theory offers little guidance about how parties actually identify and engineer mutual gains, and (2) historically, not everyone, whether in the social sciences or not, has understood that exchange may afford opportunities for mutual gains. There is, for example, a long tradition of primitive economic thinking, which still prevails in public policy, that frames exchange as zero-sum rather than as capable of generating mutual benefits. In contrast, economic theory has a lot to say about gains from exchange, but it has had little to say about the role (if any) of institutions and collaborative arrangements in generating those gains. Instead, it offers a narrative that is too neat and clean: parties to exchange bring complementary assets and capabilities together, thereby enabling themselves to create value. The parties' interests will be aligned insofar as they each have an incentive to maximize the surplus (the "size of the pie") from collaboration. Disagreement might obtain regarding the sharing of surplus. (Who gets the largest slice of the pie?) And, yet, bargaining theory suggests that bargaining should be efficient in that parties should be able to sort out the sharing of surplus without jeopardizing the creation of surplus.

The idea that exchange could yield mutual gains is powerful and yet has been under-appreciated in policy debates. Nevertheless, it would be wrong

[2] For a good introduction to the state of the literature on "agreeing to disagree", see Dominiak and Lefort (2015). Aumann (1976) is a good introduction to the fundamental questions.

to suggest that purely efficient bargaining should obtain spontaneously. On any one morning we can look out on to the world and easily find examples of parties occupied with destroying value and destroying each other rather than with bargaining their way to mutually beneficial exchange. As Farrell (1987, p. 115) observes, axiomatic bargaining theory (inspired by Nash 1950, 1953) does not help us understand how it is that bargaining can be inefficient in that one of the axioms of the theory is that parties will bargain their way to efficient outcomes. As Farrell (1987) further observes, making superficial appeals to the fiction of frictionless bargaining in the spirit of the Coase Theorem amounts to ignoring important action. The point of Coase (1960) was that bargaining is not seamless and frictionless. Insofar as any process for organizing exchange involves some dissipation of value owing to friction in the bargaining process, then any one set of messy processes and institutions (property rights, administrative processes embedded in firms or government, and even market processes) might have a role in enabling parties to engage in gainful (if not always purely efficient) exchange.

We develop friction further on, but for now we proceed to the zero-sum concept of exchange. The idea that gains from trade do not spontaneously obtain but must be engineered could go some way toward rationalizing a role for processes and personnel that look a lot like management and managers. These people could occupy themselves with making sure that they and their trading parties do a good job of recognizing opportunities for gainful exchange and then realizing those gains. However, if exchange is zero-sum, then the role of managers is diminished in that there are no gains from exchange to seek out and secure. Indeed, zero-sum, mercantilistic thinking has a lot of intuitive and enduring appeal. Here the idea is that exchange cannot yield mutual gain but, at best, involves zero-sum payoffs in that one party's gain entails another party's loss. If some party benefits, then some other party must have been exploited.[3] It can get worse in that parties to exchange may end up wasting resources fighting each other. Wasting resources may yield negative-sum payoffs.[4]

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[3] For references, among many, that discuss zero-sum thinking, see Bagus et al. (2016), Ogilvie (2014) regarding medieval guilds, and Rubin (2003) on "folk economics". See also Verburg (2012) on the evolution from zero-sum conceptions of exchange to "gains from trade", and see Gordon (1978) on the zero-sum conception of capitalism in "Classical-Marxian" economics.

[4] Consider the following counter-example. Geologists speculated that large oil deposits would likely be found in a particular, poor country. The country's leadership understood that, at the time, no one in the country maintained the technical

The zero-sum concept of exchange is interesting for what it is not, that is, an affirmative theory of value. It is a theory – or more of a folk intuition – that exchange does not generate value, but we can at least credit people such as the Physiocrats of the French Enlightenment for asking the question about where value did come from. To do this, they had to conceive of an economic system. They then endeavored to develop an engineer's knowledge of the natural laws governing that system. An engineer's understanding of the system could enable some degree of control over the system. The program, presumably, would involve identifying control variables (the "levers and knobs" of the system) and then distinguishing the control variables from endogenously determined quantities that might otherwise have appeared as tempting control variables.

In the Physiocrats' conception of the system, value came out of the ground. It derived from agricultural production. That value was then fully realized and distributed across the system through vertical chains of exchange relations and other productive pursuits. "The physiocrats", Hannah Robie Sewall (1901, p. 81) observed, "maintained that manufacture and trade were sterile industries, in that they created no new wealth, but merely changed its form and carried from one place another that already created". Müller (1974, pp. 314, 320–21) made explicitly plain, however, that the Physiocrats did not dismiss "manufacture and trade" as unproductive but as ancillary to the realization and distribution of value.

François Quesnay emerges in the history of economic thought as one of the most prominent of the Physiocrats, and scattered across his writings are passages that anticipate and sound a lot like Adam Smith's "invisible hand" (Müller 1974, p. 314). Smith's own sparing references to an invisible hand have been heavily interpreted. Ultimately, the invisible hand has

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competence to find, extract, refine, or commercialize that oil. The leadership appreciated, however, that it owned a resource of great potential value. It would be valuable, because the owners of the resource could contract with oil-field engineers and other parties who did maintain the competence and capabilities to develop the resource. The leadership also understood that it could induce teams of engineers to compete for contracts to develop the oil resource. After some time, the competition settled down to two parties, one party sponsored by the British government, and the other party, Standard Oil of Southern California (SoCal). SoCal eventually secured the contract. SoCal and the country's leadership set up an entity, the Arabian-American Oil Company (subsequently Aramco), to develop and commercialize the oil resource. SoCal subsequently became Chevron, and that poor country, which had not existed until 1932, was Saudi Arabia. See *Discovery! The Search for Arabian Oil* (Stegner 2007). In the early 1950s, Chevron contracted Wallace Stegner, the director of the creative writing program at Stanford, to consult its archives and compose an account of its early experience on the Arabian peninsula.

been set up as a metaphor for a proposition (the First Welfare Theorem) that atomistic, independent economic agents can collectively exhaust gains from trade in an economic system via market-mediated exchange. The proposition amounts to a glorious defenestration of the zero-sum concept of exchange. It is based on an underlying theory of value, according to which each instance of voluntary, market-mediated exchange yields value. That alone is important. The great surprise, however, is that (on paper, at least) economic agents can extract from the system all of the gains from trade that the system could yield in that no subset of agents could abscond with their own resources, trade among themselves and do better. Even more astonishing is the idea that market-mediated exchange could decentralize economic exchange between these agents in that they could collectively benefit from exchange without direction from a central authority.[5]

In discussing such results regarding a particular conceptualization of an economic system, Koopmans (1957, p. 148) observed:

> The main service [the conceptualization] renders is to show that value theory – that is, the theory of prices as guides to allocation of resources and of the relationships between these prices and the technology – is of such a fundamental character that it can be constructed without reference to institutional postulates regarding the existence and the behavior of firms and consumers.

Koopmans's comment anticipates Vernon Smith on the "institution-free core" of economics. (See, for example, Smith 2007, pp. 3, 100 or Crockett et al. 2009, although Oliver Williamson credits the "institution-free core" to Vernon Smith as early as Williamson 1990.) There are at least three interpretations of the "core". The most optimistic is that the core may make no accommodation for a manager or for institutional processes, because it does not have to. Institutions are just a distraction, and investing them with importance is delusional; the core spans the important action. A more catholic, agnostic view would be to see how much of the important action the core really does span. A role for the manager and for institutions in supporting exchange might yet become manifest. A more pessimistic view would be that the core misses the most important action in that exchange does not obtain spontaneously but instead requires institutional supports; it is the fiction of fully-efficient, frictionless exchange

[5] Decentralization lends itself to any number of metaphors beyond Adam Smith's "invisible hand". For example, in *Socony-Vacuum Oil v. United States* 310 U.S. 658 (1940) the Supreme Court of the United States recognized "the free play of market forces" as "the central nervous system of the economy".

that can be a distraction; cheap and easy appeals to free markets are far too glib.

We can imagine that Koopmans might have situated himself somewhere close to optimistic, that Smith would situate himself closer to catholic, and that Williamson might situate himself a touch more pessimistically than Smith. Notably pessimistic, however, might have been Adam Smith himself who, in Nathan Rosenberg's account (Rosenberg 1960) perceived a role for a host of processes and norms in enabling market-mediated exchange. Then there is the role of processes and norms to enable exchange within the firm or within other bodies (government, say) that are invested with administrative processes.

Meanwhile, neither optimistic, nor pessimistic but puzzled by the role of market-mediated processes in economic systems might have been, in Herbert Simon's telling, "[a] mythical visitor from Mars" (Simon 1991, pp. 27–8):

> Suppose that it (the visitor[,] I'll avoid the question of its sex) approaches the Earth from space, equipped with a telescope that reveals social structures. The firms reveal themselves, say, as solid green areas with faint interior contours marking out divisions and departments. Market transactions show as red lines connecting firms, forming a network in the spaces between them. Within firms (and perhaps even between them) the approaching visitor also sees pale blue lines, the lines of authority connecting bosses with various levels of workers . . .
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> No matter whether our visitor approached the United States or the Soviet Union, urban China or the European Community, the greater part of the space below it would be within the green areas, for almost all of the inhabitants would be employees, hence inside the firm boundaries. Organizations would be the dominant feature of the landscape. A message sent back home, describing the scene, would speak of "large green areas interconnected by red lines." It would not likely speak of "a network of red lines connecting green spots." . . .
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> When our visitor came to know that the green masses were organizations and the red lines connecting them were market transactions, it might be surprised to hear the structure called a market economy. "Wouldn't 'organizational economy' be the more appropriate term?" it might ask.

In 1938, Orson Welles's radio production of H.G. Wells's *The War of the Worlds* is purported to have convinced a number of radio listeners that actual Martians had landed on a farm in New Jersey – and these Martians had not presented themselves as curious students of organization. In 1937, however, a young Englishman posed questions and observations consistent with those of Herbert Simon's mythical Martian. In "The nature of the firm", Ronald Coase (1937) observed what would seem to have been unremarkable to the person on the street: the economy is populated with firms (many or even most of the "large green areas" in Simon's telling), and these firms interact with each other in markets (in the "network of

red lines"). What was remarkable, however, was that economic theory was not equipped to accommodate firms. (Again, theory offered no role for a manager.) Instead, theory had been occupied with the program to which Koopmans (1957, p. 148) alluded: the development of "a theory of prices as guides to [the] allocation of resources and of the relationships between these prices and the technology". At the same time, the program of organizing an entire economy (that of the Soviet Union) as a single, all-encompassing firm had already been far advanced by 1937. Intellectuals in Western Europe enthusiastically hailed what appeared to them to be Joseph Stalin's successful effort to thrust Russia out of its anachronistic, agrarian past and into a mature, industrialized present.[6]

More generally, global economic depression in the 1930s induced policymakers to revisit the idea that a shift away from market-mediated exchange (capitalism) toward increasing statism and centralization of production and distribution could mitigate excess competition and promote cooperation in economic systems.[7] The United States, for example, may have established the Antitrust Division of the Department of Justice in 1933, but the real mission of the new administration of Franklin Roosevelt was to promote cartelization through such legislation as the 1933 National Industrial Recovery Act. By 1938, the Administration reversed course. Observing, among other things, that German conglomerates were busy organizing international cartels of munitions-relevant industries, the Administration assigned the Antitrust Division a new anti-cartel mandate.[8]

It was into these turbulent waters about the relative merits of market-mediated exchange and centralization that Coase tossed "The nature of

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[6] See, for example, Medvedev (2004) on "European writers on their meetings with Stalin". Also, "like a good totalitarian", George Bernard Shaw stands out as one of the most conspicuous admirers of the Stalinist–Leninist program. "I have advised the nations to adopt Communism", exclaimed Shaw, "and have carefully explained how they can do it without cutting one another's throats. But if they prefer to do it by cutting one another's throats, I am no less a Communist. Communism will be good even for Yahoos" (Letter to Kingsley Martin, 1942, cited in Schwartzman 1990, p. 123).

[7] Concerns about excess competition had been around for some time. See, for example, Perelman (1994). Also, Seager and Gulick (1929, pp. 72–85), on the "advantages and disadvantages of trusts," illuminates some of the policy puzzles of the day.

[8] See, for example, Borkin and Welsh (1943 [1960]). Joseph Borkin went on, in 1938, to become the chief of the Division's new Patent and Cartel Section. See also Franklin Roosevelt himself on excess competition and cartelization in Roosevelt (1942).

the firm" like a message in a bottle. It was a message ultimately retrieved, a world war and half a cold war later, from tamer waters by Ken Arrow (1969) and Oliver Williamson (1971). An economics of adaptation was slow to emerge, however, because economics had been preoccupied with much bigger things. For most of two centuries, it had been occupied with the design and implementation of economic systems. Yet, in the hands of some parties, the preoccupation with economic systems was directed at implementing heaven on earth in the here and now (as in the Soviet experience). In the hands of others (such as Koopmans), the preoccupation motivated a demanding but less exalted project: to sort out the allocative efficiency of alternative systems. In the hands of all parties, however, the management of economic relationships did not inform system design. By the early twentieth century, for example, the most enthusiastic practitioners perceived the design and implementation of an efficient system as a trivially accessible matter. "The whole of society will have become a single office and a single factory," Vladimir Lenin exclaimed in 1917 (Lenin 1917 [1970], p. 121). Technocrats and their experts would impose factory discipline on the whole of that single factory (society), and they would do it by applying the principles of the emerging scientific management as expounded specifically by Frederick W. Taylor in his slender 1911 tome, *The Principles of Scientific Management*.[9] If there were an implementation problem, it would amount to no more than sweeping aside entrenched interests. In Lenin's oratory, this would involve "defeating the capitalists" or, the same thing, "overthrowing the exploiters" (Lenin 1917 [1970], p. 121).

Taylor, the former president of the American Society of Mechanical Engineers, was interested in shop-floor efficiency, and Lenin's concept of the Bolshevik program was to organize the entire economy as a single shop floor. The program would elevate the shop-floor workers to collective management of the shop floor, and they would impose shop-floor efficiency. Implicit in the Taylor program, however, was the idea that the shop was a distinct entity (a firm, say) that would interact with other entities in market-mediated exchange. Specifically, Taylor contemplated a role for managers in procuring inputs from other firms and selling shop-floor outputs to other firms. In Taylor's telling, the shop floors that populate the economy emerge as something akin to Herbert Simon's "green areas" or to D.H. Robertson's "islands of conscious power in this

[9] See Wren (1980) regarding scientific management in the Soviet Union. *The Principles of Scientific Management*, meanwhile, was published together with *Shop Management* in a more expansive tome titled *Scientific Management* (Taylor 1947).

ocean of unconscious co-operation [market-mediated exchange], like lumps of butter coagulating in a pail of buttermilk".[10] Mixing metaphors, Robertson continued:

> But even these patches [the shop floors that populate "the factory system"] are still small and scattered in comparison with the whole field of economic life. In the main the coordination of the efforts of the isolated business leaders is left to the play of impalpable forces – news and knowledge and habit and faith, and those twin elementals, the Law of Supply and Demand. (Robertson 1923, p. 86)

The Bolshevik program, meanwhile, seemed to contemplate the idea that shop-floor processes could be scaled up at no cost to encompass all exchange in the economy between erstwhile firms. There would be no need for markets. All procurement of inputs and distribution of outputs would be centrally coordinated.

In *The Economics of Control* (1946, p. 62), Abba Lerner could observe that the Bolshevik experience had yielded a "disastrous result", but enter Fred M. Taylor unto the breach. This other Fred Taylor expounded, in his presidential address to the American Economic Association in 1929, on a way of maintaining centralized control while preserving the autonomy of the "shop floors". The scheme would involve impressing an ambitious interpretation of the Second Welfare Theorem into service. (More on this below.) A central authority, rather than markets, could set prices for all commodities produced and exchanged in an economic system. Economic agents (firms and consumers) would take these prices as parameters in their internal calculus and determine inputs, outputs and consumption of commodities accordingly.

In this scheme, the fiction of the "Walrasian auctioneer" would become incarnate in the reality of a Central Planning Board, as in Lange (1937, 1938 [1964]). The Walrasian auctioneer, recall, posts prices, records excess demands, and adjusts prices in an iterative *tâtonnement* process, which is supposed to converge on a set of prices that balances supply and demand simultaneously across all markets for all commodities in the economic system. The prices that ultimately obtain are right in that no excess demand or supply in a given market persists. (The system achieves a Walrasian equilibrium.) The First Welfare Theorem implies that such prices might be doubly right in that they enable economic agents to exhaust gains from exchange across the entire economy. (The Walrasian equilibrium is Pareto optimal.) No potential gains end up being unrealized.

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[10] Robertson (1923, p. 85). Some readers may recall that Coase (1937) cited this same passage from Robertson.

Vilfredo Pareto first advanced the Pareto optimality criterion (*ophélimité*) in the first volume of his *Cours d'Economie Politique* (Pareto 1896), and he first advanced a version of the First Welfare Theorem in sections 720–35 of the second volume (Pareto 1897). He advanced these theoretical developments as a way of suggesting how free, market-mediated exchange (*la libre concurrence*) could yield socially desirable outcomes. More pointedly, he advanced these results as a benchmark against which *l'Etat collectiviste* (or any system) would have to perform (Pareto 1909, ch. 6, paras 49–55; see also Pareto 1897, s. 837).

The proposition advanced by Taylor (1929), Lange (1937, 1938 [1964]), Lerner (1946) and others was that the collectivist state could meet and then exceed outcomes achievable by market-mediated exchange. For starters, the Central Planning Board could achieve the Walrasian benchmark (no excess demand across all markets) by implementing the computational program suggested by Walras himself, an iterative (and presumably convergent) *tâtonnement* process. They could then appeal to the theory inspired by Pareto (the First Welfare Theorem) to suggest that the result of the same computational program would meet the Paretian benchmark; having satisfied the Walrasian benchmark, they would not have to do more work to meet the Paretian benchmark.

Writing on "The computer and the market" Lange (1967, p. 158) explained that in 1938 he had demonstrated "how a market mechanism could be established in a socialist economy" which would secure the Walrasian benchmark "by means of an empirical procedure of trial and error". He elaborated:

> Starting with an arbitrary set of prices, the price is raised whenever demand exceeds supply and lowered whenever the opposite is the case. Through such a process of *tâtonnements*, first described by Walras, the final equilibrium prices are gradually reached. These are the prices satisfying the system of simultaneous equations. It was assumed without question that the *tâtonnement* process in fact converges to the system of equilibrium prices.

But, it was now 1967. Computing capability would render calculation of the "right" prices a trivial affair. "Let us put the simultaneous equations on an electronic computer," Lange (1967, p. 158) declared, "and we shall obtain the solution in less than a second. The market process with its cumbersome *tâtonnements* appears old-fashioned. Indeed, it may be considered as a computing device of the pre-electronic age."

The question of computing equilibrium prices did inspire important theoretical advances in general equilibrium theory. Among other things, Herbert Scarf and others demonstrated that more general computational algorithms could compute equilibrium prices for economic environments

that were themselves more general than those contemplated by Pareto, Lange and other contributors. (See Scarf 1973 for a useful introduction.) The theoretical results were all the more powerful in that they yielded constructive proofs of the welfare theorems. They were constructive in that they established more than just the existence of equilibrium prices for a more general set of economic environments; they also yielded actual prices. A larger point, however, was that, having handily dispatched the problem of computing the right prices by whatever algorithm, the collectivist program could then exceed market-mediated exchange by appealing to dynamic considerations. Specifically, they argued that the Central Planning Board could end the plague of business cycles to which a system of free, market-mediated exchange was susceptible.

It is not obvious that any state, including the Soviet Union, had attempted to implement the program that Oskar Lange had advocated as late as 1967, but the Soviets had experimented with other schemes for centralizing control of the production and distribution of goods and services. Meanwhile, in 1978 the Ford Foundation had a hand in sponsoring a gathering in the Soviet Union of American and Soviet academics. The proceedings included a tour of a Soviet automobile factory. One of the Russian hosts explained how the Soviets managed the factory. One of the American participants, James March, inquired of his Russian counterpart something to the effect of, "Are there ever any problems?" After a pause, his Russian host declared, "No!" After another pause, all the Russians laughed.[11]

In 1985 the Soviets, under Mikhail Gobachev's leadership, began to fitfully introduce economic reforms and political reforms. These were presented as *Perestroika* (restructuring) and *Glasnost* (openness). Within six years, the Soviet Union dissolved.[12]

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[11] My original source for this anecdote is Oliver Williamson who, along with James March, participated in the 1978 meeting. I thank James March for helping me pin down details, although we agree that recollections of a meeting after a span of 40 years may not be complete.

[12] Some authors contrast the Soviet experience with the still unfolding Chinese experience. The Chinese Communist Party eventually granted its imprimatur to a fitful program of economic reforms initiated in 1978. Authors credit Chinese success to introducing reforms without introducing political liberalization openness. Demands for political liberalization did emerge and climaxed, arguably, with the Tiananmen demonstrations. The authorities sent the tanks into Tiananmen Square on June 4, 1989, but China's economic growth continued unabated. The Chinese experience is interesting, because it complicates end-of-history narratives according to which political liberalization and economic liberalization (a shift away from centralized control to market-mediated exchange) are perceived as complementary processes.

We now take up two questions: (1) how did prescriptions of the sort advocated by Oskar Lange become heated topics of debate in the first place, and (2) how is it that problems of adaptation in economic relations only fleetingly informed the debate? That is, how did we get here? We begin where Karl Marx's great impresario, Friedrich Engels, opened his essay "Socialism: utopian and scientific" (Engels 1892 [1978]). Engels started with acknowledgment of Jean-Jacques Rousseau and "the great French philosophers" of the French Enlightenment more generally (Engels 1892 [1978], p. 681). It was in Rousseau's (1775, first published 1755) *Discours sur l'origine et les fondements de l'inégalité parmi les hommes* that the great philosophers first seriously identified private property as the principal obstacle to implementing their concept of heaven on earth. We also begin with another current common to the French, English and Scottish Enlightenments, the beginning of the emergence from its chrysalis of the concept of the economy. By the late nineteenth century the concept of the economy had evolved into a quantity susceptible to manipulation by economic policy.

From Rousseau in the mid-eighteenth century we flash forward to Pareto in the 1890s. The global economy had been mired in depression in the early 1890s, and, as with the economic depression of the 1840s or early 1870s, economic hardship may have inspired anew the expectation that Marx's chiliastic prediction of the final crisis of capitalism and the inevitability of socialism was about to unfold.[13] Capitalism would fall under the weight of its own internal contradictions and give way to the socialist revolution. The question was: should eager socialists patiently wait around for the inevitable revolution, or should they play an active role in inducing the revolution?[14]

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[13] In the afterword to the German edition of *Das Kapital* (1872, p. 822, English edition 2018, p. 15), Karl Marx confidently predicted just such an impending crisis of capitalism in Germany:

> The contradictions inherent in the movement of capitalist society impress themselves upon the practical bourgeois most strikingly in the changes of the periodic cycle, through which modern industry runs, and whose crowning point is the universal crisis. That crisis is once again approaching, although as yet but in its preliminary stage; and by the universality of its theatre and the intensity of its action it will drum dialectics even into the heads of the mushroom-upstarts of the new, holy Prusso-German empire.

[14] The failure of the 1848 revolutions in continental Europe appears to have convinced at least one eager socialist, the 30-year-old Karl Marx, that socialist revolution would require some active effort. In the *Neue Rheinische Zeitung*, the daily newspaper that he edited, Marx posted a piece titled "The victory of the

Pareto (1896, 1897) seems to suggest that socialist revolution may be all well and good, but the socialist program should be made to stand up to performance benchmarks. Hence his early sketch of the First and Second Welfare Theorems. These theorems suggest how markets can perform surprisingly well (on paper at least) in stylized, frictionless economic environments. However, that was merely preamble to Pareto's larger analysis. Pareto's contributions included ideas that anticipate Coase (1937), on the relative costs of organizing exchange in markets or by means of administrative processes in firms, and Arrow (1969), on "the costs of running the economic system" more generally. He deployed a metaphor from thermodynamics to suggest that exchange processes – whether centralized, decentralized or hybrid – are not frictionless but instead dissipate value much as a steam engine dissipates energy (in the form of heat) in its own operation (see Pareto 1897, s. 837). He went on to propose a type of comparative institutional analysis: decentralized processes (principally, *la libre concurrence*) and centralized processes (the socialist program) should be made to stand up against each other, and transaction costs, characterized much as a form of thermodynamic dissipation or friction (*frottements*), should be folded into the analysis. "*La machine à vapeur n'utilise qu'une petite fraction des calories produites par le combustible*" ("The steam engine uses only a small fraction of the calories produced by the fuel"), he observed, but, one "machine" may yet outperform another: "[*S'*]*il existait une machine qui utilisât mieux la chaleur, il faudrait se hater de la substituer à nos machines à vapeur*" ("If there exists another machine that dissipates less energy as heat, then we should hasten to substitute our steam engines with it") (Pareto 1897, p. 187).

It was Enrico Barone (1908 [2009]), not Fred Taylor or Oskar Lange, who first advanced the idea that the welfare theorems identified how a central authority, "the Ministry of Production in the collectivist state", could implement a program that would satisfy Pareto's benchmarks. What really excited later proponents of such a program, however, was

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counter-revolution in Vienna". He assigned blame for the failure of the revolutions on the members of the bourgeoisie. By his telling, the bourgeoisie had a pivotal role to play in toppling the established elites, but their interests proved to be too close to those of those same elites. They betrayed the October revolution in Vienna. An angry and frustrated Karl Marx closed his piece with a flourish: "The purposeless massacres perpetrated since the June and October events, the tedious offering of sacrifices since February and March, the very cannibalism of the counterrevolution will convince the nations that there is only one way in which the murderous death agonies of the old society and the bloody birth throes of the new society can be shortened, simplified and concentrated, and that way is revolutionary terror" (Marx 1848 [1977], pp. 505–6).

not the program itself but (1) the prospect of using the program to achieve the ultimate objective of socialist programming (the imposition and maintenance of economic equality), and (2) to do it in a way that would insulate the program from critics (principally, Ludwig von Mises and Friedrich Hayek) who had advocated decentralized, market-based solutions as superior alternatives to centralized, socialist solutions. They would do all of this by appealing to the Second Welfare Theorem as a kind of crude implementation theorem. Specifically, the state would impose a one-time redistribution of wealth, and then it would let economic agents trade in markets for which the state would have calculated prices. Lange (1937, pp. 134–5) did suggest that redistributing wealth without too much dislocation could involve something in the spirit of a surprise, economy-wide smash-and-grab "expropriation" by the state so that the victims of such expropriation would not have time to mount a defense. "Socialism", Lange (1937, pp. 135) averred, "is not an economic policy for the timid."

In his Nobel Prize lecture, Eric Maskin could observe that the "Planning Controversy" of the 1930s may have been "important and fascinating", but, not surprisingly, "for certain onlookers such as Leonid Hurwicz, it was also rather frustrating" (Maskin 2008, p. 571). Leo Hurwicz went on to be one of the most important developers of implementation theory. At first sight, we can distinguish implementation theory from the early "Utopian Socialism" and the later Marxist "Scientific Socialism" as a matter of verb tense. "Socialism" had made it into the lexicon by 1820, and it was the early socialists and proto-socialists such as Rousseau who had advanced a program for how the world *should* be made to work. The Marxist program was ostensibly scientific in that it advanced a prediction about how the world *would*, as a matter of course, be made to work by virtue of the historical inevitability of the socialist chiliasm. Implementation theory, however, has been occupied with how the world *could* be made to work. Indeed, Hurwicz expressed some frustration with the Marxist approach in that its theory of the "historical inevitability" of Socialism (and, ultimately, of Communism) induced "neglect of problems of resource allocation" (Hurwicz 1977, p. 4). In contrast, implementation theory situated itself to take up questions of comparative institutional analysis of the sort contemplated by Pareto (1897).

One of the great innovations of implementation theory is that it explicitly folds incentive constraints into the analysis of resource allocation problems. The theory has also been generalized to address matters smaller than the design of economic systems. It has been scaled down to accommodate richer, boutique applications as in contract theory and mechanism design theory more generally. This is where, finally, we might expect economic theory could situate itself to begin to recognize a role

for a manager, for management, and for problems of adaptation over the course of long-term exchange, but it turns out that recognizing a role for management requires more than just folding incentive constraints into the theory. A larger theory has had to accommodate concepts such as incomplete contracting. I further submit that an adequate theory would have to complement incomplete contracting with a notion of transaction costs or friction. Ultimately, the combination of friction and incomplete contracting gives life to an economics of efficient adaptation in long-term relationships.

THE PROVENANCE OF EFFICIENT ADAPTATION: TAKE ONE

Let us revisit system engineering. Starting at least with eighteenth-century political economy, economics had become occupied with the engineering of economic systems rather than with the management of economic relationships. Indeed, management is not cognizable from an engineering perspective and, therefore, has not generally proven amenable to formal modeling. It gets worse. It is not obvious that there has been much appreciation that management was an important consideration, anyway.[15]

However, management aside, the concept of an economic system or of an economy, an entity susceptible to design and manipulation, was itself slow to emerge. (See, for example, Pribram 1937, 1951; Neill 1949; and Schabas 2007; on this count.) From Schabas (2007), I understand the emergence of the concept of a manipulable economy amounted to a shift from (1) a physics or biology perspective by which economic processes were understood as being exogenously governed by natural laws to (2) an engineering perspective according to which the economy could be controlled. Once notions of control became established, however, they became (and remain to this day) the subject of much debate.

The debates on system design and engineering did inspire theoretical developments germane to the analysis of relationships. Mechanism design and implementation theory, for example, may have been inspired by the

[15] On this count Demsetz (1995, 2011b) might rise to the defense, arguing that "[T]he task faced by neoclassical economics was to understand coordination in a decentralized economic system. Its firms and its presumption of a free price system serve this task well". (See Demsetz 2011b, p. S11. The first and second commentaries in Demsetz 1995 are also apposite.) Questions about adaptation and the management of relationships have their place, but that does not preclude inquiries that ignore such considerations.

big issues (system design), but they yielded abundant results that have since inspired the development of a distinct body of contract theory. (Maskin makes parallel points. See, especially, Maskin 2008, pp. 571–2 on "a brief history of mechanism design".) The theory went far towards operationalizing the idea that incentives matter and can inform the design of contracts (or institutional processes more generally). Relatedly, the theory accommodated the prospect that parties to exchange might privately hold information that would be relevant to the payoffs they and their counterparties might realize from that same exchange. The Revelation Principle went far toward folding problems involving privately held, payoff-relevant information (hidden information) into the design of contracts.

Folding incentives and private information into the design of contracts has greatly enriched microeconomics as a theory of the second best. (See Hoff 1994 for some pointed examples.) Everyone has a (generally negative) idea about what it means to "game the system". The mechanism design approach endeavors to factor the way parties can be expected to "game" the system into the design of the system. The results of factoring in such behaviors are formidable, because they constitute an important check on what Demsetz (1969) might recognize as the nirvana approach to design problems. (See also Williamson 1996a on remediableness.) In general, incentive constraints and informational constraints can do just what they are advertised to do: constrain the outcomes that parties to a contract can secure. Absent such constraints, parties might be able to secure what poet-economists would recognize as first-best outcomes. Incentive constraints might not always bind, but, if they do bind, expectations of achieving the first best amounts to magical thinking. Instead, parties might only be able to secure second-best outcomes.

One manifestation of the nirvana approach would be to confuse first-best outcomes with implementable outcomes. That is the magical thinking. Another manifestation would be to condemn second-best outcomes as inefficient because a hypothetical, ideal (yet infeasible) first-best outcome would appear to dominate. Again, things can be much worse, in that becoming mesmerized with the magical thinking and endeavoring to secure nirvana can yield outcomes that are (possibly far) inferior to the second best. Policymakers can find themselves instituting Rube Goldberg schemes that never secure their idealized policy outcomes. However, were that informing contract design (and design problems more generally) with incentive constraints and informational constraints all that remained, then the engineering approach to contract design might nearly have exhausted further development of contract theory. Absent further development, however, the theory is silent on how parties to exchange manage their

relationships after they have designed and implemented their contract. However, if the design of a contract factors in all relevant considerations – that is, if contracting is complete – what eventualities would require management? An easy answer is that it is not obvious that parties can program all relevant contingencies into their contract. Even if they feasibly could do so, it is not obvious that leaving out some contingencies would be uneconomical – hence the appeal to "uncontracted-for" contingencies as in Hart (1995, p. 32) or Hart (2003, p. C70). It could make sense to leave contracts endogenously incomplete. Either way, incompleteness can generate demands to design and institute processes to manage uncontracted-for contingencies when and if they arise.

Such questions begin to illuminate even deeper questions about what Oliver Williamson recognizes as *ex post* governance in the context of incomplete contracting. In Williamson's early work, he appealed to bounded rationality as a motivation for the incompleteness of contracts. Williamson further argued that incompleteness mattered to contracting parties in that it could yield opportunities for mischief (opportunism). Having stumbled into a contingency not contemplated in a contract, one party might, for example, find its bargaining position improved vis-à-vis a counterparty, and might exploit the opportunity to impose renegotiation and extract more favorable terms of exchange. (See Williamson 1971, 1973, 1975 on bounded rationality and opportunism, as well as Williamson 1976 for a case study.) Opportunism makes *ex post* governance an important economic problem in that the prospect of mischief could influence decisions to invest resources in exchange relations in the first place. To mitigate such hazards, parties to exchange might set up processes for governing their relationships as they unfold over time – hence the "*ex post*" and "governance" in *ex post* governance. Finally, the economic problem is all the more interesting in that *ex post* processes might themselves be costly to design and operate. Parties to prospective exchange can be expected to factor such costs into their *ex ante* decision to invest in the relationship. Such decisions might amount to no investment and forgoing any exchange at all.

Opportunism, I would suugest, is short-hand for the compound proposition that (1) parties to exchange might behave opportunistically as (2) uncontracted-for contingencies arise. Further, (3) such hazards could inform the design and implementation of contracts and *ex post* processes, and (4) the costs of operationalizing and operating such processes can inform *ex ante* decisions to engage in exchange in the first place. The proposition has much intuitive appeal, but I would suggest that much of its appeal is that it inspired important theoretical developments, especially regarding control rights and financial structure. The main question is

deceptively simple: if a party were to behave opportunistically, could not a counterparty simply exit the relationship, and would not the threat of exit be sufficient to discourage opportunistic behavior in the first place? (We will shortly get to Alchian and Demsetz 1972 on just this question.) If so, who needs to worry about designing (potentially costly) *ex post* processes (much less contracts) if the threat of exit alone enables parties to exchange to police their relationships? That is, if investments in a relationship could be seamlessly and costlessly redeployed (possibly in a relationship with a different party), then should not the threat of exit be sufficient?

An answer could be that the threat of exit would be sufficient but that the prospect of seamless and costless redeployment is a degenerative, hypothetical case. *Ex ante* investments in a relationship may be specific to that relationship insofar as redeployment involves dissipation of value. In the extreme, assets may have zero salvage value outside a specific relationship but much value were parties to persist in deploying those assets within that relationship even after some uncontracted-for contingency were to obtain. Knowing this, one party might hold up a party that had sunk an investment in relationship-specific assets by threatening exit from the relationship. Threatening exit amounts to imposing renegotiation of the terms of exchange. It amounts to a demand to be paid off to not exit. Knowing that there is more value to continuing the relationship than ending the relationship, the investing party can be expected to pay off the party imposing hold up.

One manifestation of opportunism amounts to exploiting opportunities to impose hold up. Even so, paying off a party to remain in a relationship is not obviously a source of economic inefficiency. Inefficiency arises if the party contemplating relationship-specific investments dials back those investments so that it may mitigate hold up. However, should not the parties be able to factor the prospect of hold up into the design of a contract and thereby preserve *ex ante* incentives to invest? The parties might, for example, commit to exchange over a long term, thereby granting the investing party some assurance that assets specific to the relationship would be deployed over a long term without the threat of hold up. A more general proposition might be that, were it both feasible and economical to craft complete contracts, then parties could neutralize the hold-up problem. The incompleteness of contracts leaves open the prospect that some contingency might yet arise in which some party to exchange perceives an opportunity to threaten exit as a way of imposing renegotiation and walking away with a payoff. (See Klein et al. 1978, especially p. 301, for a parallel formulation of this proposition.) So far, incomplete contracting matters, because hold-up hazards may yet obtain.

Grossman and Hart (1986) and Hart and Moore (1990) took the hold-up problem and framed it in a way that opened a line of inquiry into what Robert Gibbons and co-authors would come to recognize as contracting for control. (Baker et al. 2011 would be a good place to start.) Grossman, Hart and Moore made control rights an explicit focus of analysis. Parties might be able to resolve hold ups by writing clever contracts. The incompleteness of contracts matters, however, because it might restrict how clever parties can be. They might not be able to secure performance along all payoff-relevant dimensions of exchange, in which case hold ups may yet obtain if and when uncontracted-for contingencies arise. A question then arises about how assets (over which property rights are presumably well defined) are to be redeployed in just such contingencies. An important idea here is that ownership implies control in these contingencies; the owner of an asset may assign to other parties rights to determine how to deploy the asset. However, insofar as these control rights or decision rights do not span all contingencies, and when such contingencies obtain, control reverts to the owner.

In the Grossman–Hart–Moore framework, the allocation of property rights matters, because it influences the magnitude of hold ups that could yet obtain in uncontracted-for contingencies. (For the most accessible introductions, see Moore 1992 and chapter 2 of Hart 1995.) Indeed, judicious allocations of property rights could potentially mitigate hold ups, and it is just such an idea that motivated what Hart (1995) recognizes as the Property Rights Approach to the theory of firm boundaries. The theory suggests how firms may correspond to judicious agglomerations of assets and attending property rights. The main point I want to indicate is that the framework invests ownership and control with much operational significance. (We revisit this point in the next chapter.) "Given that a contract will not specify all aspects of asset usage in every contingency, who has the right to decide about missing usages?" (Hart 1995, p. 30). According to the property right approach, "it is the owner of the asset in question who has this right . . . [T]he owner of an asset has *residual control rights* over that asset, the right to decide all usages of the asset in any way not inconsistent with a prior contract, custom, or law" (Hart 1995, p. 30, original emphasis). Hart further observes that characterizing ownership this way contrasts "to the more standard definition of ownership, whereby an owner possesses the residual income from an asset rather than its residual control rights" (Hart 1995, p. 30).

The property rights approach provided a way of formalizing the hold-up problem – that is, it rendered a mathematical formulation of problems involving relationship-specific investment that could (and did) yield analytical results. The early results inspired a prodigious stream of

formal modeling, and some contributors subsequently observed that such formalization subsumed, or nearly subsumed "the intuitions of transaction cost economics, as created by Coase and Williamson" (Salanié 1997, p. 176). Effectively, these authors identified Williamson's economics of *ex post* governance with the hold-up problem. Indeed, Robert Gibbons could observe that "one still sometimes hears the claim that 'Grossman and Hart (1986) formalized Williamson (1979)'" or "Grossman–Hart *merely* formalized Williamson, and '*Finally*, someone formalized Williamson" (Gibbons 2005, p. 1, original emphases). However, note what is missing. Adaptation remains missing in action. The formal modeling has yet to fold the "*ex post*" into "*ex post* governance". That is, the formal theory identified no overlap between problems involving underinvestment in relationship-specific assets (the hold-up problem) and problems of managing relationships in the future. Hold up did not inform adaptation; adaptation did not inform hold up.

To some observers, divorcing hold up from adaptation might be puzzling. One reason is that authors such as Klein et al. (1978) and Williamson (1979) explicitly appealed to the hold-up problem in order to motivate demand for efficient adaptation. One version of the general proposition might be: assets are specific to a relationship to the degree that they are less amenable to redeployment outside that relationship without significant dissipation of value; parties contemplating ventures involving investment in highly specific assets are more likely to concentrate the management of such ventures within a single entity (the firm). The single entity is better situated to absorb and respond to demands to adapt terms of exchange.

How we get from relationship-specific investment to the vertical integration of assets and capabilities within a single firm remains an important topic of research, but to motivate this proposition, let us first recap: ventures involving relationship-specific investment would be most susceptible to hold up. Hold up could distort or even jeopardize investment. That alone would invite parties contemplating complex exchange to commit to processes that could mitigate or even neutralize hold up. Remedying hold up would preserve investment incentives. That, however, is not the end of the story. Investment (relationship-specific or not) may contemplate exchange that would have the potential (and even the expectation) of unfolding over the course of a long term. Investment may even be predicated on the expectation of long-term exchange. Yet, the fact that relationships unfold over time may leave open the prospect that contingencies arise over which contracting parties would perceive mutual gain to revisiting and realigning their terms of exchange. Where investments are seamlessly redeployable (possibly outside the relationship), adaptation becomes a degenerative non-problem. Parties simply redeploy assets, no

value is lost, and that is that. But where relationship-specific investment is involved, assets cannot be redeployed without some dissipation of value. The prospect of dissipation invites parties to exchange to contemplate processes that give them some capacity to identify, craft and implement adaptations. "How to effect these adaptations poses a serious contracting dilemma" (Williamson 1979, p. 241). Among other things, how can parties invest themselves with just such capacity?

It is about here that discussion shifts to modes of governing exchange, in that different modes differentially invest parties with capacity to identify, craft and implement adaptations. Would a long-term contract afford parties sufficient capacity to implement out adaptations, or would haggling between the various parties undermine efforts to work things out? Could a more tightly integrated relationship obviate some of the haggling and serve their purposes more efficiently? For example, could it make sense to create a separate legal entity, a (finitely lived) joint venture, and invest the joint venture with the authority and processes to implement adaptations? Or should parties effectively transform themselves into a single, indefinitely lived entity by integrating all assets and capabilities within a single firm?

The crafting of more tightly integrated relationships by contract or joint venture, or even by fully integrating parties into a single party (the firm), gets us into deep questions about what it means to be a distinct party to exchange in the first place. (Alternatively, what does it mean to be integrated?) For certain purposes, perceiving the firm as a single entity can make sense. Firms assume the role of juridical persons (individuals) all the time as when, say, they individually contract with other juridical persons. However, within the firm, actual persons or teams of individuals may constitute distinct parties in intra-firm exchange, and those same persons will contract with the firm itself. This is, for example, the business of employment contracts.

The degree to which relationships can be integrated by a given mode of governing exchange may constitute one dimension over which modes of governance can be differentiated. The degree to which a mode of governance enables parties to integrate may be understood as a governance output, but what of the inputs, the various discrete features of various modes of governance that enable them to generate such outputs? Long-term contracts, for example, can be differentiated from short-term contracts by longer terms, and we may argue that, other things equal, longer terms integrate parties together more tightly. However, these same contracts may be differentiated along other dimensions. Some contracts may have more the spirit of a joint venture in that they feature voting mechanisms or other deliberative processes for enabling parties to work things out over the course of (possibly) long-term exchange. More

generally, we could differentiate modes of governance by mapping the various dimensions of governance inputs into a taxonomy of governance structures. N dimensions might plausibly map into M modes with $M < N$. We can go the next step and endeavor to map modes of governance into governance outputs such as an index that ostensibly measures the degree to which modes of governance induce integration. This is an ambitious exercise, but a less ambitious exercise might order modes of governance from those that induce the lowest degrees of integration to those that induce the highest degrees. (See Oxley 1997a and Majewski and Williamson 2004 for applications.) Then there is the last step: mapping outputs into performance. Do increasing degrees of integration, for example, invest parties to complex exchange with more capacity to work things out over the course of long-term exchange? If so, why is all exchange not integrated within a single entity? Or are there tradeoffs between governance structures that enable tighter integration and structures that maintain arm's-length relationships?

Such questions about the properties and performance of alternative modes of governance bring us not so much to a fork in the road as to a junction of paths radiating out in several directions. I indicate a few paths, one which this book spends most of its time exploring and another which it occasionally traverses, but the book makes little contact with a third path that pertains to the employment relation. The employment relation harkens back to Herbert Simon's (1951) seminal contribution on how we might operationalize in formal economic theory what it can mean to be someone's boss by means of the exercise of authority within the firm. Simon observed that "traditional economic theory" had little to say about management and "administrative process, i.e., the process of actually managing factors of production, including labor" (Simon 1951, p. 293). Administrative process matters, presumably, because it is just such process that justifies qualifying the firm as a single entity.

Simon's contribution is an early effort to formally characterize integration. It was an effort to characterize in formal economic theory the tradeoffs between (1) enlisting a boss or (vertical) hierarchy of bosses within the firm to manage relationships and (2) allowing parties to be their own bosses and to manage their (horizontal) relationships boss to boss. When it comes to governing exchange, what can the firm do that parties to exchange cannot do absent integration? Meanwhile, economic theory gadflies Alchian and Demsetz (1972) argued that it was not obvious why any tradeoffs should obtain insofar as managing relationships within the firm is no different than managing relationships between independent economic agents. "It is common to see the firm characterized by the power to settle issues by fiat, by authority, or by disciplinary action superior to

that available in the conventional market", they exclaimed (Alchian and Demsetz 1972, p. 777). "This is delusion" (Alchian and Demsetz 1972, p. 777). They seemed to argue that the threat of exit remained the principal instrument parties could use for managing their relationships whether inside or outside the firm. "I can 'punish' you", they wrote,

> only by withholding future business or by seeking redress in the courts for any failure to honor our exchange agreement. That is exactly all that any employer can do. He can fire or sue, just as I can fire my grocer by stopping purchases from him or sue him for delivering faulty products.

Williamson (1996b, pp. 97–100) compactly discusses the issues and offers a pointed rejoinder to critiques of the sort advanced by Alchian and Demsetz (1972). This book, however, does not explicitly take up the employment relation or explicitly take up theory that endeavors to sort out what the firm can do that parties cannot achieve absent integration. I note, for example, that Grossman and Hart (1986) and Hart and Moore (1990) explicitly advanced their Property Rights Approach as a way of demonstrating tradeoffs between integration and non-integration, but this book makes contact with the property rights theory only insofar as it imposes structure on how to think about ownership and control more generally.

This book does take up a question that parallels the integration question. In place of the integration question (what can the firm do that parties to exchange cannot do absent integration?), it takes up a question that might appear to the uninitiated to be less demanding: what can parties achieve by long-term contract that they cannot achieve by a sequence of short-term contracts, or vice versa? A potential advantage of short-term contracts is that they allow parties to revisit their terms of exchange and adapt them to new circumstances after nothing more than a short term. Parties are thus less likely to find themselves committed for a long time to terms of exchange that are poorly adapted to prevailing circumstances – if and when circumstances change in a manner not explicitly contemplated by their contract. After being thrust into a state of maladaptation, they can anticipate soon having the opportunity to realign terms of exchange.[16]

Absent further development, short-term contracts would seem to dominate long-term contracts, but then why would parties ever commit to

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[16] One way of conceptualizing the idea of maladaptation is that it corresponds to being knocked off the contract curve, which is language suggesting that perturbations may have rendered prevailing terms of exchange Pareto inferior even though they had been statically Pareto optimal.

long-term contracts? If shorter terms always dominate, then why should parties to exchange commit to contracts of any duration greater than zero? Should not parties find themselves organizing otherwise complex exchange by means of simple spot contracts, bolt by bolt, nut by nut, and byte by byte? Should not the complexity of exchange extend to little more than the fact that exchange could involve a large number of atomized, instantaneous spot transactions?

An economy organized entirely on the basis of atomized, instantaneous spot transactions would correspond to exchange in classical or (depending on whose rendition you are reading) neoclassical environments in the theory of general equilibrium. Much theory had been occupied with identifying conditions (if any) under which Adam Smith's "invisible hand" of the market place would be operable. Specifically, Smith posed the intuition that an economic system that is decentralized in that it is based on free exchange between independent economic agents, with each pursuing his own private interests, could yield socially desirable outcomes. Theorists endeavored to identify the most parsimonious set of conditions they could think of under which Smith's intuition would constitute a coherent vision of economic performance. The classical environment identifies such conditions – principally the absence of nonconvexities in preferences and production, as well as the absence of indivisibilities in production.[17]

The classical conditions do not explicitly say much about the nature of transactions, but the model of decentralized exchange is most intuitively accessible insofar as it involves the frictionless, instantaneous exchange of commodities. The analytically convenient feature of stylized commodities is that they can be atomized. Exchange of atomized commodities between atomized economic agents would correspond to the most extreme version of what Ian MacNeil (1974, 1978) could recognize as transactional contracting. MacNeil characterized exchange as transactional insofar as the contracting that attended it is "sharp in by clear agreement" and "sharp out by clear performance" (MacNeil 1978, p. 902). Absent further development, the classical assumptions would seem poorly situated to accommodate what MacNeil was really interested in, that is, relational contracting. Here individual transactions may involve performance, which itself may be very elaborate, that unfolds over some non-trivial interval of time. Indeed, time might be an essential input in production, and the dimension of time alone may draw parties to exchange into a relationship. In the future, that relationship may support further exchange.

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[17] See, for example, Hurwicz (1972, p. 298), Hurwicz (1969, pp. 513–14), and Koopmans (1957, pp. 35–7) on the role of convexity assumptions.

Given the classical model of decentralized exchange is essentially static, we have to apply some imagination verging on willful suspension of disbelief in order to suggest how it could accommodate time. Neoclassical adaptations to the model include such abstractions as the fiction that economic agents trade in the present in markets for commodities that they consume in the future. We may further assume that these markets are complete in that they contemplate consumption at any place and at any time in the future. We might, for example, contemplate a market for ice cream the July after the next July on the corner of 34th and Lexington in New York.[18]

Then there is the question of transaction costs. In the view of Coase (1937) and Coase (1960, pp. 15–19), organizing transactions via market-mediated exchange is not free, but involves incurring some volume of transaction costs. (Again, see Pareto 1897, s. 837 on this count.) These costs could inspire an active role for the firm in that parties to exchange might finesse the costs of market-mediated exchange by organizing exchange within the firm – although this would also generate transaction costs. Yet, in the classical model, the firm is merely a mathematical construct, a production function that seamlessly takes prices as inputs and generates some volume of commodities. Transaction costs, however, could begin to motivate the integration question in that economic agents might organize transactions within the firm rather than execute them in markets. Coase seemed to further imply that it was not obvious that Smith's intuition would entirely hold up once the model of decentralized exchange was made to accommodate a more elaborate concept of firms. Demsetz (2011a) went on to argue, however, that the model of decentralized exchange could accommodate transaction costs (insofar as costs are costs) without upsetting Smith's intuition, but Demsetz (2011b, p. S11) also made the point that "the task faced by neoclassical economics was to understand coordination in a decentralized economic system. Its [abbreviated concept of] firms and its presumption of a free price system serve this task well".

> Transactors are characterized by their cleverness, to the point of deviousness, in circumventing rules, discovering loopholes, or otherwise exploiting strategic advantages. (Masten 1988, p. 182)

This passage from Masten (1988) is reminiscent of the passage from Kawabata's (1981) *The Master of Go*. Masten opens with a passage from Williamson (1985, pp. 41–2) on the "comparative institutional assessment

[18] See, for example, Koopmans (1957, pp. 60–62) on how the model may be adapted to accommodate time. More generally, see "Arrow-DeBreu assets".

of *discrete institutional alternatives*". *The Master of Go* itself was a literary exploration of institutional alternatives. Kawabata enlisted changes implemented after World War II in the governance of *Go* tournaments as a metaphor for changes in governance more generally. He explored rules-versus-discretion tradeoffs between traditional modes of governance (that depended more on deference to age and rank) and rules-based, democratic modes (that depended on "modern rationalism" and "regulation") (Kawabata 1981, p. 52). Lost in the transition from traditional modes to rules-based modes was "the fragrance of Go as an art" in that "One conducted the battle only to win" (Kawabata 1981, p. 52). "[T]he finesse and subtlety of the warrior's way [the chivalric code of *Bushido*, 武士道], the mysterious elegance of an art" was sacrificed (Kawabata 1981, p. 54). Alas, "[t]he Master was accustomed not to this new equality but to old-fashioned prerogatives . . . and so it would seem that . . . his juniors had imposed the strictest rules to restrain his dictatorial tendencies" (Kawabata 1981, p. 55). More generally, "the Master could not [be permitted to] stand outside the rules of equality" (Kawabata 1981, p. 54).

Masten (1988), meanwhile, explores equity (if not strictly equality) in exchange relations. He does this in order to provide a context within which to introduce transactional frictions. Up to this point, transaction costs had mostly remained little more than metaphorical (as in Pareto 1897) or broadly hypothesized (as in Coase 1937). However, Masten (1988, p. 184) could observe that the hypothesis that bargaining is costly had been implicit in much literature in law and economics. He made the hypothesis explicit in a model in which two parties may perceive opportunities to strategically impose renegotiation of their terms of exchange as uncontracted-for contingencies arise, but not any and all contingencies. Given renegotiation is costly, it can make sense to impose renegotiation only on those contingencies that involve perturbations of sufficient magnitude that the party demanding renegotiation could expect to realize a net gain. "Haggling, strikes and litigation are generally costly to both sides and benefit the party that initiated them only if they result in a more favorable transfer to that party"[19] (Masten 1988, p. 186).

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[19] The proposition in Masten (1988) is actually a little more specialized. The more specialized proposition is that "contracts serve to secure the terms of trade *ex ante* and thereby prevent costly repetitive haggling over the distribution of rents once transaction-specific investments are in place" (Masten 1988, p. 186). I would be tempted to suggest that the proposition can be generalized by excluding the premise that "transaction-specific investments" are implicated. So long as the redeployment of assets, whether specialized or generic, incurs costs much as any "transactional frictions," then some degree of generic lock-in attends all assets,

The principal value of the appeal to uncontracted-for contingencies is that it helps motivate a role for efficient adaptation in that perturbations may induce maladaptation. Absent revision of the terms of exchange, parties may fail to realize full value in the future. It would be no surprise, then, that one or both parties to bilateral exchange would then demand renegotiation. In contrast, equity identifies perturbations that may not implicate efficiency in the future. Instead, one party or the other may realize an unexpected windfall, or one party or the other may find itself bearing an unexpected expense, but in neither case would an unexpected windfall nor an expected expense necessarily induce maladaptation. Instead, one party may find itself aggrieved in that it had not been situated to share the windfall or had found itself bearing the cost. The aggrieved party may impose renegotiation not to restore efficiency but merely to impose a more equitable distribution of unexpected windfalls and costs.

This chapter opened with the faint suggestion that contracting parties may appear more adult than some adults in that they take care to anticipate and manage conflict in long-term relationships. Concerns for equity, however, have more the flavor of unnecessary drama in relationships. Among other things, fighting over equitable distributions of unexpected windfalls and costs can destroy value insofar as renegotiation merely generates costs. Equity is interesting, however, as concerns about it do inform exchange relations (see Goldberg 1985). It was Goldberg from whom Masten (1988) picked up the language of one party being aggrieved. This is all the more interesting in that Hart (2008) picked up on the phenomenon of aggrievement and used it to motivate his concept of reference points. Hart (2008) introduces reference points for much the same reason Masten (1988) recruited equity: "We need to bring back haggling costs!" (Hart 2008, p. 406).

Hart and Moore (2008) elaborated. The literature that Grossman and Hart (1986) and Hart and Moore (1990) inspired (literature which they recognized as *the* "literature on incomplete contracts") "generated some useful insights about firm boundaries, [but] it has some shortcomings" (Hart and Moore (2008, p. 2):

> First, the emphasis on noncontractible ex ante investments seems overplayed: although such investments are surely important, it is hard to believe that they are the sole drivers of organizational form. Second, and related, the approach is ill suited to studying the internal organization of firms, a topic of great interest

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and all of them then have the appearance of being quasi-specialized. Later literature on long-term contracting with respect to non-specific assets such as Masten 2009 would be apposite.

> and importance. The reason is that the Coasian renegotiation perspective suggests that the relevant parties will sit down together ex post and bargain to an efficient outcome using side payments: given this, it is hard to see why authority, hierarchy, delegation, or indeed anything apart from asset ownership matters. (Hart and Moore (2008, p. 2)

Hart and Moore (2008, p. 4) sketch an environment in which a "trade-off between rigidity and flexibility" in contractual relations becomes cognizable and amenable to analysis. In their environment, "[a] flexible contract has the advantage that parties can adjust the outcome to the state of the world, but the disadvantage that any outcome selected will typically cause at least one party to feel aggrieved and shortchanged". The aggrieved party may then behave opportunistically. Thus, can parties to exchange commit to terms of contract that effect an economizing balancing between inflexibility and opportunism?

Note that, (1) demands for adaptation in long-term relationships illuminate tradeoffs between flexibility and rigidity, and (2) empirical research on such tradeoffs had already taken off by the middle of the 1980s. Masten and Crocker (1985), for example, observed that commitments secured under the terms of a long-term contract may preserve incentives to sink relationship-specific investments – that is, long-term commitments mitigate hold up[20] – but a long-term commitment is rigid in that it renders the relationship susceptible to maladaptation in the future. It would be incumbent on contracting parties to engineer mechanisms that would enable them to reduce the costs of adapting terms of exchange (when and if demands for adaptation were to arise). Implementing such mechanisms would enable them to preserve an otherwise rigid, long-term contract.

The problem of engineering flexibility in long-term contracts motivated other contemporaneous research. This included Libecap and Wiggins (1984), Hubbard and Weiner (1991), Goldberg and Erickson (1987), Crocker and Masten (1988, 1991), and Crocker and Reynolds (1993). Succeeding research took up friction or sources of friction (complexity) more broadly, but the problem of enabling flexibility remained. (See, for example, Lyons 1995, Tadelis 2002, and Zhu 2003.) Regarding all of this, however, I again suggest that a paradigmatic question would be: what can parties achieve by long-term contract that they cannot achieve by a sequence of short-term contracts, or vice versa? Why do not short-term contracts strictly dominate long-term contracts in that short-term contracts afford adaptation, as a matter of course, after a short term?

[20] Empirical research by Joskow (1985, 1987) firmly established this idea in the literature.

Why, for that matter, does contract duration matter at all? Should not all exchange collapse into the degenerative case of extreme transactional contracting (as in MacNeil 1974, 1978) or into the same thing, spot market exchange? Should not markets decentralize all exchange? What is missing?

THE PROVENANCE OF EFFICIENT ADAPTATION: TAKE TWO

A traditional place to have started this book would have been Ronald Coase's "The nature of the firm" (1937). Instead, we introduced Coase (1937) by way of Simon (1991) and situated Coase (1937) in a larger context about system design. That helped us to appreciate points of contact and points of deviation between theories of system design and outstanding questions about governance in long-term relationships. We now make contact with Coase (1937) one more time and introduce it in a more traditional way. A more traditional approach would have been to suggest that Coase's paper introduces the make-or-buy decision – or, much the same thing, identifies the boundaries of the firm as a subject worthy of examination. Should a firm secure a given input internally (make), or should it secure that same input via market-mediated exchange with other firms (buy)? A given beer-brewing company, for example, might not bottle its own beer but might contract with another firm (a bottling company) to do just that. That same brewing company might not even brew its own beer. The firm may consist of little more than some intellectual property: uncodifiable know-how about brewing built-up in heads of a few beer enthusiasts-turned-entrepreneurs as well as a codified beer formulation. Our entrepreneurs could source ingredients from a number of firms, contract out beer production with a contract brewer, and organize distribution and sales through yet other entities. The nexus of contracts that encompasses the entire endeavor may end up spanning a number of distinct entities or firms. Why not coordinate all of those activities within a single firm?

Coase's principal issue was that there could be tradeoffs between coordinating activity within a firm and coordinating much of that same activity by means of market-mediated exchange between firms. Coase framed activity as transactions and posed the tradeoffs as a matter of comparing the costs of coordinating transactions within the firm with the costs of coordinating those same transactions outside the firm. We might then expect the boundaries of the firm to conform with the assignment of transactions – transactions assigned to the firm and transactions assigned to external exchange – that minimizes the sum of transaction costs realized by the firm.

All well and good, but a great difficulty is that it was not obvious (and remains not obvious) what coordination within the firm would entail.[21] Moreover, what is a transaction and what are transaction costs? Before revisiting such questions, let us situate questions about the boundaries of the firm and coordination in the debates about the relative merits of economy-wide decentralization and centralization. Coase motivated the question about firm boundaries by juxtaposing firms and markets. Orthodox economic theory elaborated how market-mediated exchange could secure an efficient allocation of resources, but made no accommodation for the idea that much allocation of resources might be coordinated within firms. As Demsetz (2011b, p; S8) suggested, "Coase's view of neoclassical theory's theory of the firm, expressed quite early in his career, is simple enough – it has no theory of the firm".

Theory or no theory, 1937 would have been a better year than most in which to pose questions about coordination within the firm, for there had been a resurgence of interest in central planning – that is, in the idea of organizing an entire economy almost as one large firm. In the United States, 1937 marked the beginning of the second, steep dip of the Great Depression. Economic depression, if not the double-dip feature, was a global phenomenon, and global depression had prompted a resurgence of interest in questions about the optimal role of government (if any) in tempering the business cycle. Hansen et al. (1936, p. 53) could, for example, observe that a "voluminous literature on business-cycle theory [had] appeared during the last two years". Interest resurged in questions about how to measure business cycles and, ultimately, in questions about how government might design and implement stabilization policies to moderate business cycles.

The socialist prescription for controlling business cycles was to dispense with partial measures (stabilization policy) and to impose a direct, fundamental solution, that is, eliminate business cycles by fiat. Capitalism had been identified with market-mediated exchange between independent entities (firms and consumers), and yet it had been understood for most of a century that capitalism was endogenously subject to periodic downturns.[22] The prescription was to concentrate control of an entire economy within a Central Planning Board. Lange (1937, p. 126), and others,

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[21] Demsetz (1997) advances a few ideas about this. Simon (1951) introduced the "employment relation" as a way of characterizing coordination. Again, see Alchian and Demsetz (1972), especially the quip about what it would mean to "fire my grocer".

[22] In the afterword to the second German edition of *Capital*, Volume I (1873, for which see Marx 2018), Karl Marx identifies the financial crisis of 1825 in

appeared to argue that business cycles amounted to individually rational but collectively irrational outcomes. One private party's over-optimistic expectation of demand, for example, could encourage over-production. Over-production would inflate that same party's demands for others' inputs, which, in turn, would encourage other parties to over-produce. Firms operating in markets injected with over-demands would perceive price signals encouraging them to over-produce. Markets could induce a contagion, transmitting signals to markets spanning the economy. The economy would enter the boom of the boom-and-bust business cycle. Eventually, the reality of a demand insufficient to sustain inflated levels of production would become manifest, in which case markets would transmit a reverse contagion. Markets would transmit signals to cut production. Firms would cut back, some would close, and the economy would enter the bust phase of the boom-and-bust business cycle.

Two advantages presumably obtained to centralization (coordination of economic activity by means of administrative processes concentrated in the Central Planning Board) over decentralization (coordination of economic activity by means of market-mediated exchange between autonomous economic agents). The Central Planning Board would have the competence to identify collectively rational outcomes as well as the capacity to implement collectively rational outcomes. It would, for example, enjoy degrees of freedom to act not afforded to any single private party. "A private entrepreneur has to close his plant when he incurs grave losses", Lange (1937, p. 126) observed. However, the Central Planning Board, unencumbered with the parochial perspective, the parochial interest, or the parochial constraints of a given entrepreneur, could identify efficient adjustments in productive capacity (plant closures or expansions) and identify efficient levels of production in the future.[23]

We might understand extreme centralization as concentrating all make-or-buy decisions spanning the economy in the hands of the central planner,

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Britain (the "Panic of 1825") as the first manifestation of the downside of an endogenous business cycle.

[23] Enrico Barone maintained some skepticism about the capacity of the central authorities to efficiently manage the expansion or withdrawal of production capacity.

> Some collectivist writers, bewailing the continual destruction of firms (those with higher costs) by free competition, think that the creation of enterprises to be destroyed later can be avoided, and hope that with *organized* production it is possible to avoid the dissipation and destruction of wealth which such *experiments* involve, and which they believe to be the peculiar property of "anarchist" production. (Barone 1908 [2009], p. 288, original emphases)

but note what Coase (1937) did not do. He may have stood up firms next to what Demsetz (2011a, p. 2) recognized as "extreme decentralization", but he did not explicitly situate the firm between the two poles of extreme decentralization and extreme centralization. That is where the economics literature lost track of Coase (1937) – between the poles. It got lost in debates about the proper place of decentralization (market processes) or centralization (administrative processes) in ordering economic activity across entire economies.

Coase himself did not explicitly take up questions about economy-wide performance, but his ideas could have inspired deep questions. Would it be efficient to populate the economy with pockets of administrative ordering – that is, with firms? Could assigning transactions in a discriminating way to firms and to markets minimize what Arrow (1969) might have recognized as the costs of running the economic system? Should firms be permitted to organically emerge, or should a central authority direct that process? Specifically, should a central authority dictate the assignment of make-or-buy decisions to firms and markets?

The socialist prescription would appear to have been that the economy should be organized as one big firm – end of debate. The proponents of centralization could not admit room for debate, because they did not recognize any tradeoffs between centralization and decentralization. Whatever decentralization could achieve, centralization could do better. However, for parties who were willing to attribute costs to centralized, administrative processes – whether transaction costs of the sort contemplated in Coase (1937) or other costs – it would not have been obvious that centralization would dominate decentralization.

On this count, Ludwig von Mises demonstrated himself to be one of the more articulate and entertaining commentators. Writing, for example, on "socialism under dynamic conditions" (von Mises 1951 [2009], pp. 196–210) and on (he argued) the consequent "impracticability of socialism" (von Mises 1951 [2009], pp. 211–20), von Mises observed that the proponents of centralization recognized no role for management – that is, for the capacity to deal with considerations less amenable to programming. (In particular see von Mises 1951 [2009], pp. 196–7, 213–16.) These considerations would include "such questions as dissolving, extending, transforming and limiting existing undertakings and establishing new undertakings" (von Mises 1951 [2009], p. 215) in the face of demands for adaptation. The proponents instead seemed to perceive that economic activity would not require active adaptation in the future and was therefore amenable to strict programming. Indeed, Lenin himself, von Mises (1951 [2009], p. 214) observed, suggested that "Capitalism has simplified to the utmost and has reduced to extremely simple operations of superintendence and book-

entry within the grasp of anyone able to read and write". Yet, the principal role of administrative process, by which centralization would dominate decentralization, extended beyond such clerical functions. It was to bring the expertise of properly trained bureaucrats to craft the programs by which the economic system would operate. Such a view derived from "the bureaucratic mind: that is to say it comes from people for whom all human activity represents [nothing more than] the fulfilment of formal, official and professional duties" (von Mises 1951 [2009], p. 215).

Explicit questions about how problems of adaptation relate to economic organization would have to await Williamson (1971) on "The vertical integration of production: market failure considerations" – vertical integration being a more technical term for make-or-buy. Moreover, by 1969, no one had managed to advance the Coasean program of 1937. That program would include developing an analysis that would yield testable hypotheses about the endogeneity of firm boundaries or (the same thing) the assignment of make-or-buy decisions. Arrow (1969, p. 60) could only elaborate marginally on the Coasean proposition in more modern terms: "An incentive for vertical integration is replacement of the costs of buying and selling on the market by the costs of intra-firm transfers; the existence of vertical integration may suggest that the costs of operating competitive markets are not zero, as is usually assumed in our theoretical analysis,"[24] and yet, "The identification of transaction costs in different contexts and under different systems of resource allocation should be a major item on the research agenda of the theory of public goods and indeed of the theory of resource allocation in general".

The socialist controversy involving von Mises, Lange and a host of others in the 1920s and 1930s constituted only one episode of debates relating to systems of resource allocation. Indeed, in the introduction to *Studies in Resource Allocation Processes*, Leo Hurwicz suggested that "The idea of searching for a better system is at least as ancient as Plato's *Republic*" (Hurwicz 1977, p. 3). For our purposes, however, it can make sense to put the wisdom of the ancients aside and to take up the tale of system design starting with the musings of Jean-Jacques Rousseau in his *Discours sur l'Origine et les Fondements de l'Inégalité parmi les Hommes* (Rousseau 1755) and *Discours sur l'Economie Politique* (Rousseau 1765), for Rousseau provided ideas relating to property rights, free exchange

[24] The elaboration involves the bit about "intra-firm transfers" in contrast to inter-firm transfers. The elaboration presages Arrow (1977) on decentralization within firms. If decentralization is not relegated to exchange between firms but can inform coordination within firms, then does make-or-buy lose operational significance? See also Baker et al. (2001), "Bringing the market inside the firm?".

and social choice to which the early socialists and then Marx and his impresario Engels appealed.[25]

"The bourgeois is Rousseau's great invention", declared Allan Bloom (1990, p. 214). "He is the individualist in society, who needs society and its protective laws but only as means to his private ends." The bourgeois (townsman) contrasts with man in his natural state (natural man or savage man). Rousseau may have understood natural man as something of a myth in the actual development of human societies, but the institutions that support social interactions did not always exist. They may have organically and spontaneously developed, but societies had to invent them. These institutions, the laws to which Bloom refers, include property rights. Property rights may have facilitated certain exchange, but Rousseau opens part two of the *Discours sur l'Origine et les Fondements de l'Inégalité parmi les Hommes*, with a soliloquy about how the institutions of exchange (most notably property rights) merely gave people something to fight over. "The first person," Rousseau (1755, p. 95) declared,

> who, having enclosed a plot of land, took it into his head to say, "This is mine," and found people simple enough to believe him, was the true founder of civil society. What crimes, wars, murders, what miseries and horrors would the human race have been spared, had someone pulled up the stakes or filled in the ditch and cried out to his fellowmen, "Do no listen to this imposter. You are lost if you forget that the fruits of the earth belong to all and the earth to no one!"? (English trans., Cress 2011, p. 69)

Rousseau argued that, in his natural state man does not require social interactions to happily support himself. Thus, unencumbered with the demands of society and its oppressive institutions, he "is at peace with all nature and the friend of all his fellowmen" (Cress 2011, p. 101).[26]

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[25] Hurwicz (1977, p. 4) also volunteered that he perceived these early socialists, the "Utopians and Utopian socialists in particular . . . as the first system designers in the social sphere".

[26] The very entertaining film *The Gods Must Be Crazy* (1980) explicitly dramatizes a Rousseauian perspective on private property, natural man and the bourgeois (or civilized man). (Much the same perspective is also presented, albeit rather more darkly, in the film *Walkabout*, 1971.) The first 15 minutes of *The Gods* presents the Bushmen of the Kalahari Desert as proto-typical specimens of natural man. They live off of the land, taking only what they need, and as their numbers are few and their needs modest, the land can serve their needs inexhaustibly. However, "One day, something fell from the sky." (A bush pilot had dropped an empty, glass Coke bottle from his plane.) "[The Bushman] Xi had never seen anything like this in his life. It looked like water, but it was harder than anything else in the world. He wondered why the gods had sent this thing down to the

The bourgeois, the civil man, the man of the *civitas*, the man of the city, is all about exchange. He is wheeling and dealing in the market square or in the coffee house – think Lloyd's Coffee House in London in 1698 – all for personal gain. The bourgeois perceives private advantage, and only private advantage, to social interaction. Moreover, social interaction provides opportunity for private gain. Without society, he would yield less private gain. We can imagine, however, that a society comprised of people who were merely pursuing private gain would ultimately yield less advantage to society as a whole. Society could perform better if individuals dedicated themselves not to pursuing private gain but to pursuing collective gain. Indeed, there is much intuitive appeal to the idea that greater gain across society as a whole could be secured were everyone in society prepared to work toward securing the common good or what Rousseau himself might have recognized as the common interest.

Insofar as one person's concept of the common good is another person's concept of arbitrary government, then it might not be obvious what common good means at all. If members of society cannot agree on what is good for society, then what is commonly understood to be commonly good? However, Rousseau's concept of the common interest or general will resolves such ambiguity by positing that each person maintains a (possibly) latent yet common understanding of what constitutes the common good. Moreover, each person commonly maintains a preference (also latent) to secure the common good. Whether or not he or she knows it, even the egoistic bourgeois maintains such a preference. On this count, none other than Ken Arrow himself advanced some ideas in *Social Choice and Individual Values* (1951 [2012]). Among other things he observed that, "There may, indeed, be wide divergences between the individual will, corrupted by the environment, and the true general will, which can never err . . . But the existence of the general will as a basis for the very existence of society is insisted on" (Arrow 1951 [2012], pp. 81–2).

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earth." But Xi's clan of Bushmen soon discovered that "It was the most useful thing the gods had ever given them, a real labor-saving device. But the gods had been careless. They had sent only one." Alas, the Bushmen discovered something new to their experience: scarcity. "A thing they had never needed before became a necessity. And unfamiliar emotions began to stir, a feeling of wanting to own, of not wanting to share." A desire to assign private ownership began to corrupt them. "Other new things came: anger, jealousy, hate and violence. Xi was angry with the gods. He shouted, 'Take back your thing! We don't want it!'" Xi then resolved to "take it to the end of the earth and throw it off." He and his clansmen anticipated that his trek to the edge of the world could take many days.

Having insisted that the general will exists, Rousseau then moves on to the matter of ascertaining the general will (for it may not be obvious what the general will is) and then operationalizing the general will. Ascertaining the general will seems to contemplate administrative processes that involve well-intentioned government and leadership of central authorities who appreciate that "the general will is always on the side most favorable to the public interest, . . . so that it is necessary simply to be just to be assured of following the general will" (Cress 2011, p. 131). Free exchange, and the institutions that support free exchange, do not appear to have any role in securing the common interest, for, after all, free exchange merely enables and encourages the egoistic, parochial pursuits of the bourgeois. Arrow himself averred that decentralized processes (the market mechanism) could not be expected to have much, if any, role in securing the common interest. Specifically, he suggested that, "Any view which depends on consensus as the basis for social action certainly implies that the market mechanism cannot be taken as the social welfare function since the mechanism cannot take account of the altruistic motives which must be present to secure the consensus" (Arrow 1951 [2012], p. 86).

Arrow's conclusions suggest that a decentralized system of market-mediated exchange may not be able to implement the Rousseauian program in the kind of environment that Rousseau had contemplated. However, that is a special environment in that, in it, all parties share the same preferences. As Rousseau explains, "Men always love what is good or what they find to be so; but it is in this judgement that they make mistakes" (Cress 2011, p. 241). Individuals may be differentially informed, but they can talk things out, agree to censor incorrect (and potentially corrupting) opinion, and thereby dispel the prospect of agreeing to disagree. From the Rousseauian perspective of Woodrow Wilson's book *The State* (Wilson 1889, p. 659), the object of governance then becomes reduced to bringing "the individual with his special interests, personal to himself, in complete harmony with society with its general interests, common to all".

In the remaining nine pages of his book, Wilson (1889, p. 659) suggests that a program could be "formulated . . . without too great vagueness" that would secure the objective of "complete harmony with society". He was vague in that he did not suggest anything about what the program would be, except to advocate that central government would have much to do with it. In contrast, Rousseau and then the early Socialists, then the Marxists, and then the Bolsheviks were more explicit about where the program would begin. It would begin by excising the corrupting influence of that greatest of egoising institutions, private property. Pareto (1896, pp. 408–9) observed:

> *Les socialistes étaient fort portés à défendre la théorie, que la propriété du sol avait partout commencé par être collective. Ils en tiraient la conséquence que la propriété individuelle avait été une usurpation sur la propriété collective, et qu'il serait convenable que la communauté reprît les biens qu'elle s'était laissé enlever*. (The socialists were very apt to defend the theory that the earth everywhere had originally been collectively owned. They concluded that the innovation of private property had constituted a usurpation of collective property and that, accordingly, it would be proper for the community to reassert collective ownership.)

Von Mises quipped that the program could be formulated as, "Once upon a time there were good times when private property did not exist; good times will come again when private property will not exist" (von Mises 1951 [2009], p. 53). Not to be outdone, the young Marx and Engels exclaimed in *The Communist Manifesto* (1848 [1969]) that, "[M]odern bourgeois private property is the final and most complete expression of the system of producing and appropriating products, that is based on class antagonisms, on the exploitation of the many by the few. In this sense, the theory of the Communists may be summed up in the single sentence: Abolition of private property" (Tucker 1978, p. 484).

THE PATH TAKEN THUS FAR

The Rousseauian program and its successors were occupied with ascribing the emergence of economic inequality to free exchange and to the institutions supporting free exchange – principally private property. Pareto (1896, 1897) developed a defense of *la libre concurrence* (free exchange) by establishing performance benchmarks against which any system of resource allocation (centralized, decentralized or hybrid) could be compared. Successive authors elaborated on Pareto's contributions to reconfigure how a central authority could (on paper) organize an economy. In their telling, centralized processes could mimic decentralized processes (free, market-mediated exchange) but could yet outperform an economy organized around free, market-mediated exchange.

The debates in the first half of the twentieth century about the relative merits of centralization and decentralization inspired great innovations on system design. Implementation theory and subsequent developments in mechanism design theory and contract theory folded incentive constraints and informational constraints into microeconomic theory and elevated it into an elegant and formidable theory of the second best. That body of theory, however, corresponds to Vernon Smith's institution-free core of economics. The question remained about whether the core

encompassed all of the important action or if the analysis of problems of *ex post* governance in economic relations would require parallel theoretical developments.

Coase (1937) and Simon (1951, 1991) suggested where parallel development might start when they made the seemingly obvious observation that much exchange in the market economy is not organized by market-mediated exchange but is organized within institutions (firms and government bodies) that are invested with administrative processes. In "The nature of the firm", Coase (1937) offered the outline of an explanation for the coexistence of markets and firms. He suggested that there could be tradeoffs between organizing activity by means of administrative processes or by means of market-mediated exchange. He seemed to advocate an incipient economics of organization by which alternative modes of organizing activity are compared. Coase contemplated a binary choice: decentralized market exchange or a kind of centralization (integration within the firm). Williamson (1971) took up the binary choice but introduced adaptation as an important problem. By this time the binary choice was framed with such language as "vertical integration" or "make-or-buy" decision or "boundaries of the firm". There was a long wait for such contributions as Williamson (1985), or Williamson (1991) on "The analysis of discrete structural alternatives", for a generalization of the research program to other modes (joint ventures, long-term contracts, and so on). Even so, a host of authors (Goldberg, Masten, Crocker, Libecap, Joskow, and others) did not need to wait and had already launched a vigorous body of research on alternative modes of organizing activity. Their work set up efficient adaptation in long-term relationships as an important paradigm. Much of their work took up the question of how to set up commitments to collaborate while maintaining flexibility sufficient to enable efficient adaptations in the future without undermining those same commitments. Asset-specificity (relationship-specific or transaction-specific investment) was often important, but sometimes friction alone was the driver of action. Douglas Gale and Dean Lueck make a parallel point in their very accessible tome *The Nature of the Farm* (2003): we can characterize a lot of important action without having to recruit asset-specificity.

THE PATH IN THE FUTURE

The next chapter on "The single-entity question in antitrust" takes up a legalistic exploration of the nature of the firm and firm boundaries. By the time a young Ronald Coase was composing "The nature of the firm" (1937), litigation had already started wending its way through American

courts that took up questions that really anticipated Grossman, Hart and Moore on control rights and Simon and Williamson on adaptation, vertical integration and hierarchy in organizations. Imagine two firms, erstwhile competitors, begin to collaborate. They might even formalize their collaboration by forming a legal entity to govern their collaboration, and they may call the entity a joint venture. The two parties might even dispense with partial measures and opt for full-on merger. Either way, a merger or joint venture would neutralize competition between the two firms. Were the antitrust authorities to come calling, however, the parties might claim that they effectively constitute a single, integrated enterprise. As a single entity, they would claim, there can be no question of there being a conspiracy to fix prices or otherwise neutralize competition, for it takes more than one distinct entity to form a conspiracy. An integrated entity cannot conspire with itself.

In a world that did not support some type of merger review process, the parties gambit would seem to insulate their collaboration from any effective antitrust scrutiny. Knowing this, the idea that divisions of a single firm could conspire with each other may have had some appeal. Indeed, without investing itself with some type of intra-corporate conspiracy doctrine, how else could the law rationalize some scope for antitrust scrutiny? The law did end up innovating just such a concept, but it then spent much of the next four decades trying to unravel it and replace it with something more sophisticated. That effort yielded what looks a lot like an informal and formative theory of the firm.

The third chapter takes up the problem of managing very special types of relationships: conspiracies that involve collaboration and repeated interaction between conspirators over a time interval of indefinite duration. It is one thing to manage a relationship over the course of long-term exchange. It is another to manage that relationship while having to keep the fact of the relationship hidden from other parties. In the former case, parties to collaboration might be able to design a contract and set up processes for governing their relationship. The problem of having to maintain the secrecy of a conspiracy, however, may complicate the design of a governance structure. Conspirators might not, for example, be able to appeal to legal processes. They might not be able to use formal contracts and court-ordered processes to help them govern what could well be an illegal arrangement. Instead, conspirators may find themselves having to set up processes that are doubly secret in that the processes themselves would have to be hidden from the view of outsiders.

Conspiracy has something of the flavor of non-contractability as in Baker et al. (2002) on relational contracts. Parties to exchange (conspiratorial or not) might not be able to formally enforce dimensions of

performance or information reporting that would be relevant to their payoffs. They might find themselves having to rely on informal processes. They might, for example, find themselves having to enlist the prospect of exchange in the future (and the threat of withdrawing such exchange) to secure commitments to perform in the present.

Conspiracies that involve conduct that unfolds over time have some advantage and disadvantage over conspiracies that involve one-shot interactions. A one-and-done interaction might involve a plot to assassinate the king. In such a case, conspirators may have less scope for enlisting the prospect of exchange in the future to induce performance in the present, but once the deed is done, there is no question of having to manage performance of a stream of such deeds in the future. (Getting conspirators to remain quiet may be another matter.) In contrast, conspiracy that does involve a stream of performance over time may involve a stream of costly efforts to monitor and police performance over time. Yet the prospect of enlisting the future to police the present becomes an option. However, enlisting the future to police the present is what parties to long-run exchange may find themselves having to do when they have no other options for governing their relationship. It is the kind of desperate action parties take, for example, when they start off as antagonists rather than as natural parties to collaboration. An antitrust conspiracy, for example, to fix prices over time would involve parties who might naturally be disposed to compete with each other rather than to collaborate. Similarly, warring factions may find themselves enlisting a norm of tit-for-tat retaliation as a way of mitigating violence over time. (Israeli–Palestinian relations come to mind.) Specifically, the expectation of measured retaliation may encourage parties to throttle back or even forgo violent provocations in the first place. Observers may yet bemoan instances of retaliation, but absent some norm of retaliation, the violence might well be worse. Observers might further bemoan the fact that a stream of tit-for-tat retaliation appears interminable. ("Will it ever end?") They may have in mind some type of definitive denouement as in, say, the Manichaean script of a Hollywood film by which antagonists arrive at a chiliastic resolution – for example, a "war to end all wars" – whereas the hard reality might be that conduct that appears to persist indefinitely should be expected to persist indefinitely. Relationships may be messy in that there may never be a clean, definitive resolution.

This third chapter takes up the Apple ebooks antitrust litigation of 2013. In that matter, the district court understood that Apple had played a pivotal role in organizing a conspiracy among major, rival book publishers to raise the prices of ebooks. The chapter makes a point that the court failed to make: in any antitrust context, evidence that parties

had set up some type of secret scheme to police performance could go far toward establishing an agreement to conspire (to fix prices, to fix output, to allocate customers or to otherwise neutralize competition). The chapter also makes contact with reputation effects in that Amazon, a party that had lobbied the government to look into the ebooks matter, had cultivated a reputation for exercising its wrath on trading partners, such as book publishers, who fail to commit to terms of contract that it favors.

The fourth chapter directly takes up the question of what parties to exchange can achieve by long-term contract that they could not achieve by a sequence of short-term contracts.

The research illuminates the role of financial structure (debt or equity financing) and contract renegotiation in enabling efficient adaptation over the course of long-term exchange. The chapter then lays out evidence from a dataset of electricity marketing contracts about how electricity generators and electricity marketers use four instruments – contract duration, risk-sharing schemes, financial structure, and veto provisions – to channel investment incentives and to address both programmable and unprogrammable demands for contract adjustments. Among other things, veto provisions invest contracting parties with some capacity to impose renegotiation. The capacity to impose renegotiation invests the relationship with some flexibility. A measure of flexibility makes it easier for contracting parties to commit to longer terms of contract, and that, in turn, can facilitate efforts to line up financing for big projects.

The fifth chapter takes up a debt-versus-equity question again, but this time it takes it up in an environment in which reputation effects might have been expected to inform much of the action. The context involves overseas trade emanating from Venice during 1190–1220 and trade emanating from Crete (which Venice then ruled) in the fourteenth century. The historiography of the Late Middle Ages assigns a lot of weight to the significance of the equity-like financing of trade ventures obtained under the terms of *commenda* contracts. A merchant might send a trading agent off to Egypt to acquire pepper. The parties might resell the pepper stocks at a trade fair in Venice, and they might then agree to share the proceeds from the entire venture according to the terms of a *commenda*. Parties to *commenda* generally shared profits by linear sharing rules: half-and-half, two-thirds/one-third, three-quarters/one-quarter. Knowing this, why would not the trading agent misrepresent the costs of acquiring the pepper in Egypt and thereby enable himself to abscond with the unreported share of the profit?

The reality is that it was debt, not *commenda*, that financed commerce on the informational frontiers of the trade economy. A merchant might give his trading agent five gold coins and instruct him to return in six months with six gold coins. Such a loan would relieve the merchant of having to

know details of transactions conducted out of view at sites overseas. Debt would thus require little in the way of institutional supports. In contrast, an equity-like scheme such as a *commenda* contract might require some type of (costly) monitoring or auditing mechanism to support it.

The reality is also that trade between Venice and Egypt during 1190–1220 was not on the informational frontiers of the trade economy. It was in an information-rich core. Specifically, the Venetian Republic sponsored convoys of trading agents to selected sites. These trading agents would end up trading in common commodities at commonly visited ports. Information about prices of commodities would become commonly dispersed. The reality was also that most interactions between merchants and their trading agents were one-shot affairs. They did not occupy themselves with enlisting the prospect of future collaboration to police performance in the present. Moreover, it is not obvious that most trading agents or even merchants would participate in more than one trade venture. They would make their money and get out. Thus, it is not obvious that reputation effects could have much bearing on how merchants and their trading agents mobilized investment for trade.

The study illuminates a result that is something of the converse of Williamson (1988) on "Corporate finance and corporate governance". Williamson argues that equity-like financing can require costly supports such as costly monitoring or auditing mechanisms. Debt, in contrast, requires little in the way of costly supports. The main thing the lender needs to know is whether or not the borrower has paid up a particular fixed sum. Why, then, would parties ever use equity? One reason is that equity does not grant to some outside party (the bank) a foreclosure right. It does not allow a third party to march in and demand liquidation. Parties will use equity where much relationship-specific value is at stake. It allows them to work things out in the face of uncontracted-for contingencies without having to worry about a third party forcing them into foreclosure.

In Williamson (1988), equity shows up as the mode of financing of last resort. In the context of long-distance trade in the Late Middle Ages, debt shows up as the mode of financing of last resort. Where contracting parties could exploit features of the institutional landscape to support equity-like schemes, *commenda* could prevail. However, in environments that offer no such supports, parties would find themselves having to resort to debt financing or to forgo investment entirely.

The final chapter takes up a matter that I suggest can only be understood if we are willing to accept how messy and imprecise the governance of relationships can be. How do parties to collaborative research and development (R&D) police the disclosure to third parties of intellectual properties that they may have contributed to the collaboration or that

they may have innovated within the context of the collaboration? A party to a former collaboration may engage a third party in a new collaboration. Should a counterparty to the former collaboration be able to hold up the new collaboration by marching in and asserting claims of the misappropriation of intellectual property?

We can imagine the tradeoffs. On the one hand, parties may want to contain the spillover of intellectual properties to third parties. Restrictions on the disclosure of intellectual properties may go some way toward containing unintended spillovers. On the other hand, disclosure restrictions may enable former partners to hold up new collaboration, especially regarding intellectual properties that are unavoidably subject to some non-trivial degree of spillover anyway. Contracts governing collaborative R&D may include – and, it seems, generally do include – restrictions on the disclosure of intellectual properties. What is interesting is that the duration of these disclosure restrictions varies widely. Parties tend to assign restrictions of long (and possibly indefinite) duration to intellectual properties that are less susceptible to unintended spillover. They assign restrictions of shorter (and possibly zero) duration to intellectual properties that are highly susceptible to unintended spillover.

A policy result comes out of the research. The Advanced Technology Program (ATP) hosted by the National Institute of Science and Technology endeavored to subsidize collaborative R&D which would yield intellectual properties that would be highly susceptible to spillover. High spillover would yield high social benefits, but, as a matter of course, high spillover would also frustrate the private appropriability of costly R&D. It was just such R&D that private parties could not be expected to pursue absent subsidies.

Analysis of the duration of disclosure restrictions from a dataset of contracts suggests that the ATP ended up subsidizing projects which tended to yield intellectual properties that were less susceptible to spillover and thus more amenable to appropriation – just the sort of intellectual properties that private parties could have been expected to develop without subsidies. The results suggest that the ATP was not able to do a good job of identifying R&D collaborations most worthy of subsidization. It subsidized the wrong R&D ventures.