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The Two Sides of Competition and Their Implications for Strategy

Michael D Ryall
Joshua S Gans
Glenn MacDonald

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J. GANS, G. MACDONALD, AND M. D. RYALL

Abstract. We analyze value appropriation under competition using cooperative game theory and demonstrate that competition embodies two competing rivalries: to appropriate value on the one hand and to create it on the other. The management of this tension is central to strategy. We present a new notion of competitive intensity, show where the traditional view of competition leads one astray and introduce a new quantitative method by which practitioners may assess their strategic options.

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1. Introduction

In three decades of strategy research, few in the literature dispute the premise that competition is central to firm performance. Indeed, a major share of strategy's foundational work contemplates the dynamic interaction between competition and performance – on the sustainability of advantage. In order to analyze whether an advantage is sustainable, of course, one must typically understand what caused it to arise in the first place. Hence, much has also been written on the contemporaneous effects of competition on performance. The standard analysis frames competition as *rivalry to appropriate value*; that is, as a vigorous, zero-sum combat among market actors, each one striving to maximize its own take of the available economic profit. Under this conception, the effect of competition on performance is unambiguously negative.

Thus, it is not surprising that much of the discourse in strategy is organized around barriers to competition. Take for example, the three dominant streams of research devoted to explaining the determinants of firm performance heterogeneity. These include: (i) firm positioning (Caves and Porter, 1977; Porter, 1979); (ii) transaction cost economics (Williamson, 1971); and, (iii) the resource-based view (Wernerfelt, 1984; Barney, 1991).[1] The firm positioning literature examines mobility barriers between industry groups. The transaction cost line considers barriers arising from transactions costs and bounds on managerial rationality. The resource-based view studies barriers to the mobility of resources between rivals.[2] Today, the competitive-threat/barrier/performance logic is a central leitmotif in many popular MBA textbooks on strategy.[3]

Our thesis is that, while competition certainly involves rivalry of the type described above, it simultaneously involves another: *rivalry to create value*. This latter contest is about attracting the partners one needs for value-producing transactions over the alternatives presented to them by others. Taken together, these two sides of competition create an interesting tension – the intensity and balance of which have major, often surprising, implications for strategy.

To contrast our view against the traditional logic, consider the canonical work on firm positioning by Porter (1979, 1980), in which this logic is so sharply illustrated. Porter maintains that the definition of competition as the fight for market share among direct industry competitors is too

[1]Given the magnitude of the literatures associated with each of the primary streams, we limit our citations to their early, foundational papers. See the discussion in, e.g., Priem (2007).

[2]We are careful to note that there are, of course, variations on these themes (e.g., Porter, 1996; Eisenhardt and Martin, 2000; Priem, 2007) different themes (e.g., Kogut and Zander, 1996; Moran and Ghoshal, 1996; Rivkin, 2000), and some attempts at cross-thematic integration (e.g., Farjoun, 2002; Hunt and Lambe, 2000).

[3]See, for example,Collis and Montgomery (1997); Saloner et al. (2000); Grant (2002); Besanko et al. (2003); Gans (2005).

narrow. Instead, he argues (Porter, 1980, p. 6), "Customers, suppliers substitutes, and potential entrants are all 'competitors' to firms in the industry and may be more or less prominent depending on the particular circumstances. Competition in this broader sense might be termed *extended rivalry*" [emph. in original].

This perception of competition has a long, venerable tradition dating back to the original neo-classical economists (a theme upon which we elaborate below). It bolsters the notion that, "Competition in an industry *continually works to drive down* the rate of return on invested capital," Porter (1980, p. 5, emph. added), an idea echoed in not just the firm positioning stream, but throughout the strategy literature. For example: "In competitive environments when one firm gains some advantage over others, that advantage becomes a target for all other firms to emulate or to overcome. The *advantage begins to erode with competition*," Grant (2002, p. 235, emph. added); and, "Once established, competitive *advantage is subject to erosion by competition*," Moran and Ghoshal (1996, p. 44, emph. added).

We, thus, arrive at the conclusion that a firm enjoys a stable flow of appropriated value only in the presence of "barriers" to this essentially corrosive force. The interplay between competition and its barriers implies a spectrum of competitive intensity. According to Saloner et al. (2000, p. 150-1), "At the lower end of the spectrum, where competition is least intense, is the *monopoly* structure: industries that have a single firm ... *Perfect competition* is at the other extreme of competitive intensity ... A perfectly competitive industry has many small firms. Furthermore, each firm sells the same product that all other firms in the industry sell; there is no product differentiation" [emph. added].

This spectrum is considered important because, following from the initial premise about the nature of competition, it naturally correlates with firm profitability. As explained by Grant (2002, p. 70), "A single firm protected by barriers to the entry of new firms forms a monopoly in which it can appropriate in profit *the full amount of the value it creates*. By contrast, many firms supplying an identical product with no restrictions on entry or exit constitutes perfect competition: the rate of profit falls to a level that *just covers firms' costs of capital*" [emph. added].

Hence, the traditional logic leads us to conclude that the core strategic problem facing a firm is how to create a "defensible" position against competition's relentless push toward the eradication of economic profit. Porter (1980, p. 34) says that successful solutions to this problem are myriad but, at the broadest level, can be categorized into three internally consistent generic strategies: 1)

cost leadership, 2) differentiation, and 3) focus. To the best of our knowledge, this assertion was uncontroversial in its time and remains so to this day.

In this paper, we take a distinct path based upon a balanced notion of competition. Our analysis rests on the observation that before the economic value from a transaction can be appropriated, the requisite parties must first consent to partner in its creation. If an actor has viable alternatives to a given business proposal, then obtaining such consent is not a forgone conclusion. Potential collaborators must be jointly persuaded to produce economic value together rather than in some alternative configuration. The actual process by which such persuasion occurs can vary widely. At one end of the spectrum, the parties to a deal may engage in extensive discussions designed to identify everyone's alternatives and assess their implications. At the other, alternatives may already be known or implied by market conditions (e.g., average input prices) and thus require no more discussion than an offered payment for services. Regardless of how it actually happens, we refer to this enticement of collaborators as "rivalry to create value."

The receipt of economic value is a primary reason market actors agree to participate in the activities required to create it. Therefore, persuasion to collaborate takes the form of *giving up* sufficiently large shares of the value to be produced via collaboration. There is a fundamental tension here. Since the value associated with any transaction is fixed, every dollar given up to participant A is not only a dollar unobtainable for oneself, but also a dollar unavailable for use to entice participants B, C and D to join in as well. This adding-up, or feasibility, constraint is what gives competition its darker, zero-sum side, the one spotlighted in the traditional literature. It is what induces rivalry to appropriate.

What makes competition interesting is this essential tension. When the parties to a deal have no viable alternatives, then there is no such tension. In this case, any split of the available value is consistent with competition. At the other extreme is when this tension reaches a virtual breaking point. In this case, the actors' mutually exclusive productive alternatives are so rich that there is one, and only one, value distribution among the parties that succeeds in holding the transaction together. Thus, the full effect of competition is to determine, for each market participant, a *range* of appropriation outcomes consistent with the resolution of both types of rivalry. The greater the essential tension, the narrower the range of possible outcomes. This suggests a different way to think about competitive intensity, with the spectrum running from situations in which competition has no effect on who gets what, to those in which it fully determines each actor's share.

Seen in this way, competition loses its inherently malevolent appearance. Consistent with the standard view, competition can limit the maximum value obtainable through the market. At the same time, however, it can also work to guarantee a minimum. Whether competition has a good, bad, or little effect depends upon the constellation of value-producing alternatives available throughout the market. This shift in perspective leads to the conclusion that the core strategic problem of the firm is how to manage these competing rivalries. Because this essential tension can manifest itself in an abundance of ways, the use of the "generic strategy" concept as an analytic organizing device is highly questionable. Rather, as we demonstrate below, there is another, more refined approach to strategic analysis that properly accounts for both sides of competition.

This paper is one in a growing line in strategy that use cooperative game theory (hereafter, CGT) to analyze value appropriation under competition. Because the approach is formal, all of our assumptions, definitions and results are stated unambiguously. We show the precise sense in which competition is conceived as an inherently neutral force, acting simultaneously to raise and to limit the amount of value an economic actor can appropriate. New to this paper is the reformulation of competitive intensity as a spectrum ranging from *pure bargaining* to *pure competition*. In particular, the formal definition of pure competition introduced here generalizes early, neoclassical notions of "perfect" competition as well as more recent ones found in the economics literature. We analyze various generic strategies that the strategy literature advances to guide practitioners in the creation of competitive advantage and demonstrate where the standard intuition supporting these strategies goes awry. Finally, in place of generic strategies, we introduce a novel, quantitative approach to identifying promising strategic options that arises quite naturally from the CGT formalism.

The remainder of the paper is organized as follows. In the next four introductory subsections, we review the relevant literature, explain why CGT is well-aligned with the study of foundational issues in strategy, carefully enumerate the key assumptions underlying the methodology, and present a complete version of the model. Since many readers will be unfamiliar with this admittedly abstract approach, we take the liberty of discussing these areas as carefully and throughly as possible. Those who are familiar with CGT may safely skim these sections (i.e., with an eye toward understanding how we wish to interpret the mathematics in the context of competitive strategy). In Section 2, we discuss the origins of traditional view of competitive intensity and then move on to develop a new characterization consistent with CGT. Section 3 follows in the spirit of Brandenburger and Stuart (1996), by using simple, numerical examples to illuminate some key implications of competition

and to clearly demonstrate where traditional thinking sometimes fails. In Section 4, we apply the theory to develop a new quantitative procedure by which to assess a firms's strategic options. The last section presents our concluding thoughts.

1.1. **Review of CGT in strategy.** CGT has a distinguished history dating back to the famous book by von Neumann and Morgenstern (1944) (the idea that the exchange alternatives available to groups of agents influence the appropriation of individuals was first suggested by Edgeworth, 1881).[4] The introduction of CGT to strategy occurs with a practitioner-oriented text by Brandenburger and Nalebuff (1996) and a contemporaneous scholarly article by Brandenburger and Stuart (1996). Both works focus primarily upon the notion of *individual added value* (defined below). Brandenburger and Nalebuff (1996) challenge the conventional wisdom by rejecting the view of direct competitors purely as profit-destroying substitutes. Instead, they demonstrate that, in some situations, direct competitors are actually complementors (i.e., enhance a firm's profitability). A canonical example is the case of similar ethnic restaurants competing in the close geographical proximity of a specific city district.

Brandenburger and Stuart (1996) make numerous contributions, including: 1) describing market interaction as the "active search for value creation and appropriation opportunities;" 2) showing that, under certain circumstances, a firm that enjoys a "favorable asymmetry" with respect to its added-value must also enjoy superior profit; 3) advocating a symmetric treatment of buyers and suppliers; and, 4) explaining why CGT is ideal for analyzing the "free-form" nature of market interactions. At the same time, this ground-breaking paper leaves several issues open to future study. For example, because it restricts attention to situations in which all the action is in individual value added, the exact meaning of "favorable asymmetry" in the general case is left to future work. Similarly, the situations analyzed do not fully illuminate the inherent tension between rivalry to create vs. appropriate value. Thus, the precise impact of this tension on appropriation remains unexplored. Finally, following Porter (1980), the paper prescribes four "generic" value-based strategies. Again, because the analysis is limited to those situations in which value added is the sole determinant of appropriation, practitioners cannot be confident of the efficacy of such strategies in more general settings.

[4]Industrial organization economics relies heavily on noncooperative market games; i.e., Cournot quantity and Bertrand price competition games.

The general, formal work in strategy using CGT begins with MacDonald and Ryall (2004), who introduce the notion of an actor's "minimum total value" and use it to derive a necessary and sufficient condition for a firm to be guaranteed strictly positive appropriation by force of competition alone.[5] Adner and Zemsky (2006) study the interaction between consumer versus resource heterogeneities to derive, among other things, the conditions required to support strategic diversity in a market. MacDonald and Ryall (2006) characterize how the entry of an arbitrary agent into a market affects the lower bound on a firm's competitive range of appropriation. Ryall and Sorenson (2007) explore the formation of and value appropriation in productive social networks and characterize the conditions under which competition guarantees network brokers a share of value. Brandenburger and Stuart (2007) introduce the notion of a "biform" model in which an initial, non-cooperative stage, in which agents make strategic moves designed to alter their competitive landscape, is followed by a CGT stage, in which the consequences of these moves are determined.[6] Chatain and Zemsky (2007) study strategic issues in supply chain management. de Fontenay and Gans (2008) examine how outsourcing changes value appropriation and asset value. Adegbesan (2008) extends factor market theory to show that firms can profit when they exhibit superior complementarity to target resources, even in the absence of asymmetric expectations.

1.2. **Why CGT?.** A CGT model takes as input the value-creating options available to a set of economic actors through their joint productive activities. In the context of strategy, these options are determined by the actors' resources, preferences, technologies, skill, knowledge, etc. The output of the model is a precise description of the way competition shapes an actor's ability to capture value from the actual transactions in which it engages.

One of CGT's useful features is its generality. For example, industrial organization economics relies heavily on market games (i.e., Cournot quantity and Bertrand price competition games) to derive theoretical results. Stuart Jr (2005) demonstrates that Cournot (and, by implication, Bertrand) can be set up as *special cases* of the biform model. This is significant as it implies that any results demonstrated using a general biform game also apply to situations satisfying the assumptions of these market games. Conversely, results proven using Cournot or Bertrand do not necessarily hold in the more general competitive settings that can be modelled with CGT.

[5]It should be mentioned thatcLippman and Rumelt (2003) provide some additional informal speculation on possible connections between CGT and strategy.

[6]The first version of this paper appeared in 1996, positioned for an economics audience. However, as it gained increasing recognition as an enormously useful analytic framework for strategy, it was eventually revised with that audience in mind.

Unlike the more familiar market games of economics, CGT focuses on agents and appropriation rather than on products and prices. Thus, CGT delivers on the original speculation by Wernerfelt (1984, p. 171), "For the firm, resources and products are two sides of the same coin." [7] CGT tells us who appropriates how much independent of the specific mechanism by which that value is transferred. The transfer mechanism may well be price, but is not restricted to it (e.g., exchanges of goods-in-kind between business, non-monetary benefits for employees, etc., are also covered). When terms of trade are important, they can be incorporated explicitly (e.g., Byford, 2007).

This shift in focus has important implications. In the standard noncooperative market models, firms are simply handed "bargaining power" in the form of price-setting authority. Appropriation in a CGT model is due to two explicit sources: a minimal amount guaranteed by competition and an additional quantity due to extra-competitive factors (such as individual bargaining skill). This makes clear that what a firm – indeed, any agent – gets is critically dependant upon its relative exchange alternatives. Firms are not automatically endowed with the power to dictate the terms of trade. A capacity-constrained monopolist facing a large group of small, homogeneous buyers may very well enjoy a high level of appropriation guaranteed by competition: its alternative ways to employ fixed capacity are rich relative to those of its customers. However, that same monopolist facing a single buyer (e.g., a defense contractor transacting with the government) must rely entirely upon its bargaining ability: here, the monopolist has no alternatives by which to leverage its appropriation.

In addition to these benefits, the mathematics involved – convex analysis – is simple and elegant. Moreover, convex analysis is the body of math from which linear programming arises. Hence, it is often a short leap from theoretical propositions to practical applications, the development of which is, for now, largely unplowed ground. We provide an example later in the paper.

There are, of course, downsides to these techniques. Perhaps the greatest is that the approach is technical and, presently, unfamiliar. This is a serious barrier to adoption and dissemination. In addition, generality comes at the price of abstraction. Thus, how one should interpret the math is rarely a trivial consideration. The fact that CGT comes burdened with a tradition of non-descriptive jargon (e.g., "core," "nucleolus," "cooperative," "kernel" and so on) does not help matters. Another issue is the existence of an analytical solution. In most strategy applications,

[7]Makowski and Ostroy (1995) make the duality between the product-price and agent-appropriation views explicit by using CGT to prove the Second Welfare Theorem of economics from the agent-appropriation view. As Lippman and Rumelt (2003) conclude, application of CGT is especially well-suited to those interested in the RBV.

the "core" is the appropriate solution concept (more on this below). Useful though this is, some coalitional games have no core and, as a result, cannot be analyzed in this way.[8]

Finally, some (e.g., Lippman and Rumelt, 2003) complain that working with intervals is problematic; i.e., in the sense that competition typically narrows appropriation to a nontrivial *range* rather than a unique point. However, we take the contrary position that – in the context of strategy – this feature of CGT is actually one of its strengths. Identification of an agent's range of competitive outcomes is what allows us to decompose appropriation into a competitive part and a extra-competitive part. For example, a firm facing weak competition (and, hence, a wide competitive range) might best be advised to invest in resources geared toward persuading others to part with value (e.g., a high-quality sales force) rather than in those designed to add value (e.g., a capacity expansion).[9]

1.3. **Key Assumptions.** One of the essential features of using mathematics to derive theoretical propositions is that it requires the full explication of all critical assumptions. Our results require the following three assumption.

Assumption 1. All agents measure the value of their transactions in the same way (typically, money).

In the context of firms and markets, this assumption is a mild one. However, it does have two important consequences. First, it allows us to make "apples to apples" comparisons between agents in terms of what they appropriate. Absent this, the assertion that one firm consistently outperforms another would be impossible to interpret. Second, it implies that if one unit of value is transferred from one participant to another, the total value they share is unchanged; i.e., a buyer must give up exactly \$1 to transfer \$1 to the firm. Of course, different participants are free to value the same things differently – indeed, that they do so is what creates gains from trade. This assumption merely requires that these values can be expressed in the same units.

Assumption 2. Given a feasible set of transactions, agents transact voluntarily.

[8]The conditions for core existence are well understood (Bondareva, 1962; Shapley, 1965) and, moreover, are not an issue in a wide range of market settings (Stuart, 1997).

[9]The multiplicity complaint is, in any event, rendered moot with the introduction of the "appropriation factor" (Brandenburger and Stuart, 2007) which permits us to assign specific values to agents' competitive appropriation ranges.

That is, in order for a feasible transaction to occur, all parties to it must freely decide to participate in it. By "feasible" we mean the set of transactions that are technologically, institutionally and rationally available. For example, a transaction prohibited by law (e.g., collusion) is not feasible. Similarly, transactions that are beyond the actual abilities of agents to deliver or of which, say, boundedly rational agents are unaware, are not feasible. The point is that, in order to be induced to engage in a particular set of feasible transactions, each trading partner must view their involvement as providing the best personal benefit over some other set of transactions in which they can freely engage.

Assumption 3. Participants involved in an economic exchange agree on the total value expected to be created by that activity.

This last assumption is the strongest of the three. It does not say that expectations need be correct; e.g., there is nothing preventing the anticipated value of an exchange being assessed on the basis of bad subjective expectations. What this assumption does is allow us to speak of *the* value of a group's economic opportunities without ambiguity.

In settings consistent with assumptions 1-3, agents face few exogenous restrictions with respect to how they are allowed to produce value and arrange its distribution. As a result, competition is a front-and-center issue. Agents agree upon the feasible set of transactions, they measure value the same way, and they are free to participate in the activities that leave them best off. Thus, if we conclude that a firm's minimum level of appropriation is strictly greater than its liquidation value, the result is not due to an accident, or because rivals are prohibited from competing, or as a result of disagreements over the values of outside options. Rather, it is that competition – and competition alone – has generated this outcome.

1.4. **The Formal Setup.** CGT requires the specification of two essential components. The first is a list of all the agents in the situation of interest. The second is an assessment of their joint opportunities to create economic value. Formally, these are respectively defined as: (i) a set $N \equiv \{1, 2, ..., n\}$ of *agents*; and, (ii) for every nonempty subset $G \subseteq N$ an *economic value*, $v_G \geq 0$, that members of G would generate should the transactions involve only the agents in G. We refer to a subset G as a *group* of agents;

The set of agents can be as small as two and as large as everyone in the world economy (the only restriction is that n be finite). Typically, N includes all the agents in an industry (including buyers,

suppliers, employees, firms, etc.). However, the scope need not be so large. One may, for example, wish to analyze a specific issue involving a small number of participants; e.g., the profitability of a new technology development alliance (in which case, the analysis might be limited to the set of potential partners). In large retail markets, customers can often be "abstracted out of the analysis" by estimating demand in the standard way and then analyzing how the revenue appropriated from consumers gets distributed up the industry value chains.

The element of CGT most subject to misinterpretation is the value associated with a group, v_G. Therefore, some discussion about this is warranted. v_G is the amount of economic value the actors in G would be expected to generate were they only to transact among themselves conditional upon the institutional, knowledge and technological constraints of their environment. In some settings, the production of v_G might imply central coordination or cooperation across all group members; e.g., if cartels are legal, agreeing to capacity limits. However, *such an interpretation is not required.* Transactions beyond the knowledge of the actors or that violate the law are not feasible. In most settings of interest to strategy, v_G is the value that could be created were the members of G independently free to engage in any of the feasible transactions available within that group. Finally, the meaning of "value" can vary depending upon what is appropriate for the analysis at hand: v_G is a scalar that can represent a deterministic cash value, a net present value, or an expected value.

Thus, for each agent i in N, $v_{\{i\}}$ is the value that agent i would receive were i to decline participation in transactions involving any other agents in N. For example, if N contains all the agents in firm i's global markets, then $v_{\{i\}}$ might be its liquidation value. If N represents a new market that firm i is thinking about entering, then $v_{\{i\}}$ is the value it would expect to capture were it to deploy the resources required to enter that market to their next-best use. At the other end of the spectrum, v_N is the value generated when all agents are free to engage in any combination of feasible transactions. Of all the values, v_N is the one produced with the fewest restrictions on who can deal with whom. We interpret it as the actual value that the agents in N anticipate producing and use a special symbol, $V \equiv v_N$, to highlight this fact.

For example, suppose Bob owns a TV that he is indifferent between keeping and selling at a price of \$500. Kate has seen Bob's TV, which she considers much nicer than her current model. She figures that owning Bob's TV herself is worth \$1000. Alternatively, she can continue watching her set, an option she values at \$200. In this case, $N = \{Bob, Kate\}$. Bob and Kate's outside alternatives are simply to keep their current TVs. Therefore, $v_{\{Bob\}} = 500$ and $v_{\{Kate\}} = 200$. If

Bob and Kate agree to exchange, they have to negotiate how to split the $1000 worth of value such an exchange creates. Thus, $V = 1000$.

In this example, V is the actual, monetary value of the contemplated transaction. Hence, "appropriation" here refers to the utility, denominated in dollars, directly enjoyed by each participant to the transaction. Gross monetary value can always be converted to economic value via a normalization that accounts for the agent's outside alternatives. For example, in the preceding example, there is $300 in economic value available from the transaction (i.e., the gross value less reservation values, $1000 - 500 - 200 = 300$). Thus, an alternative specification is $v_{\{Bob\}} = v_{\{Kate\}} = 0$ and $V = 300$. Under this specification, "appropriation" is in terms of net economic profit.

Alternatively, suppose Flexo Products, Inc. has one unit of its proprietary Flexomatic available to sell. Bob and Kate both value a Flexomatic at $1 above-and-beyond their next-best alternative to buying it. Flexo Products, Inc. has no alternative use for its product. In this case, the outside alternatives are all zero-value. Left to themselves, Flexo Products and Bob can create $1 in value by transferring ownership of the Flexomatic to Bob. The same is true for Kate. Taken as a whole, the group can still only create $1 in value (i.e., Flexo Products, Inc. will sell its Flexomatic either to Bob or to Kate). Bob and Kate cannot create value together. Thus: $V = 1$; $v_{\{FPI,Bob\}} = v_{\{FPI,Kate\}} = 1$; $v_{\{Bob\}} = v_{\{Kate\}} = v_{\{FPI\}} = v_{\{Bob,Kate\}} = 0$.

Note that this setup does not imply the absence of "transaction costs." For example, it could be that, other things equal, Bob and Kate each value a Flexomatic at $5 but that the process of transacting is so resource consuming – for the usual reasons – that all but $1 of value is used up by transacting. What we wish to know is how the $1 in net economic value is, ultimately, split up between FPI, Bob and Kate.

Similarly, the approach does not rule out information asymmetries in the production of value. For example, the preceding parameters could summarize a situation in which the contemplated transactions are which of Bob or Kate to hire as CEO of FPI. Consistent with the concerns of agency theory, prior to hiring everyone knows that managers are privy to better information than the shareholders, that they will use this information to their own advantage and that the board will implement some incentive scheme designed to keep such behavior in check. Then, the $1 is the economic value everyone expects the manager will create given the appropriate incentive scheme, anticipated self-interested behavior and so on.

This setup allows a precise definition of an agent's *added value*. First, when agent i is a member of group G, we adopt the notational convention of writing G_{-i} to indicate the group G with agent i removed. Then, formally, agent i's value added is $av_i \equiv V - v_{N_{-i}}$. Value added is the difference between the actual value created and the value that could be created should transactions with i be removed from the mix.

In strategy applications, what we wish to know is, given a set of agents and their exchange alternatives, how much value gets created and how it is distributed. To describe what agents appropriate, define a *distribution of value* as a list $\pi \equiv (\pi_1, ..., \pi_n)$ in which π_i indicates agent i's specific level of appropriation. Thus, from the perspective of an outsider, the "observables" are V, the value produced, and π, each agent's share of that value appropriated. The alternative values, the v_Gs, while known to the particpants, are not necessarily seen from the outside. The following definition connects the available value (V) and the agents' various productive alternatives (the v_G's) to how much each agent appropriates (π).

Definition 1. A distribution of value π is said to be *competitive* if the following two conditions are met:

(1) *Feasibility*: $\sum_{i \in N} \pi_i \leq V$,
(2) *Consistency*: For all $G \subseteq N, \sum_{i \in G} \pi_i \geq v_G$.

The idea behind Definition 1 is that, when agents are free to select among their feasible productive opportunities, the available value must be distributed in such a way that no subset of actors can appropriate more by engaging in some alternative transactions. Specifically, Condition 1 (Feasibility) says that the total amount of value appropriated by all the actors cannot exceed the amount actually available (V).[10] Condition 2 (Consistency) says that, for every group G, the aggregate share of V appropriated by its members must be at least as much as they could generate were they to restrict themselves to transactions within the group (i.e., v_G). When the consistency condition is not met, the actors in G can abandon their roles in the creation of V, produce v_G instead, and distribute it in a way that makes everyone in the group better off.

For any specification of actors and exchange opportunities, there may be many distributions that satisfy conditions (1) and (2). Traditionally, the set of all such distributions is referred to

[10]The notation $\sum_{i \in N} \pi_i$ is shorthand for the sum of the appropriation of every actor i in N; i.e., $\pi_1 + \pi_2 + \cdots + \pi_N$.

as the *core*.[11] It can be shown that, from the perspective of agent i, (1) and (2) imply a range of competition-consistent appropriation levels: anything between a competitive minimum, denoted $\pi_i^{\min}$, and a competitive maximum, denoted $\pi_i^{\max}$. Thus, each point in the interval $[\pi_i^{\min}, \pi_i^{\max}]$ is associated with at least one distribution of value that meets the conditions of Definition 1.

Recalling our introductory discussion, conditions (1) and (2) generate the two rivalries that, together, define the full effect of competition. The feasibility constraint implies rivalry to appropriate value in the sense that each unit of V appropriated by actor i is a unit that cannot be appropriated by anyone else. This is "zero-sum" side of competition that appeals to our intuition and garners so much attention. What Definition 1 makes explicit is that there is another side to competition, the one associated with the consistency constraints of Condition (2). These imply rivalry to create value in the sense that, in order to persuade any subset of actors to participate in the production of V, they must be offered an aggregate amount of value at least as great as they could produce on their own.

Notice that an immediate implication of a distribution of value π being competitive is that, for every agent i, $v_{\{i\}} \leq \pi_i^{\min} \leq \pi_i^{\max} \leq av_i$. That is, no agent can be forced to participate for an amount less than what they could get if they freely chose not to participate (hence, $v_{\{i\}} \leq \pi_i$). Similarly, all the other agents cannot be forced to transact with i under terms that leave them with less than they could get if they freely chose not to (hence, $\pi_i \leq av_i$).

Continuing with the Flexomatic example, suppose the actual transaction is: FPI sells a unit to Bob at a price of 90¢. The price allocates value: of the $1 in value generated by this transaction, FPI earns a cash flow of 90¢ and Bob enjoys consumer surplus of 10¢. We write $\pi = (\pi_{FPI}, \pi_{Bob}, \pi_{Kate}) = (.9, .1, 0)$. Unfortunately for Bob, this distribution is not competitive. Clearly, condition (1) is satisfied (exactly $1 is distributed). However, $\pi_{FPI} + \pi_{Kate} = .9$. This is a problem given that $v_{\{FPI,Kate\}} = 1$. Therefore, condition (2) fails: π is not consistent with the alternative transactions available to these three agents. Rather than accept the trade with Bob at 90¢, FPI could offer to sell to Kate at any price strictly greater than 90¢ and less than $1 – such a deal is strictly preferred by both parties to the alternative transaction (FPI and Kate). Thus, $\pi = (.9, .1, 0)$ is not a competitive distribution of value. This example is quite special in the sense that competition

[11]We assume V is large enough that the set of competitive distributions is not empty. Stuart (1997) demonstrates that competitive distributions exist for a broad range of market situations. However, there are exceptions (see, e.g., Telser, 1978).

fully determines what each agent appropriates: $\pi_{FPI} = 1$, $\pi_{Bob} = \pi_{Kate} = 0$. In this case, Bob and Kate are exactly indifferent between participating in this market or their next-best alternative.

2. Value appropriation under competition

We begin to build intuition about competition by first presenting the case in which it has zero effect on the distribution of value, *pure bargaining* (formally described in Definition 2). We then turn to the opposite case, *pure competition*, in which the force of each actor's alternatives fully determines how value is distributed (Definition 3). While both definitions are, as far as we can ascertain, new to this paper, Definition 3 is of special interest because it generalizes concepts of perfect competition used both in economics and strategy. We imagine that the lion's share of real world markets lie somewhere between these two extremes. Later, we present a method (due to Brandenburger and Stuart, 2007) by which to assess individual appropriation when an actor's range of competitive outcomes is an interval (i.e., when $\pi_i^{\min} \neq \pi_i^{\max}$).

2.1. **Pure Bargaining.**

Let us consider a two agent example (like Bob & Kate) but this time involving a hypothetical transaction between General Dynamic Electric Boat Corporation (EB) and the U.S. Navy (USN). The transaction under contemplation is the delivery of 10 Virginia Class submarines from EB to USN over a 10 year period. Assume that the resources EB would use to produce the subs meet conditions for sustained competitive advantage asserted by Peteraf (1993); i.e., they are unique, inimitable, known to be inimitable, and immobile. Based upon its fit with existing weapons systems, perceived threats to national security, etc., the present value of benefits per boat to USN is \$1.8 billion. Make an extreme assumption that EB's resources have no alternative use (including being sold, due to incomplete markets) and, hence, zero economic cost. If EB declines the transaction, then it does not incur production costs of \$1.2 billion per boat.

Thus, the economic value created by this transaction is, in billions, \$1.8 – \$1.2 = \$0.6. Stated in terms of the model, $V = .6$, $v_{\{USN\}} = v_{\{EB\}} = 0$. It should be easy to see that any split of the \$600 million constitutes a competitive distribution of value. If the USN pays a price of \$1.2 billion, thereby capturing \$600 million in value, EB is just indifferent to a resource redeployment. Given the scope of the analysis, USN is the only available transaction partner. Other than exiting the market for advanced fast attack submarines, EB has no alternatives. Of course, the same is true for USN. At a price of \$1.8 billion, the government is just-indifferent to consummating the deal. Any

split of the $600 million (i.e., any price between $1.2 and $1.8 billion) constitutes a competitive distribution of value.[12] This leads to the following definition.

Definition 2. A market interaction described by a coalitional game is *pure bargaining* if, for every participant i in N, $\pi_i^{\min} = v_{\{i\}}$ and $\pi_i^{\max} = V$.

In other words, the agents' productive alternatives do not shape their competitive ranges in any way: any level of economic profit between $v_{\{i\}}$ and V is consistent with every agent's feasible alternatives. Clearly, the preceding example meets this definition. EB and USN must resort to whatever means they can think of to persuade each other to part with some portion of the $600 million in economic value (e.g., arguments about "fairness," highlighting employment implications in key congressional districts, and so on). If EB does appropriate value, *it will not be due to USN's need to persuade it not to engage in alternative transactions freely available with other actors* – i.e., competition.

Recall, EB's resources were assumed to meet all the conditions traditionally thought to endow a firm with a sustained competitive advantage. Yet, in this case, no advantage is assured in the first place, much less sustained. Depending upon extra-competitive factors (e.g., relative bargaining skills or institutional norms), EB might wind up with anything from none of the economic profit to all of it (neither extreme may be the most likely outcome, but both are viable possibilities just the same).

2.2. **Pure Competition.** Let us move from pure bargaining to its polar opposite by introducing a new notion we term *pure competition*. This concept generalizes the notion of perfect competition imported from economics in ways that are helpful to strategy. In order to understand what is new and useful about it, we begin with the more familiar idea of perfect competition.

In strategy, the conventional take on perfect competition is consistent with the *standard model* of economics, by which we mean a homogeneous product market with free entry of identical firms.[13] In this model, a perfectly competitive market is one in which: i) the product is standardized; ii) firms are price-takers; iii) factors of production are perfectly mobile; and, iv) consumers and firms have perfect information (Frank, 2006, p. 364).[14] Taking input prices as given, the implication is a

[12]This outcome does not depend upon the fact that $n = 2$.

[13]See Viner (1933).

[14]One of the first versions of this model is due to Walras (1874) (Walras, 2003, in English) who, along with his contemporaries Jevons (1879) and Menger (1871), fathered neoclassical economics. Debreu (1959) represents the pinnacle of this line of thinking.

perfectly elastic supply curve and zero economic profit for firms. Many strategy researchers would agree with Knight (1946, p. 102) that "perfect competition" of this kind exhibits few features in common with real world markets:[15]

> The "perfect" market, of theory at its highest level of generality, is conventionally described as perfectly or purely "competitive." But use of this word is one of our worst misfortunes of terminology. There is no presumption of psychological competition, emulation, or rivalry, and this is rather contrary to the definition of economic behavior. Market relations are impersonal, between persons and goods; and persuasion or "bargaining" is also excluded.

The perfect competitor of the standard model is one who behaves as a passive price-taker and, with zero entrepreneurial creativity, as a passive market-taker as well. As Makowski and Ostroy (2001, p. 484) add

> Neoclassical economists borrowed from their classical predecessors the view that, in a production economy, perfect competition is the simple, inescapable conclusion of free entry. And with free entry comes zero profits. Almost to the same extent as price-taking, the common identification of perfect competition with a free entry/zero profit equilibrium eliminates the space needed for the expression of market creativity.

Much that has been written in strategy stems from a basic dissatisfaction with the standard model: beyond the theoretical limitations already identified by Knight (1946), firms in real markets exhibit a degree of heterogeneity and richness that is in stark contrast to its implications. It is interesting that although much of the work in strategy rejects the conclusions of the standard model, it yet continues to embrace its essential logic. Thus, in seeking to explain the gap between the predictions of the standard model and reality, each primary stream in strategy focuses upon certain "barriers to competition" (resource mobility, knowledge, industry position, etc.) that are thought to stymie the "inescapable conclusion" of the neoclassical view.

A fundamental flaw in this thinking is that it considers only the zero-sum side of competition and, as a result, presents a profoundly incomplete characterization of its effect. This point is not lost on modern economists. In the modern view, a "perfect competitor" is an economic actor who pursues the capture of economic value with creative zeal, "bargaining vigorously with others for a better deal, innovating new products if he sees a profit to doing so, strategically misrepresenting

[15]This comment was first brought to our attention in Makowski and Ostroy (2001, p. 484).

his private information if this is profitable," Makowski and Ostroy (2001, p. 480). In this view, perfect competition is defined as *any allocation of resources at which each participant receives the full contribution it makes to the total gains from trade*; i.e., each participant appropriates its added value. Thus, while the zero-profit industry of the standard model meets the more general, modern definition of perfect competition (because, there, firms have added values of zero), so do others – including some in which firms innovate, differentiate, and profit.

To illustrate, consider three airlines, say, Qantas (Q), American Airlines (A), and British Airways (B), who are contemplating the formation of a "UnifiedWorld" alliance. These airlines believe that by sharing frequent flier programs, establishing joint ticketing options, and so on, they will create operating efficiencies, increase customer loyalty and improve overall profits. Keeping things simple, suppose any two of these airlines can form an alliance that increases joint profits by $20 million. A three-way alliance generates $30 million in additional profit. Formally: $V = 30$; $v_{\{QA\}} = v_{\{QB\}} = v_{\{AB\}} = 20$; $v_{\{Q\}} = v_{\{B\}} = v_{\{A\}} = 0$ (where the outside values are the profitabilities of the non-allied airlines normalized to zero).

The set of feasible, arm's-length alternatives guarantees that each airline receives precisely $10 million in return for their participation in the 3-firm alliance – no more, no less. To see this, notice that if Q attempts to negotiate a larger share – one that leaves A and B with less than $20m between themselves – A and B simply point to their own ability to generate and share $20m without Q (an option they strictly prefer to any 3-firm alliance that leaves them with less). This argument holds identically for all three firms. Thus, the 3-firm alliance forms with each participant getting $10m of the $30m generated, an amount exactly equal to its added value ($10 = $30 – $20).

Here, competition actually guarantees that every agent is a *full-appropriator*: each has added value of $10 and this is precisely what each receives. Hence, this situation meets the modern economics definition of perfect competition. Notice how this turns the neoclassical view of competition on its head: now, competition is a force acting to guarantee that every firm appropriates the full measure of its productive contribution to the economic interactions in which it participates. Moreover, this positive state of affairs comes about as a result of (presumably, heterogeneous) managers actively seeking innovative opportunities by which to create and appropriate value.

What could be better? At this point, some might argue that the essential normative message of strategy should be reversed: "Managers, *seek* perfect competition!" To this conclusion, we demur. In our view, competition is an essentially neutral force. From the strategy perspective, the key

feature of the preceding example is not that every agent is a full appropriator but, instead, that the distribution of V *is entirely determined by the agents' feasible alternatives.* That is, it is the polar opposite of pure bargaining. This naturally leads to the following definition.

Definition 3. A market interaction described by a coalitional game is *purely competitive* if, for every participant i in N, $\pi_i^{\min} = \pi_i^{\max}$.

Our notion of pure competition emphasizes the true role of competition as an essentially neutral force that determines the bounds of agent appropriation. In situations of pure competition, bargaining plays no role in what agents appropriate. In situations of pure bargaining, competition plays no role. The symmetry is complete. In addition, Definition 3 generalizes existing notions of perfect competition. Perfect competition in the neoclassical sense meets this definition (a single equilibrium price distributes value in a unique way) as does the modern, full-appropriation sense (where, for all agents, $\pi_i^{\min} = \pi_i^{\max} = av_i$). However, Definition 3 encompasses a wider range of situations beyond either of these.

To see a case of pure competition in which agents do *not* get their added values, consider a different example involving productive social networks. Suppose the investment banking market contains four firms. It does no harm to assume these firms are heterogeneous on many key dimensions; e.g., specialized industry know-how, client contacts, reputation, distribution channels, and so on. Assume further that – as a result of information complementarities, scale economies and transaction costs – there are diminishing returns to social network size. Specifically, assume that: i) individually, banks cannot generate a profit; ii) any network of two produces joint profit of \$20; and, iii) adding more to a two-firm network is not profitable. Then, $V = 40$ (two distinct networks form producing \$20 each). Single-firm groups produce value of \$0 and two- and three-firm groups produce \$20 (in the latter, two firms create a network and the third firm is left to produce zero). The driving feature of this example is that value is created by intermediate-sized groups. By Definition 3, this interaction is purely competitive – each firm appropriates exactly \$10. However, because each agent's added value is \$20, none is a full appropriator; thus failing the modern economics definition of perfect competition (and, obviously, the conditions of the standard model as well).

Thus, Definitions 2 and 3 identify two ends of a continuum, neither of which are likely to arise in any real world setting. Their usefulness, is not in their empirical descriptive power but in

what they say about a firm's overarching strategic situation. The kinds of resources, knowledge, technologies and institutional structures that cause superior performance in industries closer to the pure bargaining end of the spectrum are likely to be quite distinct from those at the pure competition end. This distinction is potentially crucial both in terms of normative and positive strategy theory. First, it eliminates the dead-end perfect competition of the standard model as an interesting focal point: we see no obvious argument in favor of industries being invariably pushed toward one end of the continuum or the other. Second, the rich diversity observed in real markets arises as a natural implication of the economic motivation induced by competition. Third, agents inherit all the attractive features of the perfect competitor of modern economics (i.e., are active, unique, potentially innovative, value-seekers). Finally, competition is conceived of as neither inherently good nor bad; e.g., sometimes pure competition implies full appropriation, sometimes the opposite.

2.3. **The general case.** Definitions 2 and 3 are clearly special, with most real world cases probably falling somewhere in-between; i.e., $v_{\{i\}} < \pi_i^{\min} < \pi_i^{\max} < V$. Suppose participant i considers taking some costly strategic action that will alter the competitive environment by both lowering $\pi_i^{\min}$ and increasing $\pi_i^{\max}$. How should it evaluate this option? At this point in the development of our theory, we have only the interval of competitively consistent possibilities rather than a specific point-estimate. In order to compute the profitability of strategic investments, we require point-estimates.

Brandenburger and Stuart (2007) introduce a method of valuing competitive intervals that has the character of a subjective expectation (and, hence, an interpretation we choose to emphasize). When facing $[\pi_i^{\min}, \pi_i^{\max}]$, a firm's subjective expected level of appropriation can be assessed as $\pi_i = \alpha_i \pi_i^{\max} + (1 - \alpha_i)\pi_i^{\min}$, where π_i is firm i's anticipated level of of appropriation with $\alpha_i \in [0, 1]$ summarizing its subjective beliefs about the effects of extra-competitive factors. Thus, π_i can be interpreted as the firm's subjective expected appropriation level, taking these factors into account. The parameter α_i is referred to as firm i's *appropriation factor* (AF). Rearranging terms,

$$\pi_i = \pi_i^{\min} + \alpha_i \left(\pi_i^{\max} - \pi_i^{\min}\right), \tag{1}$$

which emphasizes that what a firm gets is the minimum appropriation guaranteed by competition ($\pi_i^{\min}$) plus an additional amount as a result of extra-competitive factors ($\alpha_i \left(\pi_i^{\max} - \pi_i^{\min}\right)$). For example, when $\alpha_i = 1$, the firm expects appropriation of $\pi_i = \pi_i^{\max}$ and, when $\alpha_i = 0$, it expects

$\pi_i = \pi_i^{\min}$. CGT, augmented by (1) allows us to untangle the effects on appropriation of what may be a very complex collection of factors.

3. Strategy and the force of competition

In this section, we bring our analysis closer to home by examining several so-called "generic" strategies. Using variations on a highly stylized numerical example (in much the same spirit as Brandenburger and Stuart; 1996), we show that even in these very simple cases, competition can work in subtle ways.

3.1. **Baseline case.** There are two suppliers, S_1 and S_2, two buyers, B_1 and B_2, and two OEMs who intermediate between the buyers and suppliers. Because our analysis centers on the OEMs, let us name them Focus Industries (F) and Rival Enterprises (R) (and, henceforth, refer to Focus and Rival jointly as the "firms"). To create value, at least one supplier, one firm and one buyer must be present. Suppliers and firms have production capacities of 50 units and 20 units, respectively. Suppliers face a constant marginal cost of \$5 per unit. In addition to whatever they end up paying S_1 and S_2, firms must incur a cost of \$2 per unit. Buyers value up to 20 units at a constant marginal utility of \$10 each. They value any units beyond 20 at zero.

Since value can be created with both buyers (\$10 > \$5 + \$2), we anticipate both will have their entire demand satisfied. The homogeneity of the products at each stage means that it is not relevant which buyer consumes output from which firms/suppliers. Thus, $V = (\$10 - \$2 - \$5)(20 + 20) = \$120$. The actors' feasible alternatives result in group values of \$120, \$60 or \$0 depending upon whether the group contains: at least one supplier with both firms and both buyers; at least one supplier, one firm and one buyer but not both firms and both buyers; no participants from at least one vertical stage.

V can be created with either supplier. Therefore, each supplier's added value is zero. Since, in general, $\pi_i \leq av_i$, competition guarantees that both suppliers appropriate nothing beyond their outside alternative (zero). Each firm and each buyer has added value of 60 (by removing any one of these agents, the producible value drops to 60). To see that each of these actors has $[\pi_i^{\min}, \pi_i^{\max}] = [0,\ 60]$, note that the distribution in which the firms appropriate 60 each and the buyers appropriate zero (and suppliers appropriate zero) is a competitive distribution of value. Similarly, the distribution in which each buyer appropriates 60 is competitive.

The suppliers have excess capacity, both individually and jointly. Competition is working in favor of the firms and buyers – at least insofar as the upper bounds on their respective ranges are not zero. The firm and buyer alternatives to transacting with either supplier are rich relative to the alternatives facing the suppliers: a supplier can be ignored without any loss in value production. This is reflected in the fact that suppliers have zero added value, which guarantees that neither supplier can expect an economic profit. From the commodities/pricing perspective, input prices will total \$5 per unit.

Now, consider a specific set of retail transactions in which \$120 in economic value is created (i.e., some allocation of the firms' total joint capacity to the buyers). To take the extreme example, suppose the buyers are full appropriators, leaving the firms with zero economic profit. This is the most undesirable outcome for the firms; they are just indifferent to quitting the market and pursuing their outside options. What feasible alternative transactions can they use to leverage additional value from their buyers? The answer is: none. For example, assume B_1 is one of Focus' customers. Then, Focus would like to use the threat to abandon B_1 in favor of transacting with B_2 to guarantee itself better-than-zero profit. Such a threat is only credible if Focus can offer B_2 a strict improvement over its transactions with Rival. However, since B_2 is already a full appropriator, no such offer can be made. Hence, both firms are stuck. A mirror problem arises for the buyers under a value distribution in which the firms are full appropriators.

A central issue in strategy is understanding what accounts for relative performance differences between rival firms and the extent to which they persist. Thus, it is important to highlight that competition can also influence relative levels of appropriation. Consider, for example, the competitive distribution of value in which Focus and Rival both earn \$0 economic profit. Seeing that there is plenty of room for appropriation left in its competitive range, suppose Focus ponders an investment to upgrade its sales force (to improve the super-competitive component of its appropriation). Assume Rival does nothing. Does Focus' appropriation increase? If so, does Focus enjoy a performance advantage over Rival?

The answers to these questions are: maybe and no. To see the latter, consider the best possible case for Focus: its new-and-improved sales force raises its take to \$60, with Rival's remaining at \$0. Suppose, for the sake of simplicity, that B_1 purchases all her product from Focus. The problem is that, rather than accept these terms, B_1 is free to transact with Rival – under terms that make *both* strictly better off (e.g., split \$60 evenly between them). This competitive instability arises in

any situation where the two firms' appropriation levels are unequal. Therefore, whatever the firms appropriate, they appropriate equally – competition exerts a strong homogenizing influence.

How would competition actually play out in this case? By increasing its super-competitive appropriation capability relative to Rival, the effect of buyers vying to consummate a deal with the weaker firm might bid up Rival's prices, thereby raising the appropriation of both firms. In effect, competition could offset Rival's weak super-competitive appropriation capability. On the other hand, the buyer stampede toward Rival might just as easily undermine Focus's effort to pry more value from buyers, thereby foiling its scheme. Without more information, it is impossible to say.

Already, our example illustrates a combination of issues that, to the best of our knowledge, are simply not addressed in the extant literature. We see that, because the firms face nontrivial ranges bounded below by zero, super-competitive influences on appropriation rise to the forefront of strategic concern. At the same time, because competition imposes an implicit performance link between the firms, these influences cannot be considered in isolation. Indeed, in cases like this, strategies aiming to achieve relative advantage may backfire spectacularly.[16] Rather, in such situations, firms may be well-advised to consider moves that improve their joint super-competitive appropriation capabilities (e.g., creating a shared sales force or jointly owned distribution venture).

3.2. **Product Differentiation.** In the baseline example, buyers are indifferent as to the firm they purchase from. One 'generic' strategy generally thought to improve a firm's performance is product differentiation. For example, Saloner et al. (2000, p. 165-66), under the heading "Differentiation Softens Competition," claim that, "The first effect of increased differentiation is to increase each firm's sales," and, "Prices are higher when products are more differentiated." Does differentiation, in some sense, "soften" competition thereby increasing prices and sales?

To answer, suppose that Focus is considering exploiting its existing knowledge resources to make its product more valuable to B_1 (and only B_1). Assume these resources meet all the requisite factor mobility barriers thereby making imitation by Rival impossible. Market research indicates that the contemplated move will cause B_1 to value its products \$11/unit (rather than \$10). Absent any other changes, this leads to $V = \$140$ and, it can be shown,

[16]We are not the first to note that counter-intuitive results on the incentives to engage in certain strategies arise in coalitional game theory. Postlewaite and Rosenthal (1974) present an early example. For a more recent and general treatment see Segal (2003). Segal considers various contracting strategies using random-order bargaining.

Agent	S_1	S_2	F	R	B_1	B_2
Added Value	0	0	80	60	80	60
$\pi_i^{\min}$	0	0	0	0	0	0
$\pi_i^{\max}$	0	0	80	60	80	60

As we see, product specialization increases both total value and Focus' added value. However, it does not change $\pi_F^{\min}$. Indeed, both firms earning zero economic profit is still a possibility. In that eventuality, Focus enjoys neither a sales nor a price increase. Of course, factors such as bargaining skill, industry norms and relative patience may all work to gain Focus a share of the economic profit, but none is assured by the force of competition. True, differentiation softens competition. However, what the conventional thinking misses is that it softens it in both directions. On the hand we usually consider, specialization reduced the relative attractiveness of the alternatives available to B_1 (i.e., buying from Rival). On the other hand, *it also reduced the relative attractiveness of the alternatives available to Focus* (i.e., selling to B_2).

If, however, the specialization also increases B_1's demand for the product (say to 25 units), then it is straightforward to show that *both* $\pi_F^{\min}$ and $\pi_R^{\min}$ rise to \$15. In this case,

Agent	S_1	S_2	F	R	B_1	B_2
Added Value	0	0	80	60	80	45
$\pi_i^{\min}$	0	0	15	15	0	0
$\pi_i^{\max}$	0	0	80	60	65	45

By increasing the volume demanded by B_1, Focus shifts the balance of competition in favor of the firms. In this scenario, Rival gains a valuable alternative to transacting with B_2 and, at the same time, B_2's Focus alternative becomes weak relative to B_1. This is reflected in the reduction in B_2's added value. The direct but counter-intuitive effect of Focus' specialization is to increase competition for *Rival*'s capacity. This significantly limits what B_2 can appropriate (no more than its reduced added value of 45) which, in turn, indirectly limits what B_1 can appropriate from Focus.

Notice that, without more details about extra-competitive factors, we still cannot say what happens relative to actual appropriation when Focus specializes. For example, some collection of factors may cause the firms to appropriate 60 in the base-case but only 15 post-specialization.

What we can say, however, is that, whatever the firms *do* get after specialization, exactly 15 is guaranteed by the force of competition independent of any of these other concerns.

Suppose that, once introduced, Focus' specialized product can be perfectly and instantly imitated by Rival (both buyers value both products identically and demand 25). Should Focus dismiss this strategic option and try to think up something else? Under imitated specialization

Agent	S_1	S_2	F	R	B_1	B_2
Added Value	0	0	80	80	80	80
$\pi_i^{\min}$	0	0	15	15	0	0
$\pi_i^{\max}$	0	0	80	80	65	65

Specialization creates favorable competitive asymmetries between firms and buyers. Focus' competitive position is not harmed if Rival imitates its strategy.

3.3. **Cost leadership.** Instead of creating product-level advantages, suppose Focus considers a resource deployment designed to increase productivity. Specifically, suppose Focus can implement an initiative that reduces unit costs to, say, \$1.8 per unit. In this case, V increases to \$124 and Focus' added value also rises, by \$4 to \$64 (the entire amount of the cost saving). Overall,

Agent	S_1	S_2	F	R	B_1	B_2
Added Value	0	0	64	60	60	60
$\pi^{\min}$	0	0	4	0	0	0
$\pi^{\max}$	0	0	64	60	60	60

Thus, for example, if Focus' super-competitive factors allow it to appropriate the same relative amount of its new range (that is, α_F remains constant), then the initiative results in strictly higher profits.

In many cases, strategies that aim to increase production efficiencies both lower costs and increase output. Suppose, after implementing the preceding initiative, Focus organizes a second one expected to reduce unit costs from \$1.8 to \$1.5 and, at the same time, increase capacity to 35 units. Now, the increase in value is even greater, from \$124 to \$138. Focus' added value jumps from \$64 to \$78. Surprisingly, however, this translates into an unambiguous *decrease* in Focus' range, from $[4, 64]$ to $[3, 33]$.

Where does our intuition go wrong? The capacity increase has two effects. First, it increases the number of buyers who transact with Focus in the production of V. While this increases the firm's value added, it also moves buyers from the "feasible alternative" to the "current customer" category. This softens Focus' competitive options. Second, by shifting purchases away from Rival, and thereby freeing up that firm's capacity, attractive and feasible alternatives open up for the buyers. Thus, the move creates downward competitive pressure on both ends of its range. Not only may firms not appropriate the full value of their investments in such initiatives, but they may diminish their ability to appropriate value altogether.

In their path-breaking paper, Brandenburger and Stuart (1996) advocate the use of added value analysis in the formulation of business strategy. They focus on how generic strategies might improve a firm's added value relative to the added values of its competitors. Here, we see the importance of assessing *all* the competitive effects of a strategic move when evaluating business strategies. Added value is an important consideration in any strategic situation because positive added value is a necessary condition for positive value appropriation. However, added value is typically a small part of the overall picture. Despite its popularity in the strategy literature, added value theory can lead to trouble if its limitations are not understood.[17]

3.4. **Competition in value chains.** Up to this point, the force of competition drove suppliers into the background. With zero added value, they were assured zero economic profit. As long as this condition persisted, the suppliers could just as easily have been eliminated, with no effect on the analysis. Let us now promote them to a nontrivial position in our simple competitive ecosystem. Begin by assuming each supplier has only 15 units of capacity. Then, $V = \$90$ and:

Agent	S_1	S_2	F	R	B_1	B_2
Added Value	45	45	30	30	30	30
$\pi_i^{\min}$	15	15	0	0	0	0
$\pi_i^{\max}$	45	45	30	30	30	30

Suppose Focus can specialize its product to B_1, increasing B_1's willingness to pay from \$10 to \$11 and its capacity from 20 to 25 units. Then, $V = \$105$ and:

[17]Brandenburger and Stuart (2007), the biform games paper, presents a complete theoretical approach.

Agent	S_1	S_2	F	R	B_1	B_2
Added Value	45	45	45	30	45	30
$\pi_i^{\min}$	15	15	0	0	0	0
$\pi_i^{\max}$	45	45	45	30	45	30

Note that in contrast to our earlier example, the bottom of Focus' range remains at \$0. This is because the supply bottleneck imposes a hard constraint on Focus' ability to create new transaction alternatives. Interestingly, B_1 faces the same problem – whereas capacity increases in the previous examples tended to help the buyers by creating de facto alternatives with Rival, these are now capped by supply limitations. More generally, a firm must consider new strategies in the context of its entire network of arm's-length transactions. Moreover, the assessment must be done jointly, not piecemeal.

4. Discovering value in the shadows

If not generic strategies, then, should managers turn? In this section, we provide an answer, one that arises from the fact that a firm's competitive range can be computed via the solution of two linear programs. By assessing the current range for their firm, managers can use the shadow prices associated with these linear programs to help craft new strategies and to estimate their competitive effects on value capture.

For each actor i, computing $\pi_i^{\min}$ and $\pi_i^{\max}$ is straightforward. $\pi_i^{\min}$ is the smallest value of π_i that is consistent with a distribution satisfying both (1) and (2), likewise for $\pi_i^{\max}$ being the maximum. To be precise,

$$\pi_i^{\min} = \min_{\pi \in \mathbb{R}^n} \left\{ \pi_i \left| \sum_{j=1}^{n} \pi_j \leq V \text{ and, for all } G \subseteq N, \sum_{j \in G} \pi_j \geq v_G \right. \right\} \tag{2}$$

and

$$\pi^{\max} = \max_{\pi \in \mathbb{R}^n} \left\{ \pi_i \left| \sum_{j=1}^{n} \pi_j \leq V \text{ and, for all } G \subseteq N, \sum_{j \in G} \pi_j \geq v_G \right. \right\}. \tag{3}$$

Those familiar with linear programming will immediately see that (2) and (3) describe $\pi_i^{\min}$ and $\pi_i^{\max}$ as the optimized values each of a pair of linear programs.[18] Thus, once data is gathered and competitive values (V and the v_Gs) specified, $\pi_i^{\min}$ and $\pi_i^{\max}$ can be computed.

Since each linear program has $2^n - 1$ constraints, associated with each solution is a $(2^n - 1)$-vector of "shadow prices," denoted $\lambda_i^{\min}$ and $\lambda_i^{\max}$, respectively. Each component of $\lambda_i^{\min}$ corresponds to a group G and quantifies the effect on $\pi_i^{\min}$ of loosening, by one unit, the competitive constraint implied by v_G. That is, if some v_G is reduced by \$1, or V increased by \$1, the corresponding components of $\lambda_i^{\min}$ tell us by how much $\pi_i^{\min}$ changes. Similarly the components of $\lambda_i^{\max}$ indicate the effects of changes to group values on $\pi_i^{\max}$.

While $(2^n - 1)$ is increasing exponentially in n, an important technical feature of (2) is that the minimum (resp., maximum) is never associated with more than n nonzero shadow prices. Nonzero shadow prices are those that correspond to groups for which (2) is met with equality – that is, the binding alternatives. As we now illustrate, this information has significant implications with respect to a firm's strategic goal of altering its competitive environment to it's own advantage.

Let us return to the base case. As we know from our earlier analysis, the solution to the minimization problem (2) is delivered by the competitive distribution in which both buyers get \$60 and all other agents (i.e., Focus in particular) get zero economic profit. Alternatively, solving (2) for Focus indicates that it gets its maximum when the firms appropriate \$60 each and everyone else gets zero economic profit. The nonzero shadow prices are (for groups capable of producing value):[19]

Nonzero Shadow Prices for $\pi_F^{\min}$

Critical Group G	$\lambda_{F,G}^{\min}$
N	-1
S_1, F, R, B_1, B_2	1

Nonzero Shadow Prices for $\pi_F^{\max}$

Critical Group G	$\lambda_{F,G}^{\max}$
N	1
S_2, R, B_2	-1

What this says, e.g., is that of the 63 different ways these 6 agents might combine to produce value via arm-length transactions, only *two* are critical in the sense of limiting the top-end of Focus' range to 60: the group including everyone (N) and the group consisting of S_2, Rival and B_2. What

[18]For example, the right hand side of equation (2) is the minimum appropriation for i (i.e., π_i) searching over all possible distributions of value (i.e., every n-dimensional real vector: $\pi \in \mathbb{R}^n$) subject to satisfying conditions (1) (i.e., $\sum_{j=1}^{n} \pi_j \leq V$) and (2) (i.e., for all $G \subseteq N, \sum_{j \in G} \pi_j \geq v_G$) of Definition 1

[19]$\lambda_{F,G}^{\min}$ and $\lambda_{F,G}^{\max}$ denote the shadow prices corresponding to group G in the solutions to (2) and (3), respectively, from the perspective of Focus (i.e., in computing $\pi_F^{\min}$ and $\pi_F^{\max}$).

the shadow prices tell us is that increasing aggregate value V by \$1 increases Focus' maximum level of appropriation by \$1. Thus, if the firm can design a strategy that generates more actual value – without affecting the value of the alternatives available to S_2, Rival and B_2 (increasing the value of these agents alternatives by \$1 *decreases* $\pi_F^{\max}$ by \$1) – then it will increase the upper bound of its range.

We saw exactly this effect in the specialization strategy. In that case, the value produced in groups containing Focus and B_1 (and a supplier) increased by \$20. This move caused V to increase by \$20 and had no effect on the value of alternative available to S_2, Rival and B_2. Hence, the effect was a \$20 increase in $\pi_F^{\max}$, as predicted by the shadow prices.

Let's explore this option with respect to the minimum. The shadow prices indicate that increasing the total value by \$1 reduces F's minimum bound – an undesirable effect. However, this effect is offset if the increase in V is brought about by a corresponding increase in the value producible by S_1, Focus, Rival, B_1, and B_2. This is exactly what happens: the increased productivity with B_1 flows through all the alternatives in which F can produce value with B_1. Thus, the net effect of specialization on $\pi_F^{\min}$ relative to the base case is, as predicted, zero.

Shadow prices are useful in the exploration phase of strategic option assessment. Given a firm's present situation and corresponding range, they identify promising areas in which to seek favorable alterations in the competitive landscape. Once some specific options are identified and their effects on the balance of transaction opportunities quantified (i.e., with respect to V and the v_Gs) (2) and (3) can be used to compute the firm's new range directly. Thus, given a firm's status quo competitive position, the shadow prices are a guide to which alternatives are ripe for strategic manipulation.

Here, the shadow prices tell Focus managers that if they wish to increase the upper end of their range of potential appropriation without regard to the minimum (e.g., they believe their appropriation factor, α_F, is close to 1), then pursuing ways in which to improve productivity with suppliers or buyers will work, regardless of whether the supplier or buyer affected is presently an actual transaction partner. This is because overall value increases and it does so in a one-to-one way with the group $G = \{S_1, F, R, B_1, B_2\}$ implying $\pi_F^{\max}$ increases with no change in $\pi_F^{\min}$. At the same time, the negative shadow price on the maximum highlights a danger posed by increased productivity on the part of Focus' direct competitor, Rival.

Now consider the shadow prices under the 'productivity' scenario in which Focus has unit costs of \$1.80 and capacity of 20. In this case, the computations leading to $\pi_F^{\min}$ and $\pi_F^{\max}$ yield the following shadow prices (omitting groups not involving Focus):

Nonzero Shadow Prices for $\pi_F^{\min}$

Critical Group G	$\lambda_{F,G}^{\min}$
N	-1
S_2, F, R, B_1	1
S_1,F, B_2	1

Nonzero Shadow Prices for $\pi_F^{\max}$

Critical Group G	$\lambda_{F,G}^{\max}$
N	1
S_1, F, B_1, B_2	-1
S_2, F, B_1, B_2	-1

Looking at $\lambda_F^{\max}$ first, it is once again true that if more value is created overall, $\pi_F^{\max}$ increases – so long as Focus' options to create value with both buyers are not significantly improved. When Focus' capacity is 20, there is no problem because the balance of alternatives between Focus and any single buyer remain unchanged. As we saw in the earlier discussion, however, as capacity is expanded this balance is altered in favor of the buyers. We see this playing out in the shadows, which are negative for the groups $\{S_1, F, B_1, B_2\}$ and $\{S_2, F, B_1, B_2\}$, both of which contain value chains involving Focus. Unfortunately, increasing productivity simultaneously increases the value producible by all three groups in the $\pi_F^{\max}$ table by the same amount. Hence, as a first approximation, F's maximum appropriation level must fall.

Turning to $\pi_F^{\min}$, we notice that increasing V (the value corresponding to N) tends to lower $\pi_F^{\min}$. This suggests a potential tension between increasing $\pi_F^{\max}$ versus $\pi_F^{\min}$ since changes to V – other things equal – push these quantities in opposite directions. In this case, more agents transact with Focus (increasing V) but, in so doing, reduce their relative values as alternative transaction partners. The net result is that $\pi_F^{\min}$ falls. Using shadow prices as a first approximation, we see this effect: V increases from 124 to 138, a net increase of 14; the alternative value producible by both of the groups $\{S_2, F, R, B_1\}$ and $\{S_1, F, B_2\}$ increases from 64 to 70, a net increase of 6. Together, the effect of the strengthened alternatives, +\$12, is not enough to offset the effect of increasing the value of actual transactions -\$14.[20]

The point here is that, presented with these shadow prices, firm managers are immediately stimulated to begin thinking about the kinds of options that will affect competition in beneficial

[20]We say, "as a first approximation" because shadow prices indicate *exact* effects over limited ranges and only for variations in the value producible by one group at a time. Hence, their usefulness as a creativity tool in the exploration stage of strategic option generation. Prior to green-lighting any specific initiative, its actual effect on the firm's competitive range should be computed directly.

ways. Preliminary shadow price analysis would, presumably, lead to a quick dismissal of the problematic, productivity-increasing strategy. At a deeper level, shadow price analysis encourages managers to think beyond 'generic' strategies and consider, instead, the subtleties of their true competitive situation.

5. Conclusion: Competition, the *one* force

Value cannot be created without exchange and, in a market system, an exchange cannot occur without the willing consent of all its participants. It follows that the transactions in which a firm participates – those from which it captures a share of the resulting value – occur only because its customers, suppliers, employees, ..., freely choose *these* over all their available alternatives. The more attractive those alternative exchange possibilities, the greater the share of value that must be offered in order to induce them to participate in deals with the firm. This rivalry to create value creates an essential tension with competition's more familiar rivalry, that to appropriate value. This more balanced view of competition leads to different insights for strategy. Chief among these is that the core strategic problem of the firm is not to defend itself against competition but, instead, to manage competition (or the lack thereof) to its advantage. Because the resolution of competition's essential tension can affect value appropriation in subtle ways, this problem is both more interesting and more challenging than previously thought.

One implication of all this is that "generic" strategy classification schemes are too coarse for the generation of effective policy prescriptions. This supports Amit and Shoemaker (1993), who voice skepticism that researchers will ever identify a laundry-list of specific strategies that are persistently effective in any given industry. Note well, however, that this is not to say there are no general principles – quite the contrary. For example, Honda's competence in engines (Prahalad and Hamel, 1990) and Southwest's unique set of tailored activities (Porter, 1996), respectively, are said to be the primary sources of these firms' superior performances. On the surface, these sources seem quite distinct. Yet, at an appropriate level of analysis, we argue that they must share important similarities in their effect on the competitive positions of their beneficiaries. By identifying these similarities at a general level, CGT provides a useful guide to practitioners who face the challenge of creating successful strategies under their own, unique circumstances.

Returning to Porter (1980), we now see that, ultimately, there is only *one* force of interest – the force of competition itself. Reflecting upon this brings us to observe that the view of competition

presented here may provide the glue by which to unify several of strategy's disparate streams of theory. Whether the immediate concern is a new entrant, the introduction of substitute products outside the industry, increased capacity within the industry, or buyers figuring out a way to reduce switching costs, the deeper question is always the same: how do these possibilities affect the balance of productive opportunities facing the firm and its potential transaction partners? Answering this tells managers whether competitive intensity is increasing or slackening and with what effect – favorable or unfavorable.

The determination of whether changes in competitive intensity inherently favor or disfavor a firm depends upon its stock of resources and capabilities. The interplay between industry and resource positions are naturally integrated via CGT. From a prescriptive angle, the essential issue here is identifying what kinds of resources create a rich set of productive alternatives for the firm while limiting those available to its transaction partners. For example, by directly preventing imitation by a rival, a firm indirectly prevents its customers from gaining equally attractive alternatives to transacting with it. Industry structure, firm resources and capabilities, transactions costs, institutional factors, technological considerations, and so on, all work in concert to create the transaction environment in which the firm operates. This, in turn, determines the firm's range of competitive outcomes. Strategies can aim to improve the lower end of the range, raise the upper end or, if the range is wide, increase super-competitive appropriation (e.g., improved sales force capabilities).

The integrative nature of the CGT approach may also facilitate the analysis of theoretical consistency across areas of inquire within strategy. For example: Are products and resources really "two sides of the same coin," (Wernerfelt, 1984, p. 171)?; Can a firm can control unique, inimitable, value-producing, etc., resources and yet operate in a purely competitive market?; Given an existing bundle of resources, why types of transactions costs cause a firm's appropriation opportunities to improve? We believe the answers to questions of this kind are wide open to work via CGT techniques.

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University of Melbourne

Washington University

University of Melbourne, 200 Leicester St., Carlton, VIC 3053 Australia
E-mail address: m.ryall@mbs.edu