Strategy Science

Publication details, including instructions for authors and subscription information:
http://pubsonline.informs.org

Competing with Theories: Using Awareness and Confidence to Secure Resources and Rents

Timo Ehrig; , Todd Zenger

To cite this article:
Timo Ehrig; , Todd Zenger (2024) Competing with Theories: Using Awareness and Confidence to Secure Resources and Rents. Strategy Science 9(4):416-432. https://doi.org/10.1287/stsc.2024.0177

https://pubsonline.informs.org/journal/stsc

STRATEGY SCIENCE
Vol. 9, No. 4, December 2024, pp. 416–432
ISSN 2333-2050 (print), ISSN 2333-2077 (online)

Competing with Theories: Using Awareness and Confidence to Secure Resources and Rents

Timo Ehrig,[a] Todd Zenger[b,*]

[a] Solvay Brussels School of Economics and Management, Universite libre de Bruxelles, 1050 Bruxelles, Belgien; [b] David Eccles School of Business, University of Utah, Salt Lake City, Utah 84112

*Corresponding author

Contact: timo.ehrig@ulb.be (TE); todd.zenger@utah.edu, https://orcid.org/0000-0002-9830-4066 (TZ)

Received: February 10, 2024
Revised: July 22, 2024
Accepted: September 22, 2024
Published Online in Articles in Advance: November 18, 2024

https://doi.org/10.1287/stsc.2024.0177

Abstract. An assumption of factor market efficiency is often used to grant primacy to firms' existing unique and valuable resources as the source of economic rents. But this assumption is difficult to reconcile with observed market outcomes. For instance, five of the six companies with the highest global market capitalization in 2022 were upstarts in their industries with few resources at their origins. More surprising, three of these entrants were assisted by incumbents with vastly superior resources in assembling the resources they required. In this paper we explore how entrants compete with theories to secure resources from incumbents and capture rents. We introduce a modeling approach in which theories with causal logic generate awareness of valuable potential future states and shape the beliefs about payoffs and probabilities associated with these states. We combine work in the theory-based view and value capture theory to distinguish among three distinct sources of economic rents that are potentially available to entrants: awareness rents, confidence rents, and resource rents. We explore the circumstances under which these three types of rents are available. By exploring the role of theories and awareness in value creation and capture, our paper seeks to deepen our understanding of how entrants both attract resources and secure rents.

Funding: T. Zenger was supported by the ION Management Science Lab, Utah.

Keywords: theory-based view • entry strategies • value-added • resource-based approaches • competitive strategy

1. Introduction

The strategy literature posits two distinct sources of economic rents from resources. Firms either leverage unique and valuable resources that they already possess and about which they therefore have superior information, or they use "superior expectations" about future value to secure new resources at a discount in factor markets (Barney 1986). A strong assumption of factor market efficiency has led the strategy field to place primacy on the first source: on resources already possessed. Yet, observed outcomes in capital markets arguably point to the primacy of the second source. Five of the six companies with the highest global market capitalization in 2022 were upstarts in their industries with rather few resources at their origins. Moreover, for three of these entrants, incumbents and other well-resourced industry actors actively collaborated with them to assemble the resources that their entrance required. IBM contractually funded Microsoft and provided the platform for its most critical initial resource. Daimler provided Tesla with vital capital and technology. Xerox famously offered critical technology and funding to Apple, and later music producers provided resources critical to its build out of iTunes. Although prior literature highlights entrants routinely beating incumbents (Schumpeter 1911, Christensen 2013), our interest is in explaining how. Our argument is that firms, including entrants, compete based on their theories and the awareness they provide of paths to possible future states with their probabilities and payoffs. It is these theories that commonly generate the superior expectations that enable firms to secure critical resources and capture rents.

To develop our explanation, we introduce a modeling approach that links the theory-based view with its focus on causal logic generating counterfactual future states (Felin and Zenger 2017, Ehrig and Schmidt 2022) and the added value literature (Brandenburger and Stuart 1996), particularly the pioneering work by Bryan et al. (2022) on value creation and capture in games of unawareness. In our modeling approach, the assumptions and causal logic of theories formally define states, whereas beliefs

about these states define probabilities and payoffs. Actors then use their theories and awareness of others' theories to compete for resources and secure rents. With this modeling apparatus, we highlight theories as generating two distinct sources of rents that extend beyond standard value-added logic: awareness and information, both featured in Bryan et al. (2022; henceforth BRS). We argue that it is novel theories held by actors that provide this awareness of future states unseen by others (Levinthal 2011, Karni and Vierø 2013, Felin and Zenger 2017) and make salient particular forms of information or data that otherwise lie unseen or dormant (Felin et al. 2023). Information can reduce uncertainty given a theory, reducing the entropy of a subjective distribution of possible states. But theories also compete. Theories will differ by economic actor, and their assumptions may logically contradict in ways that shape payoffs and probabilities. As we further develop and illustrate, theories are central to providing the awareness and information needed to identify undervalued resources, the currency or means to obtain them, and ultimately the access to rents that may result.

Our explanation of entrant success diverges from the common disruption narrative in which incumbents with superior resources often passively sit back and leverage them rather than craft a new future. In our motivating examples, both entrants and incumbents alike possessed theories of the future. IBM, Daimler, and at least some factions within Xerox all had theories of the future of their industries and were actively working toward them. What differed was the substance of their theories, the novelty of the awareness or state-spaces they revealed, and the approach each actor took to competing with them to secure resources and rents. A common prescription for those who believe they have superior awareness or information is to keep that awareness or information secret. Entrants should fly under the radar, quietly target a niche, and use their superior awareness or information to purchase resources at a discount relative to their use value until incumbents find it is too late to catch up. Such logic is implicit in the description of Christensen (2013) of successful disrupters and central to recent papers by Wernerfelt (2022) and BRS, which explicitly highlight how those with superior awareness or information capture rents.

But resource acquisition frequently demands more than participation in factor markets with nicely packaged and priced resources. Frequently, resource acquisition demands the construction of partnerships through which resources are composed or slowly transferred. To compose these resource-building or resource-transferring partnerships, deviating from secrecy is often required, which was the path of resource deficient entrants, like Apple, Microsoft, and Tesla. Tesla famously shares its secret master plan. Apple conveys its vision for digital music sales with music producers. To induce the collaborative and cospecialized investments that generate valuable resources (Argyres and Zenger 2012), these firms disclosed their theories or parts thereof. But, of course, this revealing carries a threat, as it allows incumbents (those with superior resources) to gather information about the theory and its potential payoffs. In light of this, how should entrants compete with their theories?

We use the Tesla-Daimler example to illustrate our modeling approach and highlight our contribution. Both parties in this example compete with theories in mind. Daimler anticipated an eventual disruption from electric vehicles, but its theory foresaw a slow evolution with success shaped by accumulating new technological resources critical to technology leadership. Tesla held a competing theory and was focused on assembling an alternate future: one that involved composing a future through resources outside Daimler's awareness (integrated software platforms, an electric vehicle (EV) recharging network, and large-scale assembly and battery production). However, Tesla needed the assistance of Daimler and other incumbent suppliers to compose its envisioned resources and future.

In developing our modeling approach, we extend the BRS modeling in several important ways. We introduce causal theories with assumptions and logic as the mechanism through which new awareness is developed that defines new states. We highlight how alternative theories compete and interact to shape states, probabilities, and payoffs, and thereby dictate opportunities for resources and rents. We show that superior awareness in the sense of seeing superior state-spaces or possessing a richer vocabulary to speak about a future world is not enough to secure rents. It needs to be complemented with superior abilities to see value creation possibilities associated with the new states and/or superior means to translate facts into probability distributions over these states. Our contribution is conceptual, illustrated with an extended formal example in the spirit of Menon (2018). Although BRS provide an important technical contribution—the coarse core solution concept extended to unawareness—what we add are constraining assumptions to make this solution concept workable and conceptual assumptions to make sense of the predictions of the modeling about rents. In particular, we highlight important logical distinctions among three types of economic rents: (1) awareness rents—rents that accrue to possessing superior awareness about new states of the world and their causal linkages, (2) confidence rents—rents that accrue to superior (or accurate) confidence in the probabilities associated with the future states a theory reveals, distinguishing these confidence rents from simple information rents, and (3) traditional resource rents—rents that accrue to the possession of unique and valuable resources (Brandenburger and Stuart 1996). In the

process, we seek to bring clarity to the central and distinctive roles that theories and confidence in them play in securing resources and rents.[1]

2. Theories, Awareness, and Resource Acquisition

The idea of using asymmetry in awareness or information to acquire resources at advantageous prices has important antecedents in the entrepreneurship and strategy literature. In the resource-based view literature, it is superior information that enables access to "underpriced" resources in strategic factors markets (Barney 1986). Such asymmetry relates to the central idea in the work of Shane (2000) on opportunity discovery and to the work of Felin and Kauffman and colleagues on seeing novel affordances (or the adjacent possible) in resource use (Felin et al. 2014, 2023), where advantage is derived from simply seeing value in a resource that others do not. Similar logic undergirds Schumpeterian (Schumpeter 1911) notions of value creation.

But prior literature has most often emphasized information acquisition as the source of these superior expectations in strategic factor markets (Barney 1986, Makadok and Barney 2001). Yet awareness is different from information. Two entrepreneurs in possession of identical information may have fundamentally different awareness, reflecting distinctly different theories of value. The entrepreneur who is aware of something, about which the other is unaware, can gather information about the feasibility of that thing. Meanwhile the agent who is unaware of a state does not even know what information is missing. Our interest is in awareness provided by theories.

To elevate conceptual precision, we draw on basic elements of a modeling innovation introduced by BRS. They use the familiar Cirque du Soleil example to illustrate their logic, modeling how three parties, Cirque du Soleil, a big top circus, and street performers, all think in different state-spaces, reflective of what we suggest are distinctly different theories of value. By withholding its awareness of a future state in which a novel form of circus exists that integrates street performance and traditional circus assets, Cirque du Soleil bargains for access to big top circus and street performer resources at a discount. The classic Barney (1986) logic of advantage gained through superior expectations applies, but in BRS, the emphasis is on awareness not information. All parties may possess similar information, but only Cirque du Soleil has awareness of a future state in which street performer and big top circus assets are composed into a novel circus format.

However, much is hidden in the assumption that Cirque du Soleil could actually make a deal with the street performers and circus companies *without* making them aware of the idea. Arguably, this was possible, because the innovation largely involved a simple Schumpeterian recombination that required no major investment or Williamson-like cospecialization (Williamson 1975, Argyres and Zenger 2012) by the street performers or circus companies. But not all theories involve such simple arbitrage or resource recombination. Some theories involve securing resources and then actively recomposing them through ongoing investment and reconfiguration across time (Argyres and Zenger 2012, Wuebker et al. 2023). The challenge is not merely a classic contracting problem with ex post hold-up (Williamson 1975, Klein et al. 1978) where the solution involves simple ownership or employment of resources. Frequently, entrepreneurs must secure and build these substantial cospecialized resources over time, with limited financial resources and with the recognition that sharing awareness about how to more productively use or compose resources may simply lure the collaborating resource providers to independently pursue the entrepreneur's theory, but now with precisely the resources needed to promote its success. How then do entrepreneurs secure the necessary resources from incumbents to pursue their theories, when the primary (or even sole) currency that the entrepreneur possesses is superior awareness of possible states and a theory of how to get there?

3. Superior Awareness and Resource Composition

As an example of the strategic problem we seek to explore, consider Elon Musk's efforts to secure resources for the Tesla startup. When Elon Musk tweets his so called "secret master plan" for Tesla, his need for complementary resource owners was quite different from Cirque du Soleil. He not only needed to design an EV with efficient battery storage, but he needed to acquire vast knowledge from incumbents and others about how to efficiently manufacture automobiles and large batteries, build reliable supply chains, and compose a global recharging network. Initially, particularly as measured on the scale of incumbents in the car industry, Tesla had close to no resources. It had but a vision or theory, a portion of which it laid out in a famous 2006 blog post: "The strategy of Tesla is to enter at the high end of the market, where customers are prepared to pay a premium, and then drive down market as fast as possible to higher unit volume and lower prices with each successive model."[2] As further elaborated, the plan was to build a sports car, use the proceeds to build a more affordable car, and then use those proceeds to build an even more affordable car.

The content of this communication seems strategic, and hindsight suggests it was an accurate reflection of

intent. But also notable is how little it actually revealed of the secret master plan. It merely articulates a goal and highlights where the financial resources to pursue that goal would come from. But much more was hidden, including the causal logic about how to achieve this state. In 2009, Tesla entered into a strategic relationship with Daimler through which Tesla sought to secure critical production and supply chain knowledge and financial resources in exchange for sharing its electric drive train and battery technology with Daimler.[3] To enable the formation of this strategic partnership and secure the needed resources, Tesla shares part of its superior awareness, part of its theory of value, specifically that part consistent with Daimler's own awareness and theory about the future of EVs. Daimler held a belief common among industry incumbents that a disruption in the automotive industry would eventually occur and cannibalize its existing resource base but that the evolution would be slow. Daimler sought to position itself with the resources to succeed in this slowly evolving industry.

3.1. Refining the Concept of Superior Awareness

We argue that Telsa possessed superior awareness of future possible states, including one in which it was the dominant player in a fast-emerging EV industry. Consistent with BRS, we model superior awareness as a capacity to see richer state-spaces, including a capacity to see the state-spaces of those with inferior awareness. But BRS leaves unconstrained and unexplored how this superior awareness relates to correctness of beliefs in generating value. An agent with the ability to see more states may err and attribute high probabilities to states that never materialize. Although the central insight of BRS, the coarse core solution concept, is highly general, the authors call for future work that adds the additional assumptions needed to elevate application, which is precisely what we take up.

Like BRS, unless differently stated, we assume agents are "rational" in a sense that differs from common notions of rationality in economics. Our agents differ in their awareness endowments, or in the states of the world of which they can conceive (Karni and Vierø 2013). However, within their awareness, agents form subjective beliefs about the probability distribution across states and update them in a Bayesian fashion as they gather information (BRS). Throughout our analysis, we assume that communicating a theory perfectly raises the awareness of the receiver, and thus we abstract away from any behavioral bounds associated with communicating or becoming aware of something (Gavetti 2012). Moreover, when we later speak of "making someone aware of A," this means communicating the entire mental blueprint of a causal model: a structured set of what-if statements that renders A true (Felin and Zenger 2017, Ehrig and Schmidt 2022).

Importantly, however, theories are not a fact-based reduction of uncertainty. They provide awareness and, through that awareness, access to information. Conceptually, being aware of A is very different from knowing the odds that A can be made true. One cannot improve knowledge of the odds of A being true without first being aware of A. But one can be aware of A and choose to refrain from efforts to generate information about its validity. The distinction and relation between awareness and information, as well as their possibly asymmetric distribution yields a refinement of the original analysis of Barney (1986) of the antecedents of advantage. We will return to this important point in the discussion.

At the same time, agents will differ in the confidence they place in theories of which they are aware, and in their willingness to question their own theories. By confidence we refer to an agent's translation of available facts into a probability distribution over the states of which the actor is aware. In a companion paper (Ehrig and Zenger 2024) we take up the issue of how exactly theories with their causal logic shape confidence. For the present paper, our analysis of the agents' confidence is verbal. We assume that basic confidence is a product of the logical structure in theories and across theories. Theories may also contradict each other (Ehrig and Schmidt 2022), and these contradictions will also shape the probabilities that agents assign to the states associated with theories. For instance, if incumbents learn of a theory that contradicts their own, they may attribute low probabilities (low confidence) to this contradicting alternative theory.

To advance this paper, we make several important assumptions:

1. There is exactly one entrant with superior awareness: an entrant with a theory that contains elements of a possible future of which the incumbent is unaware and that given access to the necessary resources possessed by the incumbent, the entrant believes it can create. Awareness of this theory is asymmetric. The entrant is aware of the incumbent's theory, but not the other way around.

2. To obtain the envisioned future state, the entrant needs access to resources from the incumbent obtainable through a partnership. Fortunately, the incumbent also perceives that a partnership with the entrant is helpful in preparing for the possible future it foresees. Both parties also have outside options. The entrant could simply continue as a stand-alone start-up and seek to slowly generate the resources it requires. The incumbent could also build the required capabilities, but more slowly on its own. We assume that if the entrant reveals nothing of its theory, the incumbent values its outside option higher than partnering with the entrant.

3. We assume that lying by the entrepreneurial entrant is ineffective, but that the entrant can tell

half-truths in the sense of communicating partial beliefs while keeping other core beliefs secret.

3.2. Tesla's and Daimler's Competing Theories

Before we derive our results more formally, we provide brief sketches of Daimler and Tesla's theories of value, including the logical structure that operates both within and between these theories. Beginning with the incumbent, Daimler envisions a slowly emerging future world of electric engines and electric energy storage in which it enjoys a position of technology leadership. The theory thus contains one assumption that we label *I* that might read as follows:

I: Value capture in a future electric car industry is a capability game, and early insights should be protected by patents. An incumbent which generates the most valuable patents will stay a leading player in the industry.

Daimler's theory and awareness expresses no concern about an alternative ecosystem, with a new entrant building and competing at scale. Instead, it assumes competition will play out as it always has, as technology competition among competitors like Toyota and VW, who build, borrow, and buy new technology.

Tesla, of course, thinks quite differently about the future EV industry. It envisions a future state in which EVs dominate and Tesla is the largest player. To build its envisioned future state, Tesla sees a need to quickly achieve scale, own standards, and secure critical resources from multiple parties. We will focus on Daimler as the source of these resources but recognize that after entering an initial partnership with Daimler, Tesla also partners with Toyota and Panasonic. Tesla's theory of value in the EV industry is composed of two assumptions *A* and *B* and might read as follows:

A: Value capture in the electric car industry is a scale game that generates low-cost vehicle production and low-cost charging. The winner shapes an ecosystem, pushing others to operate on or with its hardware and software platforms and standards. Control of the ecosystem is gained not by owning patents, but by being early to scale with a well-designed system to produce, operate and fuel electric vehicles. Such control demands extensive capital and requires moving early to establish deeply integrated hardware and software platforms that control all components of an electric car and its operation.

B: Entrant and incumbent can learn valuable technologies from each other in designing and producing electric vehicles (e.g., automotive assembly for Model S, battery technology for Daimler Smartcars).

More formally, Tesla believes that if *A* and *B* are true or can be made true that Daimler's envisioned future state, which we label *BigWin*, will occur. In this sense, Tesla believes *A* and *B* are complements or necessary and sufficient conditions to enable *BigWin*.

Our basic theoretical story is to compare the entrant revealing only the *B* element of its theory, a theory element that also complements the incumbent's *I*, with the alternative of the entrant revealing both *A* and *B*. Unlike *B*, the *A* element of Tesla's theory is clearly not consistent with *I* and is accordingly not communicated. We suggest that with this selective communication, Tesla induces Daimler to enter into what Daimler sees as a mutually beneficial partnership: one that complements both *A* and *I* individually.[4] But of course *A* and *I* are contradictory and unable to both be true. When *B* is revealed by Tesla, Daimler sees it as complementary to *I* and that it will allow Daimler to generate what we label as *SmallWin*. Daimler is simply unaware of *A* and its contradiction with *I*.

We also observe the result of Tesla eventually communicating *A* in addition to *B*. In 2016, Musk tweets about plans to build out high-volume manufacturing and announces an intent to make all of its patent's open for others' use.[5] In revealing *A*, the game suddenly changes. In response, Daimler quickly dissolves the partnership and sells its Tesla stock, presumably recognizing the logical inconsistency of *A* and *I*. Moreover, despite now being fully aware of Tesla's *A* and *B* theory, Daimler's decision to sell its equity stake suggests very low confidence in Tesla's theory, even though Daimler's new awareness now allows it to recognize and process a host of information it may have previously ignored.

Note that the mechanism that grants the entrant the capacity to secure *BigWin* is cognitive and reflects confidence in a theory. Moreover, contradiction and consistency (or complementarity) across elements within theories (in our case, *A*, *B*, and *I*) shape this confidence and in turn the bargaining behaviors and outcomes that result across time. Concretely, *B*'s consistency with *I* helps sustain Daimler's confidence in its theory and encourages the partnership, whereas *A*'s inconsistency with *I* enables Tesla's access to *BigWin*.

In the model that follows, we highlight the differences between what amounts to two variants of an unawareness game involving first partial and then complete revelation of an entrant's theory. We then briefly compare these games to the standard value creation and value capture game involving resource differences, which implicitly assumes common awareness and information. In the process, we examine how theories are productively used, how beliefs are updated, and how rents arise in each of three cases.

4. How Should the Entrant Obtain Resources and Secure Rents?

We use the Tesla-Daimler example to illustrate three variants of a simple value capture game that builds on BRS. We begin with the most complex variant and progressively simplify. Our analysis first translates the entrant and incumbent's competing theories into

different awareness structures with subjective probabilistic beliefs about the possible states that these theories reveal. The states that emerge are cognitive constructions from causal logic (Ehrig and Schmidt 2022). For each actor, the states they see are all true or false combinations from the logical propositions (A, B, and I) that comprise the theories that they see: an approach to modeling that resonates with the epistemic assumptions in Felin and Zenger (2017).

Our first game variant involves differential awareness and explores how an entrant with superior awareness from a theory uses partial disclosure of that theory to gather resources, and secure awareness rents. In our example, this variant corresponds to the entrant revealing B but not A.

A second variant of the game assumes the entrant with superior awareness completely shares its awareness with the incumbent (shares both A and B). Now Tesla and Daimler think in or see the same state-space but attribute different probabilities to states based on the information and beliefs possessed. Here the entrant can potentially enjoy what we label "confidence rents," which are rents that may exploit an incumbent's sustained disbelief in an entrant's theory despite full awareness of the theory and the capacity to gather and interpret the same evidence using it. Again, here Tesla and Daimler are equally aware; they think in the same state-space but attribute different probabilities to states based on the information and beliefs possessed.

Finally, in a third variant that parallels the standard value capture game (Brandenburger and Stuart 1996) with common awareness and information, the entrant and incumbent enjoy rents that solely reflect the attributes of the resources possessed by each. This corresponds to the case of the entrant sharing awareness of A and B and both incumbent and entrant experimenting with A, B, and I upfront so they have common estimates of the likelihood of these propositions as they enter bargaining. Under these conditions, rents simple accrue to the party who owns the valuable resources.

4.1. Unawareness Structure Under Two Degrees of Theory Revelation

As noted, our modeling approach builds on both the causal logic of theories as described in the prior section and the BRS conceptual setup of unawareness in a value-added bargaining game. Differences in awareness and theories are modeled as agents thinking in different state-spaces: seeing different possible futures (BRS; Heifetz et al. 2013; Camuffo et al. 2024, this issue).[6] Agents with superior awareness see richer state-spaces, whereas agents with lower awareness see sparser state-spaces that are technically "downward projections" (BRS) of the more expansive state-spaces seen by those with superior awareness. These downward projections thus encode both how the inferior awareness player thinks, as well as how the superior awareness player thinks about the awareness of the inferior awareness player.

Following this intuition, Figure 1 depicts the awareness structure for the first variant of the game where Tesla reveals only B. It depicts two different state spaces that separately reflect the entrant's awareness as various combinations of A, B, and I being either true or false and the incumbent's awareness as various combinations of B and I being true or false. Hence, Daimler sees four states and assigns, as we add later, a high payoff and probability to the state where both I and B are true. Meanwhile, Tesla sees eight states (all combinations of A, B, and I being true or false), but it assigns high probability and payoff to the state where A and B are true. Throughout this paper, $\wedge$ denotes logical "and" and $\neg$ denotes negation. Thus $\neg A$ means A is

Figure 1. (Color online) Awareness Mapping Daimler/Tesla Revealing B Only

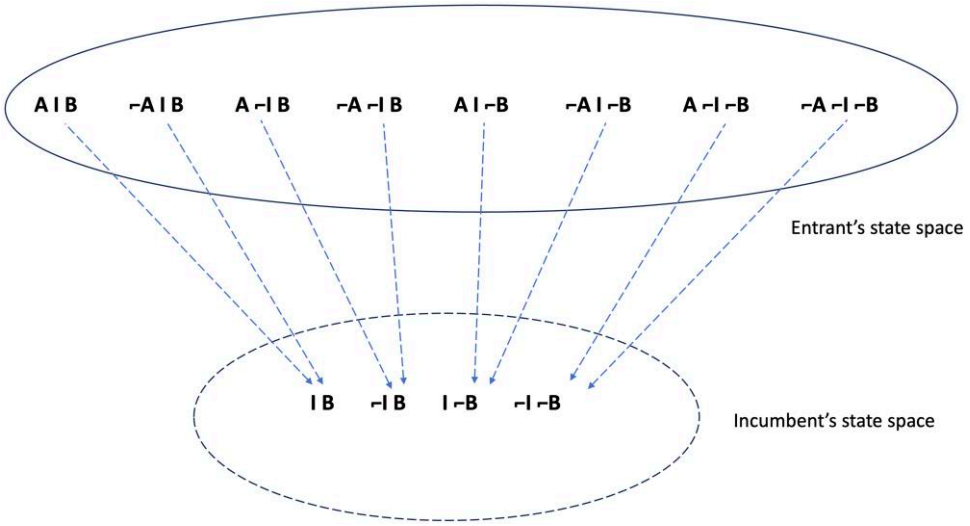
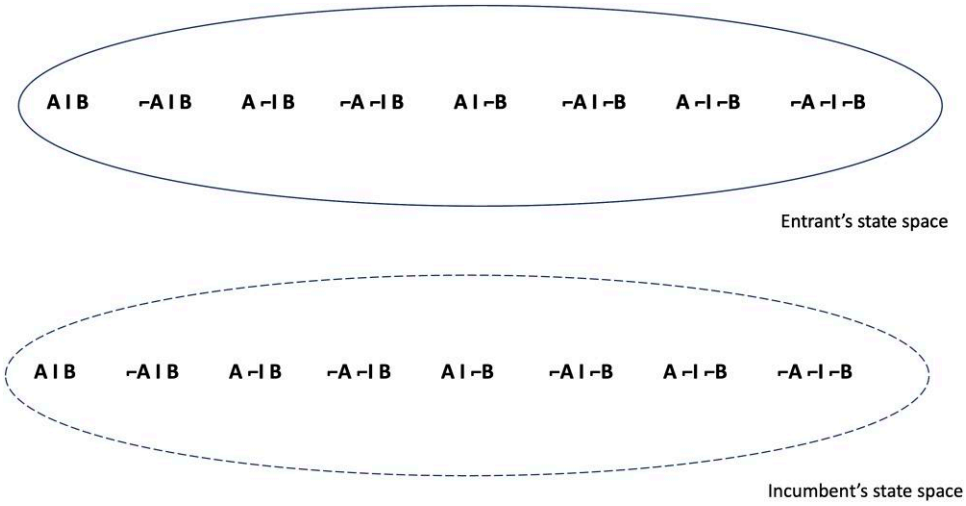


Figure 2. (Color online) Awareness Mapping Daimler/Tesla Revealing A and B (Complete Revelation)



false. In the figures we depict vectors of atomic states, and in the tables we characterize states by logical sentences over atomic states. Thus, the vector AIB is formally equivalent to the state defined by the logical sentence $A \wedge I \wedge B$. After Tesla reveals A in 2016, the unawareness structure between Telsa and Daimler transitions to Figure 2 where both parties see the same states, although as we later discuss and display, their assigned probabilities may differ.

4.2. Coarse Core Solution Concept

What do these sketched asymmetries in awareness imply for a potential Daimler-Tesla partnership and the value created and captured? To analyze this, we combine state-spaces formed from true and false assumptions with the BRS coarse core solution concept. Conditional on their awareness, agents are still uncertain as to which states in their awareness will be true, but they have a probability distribution over them. For our modeling, the entrant also knows that because of its own superior awareness including its knowledge of how the underlying assumptions A, I, and B interact, that the incumbent has a different distribution over the awareness states that incumbents and entrants share. However, the incumbent who is unaware of A errantly thinks that the entrant also thinks with the same inferior awareness and assigns the same subjective probabilities across these lower awareness states.

The rest of the coarse core solution concept follows the logic of standard value capture theory (Brandenburger and Stuart 1996). To model this, we add probabilities and payoffs that different coalitions can capture across these state-spaces. By specifying the value creation potential for alternative coalitions, bounds on value capture by single agents are derived, as some single agents with more unique contributions can leave coalitions for others, whereas others cannot. Value capture is thus basically a function of value creation possibilities shaped by bargaining (Gans and Ryall 2017).

For value capture under unawareness, the twist here is that we can encode that different awareness levels imply different sets of states, different subjective probabilities across these states, and different projected value within each state that depend on whether they partner or choose to go it alone. We again remind the reader that the BRS structure imposes constraints on interactive awareness but does not specify "who is right" in terms of believed value capture possibilities and confidence in them. But the BRS technology allows us to encode assumptions about this, and this is what we do. As noted, the agent with superior awareness, in our case, Tesla, thinks in a state-space that reflects A (or $\neg A$) as well as B and I, whereas the agent with lower awareness, Daimler, thinks in a state-space that does not reflect the existence of A but rather thinks in states determined solely by B and I. Importantly, if an agent is unaware of a state, it the agent cannot think about its negation either, nor can the agent form a probability estimate for events involving it. Thus, unawareness is very different from probability zero. Below we explore this difference in comparing awareness rents and confidence rents, where one is derived from belief strength or superior information and the other from superior awareness.

Now we have all that we need to conceptually describe a coarse core. At each state, in each awareness level, agents consider two conditions: first that the value divisible at each state is bounded by the joint value created and second that no group of agents can leave the coalition of agents and find an alternate one that allows for greater value capture than is available in the present coalition (the no blocking condition). The first condition simply means that for each actor at each

Table 1. Ex Ante Probabilistic Beliefs Given Daimler's Awareness and Theory

State	$I \wedge B$	$\neg I \wedge B$	$I\neg \wedge B$	$\neg I \wedge \neg B$
Probability	0.4	0.1	0.4	0.1

state, no more value can be divided than the payoff included in the table of value creation possibilities that it sees. The second simply means that the value distribution that actors agree on, given that they decide to partner up, must give each of them (in expectation) more value captured than their outside option (in expectation); otherwise, they would simply not partner but instead choose the outside option.

5. Differential Awareness, Resources, and Awareness Rents

We now encode agents' subjectively believed value capture possibilities and their confidence in them. We then compare the three games announced above, starting with the first where the entrant reveals only its theory part B and not A.

5.1. Translating Theories into Awareness and beliefs

By translating theories into an awareness of state-spaces with payoffs and classic Savage-like (Savage 1956) probabilities across states, we allow agents to think in lotteries that sum to one. We start with Daimler. As a baseline and as shown in Table 1, Daimler is highly confident of its assumption I, to the tune of assigning it an 80% chance of being true. Thus, the probabilities of states where I is true sum to 0.8. Moreover, based on the theories' logic, we assume that Tesla's B is consistent with Daimler's I, but Tesla's A is not consistent with I. Tesla's complete theory of value creation is thus contrarian relative to the incumbent's (Felin and Zenger 2017), but there is a component B of its logic that is consistent with Daimler's theory. Daimler believes B may help accelerate its capacity to achieve *SmallWin*. However, because Daimler has had no time to experiment with and evaluate B, we assume Daimler assigns maximal uncertainty or entropy to B (in a probabilistic sense), assigning it a 50%/50% chance of being true (or false). This logic yields Table 1.

Tesla is even more highly confident in its theory about the future of the EV market than Daimler (i.e., its probabilities across states are more concentrated on high payoffs). Thus, states in which A and B are both true have high weights in Tesla's subjective probability distribution that corresponds to Tesla's awareness. However, Tesla's assumption A and Daimler's I contradict each other. As a consequence, logic argues that states in which A and I are both true are impossible and thus have probability zero. Moreover, Tesla estimates that $A \wedge B$ is highly probable, meaning $\neg A \wedge B$ must be quite improbable. Again, the above logic yields Table 2 that reflects Tesla's awareness, beliefs, and assigned probabilities (or confidence) across states.

Table 3. Daimler's Beliefs About the Value of Coalitions

Groups	$I \wedge B$	$\neg I \wedge B$	$I \wedge \neg B$	$\neg I \wedge \neg B$	Lottery #
D, T	*lOut*	*Out*	*Out*	0	1
D	*Out*	0	*Out*	0	2
T	*Out*	*Out*	0	0	3
Probability	0.4	0.1	0.4	0.1	

5.2. What Theories Imply for Anticipated Value Creation

Although theories define state-spaces and the most probable states, theories also highlight subjective beliefs about the payoffs associated with each state. As noted, our modeling approach encodes causal theories into believed value creation possibilities: an extension beyond BRS. However, the BRS awareness hierarchy modeling creates bounds on the higher-order beliefs. Thus, the entrant sees greater value creation states and sees what the incumbent sees but not the reverse.

We then display the state-dependent characteristic functions implied by agents' theories. We start with the inferior awareness of the incumbent, Daimler, and the imagined state-dependent characteristic function associated with this awareness (Table 3). D denotes the incumbent ("Daimler"), and T denotes the entrant ("Tesla"). We denote with *Out* (or the outside option of the incumbent), the value Daimler believes it can generate on its own in playing a niche strategy game.

To keep things simple, we assume that Daimler thinks that if B is correct, Tesla can also make *Out* with its own niche strategy. Thus, Daimler thinks of Tesla's outside option as a lottery that would yield $0.5Out$ in expectation, because it believes B only materializes with probability one half, and because in Daimler's thinking, Tesla only captures *Out* if B is true.

But Daimler also believes that the partnership will accelerate its own capabilities in critical EV technologies, particularly batteries and drive train development, and

Table 2. Ex Ante Probabilistic Beliefs Given Tesla's Awareness and Theory

State	$I \wedge B \wedge A$	$\neg I \wedge B \wedge A$	$I \wedge \neg B \wedge A$	$\neg I \wedge \neg B \wedge A$	$I \wedge B \wedge \neg A$	$\neg I \wedge B \wedge \neg A$	$I \wedge \neg B \wedge \neg A$	$\neg I \wedge \neg B \wedge \neg A$
Probability	0	0.9	0	0.02	0.02	0.02	0.02	0.02

Table 4. Tesla's Awareness About the Value of Coalitions

Groups	$I \wedge B \wedge A$	$\neg I \wedge B \wedge A$	$I \wedge \neg B \wedge A$	$\neg I \wedge \neg B \wedge A$	$I \wedge B \wedge \neg A$	$\neg I \wedge B \wedge \neg A$	$I \wedge \neg B \wedge \neg A$	$\neg I \wedge \neg B \wedge \neg A$	Lottery #
D,T	*BigWin*	*BigWin*	*Out*	0	*lOut*	*Out*	*Out*	0	4
D	$\frac{BigWin}{d}$	$\frac{BigWin}{d}$	*Out*	0	*Out*	0	*Out*	0	5
T	*Out*	*Out*	0	0	*Out*	*Out*	0	0	6
Probability	0	0.9	0	0.02	0.02	0.02	0.02	0.02	

will thereby generate *SmallWin*, which we measure as l times the value of its outside option, or *lOut*. For convenience, when both Daimler's I and Tesla's B are true, we can think of l being close to three, meaning Daimler and Tesla as partners can together generate roughly three times as much value together as Daimler can on its own. Table 3 combines the payoffs for alternative coalitions across different states that Daimler perceives with the probabilities that Daimler assigns to these states from Table 1.

But, as encoded in Table 4, with four additional states, Tesla sees with more awareness than Daimler. We denote the value of succeeding with the scale game that Tesla envisions as *BigWin*. We assume that *BigWin* is orders of magnitude larger than *Out* (perhaps by a factor of 30). Tesla is highly confident in its theory A and assumes that *BigWin* will materialize, as long as it gains access to the key resources particularly those from Daimler that the theory demands. Thus, Tesla attributes a high probability of 0.92 to states in which A is true. Table 4 also shows a pivotal feature of the unawareness modeling technology. Tesla is aware that Daimler could generate $\frac{BigWin}{d}$ on its own if A materializes and if it were aware of A, essentially the *BigWin* payoff deflated by d, a parameter that measures Tesla's initial resource endowment or a measure of its *material* added value. If Tesla's tangible resources are close to zero, then d is close to one, whereas if Tesla's added value is substantial, d is well above one. However, Tesla is aware that Daimler only sees the lower state-space and does not see A and thus also not $\frac{BigWin}{d}$.

5.3. Value Capture

The analysis of expected value capture for the entrant and incumbent follows the coarse core logic of BRS. As noted above, the coarse core defines payoffs that match two constraints: (1) that value creation from the coalition is available to distribute and (2) that competitive constraints are met, meaning that no agent in the coalition is better off leaving the coalition. However, these constraints must be met *in the perspective of every agent*.

From Table 3, Daimler's perspective, Daimler and Tesla can jointly create as much value as *SmallWin* or *lOut* in state $I \wedge B$. By contrast, from Table 4, Tesla's perspective, Tesla and Daimler can generate a much larger joint value creation of *BigWin* to divide in states where A and B are true.

We start with analyzing what the two constraints imply in Daimler's perspective. Daimler compares the value capture of partnering with Tesla, as a lottery in probabilities and payoffs across states, with the value of its outside option. From Table 3, this means Daimler compares lotteries 1 and 2. Note that here Daimler *does not* think about the possibility of creating $\frac{BigWin}{d}$ on its own from Table 4 (lottery 5), as Daimler is simply not aware of A.

In considering lottery 1, Daimler thinks the partnership will generate in expectation $0.4lOut + 0.5Out$, calculated by simply matching probabilities and payoffs within the table. To determine whether this is more than its lottery 2 (what Daimler thinks it could make alone), Daimler needs to think about how much Tesla will be able to capture from lottery 1 if they partner. In considering this, Daimler thinks that Tesla also only sees Table 3, and not Table 4. We assume that not only does Daimler think that Tesla thinks in Daimler's same state-space (that is implied by Figure 1) but that it also believes that Tesla assigns the same probabilities and payoffs to states when evaluating whether to partner or go it alone. Thus, Daimler also thinks that Tesla considers its outside option as $0.5Out$, captured as lottery 3 in Table 3. Thus, Daimler thinks that Tesla agrees to partner if it gets more than its outside option of $0.5Out$ in expectation.

Comparing lotteries 1, 2, and 3 of Table 3 makes clear that Daimler expects Tesla to partner if Tesla gets more than 0.5 Out in expectation, and dividing lottery 1 in this way yields enough upside in profits for Daimler beyond its outside option lottery 2. Thus, based solely on Table 3, Daimler seeks to partner and believes Tesla will also if l is bigger than 2.

But, of course, Tesla is interested in the partnership for much bigger reasons. Tesla sees Daimler's reasoning, but it also see an alternative theory with additional states and payoffs, which it will keep to itself. In particular, Tesla sees lottery 4 in Table 4 but also lottery 6 that encodes that Tesla has no chance to get *BigWin* alone. To access lottery 4 and gain a large share of its payoffs, Tesla needs Daimler to partner, and to *not block* a division of lottery 4.

Importantly, if Daimler was aware of Tesla's theory and the additional states of Table 4, it would also see lottery 5 that it can access on its own, with its attractive payoff of $\left(\frac{BigWin}{d}\right)$. Depending on the magnitude of d, Daimler's go-it-alone lottery 5 option is quite attractive,

presumably far more attractive than its lotteries 1 or 2 from Table 3. Were it aware of this lottery 5, it could bargain for a much larger share of lottery 4.

Daimler will not block the partnership as long as it thinks in Table 3 and l is large enough. Tesla will thus be very happy to let Daimler think in the restricted logic of Table 3. The key point is that state A is not contracted on, only I and B. But the partnership will enable Tesla to build resources that allows it to capture most of *BigWin* if A materializes.

There are, of course, clear implications for a contract that might be drawn to support the partnership. The fact that Tesla and Daimler see different state-spaces will profoundly shape any such contract. Tesla will want to ensure that Daimler has no claim on payoffs in states that Daimler is unaware of. Fortunately for Tesla, Daimler's unawareness of *BigWin* and how to achieve it makes this quite feasible. Daimler simply thinks that the bilateral partnership for which it is contracting has the potential to generate value in expectation of $0.4lOut + 0.5Out$ to divide with Tesla. As long as l is >2, then Daimler sees that there is sufficient value generated in expectation for both Daimler and Tesla to receive above the outside options that Daimler perceives: $0.5Out$ (see lottery 3 in Table 3) for Tesla and $0.8Out$ for Daimler (see lottery 2). Thus, Daimler is not surprised that Tesla willingly signs a partnership contract given the coalition value alternatives and probabilities that it sees. But to win this scale game and capture most of *BigWin* anticipated in A, Tesla must also minimize the equity it grants to Daimler in the partnership agreement as this also becomes Daimler's claim on *BigWin*. Nine percent was Tesla's actual agreement with Daimler.

5.4. Generating Awareness Rents

We summarize the discussion above into our first proposition. All three of our propositions seek to promote conceptual insight surrounding how firms compete with theories using simple formal results that combine our modeling of theories and state-spaces with the awareness rent logic of BRS.[7]

In our setting, under standard value creation-capture assumptions of common awareness and beliefs, our entrant can only capture value if its resource value added as measured by d is above one. However, with unawareness and partial revelation, the entrant can both obtain resources and capture rents. The formal aspect of our Proposition 1 is simple. We assume that the high payoff state that the incumbent sees, *SmallWin* or *lOut*, is much smaller than *BigWin* (say, *BigWin* is at least 10 times larger), and that Daimler cannot claim more from the partnership than $0.4lOut - 0.5Out$ in expectation simply because this is the value Daimler believes Tesla and Daimler can create together. But Tesla's awareness reveals *BigWin* when A and B are true with 90% probability, which implies that Tesla can in expectation obtain at least $\frac{9}{10}$ *BigWin* $-(0.4lOut - 0.5Out)$, if Daimler partners up. This means, Tesla can capture most of *BigWin* if it somehow lures Daimler into the partnership. Thus, managing Daimler's inferior awareness and belief so that the partnership will materialize is more important to Tesla here than details in the contract about the division of *lOut*. The entrant must simply convince the incumbent to see the gains from a partnership. In this sense, B must be both consistent with *A and I* to have the persuasive power to lure the incumbent into pursuing the partnership. We summarize as follows.

Proposition 1. *The entrant can obtain the resources it needs from the incumbent to create BigWin and capture most of it by communicating only B (not A), as long as B is consistent with both A and I, and the incumbent thinks that implementing B through a partnership yields greater value than the incumbent's perceived outside going-it-alone option.*

Note that Proposition 1 is conceptual and goes beyond BRS. It is based on the possibility of awareness rents logic of BRS's proposition 1 but highlights how logical relations among theories shape cognition and beliefs about payoffs and probabilities in ways that determine outcomes. For awareness rents to occur, B needs to be consistent with or complementary to I and A and with an expected payoff by Daimler sufficient to motivate the partnership that generates *BigWin*. As discussed, the formal logic of Proposition 1 is that entrant and incumbent have different theories. Tesla knows that Daimler thinks in the small table of lotteries, whereas Daimler cannot think about Tesla's big table of lotteries. Tesla can propose a contract to Daimler that makes Daimler happy in its small world and allows itself to enjoy the *BigWin* payoffs of the larger table. Tesla is aware of contingencies that could be contracted on from the big table, but leaving the contract incomplete in regard to large world outcomes allows Tesla to both keep these states secret and capture most of the payoffs that it believes will emerge.

6. Shared Awareness, Resources, and Confidence Rents

We now turn to our second game: a game with shared awareness and differing beliefs. Under some circumstances revealing only B may be insufficient to entice the incumbent to partner and share resources. For instance, the incumbent's relevant in-house resources could be considerable and the added value of the partnership under B and I too modest to entice the incumbent to partner. Or, the incumbent may mistrust the capabilities of the entrant, diminishing the l multiplier, that entices the partnership. What could the entrant then do further to enable the partnership and jointly create *BigWin*?

One obvious possibility is to reveal the entire theory, A and B, to the incumbent along with all details. Of course, this allows the incumbent to see the causal path to *BigWin* embedded in A. But A also contradicts I: the theory that the incumbent believes. Accordingly, the incumbent may attribute a low, although still positive, probability to A being true. This low probability may reflect several factors. First, Daimler may lack information that Tesla has already accumulated about its theory. Second, Daimler may simply disbelieve or lack confidence in the logic of A. Third, Daimler may simply have had insufficient time to learn about and gain confidence in A. Accordingly, the incumbent's perceived lottery across the full set of states it now sees may look something like Table 5. Now both Tesla and Daimler see the same states, but Tesla thinks A is probably true. Daimler sees it as likely false as shown in Table 4. Tesla sees I as false, whereas Daimler sees it as true. Both recognize that A and I are contradictory (unable to both be true), and both see B as likely true. It is this logical structure of the competing theories, but now with full awareness (of states), that is reflected in Table 5.

Very importantly, although Daimler may reject Tesla's fully revealed theory and disbelieve the logic, as reflected in the very different probabilities Daimler assigns to states (compare Table 5 and Table 4), Daimler can now follow Tesla's logic. Daimler and Tesla now share awareness (see the same states) but differ in confidence (different probabilities in Table 5 and Table 4) Thus, Daimler is aware that if Tesla's theory A would indeed be true, the value creation and capture possibilities are the ones encoded in Table 4. Hence, Daimler is not just aware that if A materializes, *BigWin* results, and it can contract to share it, but it is also aware that it could generate $\frac{BigWin}{d}$ on its own. Accordingly, Daimler's rational response would be to bargain for a share of *BigWin* if it materializes and to gather evidence to test A or test its logic for disbelieving A. This additional payoff, although Daimler sees it as low probability, further enhances its interest in partnering.

In fully revealing A and B to Daimler, we now face a game with symmetric awareness but divergent beliefs about probabilities or confidence in theories, particularly the probabilities assigned to *BigWin* and *SmallWin* states and payoffs. Tesla is very confident in A (Table 4) and attributes a mere 2% chance to A being false, while $I \wedge B$ are true and thus only a 2% chance that the payoff from Daimler and Tesla collaborating will be *lOut*. The picture is flipped for Daimler. Daimler is not confident at all about A, assigning it a 5% probability, but attributes a 45% chance to generating *lOut* if I and B are both true and A is false and a 45% chance to generating *Out* together if only I is true. In this sense, Daimler and Tesla have very different levels of confidence in each others' theories. But now, the source of potential rents is not about awareness but rather about beliefs, including the poorly informed low level of confidence in Tesla's *BigWin* theory.

Relative to our prior game of differing awareness, here the range of potential payouts to both agents is wide ranging. As before, if both agents partner up, they cannot capture more than *BigWin* given A. Daimler can capture $\frac{BigWin}{d}$ on its own, given A, and is now aware of this. Moreover, competitive consistency requires that Daimler compare the odds of value creation and capture while partnering up with Tesla with the odds of creating and capturing value on its own. However, ex ante, Daimler attributes a mere 5% chance to A being true, and thus given its beliefs, captures but a small fraction of $\frac{BigWin}{d}$ in expectation.

In their decision whether to partner up, both agents compare their odds of capturing value on their own with the odds of value capture in the partnership. In cooperating, Daimler and Tesla could agree to give all value capture in states where A is untrue $\neg A \wedge I \wedge B$ and $\neg A \wedge I \wedge \neg B$ to Daimler and a substantial fraction of *BigWin* to Tesla in states where A proves true. Daimler sees its outside option in going solo as generating $0.9Out + 0.025\frac{BigWin}{d}$. If Tesla agrees to give all of *SmallWin* or *lOut* to Daimler under $\neg A \wedge I \wedge B$ and Daimler believes this state has probability 0.45, the expected value capture in this state alone if l is large enough is potentially bigger than the going it alone outside option of $0.9Out + 0.025\frac{BigWin}{d}$. Thus, the core interval could contain agreements in which Tesla and Daimler both capture a significant part of *BigWin*. However, as Tesla's outside option is weak, and Daimler knows this, there is no guarantee for Tesla to capture a significant part of *BigWin*, even if Daimler is stubbornly wrong about the probability of A being true. Even if l is large, the core interval also contains allocations in which Tesla does not get a big share of BigWin. Again, the variances in potential payouts to each party are quite substantial.

Table 5. Daimler's Ex Ante Probabilistic Beliefs Given Full Theory Revelation

Groups	$I \wedge B \wedge A$	$\neg I \wedge B \wedge A$	$I \wedge \neg B \wedge A$	$\neg I \wedge \neg B \wedge A$	$I \wedge B \wedge \neg A$	$\neg I \wedge B \wedge \neg A$	$I \wedge \neg B \wedge \neg A$	$\neg I \wedge \neg B \wedge \neg A$
D, T	*BigWin*	*BigWin*	*Out*	0	*lOut*	*Out*	*Out*	0
D	$\frac{BigWin}{d}$	$\frac{BigWin}{d}$	*Out*	0	*Out*	0	*Out*	0
T	*Out*	*Out*	0	0	*Out*	*Out*	0	0
Probability	0	0.025	0	0.025	0.45	0.025	0.45	0.025

As in our first game, Tesla can still capture more value than Tesla adds in expectation: a result that is consistent with and formally proven by BRS in the first part of their proposition 1. What we add in our conceptual Proposition 2 is to make sense of this formal result in the context of a resource-barren entrant who needs an incumbent to create the BigWin but must also reveal its theory of value to secure the incumbent's collaboration.

Proposition 2. *If the entrant has few valuable resources (i.e., d is close to one), the entrant can partner with the incumbent to create BigWin and capture part of it, by communicating both A and B, but only if the incumbent disbelieves A due to its inconsistency with I, and the incumbent lacks the time to learn otherwise. Nonetheless, because the incumbent is now aware of BigWin and aware of the entrant's weak outside option, the entrant is now in a much weaker bargaining position to capture a large share of BigWin.*

We call these confidence rents: rents that accrue to actors with shared awareness when one actor's greater confidence in a theory proves correct. In our example, Tesla after sharing its full theory may still enjoy confidence rents, if Daimler, due perhaps to a strong belief in its own theory, incorrectly assigns low probability to the *BigWin* states of Tesla's theory. Daimler's lack of confidence in Tesla's theory may either reflect the incumbent's belief strength, resulting in an unwillingness to question its own theory (I) or an unwillingness to experiment with the alternative theory (A).

Relative to awareness rents, confidence rents for the entrant are more uncertain in magnitude. Although entrants can capture a large share of a *BigWin* payoff, this is not guaranteed. There is a wide range of bargaining outcomes that could result in this game. The entrant could potentially capture considerable confidence rents if the entrant strongly believes in a correct theory that the incumbent is now aware of but disbelieves. Or, the bargaining result for the entrant could be more modest, receiving only a little beyond its very low outside option. This uncertain bargaining outcome does not necessarily change based on how low of a probability that Daimler assigns to A. We can now make our notion of confidence rents precise. Confidence rents are the substantial shares of *BigWin* that the entrant can capture, despite joint awareness of A and any material value added by the entrant. Our analysis shows that confidence rents are brittle: a reflection of misplaced belief in I, essentially agreeing to disagree despite having the same awareness (Aumann 1976).

Note as well that here the contracting process plays out with all contingencies known to both parties. They know that one of them will win and one will lose based on how these divergently believed probabilities play out. Yet, they may still partner up. What is striking is that even though there is this possibility that Tesla can enjoy confidence rents, betting on this possibility by revealing both A and B is a bet on the inertness of the incumbent's beliefs. Moreover, the incumbent is also now aware of the entrant's bargaining weakness, and even though it disbelieves the entrant's theory A, the incumbent may bargain to capture value with such aggression that it simply discourages the entrant's pursuit of *BigWin*.

It is interesting to note that by 2014, the Daimler/Tesla case had essentially transitioned from our initial game of unawareness and awareness rents to a game of full awareness with potential confidence rents. In 2014, Tesla essentially revealed some version of A to Daimler as it announced the construction of its Gigafactory to build EV batteries, along with an announcement to make its patents all open access. These moves not only revealed A but confirmed a disbelief in Daimler's I. Notably even with this partial revelation of A, Daimler seemed to stubbornly disbelieve A and its *BigWin* possibility. Daimler accordingly cashed out its 9% equity stake in Tesla. Although Daimler received a very handsome return of $780 million from the equity's appreciation through 2014, the return was nowhere near the return that would have been possible just a few years later as the market began to see the merits of A and its *BigWin* potential.

What are the origins of Daimler's misguided beliefs even after the full Tesla theory was revealed? Of course, the final story is also not written here, and there is much history to play out. Daimler may well have absorbed all relevant evidence revealed by the Tesla theory, yet still disbelieved the theory to the point of seeing the capital markets as overvaluing Tesla's theory: overweighting the probability or payoff of Tesla's *BigWin*. They may have believed that the strategic game in EVs would eventually reveal I to be true, and that EVs would be a game of technology and patents.

7. Shared Awareness, Common Information, and Resource Rents

Standard value capture theory assumes that all agents share the same awareness or theory, the same confidence in it, and the same access to information. To complete our analysis, we consider a familiar third value creation and capture game in which actors share both common awareness of states and share a common probability distribution across them. Although this is different from standard value capture as there is standard probabilistic uncertainty (standard value capture theory does not introduce such uncertainty; this too is the contribution of BRS), shared awareness and shared confidence imply a spiral back to the logic of standard value capture theory. In this final game, Daimler and Tesla agree on probabilities and share the

same awareness. Thus, entrant and incumbent now agree on Table 4, and their "confidence" in the outcomes is identical.

Both entrant and incumbent are now equally confident in *A*. If *d* approaches one (i.e., Tesla has no initial resource value added), the entrant will capture close to nothing from *BigWin*, as Daimler could break any agreement, giving Daimler most of *BigWin* by threatening to just create $\frac{BigWin}{d}$ on its own without partnering up. Thus, we are back to a resource logic here. Unless Tesla is objectively adding value (thus, *d* is substantially bigger than one), Tesla will not capture value in a situation of common awareness and common beliefs.

Proposition 3. *If both entrant and incumbent are confident about A, and the incumbent can capture* $\frac{BigWin}{d}$ *on its own given A, then if d is close to one, the entrant will capture close to no value.*

If entrant and incumbent agree on probabilities and share awareness, then they agree on the expected value capture of the entrant on its own, the incumbent on its own, and the expected joint value capture. If *d* is one, the entrant brings no unique resources to the table, then the expected value capture of the incumbent on its own is the same as the expected value capture of the incumbent and entrant together. Under these conditions, the incumbent would block any allocation of value to the entrant.

8. Discussion

At a high level, our results describe how firms lacking resources can secure them and generate substantial rents through the full or partial disclosure of their firm-specific theories (Felin and Zenger 2017). They do this by exploiting superior awareness that theories may provide or by exploiting superior means or efforts to calibrate confidence in a theory. Our results take important steps toward formalizing the substantive differences among three types of rents: awareness rents, confidence rents, and resource rents. However, much remains to be done as the endeavor to differentiate among such rents highlights foundational questions in strategy. The extended example in this paper outlines key conceptual issues in understanding these distinct types of rents. Awareness rents derive from a firm's capacity to develop and communicate theories as causal logic: a capacity to thereby see state-spaces that are completely outside the awareness of other actors, as well as a means to achieve them. Actors able to see valuable states and causal paths to achieving them can potentially secure resources from incumbents and others at prices that reflect the lower awareness of those with whom they negotiate and build partnerships. By contrast, confidence rents arise in settings where actors share similar awareness, but where one actor is superior in calibrating confidence in a theory that proves correct: in learning the appropriate probabilities to assign to states based on logic and evidence. By building on the logic of the theory-based view and the awareness modeling of BRS, our aim has been to deepen an understanding of how firms compete for resources and rents.

8.1. Awareness and Confidence Rents: Contributions to Value-Added Logic Beyond BRS

Our discussion of awareness and confidence rents extends in important ways beyond the central claim of BRS that "it is possible" for a firm under conditions of incomplete information or awareness to capture value beyond their resource added value. Although BRS provides an important proof of concept, they left for future work the articulation of constraints under which these "possible rents" actually occur. We derive our results by adding additional assumptions beyond BRS, and in doing so, we respond to their call for future work that fills in "appropriate characteristic function[s]" for the "application[s] being modeled" (p. 173).

With the introduction of a modeling approach where the logical assumptions of theories define state-spaces, we introduce causal logic and theories (Felin and Zenger 2009) as the mechanism by which actors obtain superior awareness, generate states, and secure awareness rents. Additionally, we use the notion of confidence in theories, rather than mere information, as a second source of rents: what we call confidence rents. As discussed, Tesla possesses superior awareness and confidence in its theory *A*. As a consequence, Tesla, even if it shares its theory, may still enjoy rents due its well-calibrated confidence in its theory. With our additional assumptions, we generate normative implications as well. Entrants with imaginative, but strong logical reasons to support the high payoff states that they envision should pursue awareness rents. Those lacking superior awareness but who believe that their calibration of confidence through empirical testing is superior should pursue confidence rents.

Although BRS introduces a hierarchy of state-spaces, with agents in richer state-spaces being superior in awareness as they see more states than inferior agents, they *do not* require that agents with superior awareness see a more correct characteristic function or are endowed with a superior calibration of confidence. "Superior" in BRS is superior with respect to the vocabulary that agents have to speak about the world or to see state-spaces. But BRS imposes no constraints as to who has calibrated probabilities correctly and how well the envisioned characteristic functions match with objective ex post outcomes of value creation.

To address these limitations, we explore differing assumptions in which actors differ in the richness of their causal logic that grants awareness and then

differences in their capacity to calibrate confidence in this causal logic. Although a full analysis of the implications of unawareness and asymmetric confidence between entrant and incumbent requires an even more comprehensive examination of all combinations of inferior and superior among relevant dimensions, our aim has been a step toward more clearly separating these two forms of rents, both from each other and from standard resource rents.

An important conceptual insight of our paper is that confidence rents may be more prevalent in reality than awareness rents, even though confidence rents are theoretically very brittle. In our example, one might ask while reading the "reveal only *B*" section: Given that Daimler and Tesla were strategic partners, routinely visiting each other, why would Daimler not quickly find out about *A* and renegotiate while Tesla was still resource constrained? From our story, the simple answer may be that Daimler strongly believed in *I*, and *I* simply contradicted *A*. Therefore, what delivered Tesla's success may simply have been Daimler's enduring confidence in *I* despite an awareness but lack of confidence in *A*.

8.2. Confidence, Awareness, and Rethinking Strategic Factor Market Logic

A full formal analysis of awareness and confidence rents points to a broad research agenda in strategy rather than a pair of papers. In particular, engaging with awareness and confidence rents highlights a need to rethink the superior information logic that undergirds the most common applications of the resource-based view (Barney 1986). Strategic factor market logic is conditioned on rational expectations, which assumes that all agents share the same model of factor markets, or as Tom Sargent explains, "the powerful and useful empirical implications of rational expectations … derive from [a] communism of models" (interview in Evans and Honkapohja 2005, pp. 566–567). In other words, the resource-based view (RBV) is conditioned on a model of market efficiency in which prices reflect all available information, and opportunities for rents or arbitrage arise from securing new information. Accordingly, "mispricing" in factor markets reflects heterogeneous information.

But, as Fama (2017), an inventor of the efficient market hypothesis and its tests, has argued, there is a "joint hypothesis problem" when testing the efficiency of capital markets. Anomalous market returns cannot be classified as mispricing without identifying a specific market model against which deviations are measured. The same applies to evaluating mispricing in factor markets. With a different model of factor markets, perhaps one based on theories and awareness, and not mere information, factor markets may reveal extensive mispricing, because what one observes as relevant information and evidence is conditioned by the model or theory one sees. In our setup, if entrant and incumbent see and/or believe different theories, they see distinctly different value in factors markets, with precisely the same information. Thus, without a theory for rational calibration of confidence in one's theory (Ehrig and Schmidt 2022, Ehrig and Zenger 2024), we cannot say how information should rationally be mapped to a probability distribution over states. Correspondingly, bargaining situations within factor markets may create "value illusions." Both parties may well believe they have a superior probability distribution on which to act and may accordingly agree to a distribution of value that, in expectation based on their own beliefs and calculations, will let both of them win, even though logically one of them has to lose.

This problem is not new to finance and economics scholars. Value illusions have been described by others (Simsek 2013, 2021). However, the corresponding implications for factor markets are not worked out. We thus invite formal work that explores in greater detail how in light of a particular model or theory, superior information, superior theories, and superior confidence calibration technologies are used to form "superior expectations" that can be used to secure resources and rents.

8.3. What Is Rational, Really?

The complexities introduced by uncertainty about the right theory or the correct way to map information to states revealed by a theory begs the question of what rationality is. The efficient market logic of informational efficiency implies a logic of behavioral over- and under-reactions to information, which links to the concept of "irrational overconfidence." But, of course, in a world of multiple models held by market actors, what is over and under confidence in a theory or under or over reaction to information is problematic to discern. Any updated normative theory of strategic behavior in strategic factor markets must delineate a more nuanced notion of rationality. Rationality should extend to rational testing of theories, rational theory revision processes, and rational ways of mapping information to distributions from theories. Although we have sought to make some initial headway, this too is an avenue for future work.

In the confines of our extended example, one might argue that an economic actor is "irrational" when it fails to re-evaluate facts in light of becoming aware of a new theory. Although we have emphasized rational explanations for Daimler's belief strength in its own theory or its lack of sufficient time to learn as explanations for it ignoring the Tesla theory, once it was revealed, there is of course an alternative story. Daimler may have acted "irrationally" in failing to reinterpret the evidence and information that it had already

accumulated in light of the new Tesla theory. In 2014, when Daimler learns that Tesla was betting on the EV industry playing out as a scale game, Daimler's rejection of this conjecture and its unwillingness to reinterpret data about Tesla's growing success or the stock market's favorable response and its failure to retain its equity in Tesla could also be labeled as irrational. Daimler was now aware of Tesla's theory and could arguably in light of that theory see evidence that the conjecture could be true. Perhaps, Daimler should have at least experimented with the reasons that it had for why Tesla's theory *A* was false (Ehrig and Schmidt 2022). Arguably, Daimler's decision to sell its Tesla share suggests that Daimler was unwilling to test and compare its patent game theory *I* with the scale game theory *A*: a violation of the maxim – do not reject a contrarian theory without a reason put forward by Ehrig and Schmidt (2022), which we see as a violation of rational versatility in thinking (Gärdenfors 1988). The important idea here is that, in a world of multiple theories, defining what is a rational behavior in response to information is a more complex conversation.

8.4. What Is Disclosure, Really?

One of the contributions of the paper is to highlight and formally represent the strategic distinction between "disclosing awareness" and "disclosing information": a distinction useful in distinguishing the logic of the theory-based view from traditional resource-based arguments. Resource-based logic has historically anchored on superior information as the source of any superior expectations that enable value creation in strategic factor markets beyond luck (Barney 1986). Accordingly, the RBV has highlighted a firm's internal resources as particularly valuable because here the firm has an informational advantage in understanding their use and value (Barney 1986). Building on prior work, we suggest that awareness is quite different from information. In fact, it is awareness that in large part unleashes the capacity to identify and gather relevant information, and it is unawareness that prohibits the incumbent from doing so.

Our analysis also highlights the fact that, for many resource-starved entrants, awareness is their primary currency through which to secure resources. By selectively disclosing awareness, specifically elements of their theory that do not contradict the incumbent's theory, entrants can under some circumstances induce collaborative relationships that compose and transfer the resources their theories demand.

Note that in our analysis, what actors learn from information disclosure is shaped by what they believe–what they are aware of. Daimler cannot test Tesla's theory if it lacks awareness of it. But even with shared awareness, actors may take up different paths of learning that reflect their differing beliefs about theories. If Daimler rejects Tesla's theory *A* but is aware of it, then Daimler should rationally seek to learn that winning is *not* a scale game, winning is *not* about standards and protocols, *not* about a new charging ecosystem, and *not* about superior ways to build battery factories. Ideally, Daimler will experiment with what are now newly believed hidden premises of its own theory *I* (i.e., that the premises of *A* are false) (Ehrig and Schmidt 2022). If in testing, the hidden premises are refuted, Daimler then refutes its own (revised) theory *I* (theory *I* together with hidden premises). Then Daimler must develop a new theory to compete in the EV market against Tesla: one that reflects this failure to refute *A*. This highlights the central role of "hidden premises" in the generation of competitive advantage (Ehrig and Schmidt 2022). As long as one agent is superiorly aware, then this agent can generate superior information. But once awareness is shared, then a learning competition plays out that is shaped by prior beliefs and priorities of assumptions (Ehrig 2023).

An obvious implication of our analysis it that incumbents should be on the lookout not only for new technology and information but for the disclosure of new theories of potential disruption from entrants. We know from Ehrig and Schmidt (2022) that contrarian theories can be treated as counter-theories to an incumbent's theory and that learning counter-theories creates value *even if* the counter-theory is rejected, via learning hidden premises. Learning about entrants' theories can be a relatively cheap and productive way to learn. To accelerate learning, incumbents should actively seek to access entrants' awareness and test their assumptions. Overall, our results redirect the meaning of "strategic factor market intelligence." Rather than intelligence solely pointing to factual information, factor market intelligence should focus on finding out the details of how agents who aspire to reshape an industry think.

8.5. Limitations

Our paper has notable limitations. We only feature the causal logic of theories verbally. Formally we only minimally describe the logical relations among *A*, *B*, and *I*. Although theories that express believed counterfactual causality are formalized in Ehrig and Schmidt (2022), to model fully nested causal theories into the game theoretical approach provided by BRS remains for future work. Likewise, although we verbally discuss how the believed causal logic shapes confidence, this is a deep topic in itself, which we take up in a companion paper (Ehrig and Zenger 2024).

It is impossible in one paper to cover all the consequences of dropping the "shared awareness" assumption implicit in Barney (1986) and other foundational factor market analyses. In introducing asymmetric awareness, we implicitly introduce three distinct forms of expectational superiority, in contrast to the one in Barney's analysis (superior information). (To avoid

confusion, the three dimensions of superior do not match one-to-one with the three types of rents.) First, agents can be superior in seeing states, expressed by the BRS technology of a hierarchy of state-spaces. Second, agents can be superior in calibrating their confidence (being closer to a probability distribution over the states that mirrors chances of actual outcomes). This is similar to superior information in the sense of Barney (1986), but complexities are introduced, as now agents think in different state-spaces and there is no absolute reference point or true distribution over a true state-space. Third, agents can be superior in translating states of the world into payoff possibilities, that is, superior in associating monetary outcomes with coalitions and states.

BRS define formally what superior means in the first dimension, that is, agents with richer state-spaces are superior to the agents with poorer state-spaces. For the second and third dimensions of superiority, the BRS setup permits their expression but offers no constraints or fixed ideas on what superior precisely means. Part of the challenge is that unlike other modeling approaches, in BRS and the theory-based view more generally, there is no ultimate reality reference point with which agents' beliefs about dimensions two and three could be compared. We see this as a feature and not a bug. In a world of unawareness, rationality and learning is no longer the same as coming closer to an ultimate truth, but rather following constraints, such as the falsification constraints offered in Ehrig and Schmidt (2022), to make progress. Unawareness leaves us with a relativistic notion of rationality and superiority. Consistent with philosophy of science logic, Ehrig and Schmidt (2022) propose that agents can never know ultimately that they are right or close to the ultimate superior expectations, but agents can know that they are wrong, if they falsify elements of their logic.

Note that these three dimensions of superiority are not hierarchically nested: Agents with superior awareness of states in the sense of BRS may well place high confidence in a weak theory. We believe these three types of expectational superiority offer a rich analytical scheme that can add precision to the central question of "who profits from innovation?" (Teece 1986). The analytical scheme is implicit in BRS, but the question of how the three types of superior interrelate and what constrains these interrelations provides a rich avenue for future work.

8.6. Conclusion

Our extended example and accompanying modeling approach are a reminder that the theory-based view is more than just a cosmetic update of the RBV. Theories are *not* just a new word for information. The theory-based view allows us to systematically unpack the ingredients of superior expectations that are the origins of rents from strategic factor markets. Superior expectations reflect a superior ability to see new states of the world (the logic of superior awareness in BRS), superior ways to calibrate confidence by mapping information to probability distributions across states, and (of course) simply superior information. Our work by no means invalidates the RBV's focus on information but constrains it to but one source of the origins of superior expectations that generates rents or competitive advantage.

Our aim has also been to highlight the capacity of more formal methods and this particular formal modeling approach to tackle foundational questions in strategy. But we see this as but one contribution to a much broader research agenda that more formally explores the role of theories and causal logic, information and confidence, and resources and factor markets in the acquisition of resources and rents. There is much work to be done in using more formal models to tackle strategy's more foundational questions.

Acknowledgments

The authors thank Nicolai Foss, Michael Ryall, and Burkhard Schipper, as well as the editors and reviewers for this special issue for feedback and suggestions. Errors remain ours.

Endnotes

[1] For purposes of illustration and consistency with our example, we assume an entrant with superior awareness granted by a theory. But, of course, the actor with superior awareness could also be an incumbent.

[2] See https://www.tesla.com/blog/secret-tesla-motors-master-plan-just-between-you-and-me.

[3] See https://archive.nytimes.com/wheels.blogs.nytimes.com/2009/05/19/daimler-takes-a-stake-in-tesla-motors/.

[4] For details see "Daimler eyes 780 million boost from surprise sale of Tesla," October 22, 2014, *Reuters*.

[5] See https://www.latimes.com/business/autos/la-fi-hy-elon-musk-opens-tesla-patents-20140612-story.html.

[6] As Levinthal (2011) suggests, constructing a state-space is a necessary precondition for any Savage (1956)-type rational analysis to proceed.

[7] Although BRS in their Proposition 1 argue that agents can possibly capture more than their added value under conditions of "incomplete information or unawareness," our modeling documents how this possibility becomes probable in the context of entrant and incumbent. The BRS proposition is essentially a possibility claim and a general model for awareness rents, but they too recognize that further progress requires additional context-specific assumptions that allow predictions for when such rents are probable.

References

Argyres N, Zenger T (2012) Capabilities, transaction costs, and firm boundaries. *Strategic Management J.* 23(6):1643–1657.

Aumann RJ (1976) Agreeing to disagree. *Ann. Statist.* 4(6):1236–1239.

Barney J (1986) Strategic factor markets: Expectations, luck, and business strategy. *Management Sci.* 32(10):1231–1241.

Brandenburger AM, Stuart HW Jr (1996) Value-based business strategy. *J. Econom. Management Strategy* 5(1):5–24.

Bryan KA, Ryall MD, Schipper BC (2022) Value capture in the face of known and unknown unknowns. *Strategy Sci.* 7(3):157–189.

Camuffo A, Gambardella A, Pignataro A (2024) Theory-driven strategic management decisions. *Strategy Sci.*, this issue.

Christensen CM (2013) *The Innovator's Dilemma: When New Technologies Cause Great Firms to Fail* (Harvard Business Review Press, Cambridge, MA).

Ehrig T (2023) Prioritizing beliefs and the formation of expectations. *Eur. Management Rev.* 20(4):651–664.

Ehrig T, Schmidt J (2022) Theory-based learning and experimentation: How strategists can systematically generate knowledge at the edge between the known and the unknown. *Strategic Management J.* 43(7):1287–1318.

Ehrig T, Zenger T (2024) Strategic learning. Working paper, University of Utah, Salt Lake City.

Evans GW, Honkapohja S (2005) An interview with Thomas J. Sargent. *Macroeconom. Dynamics* 9(4):561–583.

Fama EF (2017) Finance at the University of Chicago. *J. Political Econom.* 125(6):1790–1799.

Felin T, Zenger TR (2009) Entrepreneurs as theorists: On the origins of collective beliefs and novel strategies. *Strategic Entrepreneurial J.* 3(2):127–146.

Felin T, Zenger TR (2017) The theory-based view: Economic actors as theorists. *Strategy Sci.* 2(4):258–271.

Felin T, Kauffman S, Zenger T (2023) Resource origins and search. *Strategic Management J.* 44(6):1514–1533.

Felin T, Kauffman S, Koppl R, Longo G (2014) Economic opportunity and evolution: Beyond landscapes and bounded rationality. *Strategic Entrepreneurial J.* 8(4):269–282.

Gans J, Ryall MD (2017) Value capture theory: A strategic management review. *Strategic Management J.* 38(1):17–41.

Gärdenfors P (1988) *Knowledge in Flux: Modeling the Dynamics of Epistemic States* (MIT Press, Cambridge, MA).

Gavetti G (2012) Perspective: Toward a behavioral theory of strategy. *Organ. Sci.* 23(1):267–285.

Heifetz A, Meier M, Schipper BC (2013) Dynamic unawareness and rationalizable behavior. *Games Econom. Behav.* 81:50–68.

Karni E, Vierø ML (2013) "Reverse Bayesianism": A choice-based theory of growing awareness. *Amer. Econom. Rev.* 103(7): 2790–2810.

Klein B, Crawford R, Alchian A (1978) Vertical integration, appropriable rents, and the competitive contracting process. *J. Law Econom.* 21(2):297–326.

Levinthal D (2011) A behavioral approach to strategy—What's the alternative? *Strategic Management J.* 32(13):1517–1523.

Makadok R, Barney JB (2001) Strategic factor market intelligence: An application of information economics to strategy formulation and competitor intelligence. *Management Sci.* 47(12):1621–1638.

Menon A (2018) Bringing cognition into strategic interactions: Strategic mental models and open questions. *Strategic Management J.* 39(1):168–192.

Savage IR (1956) Contributions to the theory of rank order statistics-the two-sample case. *Ann. Math. Statist.* 27(3):590–615.

Schumpeter J (1911) *The Theory of Economic Development* (Harvard University Press, Cambridge, MA).

Shane S (2000) Prior knowledge and the discovery of entrepreneurial opportunities. *Organ. Sci.* 11(4):448–469.

Simsek A (2013) Speculation and risk sharing with new financial assets. *Quart. J. Econom.* 128(3):1365–1396.

Simsek A (2021) The macroeconomics of financial speculation. *Annu. Rev. Econom.* 13:335–369.

Teece DJ (1986) Profiting from technological innovation: Implications for integration, collaboration, licensing and public policy. *Res. Policy* 15(6):285–305.

Wernerfelt B (2022) When does the underdog win? *Strategy Sci.* 7(1):1–9.

Williamson O (1975) *Markets and Hierarchies: Analysis and Antitrust Implications* (Free Press, New York).

Wuebker R, Zenger T, Felin T (2023) The theory-based view: Entrepreneurial microfoundations, resources, and choices. *Strategic Management J.* 44(12):2292–2949.