

Which Part of the Elephant?
Knowledge, Innovation, and Intellectual Property in Strategy Research

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Abstract

Innovation has long been a prominent theme in strategy research. Yet the expanding literature often conflates distinct concepts such as innovation and intellectual property (IP), knowledge flow and learning, and strategic imitation and legal infringement. In this article, I argue that these distinctions matter because different concepts, measures, and levels of analysis capture different parts of the broader innovation process. Conflating them can create mismatches between theory and measurement, complicate cross-study comparisons, and distort managerial and policy inference, particularly in settings where firms compete across institutional boundaries. Using the autonomous driving sector as an illustrative case, I show how the same innovation can look very different depending on what we measure and where we draw the boundaries of analysis.

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INTRODUCTION

From transaction cost economics (TCE) to the resource-based view (RBV) and the dynamic capabilities approach, major theoretical frameworks in strategy emphasize the crucial role of knowledge and innovation in firm strategy and performance. Yet innovation-related constructs are often defined loosely or used interchangeably, obscuring distinctions that matter for both theory and empirical analysis.

Three distinctions matter here: innovation and intellectual property (IP), knowledge flow and learning, and strategic imitation and legal infringement. I develop these distinctions through three related discussions. The first considers innovation and imitation, asking where the boundary lies between creating new knowledge and building on what already exists. The second examines knowledge flow and learning, shifting attention from how knowledge moves to how the same movement can look different depending on whose perspective we take. The third considers IP ownership and infringement, showing how legal and institutional context shapes both firms' strategic behavior and how that behavior is interpreted. Together, these discussions illustrate the importance of greater conceptual precision to our understanding of the creation, movement, and use of knowledge.

Concerns about conflating related constructs are not new. Strategy scholars have long grappled with how to define innovation and how to interpret IP as a strategic tool. Because innovation spans a long value chain and dispersed geographies, prior work has also noted sample-selection challenges that arise when analyses capture only part of a system. The aim here is not to claim novelty in raising these issues or to offer a definitive solution. Instead, it synthesizes recurring challenges I have observed as a researcher, reviewer, and editor and organizes them into a framework that can facilitate clearer dialogue across subfields.

The primary objective is conceptual: to distinguish related elements of the innovation process that are often treated as interchangeable. These distinctions, however, also have implications for empirical inference. When overlapping empirical measures capture different concepts, what researchers observe depends partly on the strategic, organizational, and institutional processes that generate the observations. Conceptual clarity helps define not only what a measure represents, but also what can reasonably be inferred from it and at what level of analysis.

DISTINGUISHING RELATED CONCEPTS

The innovation process involves closely related activities and outcomes that strategy research often examines through different conceptual lenses. Because these concepts often overlap in empirical settings, distinctions among them can easily become blurred. I focus on three such distinctions: innovation and imitation, knowledge flow and learning, and IP ownership and infringement. Each highlights a different question about knowledge: how it is created and reused, how it moves and affects firms, and how rights over it are defined and enforced.

Innovation and Imitation

We often treat “innovation” and “imitation” as opposing categories, implicitly associating innovators with creativity, investment, and originality, and imitators with free-riding and opportunism.¹ However, this dichotomy rests on a boundary that is far less objective than it appears.

Merriam-Webster defines innovation as “a new idea, method, or device,” or “the introduction of something new.”² The *Harvard Business Review* adds that innovation must be “both novel and useful,”³ while McKinsey emphasizes that a new idea qualifies as innovation only

¹ I use “innovation” as the broader term throughout this article, while recognizing the distinction between invention and innovation. In particular, patents more directly capture invention, the creation of new ideas or technologies, than their implementation or commercialization.

² <https://www.merriam-webster.com/dictionary/innovation>

³ <https://online.hbs.edu/blog/post/importance-of-innovation-in-business>

when it “increases value and drives growth.”⁴ These definitions raise two fundamental questions: new *to* whom, and value *for* whom? Traditional Knowledge (TK)⁵, such as herbal medicine or cultural routines, has generated sustained controversy over who can claim discovery, and whether adaptation or commercialization should be viewed as appropriation rather than innovation. The notion of value is even more contested. If value is defined from the firm’s perspective, then many useful factors (e.g., air) may not increase exchange value, and many factors that increase exchange value (e.g., entry barriers) may not be useful in a broader technological or social sense.

Three considerations make this boundary particularly difficult to draw: innovation builds on existing knowledge, imitation is itself an active strategic process, and institutions shape which forms of reuse are permissible.

First, research on technological evolution and recombination shows that new knowledge is often created by rearranging prior components or drawing on existing knowledge bases in novel ways (Fleming, 2001; Nelson, 1994; Weitzman, 1998; Xiao et al., 2022). Thus, it is difficult to specify where recombination ends and imitation begins. From this perspective, the distinction between innovation and imitation may reflect differences of degree along a continuum of knowledge recombination (Posen et al., 2023; Rosenkopf and Nerkar, 2001), differences in cognitive and rhetorical framing (Gilbert, 2005; Kaplan, 2011), or differences in formal legal classification (Beukel and Zhao, 2018; Fan et al., 2013).

This line of work also highlights economically significant improvements that often fall outside conventional measures of innovation. Research on process innovation shows that firms classified as imitators nonetheless generate substantial learning through scale-up, efficiency improvement, and process refinement (Abernathy and Utterback, 1978; Pisano, 1997). Further,

⁴ <https://www.mckinsey.com/featured-insights/mckinsey-explainers/what-is-innovation>

⁵ <https://www.wipo.int/en/web/traditional-knowledge/tk/index>

repeated engagement in production and implementation builds new capabilities (Arrow, 1962; Levitt and March, 1988), yielding performance advantages not captured by technology- or product-level novelty metrics.

The boundary between innovation and imitation is further complicated by how these dynamics shift across levels of analysis. The evolution of smartphones provides a useful example. Samsung initially responded to the emergence of the iPhone by incorporating many elements of Apple's design into its own products (Eichenwald, 2014; Park, 2022). Apple later also adopted features pioneered by competitors. Thus, a firm may imitate at the level of particular features while innovating at the product level, and specific acts of imitation may contribute to its leadership position at the firm level. At an even broader level, imitation among competitors and complementors can contribute to capability renewal and subsequent innovation across an ecosystem (Posen et al., 2023; Yilmaz et al., 2023). Innovation and imitation can thus coexist and reinforce one another across features, products, firms, and ecosystems as competition unfolds.

Second, imitation is not passive. Research on absorptive capacity shows that firms must invest in related knowledge to recognize and apply external ideas, and such investments also shape the firms' capacity for subsequent learning and innovation (Cohen and Levinthal, 1990; Zahra and George, 2002). Relatedly, studies of replication and transfer highlight the importance of judgment and adaptation in deciding what aspects of others' practices to emulate and how to fit them to local contexts, a process that generates future learning and variation (Shenkar, 2010; Williams, 2007).

Even if imitation were effortless, it would not create value for the imitating firm unless it has the complementary assets, capabilities, and market infrastructures needed to commercialize what it learned (Chakrabarti *et al.*, 2011; Teece, 1986); developing such assets is itself the outcome of prior strategic investment. Consequently, both innovation and imitation are strategic choices

whose feasibility and value depend on firms' capabilities and available information (Posen et al., 2023; Yilmaz, 2023).

From a strategy perspective, firms may sometimes benefit from allowing rather than deterring imitation. Polidoro and Toh (2011) show that deterring imitation can push rivals to search for substitutes, which may pose a greater competitive threat than imitation of the focal firm's existing technology. Kim and colleagues (2025) show that imitators may experiment with variations of an innovator's product, allowing the innovator to learn vicariously from their successes and failures. These two mechanisms operate in complementary directions. Tolerating imitation can shape rivals' search by keeping them closer to the innovator's existing technology, while simultaneously generating information that supports the innovator's own subsequent innovation. Hence, innovators may have strategic reasons not to prevent all imitation. Tesla's 2014 pledge not to enforce its patents against parties using its electric-vehicle technology in good faith⁶ provides an exemplar: rather than viewing diffusion of its technology solely as an imitation threat, Tesla argued that broader use could accelerate development of the electric-vehicle ecosystem.

Third, the boundary between innovation and imitation also depends on how legal and institutional rules define what firms can protect and what rivals are permitted to copy. Firms may seek to influence that boundary through litigation, participation in standards organizations, and engagement with regulatory agencies, particularly where technologies are fragmented, and the stakes of appropriation are high (Hall and Ziedonis, 2001; Hemphill and Sampat, 2012; Ranganathan et al., 2018; Ziedonis, 2004). When IP is protected or enforced across multiple countries, firms can also choose where to seek protection or litigate, and the same underlying activity may receive different legal treatment across jurisdictions (Beukel and Zhao, 2018; Cotter,

⁶ Tesla, "Patent Pledge," June 12, 2014. <https://www.tesla.com/legal/additional-resources#patent-pledge>

2021; Elmer and Gramenopoulos, 2019). Therefore, institutional environments and firms' strategic actions within them are integral parts of the dynamic.

These perspectives suggest that innovation rarely functions as a discrete act of originality. Instead, innovation and imitation are often intertwined within processes of knowledge reuse, recombination, and adaptation. The dividing line is often constructed, negotiated, and institutionalized. In this sense, disputes over whether a given activity constitutes innovation or imitation frequently resemble observers touching different parts of the same elephant, each grounded in a partial encounter with a shared underlying process.

Knowledge Flow and Learning

The distinction between innovation and imitation concerns what firms do with existing knowledge. A related issue is how knowledge moves across firm boundaries and when such movement translates into learning.

We often think of knowledge that leaves the firm as “spillover” or “leakage,” implicitly treating outward flows of knowledge as a loss for the originating firm and inward flows as a benefit to others. However, like the distinction between innovation and imitation, this mapping is based on assumptions that are less objective than they appear. As firms engage with a community, ideas, routines, and technical know-how circulate through mechanisms such as mobility, collaboration, and participation in shared networks of practice. These dynamics are especially salient in regional clusters, where proximity increases opportunities for observation and informal exchange (Saxenian, 1994; Shaver and Flyer, 2000), and in industries with high rates of mobility among engineers and scientists (Almeida and Kogut, 1999; Song et al., 2003). The key question, therefore, is not simply whether knowledge flows out of the firm, but how outward knowledge flows affect firms' own capability development and relative market competitiveness.

Empirical research indicates that firms that appear to be net contributors of knowledge may simultaneously be among the most effective learners within their ecosystem. In semiconductors and electronics clusters, for example, engineer mobility may diffuse knowledge outward to competitors, but originating firms can still access a broader knowledge base and benefit from reciprocal learning (Almeida and Kogut, 1999; Rosenkopf and Almeida, 2003). Research on regional and industrial innovation systems highlights how openness, shared practices, and community-level learning sustain technological dynamism and renewal over time (Iammarino and McCann, 2013; Saxenian, 1994). Evidence from biotechnology networks points in a similar direction: firms embedded in open, research-intensive communities tend to develop deeper learning capabilities and more dynamic innovation trajectories than more isolated counterparts (Maurer and Ebers, 2006; Powell et al., 1996). In this light, participation in technology clusters can strengthen firms' competitive position in product markets, where strategic outcomes are ultimately realized, even as it entails potential risks to their leadership (Alcácer and Zhao, 2012; Almeida and Kogut, 1999).

Knowledge flow does not necessarily result in learning. Knowledge may become accessible to another firm without changing what that firm knows or can do. Rather, learning requires the recipient to recognize, absorb, and apply that knowledge (Cohen and Levinthal, 1990; Zahra and George, 2002). This distinction is important empirically because some widely used measures of knowledge flow are observed only when the recipient subsequently produces an identifiable output. Patent citations, for example, connect prior knowledge to a subsequent invention, while patent- or publication-based measures of inventor mobility trace knowledge through output produced after an inventor joins a new firm. Such measures therefore condition the

observation of knowledge flow on evidence of its subsequent use, making it difficult to separate the movement of knowledge from the recipient's learning from it (Roach and Cohen, 2013).

The distinction between knowledge movement and its consequences also matters across national boundaries. Early work in international economics often portrayed cross-country knowledge transfer as asymmetric, with innovation originating in advanced economies (the “North”) and imitation occurring in developing countries (the “South”) (Helpman, 1993; Mansfield, 1985). Subsequent research, however, reveals more complex and bidirectional patterns. Firms in developing countries do not simply absorb knowledge created elsewhere; they develop capabilities and generate their own knowledge, some of which subsequently flows back to advanced economies (Hobday, 1995; Lall, 1992). Similarly, within multinational R&D networks, parents and subsidiaries embedded in different institutional and market environments can contribute distinctive knowledge that is transferred and recombined across locations rather than diffused outward from the parent (Berry, 2023; Cantwell, 1989; Kogut and Zander, 1992).

One manifestation of this process is frugal innovation: developing lower-cost, less resource-intensive solutions designed around the needs and constraints of emerging markets, as GE Healthcare illustrates. Conventional ultrasound machines developed for advanced economies were too expensive and cumbersome for many rural clinics in China. Rather than stripping features from its existing machines, GE developed a much cheaper, portable ultrasound system built around a laptop and designed for local market conditions. Such frugal innovation often results in reverse innovation: innovation first adopted in an emerging economy and later diffusing to advanced economies (Govindarajan and Ramamurti, 2011; Immelt et al., 2009).

These examples challenge characterizations of international knowledge flow as either the diffusion of superior knowledge from advanced to developing countries or the loss of knowledge

in the opposite direction. Knowledge may move across borders, combine with locally generated knowledge, and return in forms that create value for the original source. What appears to be knowledge leakage, learning, and local adaptation depends partly on which stage and direction of this larger process an observer examines.

IP Ownership and Infringement

The earlier subsections showed that the boundaries between innovation and imitation, and between knowledge flow and learning, are not as clear-cut as they first appear. A related problem arises when we interpret technological activities through the lens of intellectual property. Innovation and IP are intricately connected, but they represent different domains. Innovation concerns the creation and application of new knowledge, whereas IP defines legally recognized rights over particular manifestations of that knowledge. The relationship between the two is therefore neither automatic nor one-to-one. Below I list three major distinctions.

The first distinction is between innovation and IP ownership. Whether an invention receives IP protection depends not only on what has been invented, but also on whether firms seek legal protection and how legal institutions define the exclusive rights. Patenting itself is highly strategic. Firms may patent for signaling, licensing, bargaining, or litigation purposes (Hou et al., 2023; Somaya, 2012), and government policies can significantly influence firms' propensity to patent (Cohen et al., 2000; Sun et al., 2025). Evergreening in pharmaceuticals (Feldman, 2018; Hemphill and Sampat, 2012), continuation of Standard Essential Patents (SEPs) (Lerner and Tirole, 2015; Righi and Simcoe, 2023), defensive fence-building (Hall and Ziedonis, 2001; Ziedonis, 2004), forum shopping (Obendiek, 2023; Sytch and Kim, 2021), and participation in standards-setting organizations (SSOs) (Baron and Spulber, 2018; Ranganathan et al., 2018) further illustrate how firms actively shape the scope and strategic value of their IP portfolios.

Nor does obtaining a patent establish a fixed boundary around the protected technology. Patents are probabilistic rights whose validity and scope remain uncertain until tested in court (Lemley and Shapiro, 2005; Shapiro, 2003). Firms differ substantially in their ability to establish and defend those boundaries, which is costly, uncertain, and time-consuming (Bessen and Meurer, 2008; Lanjouw and Schankerman, 2004). Incumbents with financial and legal resources can build dense patent portfolios and sustain costly disputes, whereas entrepreneurial firms may struggle to rely on IP to capture value. Instead, entrepreneurial firms often use IP to reduce information frictions with investors and other resource providers (Conti et al., 2013; Farre-Mensa et al., 2020).

Resource asymmetries also matter on the other side of the transaction. As technology users, some well-resourced firms are believed to practice “efficient infringement,” waiting to be sued rather than proactively seeking licenses (Barnett and O’Connor, 2023; Schankerman and Scotchmer, 2001). Thus, observed IP ownership and IP assertion reflect not just inventive output, but also firms’ strategic objectives, resources, and ability to mobilize the legal system.

A second distinction concerns imitation and IP infringement. Imitation does not necessarily violate the underlying IP right. Across technology-enabled markets such as grocery delivery and ride-sharing, firms routinely replicate products, services, business models, and organizational forms without infringing IP. Competitors may also “design around” patents, drawing on disclosed knowledge while developing alternative solutions that fall outside the scope of the patent claims. The ability to invent around patents has long been recognized as an important limitation on patent-based appropriability (Cohen et al., 2000; Gallini, 1992; Levin et al., 1987), especially in industries where inventions are difficult to specify. Such workarounds occur even in industries traditionally associated with strong patent protection. Wang (2008), for example, describes strategies through which biotechnology firms modify technologies to avoid falling within existing patent claims. The

apparent use of, and further build-up on, someone else's knowledge does not by itself establish infringement.

Fundamentally, infringement is a legal determination. Before adjudication, a patent holder can only allege that another firm's product or technology infringes its rights. Whether infringement is ever established depends partly on the patent holder's decision to pursue the claim. Patent holders may become aware of apparent infringement and nevertheless decide not to pursue it. Besides the high litigation costs mentioned above, enforcement can create strategic costs of its own. Choi (1998), for example, shows that patent litigation generates information about patent validity that other potential competitors can exploit, while an unsuccessful suit can invalidate the patent and weaken the patent holder's position against all competitors. As discussed earlier, firms may also benefit from tolerating some imitation when deterrence would redirect rivals toward substitutes or when imitators generate information the innovator can learn from. Enforcement is therefore itself a strategic choice.

More broadly, formal legal enforcement is only one mechanism through which firms govern the use of knowledge. When behavior cannot be fully specified contractually, firms often rely on relational governance sustained by repeated interaction and expectations of future exchange (Gibbons and Henderson, 2011; Macneil, 1980; Poppo and Zenger, 2002). Such governance arrangements are particularly relevant when firms depend on one another for complementary capabilities (Dyer, 1996; Jacobides et al., 2018).

The final distinction concerns institutions' role in defining and enforcing IP rights. IP rights are territorial: they are granted and enforced within particular national jurisdictions (Peng et al., 2017; Prud'homme and Tong, 2024). The same underlying technological activity can therefore fall within the scope of an enforceable right in one jurisdiction but not another.

Global disputes over FRAND (Fair, Reasonable, and Non-Discriminatory) licensing for SEPs make the institutional contingency particularly visible. Courts in different countries have increasingly asserted authority over global licensing relationships, including setting global FRAND rates and issuing anti-suit or anti-enforcement injunctions affecting proceedings elsewhere (Tsilikas, 2021; Zheng, 2023). The Samsung–ZTE dispute provides a recent illustration. In 2026, courts in London, Chongqing, and Munich considered the FRAND terms governing the same global cross-licensing relationship but reached substantially different conclusions. The English High Court determined a \$392 million lump-sum payment for a five-year license, whereas the Chongqing court accepted ZTE's proposed \$731 million payment for a six-year license. The Munich Regional Court declined to set a global rate but found ZTE's offer within the FRAND range and indicated that its own analysis would produce a substantially higher valuation than that of the English court. The courts also differed in how they selected and evaluated comparable licensing agreements and calculated the value of the patent portfolios. Here, neither the underlying technologies nor the firms changed; the institutional venue through which the rights were interpreted and valued did.⁷

Firms can respond strategically by choosing where to seek protection, where to litigate, and where to participate in standards-setting. This separation between the geography of innovation and the geography of IP also helps explain two seemingly contradictory trends. On the one hand, IP strategy has become increasingly globalized, with multinational firms patenting and enforcing rights across multiple jurisdictions (Beukel and Zhao, 2018; Elmer and Gramenopoulos, 2019).

⁷ Sources for the 2026 Samsung–ZTE FRAND determinations include Samsung Electronics Co., Ltd. v. ZTE Corporation [2026] EWHC 999 (Pat), <https://www.judiciary.uk/wp-content/uploads/2026/05/Samsung-v-ZTE-FRAND-judgment-REDACTED-Final-for-hand-down.pdf>, and Cleary Gottlieb, “Competing Global FRAND Determinations,” May 6, 2026, <https://www.clearygottlieb.com/news-and-insights/publication-listing/competing-global-frand-determinations>.

On the other hand, geopolitical tension has encouraged technological decoupling. These developments appear paradoxical only if we assume that the geography of IP maps directly onto the geography of innovation. Once we relax this assumption, the patterns become clearer. A firm may conduct most of its R&D in one country while patenting and enforcing its rights across many jurisdictions. A firm may also source knowledge globally while concentrating patenting and litigation in only a few.

As more countries seek to secure advantages in key technologies, IP litigation⁸ and government participation in standards-setting⁹ are increasingly used to counter foreign competition. Perceptions of threat intensify when knowledge flows toward countries with different enforcement practices or preferential state support for domestic firms, as institutional arrangements may enhance rivals' ability to appropriate returns from similar technologies. Thus, technological rivalry may increasingly extend into competition over legal and institutional capacity (Mellahi et al., 2016; Park et al., 2026). Firms may therefore escalate cross-border IP conflict even as underlying innovation becomes more localized.

The three distinctions developed in this subsection can be summarized as a sequence. Innovation does not necessarily result in IP ownership; the use of another firm's knowledge does not necessarily constitute infringement; and perceived infringement does not necessarily lead to enforcement or a legal finding of infringement. Moreover, the meaning and value of IP rights can vary across institutional settings. Observers who focus on different stages or dimensions of this knowledge-appropriation process therefore encounter different parts of the "elephant," each capturing something real, yet remaining partial.

⁸ <https://www.wsj.com/articles/u-s-china-technology-disputes-intellectual-property-europe-e749a72e>

⁹ <https://www.nist.gov/speech-testimony/setting-standards-strengthening-us-leadership-technical-standards>

FROM CONCEPT TO INFERENCE

The conceptual distinctions developed in the preceding section have corresponding implications for empirical research. Prior work has emphasized the importance of aligning theoretical constructs with their empirical measures (Boyd et al., 2005; Leiblein, 2011). The issue considered here goes one step further: what we can infer from an observed relationship also depends on how the underlying phenomenon enters the data. This section illustrates these challenges in several familiar research settings. The aim is not to question the validity of existing findings. Rather, it considers more carefully what particular empirical observations allow us to infer. Patents, geographic concentration, and litigation records all reveal important aspects of innovation-related activity. But each provides a particular vantage point on the underlying process. Recognizing that the vantage point matters helps connect empirical results to the theoretical mechanisms they are intended to represent.

Strategic Patenting: When an Invention Measure Captures Appropriation

IP records, particularly patents, are valuable sources for empirical research. Researchers frequently rely on patent data to study inventor locations and knowledge flows (Alcácer and Gittelman, 2006; Criscuolo and Verspagen, 2008; Jaffe et al., 1993). Yet, as discussed earlier, patenting also reflects firms' appropriation strategies. Firms engage in defensive patenting, portfolio "fence-building," and strategic cross-licensing to strengthen bargaining positions, deter rivals, or navigate institutional uncertainty. In such settings, increases in patenting may reflect changes in underlying knowledge creation, changes in appropriability strategy, or both. The appropriate interpretation therefore depends on the research question.

A familiar tension in the innovation literature is that highly innovative firms need not patent more. Survey evidence on appropriability mechanisms indicates that in many industries, firms rely

more heavily on secrecy, lead time, and complementary assets than on patents to capture returns from innovation (Cohen et al., 2000; Levin et al., 1987; Png, 2017; Teece, 1986). Where formal IP protection is weak or difficult to enforce, heightened imitation risk may lead firms to accelerate innovation cycles, emphasizing speed to market. Meanwhile, weak protection reduces firms' incentives to patent, either because patents offer limited protection or because disclosure facilitates imitation. If patent applications serve as a proxy for innovation, these strategic adjustments can appear as declining innovation even when experimentation and capability development have in fact intensified.

The fast-growing literature on geopolitical tension provides another illustration. Many studies leverage events such as Brexit and the U.S.–China trade conflict as exogenous shocks and examine subsequent changes in patenting among firms exposed to heightened geopolitical risks. Such settings can provide strong empirical leverage, but interpreting observed patenting responses is less straightforward. The same shock can have opposite effects on patenting depending on the strategic role of patents in an industry.

For exporting firms, such as Chinese electric-vehicle manufacturers, a reduction in U.S. patents need not indicate a retreat from innovation. When tariffs, national-security reviews, or market-access restrictions substantially reduce the viability of the U.S. as a commercial destination, the expected returns to maintaining a U.S. patent portfolio decline, making it harder to justify the high cost of cross-border patenting (Alcácer et al., 2017; Gallini, 2002). A smaller number of U.S. patents may therefore reflect a shift in the geography of appropriation rather than a decline in underlying technological effort.

The effect can run in the opposite direction in industries organized around global standards, such as telecommunications and the Internet of Things. In these settings, patenting can strengthen

bargaining positions, influence standards governance, and shape future market architectures (Denicolò, 2007; Ranganathan et al., 2018). In an era characterized by international rivalry rather than collaboration, heightened geopolitical tension can increase the strategic importance of global SEPs and related activities. Observed changes in patenting therefore cannot be interpreted independently of the strategic function that patents serve in a particular context.

Proximity and Interorganizational Relationships: Unpacking Observed Effects

A different inferential challenge arises when the same underlying process can operate through multiple mechanisms and has heterogeneous consequences across firms. Research on regional clusters provides a useful starting point. Empirical studies typically rely on geographic collocation, labor mobility, and cross-firm patent citations to trace knowledge flows across firms. Through interactive learning and reciprocal exchange, firms in clusters both contribute to and draw from a shared pool of ideas, routines, and technical know-how (Almeida and Kogut, 1999; Rosenkopf and Almeida, 2003). Yet firms differ in how effectively they benefit from agglomeration: some better recognize, absorb, and integrate local knowledge than others (Alcácer and Zhao, 2012; Lychagin, 2016). They also differ in their vulnerability to proximity costs, including knowledge outflows (Alcácer and Chung, 2007; Shaver and Flyer, 2000) and intensified competition (McCann and Flyer, 2000; Pe'er and Keil, 2013).

Such heterogeneity has implications not only for the aggregate effects but also for the distribution of outcomes. Experimentation, recombination, and interactive problem solving are inherently uncertain processes. They may produce disappointing outcomes for many firms while simultaneously increasing the probability of exceptional breakthroughs (Fleming, 2001; Katila and Ahuja, 2002). An empirical effect may therefore appear not simply as a shift in the mean or greater dispersion around the mean, but disproportionately in one or both tails of the outcome distribution.

The distribution may also evolve over time. Knowledge acquired through proximity or employee mobility is not necessarily absorbed immediately or uniformly across the receiving organization. Its initial use may remain concentrated around particular individuals and their collaborators before diffusing more broadly (Singh and Agrawal, 2011; Song et al., 2013). Thus, differences across firms may become more pronounced over time as some firms use new knowledge better than others. Earlier outcomes can also shape the subsequent path of innovative activity. Kerr (2010), for example, shows that cities with a greater relative presence of breakthrough inventions, defined as the top 1% of patents within a technology category by forward citations, experienced substantially greater subsequent patenting growth. Breakthroughs may therefore do more than represent exceptional outcomes. By attracting or redirecting subsequent innovative activity, they can shape the clusters' evolution.

More broadly, the distribution can also change as the population is changing. Firms differ in their incentives to locate in clusters and in their likelihood of surviving there (Shaver and Flyer, 2000; Mariotti et al., 2019), while entry, exit, expansion, contraction, and relocation continually alter the composition of economic activity within a location (Davis et al., 1996; Kim et al., 2022). A relatively stable level of geographic concentration at two points in time can therefore conceal substantial changes underneath: firms may diverge in outcomes, rare successes may redirect subsequent activity, and the firms constituting the cluster may themselves be changing.

These dynamics also have implications for empirical design. Analyses focused on mean outcomes over short lags may miss distribution shifts that emerge or accumulate over time. Examining tail outcomes and longer observation windows can reveal whether differences persist or cumulate, whether exceptional outcomes redirect subsequent innovative activity, and how changes in firm composition shape the observed effects of agglomeration.

Heterogeneous effects, however, are only part of the inferential problem. Even when an empirical design identifies changes within specific firms, multiple mechanisms may drive them. In research on supplier relationships, foreign direct investment, and global value chains, firms exhibit improved technological capabilities or performance after supplying sophisticated customers or through backward linkages with multinational firms (Alcácer and Oxley, 2014; Alfaro-Ureña et al., 2022; Javorcik, 2004). One important explanation is learning. Repeated collaboration, exposure to demanding technical or quality standards, and participation in product design or production can provide suppliers with opportunities to acquire knowledge and develop new capabilities. Alcácer and Oxley (2014), for example, examine how relationships with branded customers contribute to suppliers' technological and market capabilities, a process they describe as “learning by supplying.” Alfaro-Ureña and colleagues (2022) supplement estimates of supplier performance gains with survey evidence identifying learning opportunities and improved managerial practices among the benefits of supplying multinational firms.

Learning, however, is not the only process that can produce such improvements. Greater exposure to competition can also change which firms survive and grow. Competition may encourage innovation among firms closer to the technological frontier while discouraging laggards (Aghion et al., 2005; Hashmi, 2013), so observed improvements in a population may partly reflect competitive sorting rather than learning within the same firms. New market opportunities can also increase firms' incentives to invest. Access to export markets, for example, can increase the expected returns to R&D, technology investment, and capability upgrading (Aw et al., 2011; Bustos, 2011). So even among surviving firms, it can be difficult to distinguish learning based on external knowledge from market-induced investments, two distinct underlying processes that can produce similar changes within firms.

These examples also illustrate the difficulty of moving from an identified empirical effect to its theoretical interpretation. The studies cited above rigorously identify different aspects of complicated processes, and many empirical studies use additional tests to distinguish among plausible mechanisms. Such tests can substantially narrow the set of explanations consistent with an observed effect (Hedström and Ylikoski, 2010; Imai et al., 2013). Yet the underlying processes are often only partially observed. An increase in localized patent citations following collocation, for example, may involve employee mobility, social networks, observation, or imitation; an increase in innovation following entry into a supplier relationship may reflect learning, benchmarking, or stronger incentives to invest. Distinguishing among these processes therefore matters not only for explaining why an effect occurs, but also for determining how the empirical result maps onto the theoretical concept of interest.

Legal Arenas: What Litigation Does and Does Not Reveal

Litigation offers another window into innovation and intellectual property, but one that is shaped more directly by legal institutions. As discussed in the previous section, technological conflicts do not automatically become legal disputes. Firms must first decide whether their rights are at stake and whether to pursue a claim. Once they do, the dispute enters a legal system in which courts interpret the relevant rights under particular rules and procedures. What researchers observe in litigation records therefore reflects not only the underlying technological conflict and firms' strategic choices, but also the institutions that seek to resolve the conflict.

This institutional layer matters especially in cross-jurisdictional litigation and forum choice. When firms choose venues, these decisions can reflect differences in legal standards, court procedures, expected remedies, or bargaining leverage (An et al., 2026; Somaya and McDaniel,

2012). The same technological conflict may therefore follow different paths and produce different outcomes across jurisdictions, depending on how firms mobilize their legal and strategic resources.

The institutional layer also determines which conflicts become visible. Many imitation-like behaviors, including similar product designs and efforts to work around existing patents, never enter the legal system. Some do not violate legally enforceable rights. Others may present plausible legal cases but remain tacitly tolerated, privately negotiated, or strategically ignored, high cost being one of the factors (Bessen and Meurer, 2008; Lanjouw and Schankerman, 2001; Priest and Klein, 1984; Waldfogel, 1995). On the other side of the spectrum, relatively limited technological similarities between rivals may become the subject of high-profile litigation when the stakes surrounding a dominant design, industry standard, or geopolitical competition are sufficiently high. In such cases, various stakeholders such as industry groups, standards organizations, courts, and governments may become involved, so an observed lawsuit may also reflect a broader contest over markets, technologies, and institutional rules.

This creates a particular form of selection. The disputes observed in litigation data are systematically shaped by firms' enforcement choices and by the institutional settings in which those choices are made. These observations are not incomplete or inferior evidence. Rather, their meaning depends on the processes that generate them, which are themselves strategic and institutional. The empirical opportunity resides in aligning the inference with the part of the "elephant" that the evidence most directly captures.

AUTONOMOUS DRIVING: SEEING THE ELEPHANT

The preceding sections have considered how different concepts and empirical measures capture different parts of an innovation process. Autonomous driving provides an especially useful setting for bringing these arguments together because innovation depends on multiple

interdependent technologies and expertise dispersed across firms and other organizations.¹⁰ These features make the choice of analytical perspective particularly consequential. What appears as innovation depends both on the level at which the phenomenon is examined and the unit around which the analysis is organized. Technological, organizational, and legal boundaries rarely coincide: complementary technologies are developed by different firms, individual firms integrate activities spanning multiple domains, and governance arrangements cross both technological and firm boundaries. What autonomous-driving innovation looks like therefore depends on the measures used as well as the unit and level of analysis.

Locating Innovation

A typical autonomous-driving system integrates multiple technological layers, including connectivity (4G/5G and V2X communication), sensing (LiDAR, radar, and cameras), perception (computer vision and sensor fusion), decision-making (path planning and behavioral prediction), and control (vehicle dynamics and actuators). These technologies perform different but interdependent functions.¹¹ At the sensing layer, LiDAR provides precise depth information, radar performs relatively well under adverse weather conditions, and cameras provide high-resolution visual information. Perception systems then combine these inputs before decision-making and control systems can translate them into driving behavior.

Patent data provide one way to locate innovation across these technologies and organizations. Based on a technology-based delineation of this domain, Sun and Zhao (2025) identify 53,891 patent applications across 34,679 patent families from 2004 to 2023, spanning transportation and mechanical systems, sensing and perception, and electricity and

¹⁰ See Sun and Zhao (2025) for more detailed visual mappings of the technological and organizational landscape of autonomous driving.

¹¹ <https://knowledge.lancashire.ac.uk/id/eprint/49009/>

communications. Diversified entrants and specialized suppliers account for the largest share of contributions, followed by automotive incumbents, with startups representing a smaller but active segment. Viewed through patents, autonomous-driving innovation appears as technological contributions distributed across many firms and technological domains.

The picture changes when the analysis shifts from individual technologies to firms and the scope of technological activities they encompass. Some firms specialize narrowly in particular technologies or components, while others span a wide range of technological domains. Tesla combines vehicle design and production with autonomous-driving software, AI chips, model training, software deployment, and a fleet that generates driving data. Waymo combines autonomous-driving software with mapping, sensor development, simulation, fleet operations, and ride-hailing services. Zoox develops autonomous-driving software together with purpose-built vehicles, fleet-management systems, and mobility services.¹² Firm-level measures of innovation therefore capture the aggregation of very different technological activities within the firm.

Vehicle deployment further illustrates why the boundary between innovation and commercialization can depend on the outcome being studied. A vehicle fleet can be viewed as a downstream or complementary asset through which an autonomous-driving developer deploys its technology into marketable products or services. Yet operating vehicles on public roads also generates driving data and operational experience that can contribute to subsequent technological development. Unusual road conditions, system failures, interactions with other road users, and other encounters during operation provide inputs for evaluating and improving autonomous-driving systems. What appears downstream when commercialization is the focal outcome can

¹² For company descriptions, see <https://www.tesla.com/AI>; <https://waymo.com/waymo-driver/>; and <https://zoox.com/technology/>.

become upstream when innovation is the focal outcome. Such “data flywheels” highlight the risk in assigning innovative activity to a fixed position along a value chain.

The relevant boundary may extend beyond the firm. Autonomous-driving technologies are highly interdependent, so an advance within one technological domain may not translate into progress in the broader system if complementary technologies lag behind (Adner, 2006; Adner and Kapoor, 2010). Conversely, progress elsewhere in the system can increase the value of a firm's existing technology without increasing that firm's inventive output. The interpretation of an empirical measure therefore depends in part on whether the outcome of interest is technological advance, firm-level capability, or progress in the broader system.

Tracing Knowledge

Locating innovation is different from tracing where the underlying knowledge comes from. The earlier discussion of knowledge flow and learning shows that the same movement of knowledge can look different from the perspectives of the source, recipient, and broader knowledge environment. Autonomous driving makes it particularly difficult to trace knowledge flows with “paper trails” (Jaffe et al., 1993; Schweitzer et al., 2022). Relevant knowledge spans multiple technological domains, moves with engineers and teams across organizational boundaries, and is often embedded in experience, software, data, and system-integration know-how in the same cluster.¹³ Patent citations, employee mobility, and acquisitions can each reveal parts of these movements, but they need not trace the same knowledge or the same stage of its development.

The DARPA Grand Challenges, for example, brought together teams working on various frontier technologies and involved individuals who later became important participants in commercial autonomous driving (Davies, 2021). Anthony Levandowski participated in the Grand

¹³ <https://www.wsj.com/articles/car-companies-look-to-each-other-silicon-valley-for-self-driving-ventures-1539682202>

Challenge before working on Google's self-driving project, later Waymo, and founded the autonomous-trucking startup Otto, which Uber acquired in 2016. Looking only at the organization in which a capability ultimately resides can therefore conceal the multiple stages through which the underlying knowledge was accumulated.

The high-profile Waymo–Uber trade-secret lawsuit provides a different vantage point on the same process. In 2017, Waymo alleged that Levandowski had downloaded thousands of confidential files before leaving Google.¹⁴ The alleged taking of protected information raises a clear legal issue, but the source of the broader technological knowledge embodied in the people and organizations involved is much more difficult to partition. Levandowski brought experience accumulated through DARPA and Google, Otto developed as a separate organization, and Uber already had its own R&D team. What eventually appeared as autonomous-driving capability within Uber could therefore reflect employee experience, startup activity, acquisition, Uber's internal development, and allegedly misappropriated knowledge at the same time. The case eventually settled at a fraction of the initially claimed amount, focusing on the relatively narrow LiDAR technology.

Mobility and acquisition data would reveal different portions of the same history, while patent-based measures would trace still others. Litigation makes knowledge flows unusually visible, but it does so precisely because those movements became legally contested. The resulting empirical records should not be treated as interchangeable representations of a single underlying quantity of knowledge flow. Each records a different part of the process through which knowledge is accumulated, moved, and used.

Multilateral Governance

¹⁴ <https://knowledge.wharton.upenn.edu/podcast/knowledge-at-wharton-podcast/uber-waymos-race-capture-self-driving-market/>

The distributed nature of autonomous-driving technology also shapes what researchers can observe. No firm owns all the technologies required for a functioning autonomous-driving system, and relevant knowledge and rights are dispersed across many organizations. Firms therefore rely on different governance arrangements to access, share, and protect these inputs. These arrangements do more than organize transactions: they shape the empirical traces through which the underlying knowledge becomes visible. Patents and licensing, open-source collaboration, and trade secrecy make different aspects of the same broader innovation process observable.

Connectivity provides a relatively codified example. Vehicle-to-everything (V2X) communication draws on wireless standards, automotive electronics, security, and other technologies, with relevant patent rights dispersed across multiple owners. This can make even the seemingly simple question of “who must license what from whom” difficult to answer. If an automobile manufacturer had to identify and negotiate separately with every relevant patent holder, fragmented ownership would generate substantial search, negotiation, and licensing costs. Avanci addresses this problem by aggregating licenses to portfolios of SEPs and offering implementers access through a common licensing platform. The patents remain separately owned, but access is organized multilaterally through a bundled contract.¹⁵

The transaction problem looks different when the relevant knowledge is software instead of patents. Baidu's Apollo project and the Autoware Foundation provide shared software, interfaces, and development environments that firms and developers can use to build additional technologies and applications. Rather than negotiating over every piece of software that participants might use, these arrangements specify in advance what is shared and under what conditions, while leaving room for proprietary development around the shared base. AUTOSAR

¹⁵ See <https://www.avanci.com/vehicle/5gvehicle/>; <https://www.apollo.auto/en/>; <https://autoware.org/>; and <https://www.autosar.org/>.

addresses a related problem through standardized automotive software architectures and interfaces, allowing components developed by different organizations to interoperate without requiring each firm to disclose its entire proprietary implementation.

Other knowledge remains deliberately outside these shared arrangements. Training data, simulation environments, algorithms, and system-integration know-how are often protected through trade secrecy rather than disclosed through patents or open-source arrangements. These different governance mechanisms do not eliminate ambiguity; they channel it. By specifying which rights are licensed collectively, which code and interfaces are shared, and which knowledge remains proprietary, they help define how knowledge can move and be combined across organizations.

These governance choices, in turn, affect the empirical record available to researchers. Patent licensing leaves records of rights and transactions, although disclosure is often voluntary. Open-source collaboration leaves code and contribution histories, while employee mobility and acquisitions leave observable changes in organizational affiliation and ownership. Trade-secret disputes reveal knowledge flows only when they are contested in court. These traces are not interchangeable measures of an underlying quantity of knowledge flow. They arise from different ways of organizing and protecting knowledge, and each makes some forms of knowledge flow more visible than others. Empirical proxies of knowledge flows therefore capture not only where knowledge moves, but also the governance arrangements through which it moves.

DISCUSSION AND CONCLUSION

This article argues that concepts routinely used in strategy research—innovation and imitation, knowledge flow and learning, IP ownership and infringement—capture closely related but distinct dimensions of a broader innovation process. Firms recombine and adapt knowledge in

ways that blur the distinction between originality and imitation; they participate in technological and organizational communities in which outward knowledge flow may coincide with capability development; and they appropriate, defend, and contest value through institutional arenas alongside their inventive activities. Observers focusing on different dimensions of this process may therefore encounter different parts of the “elephant,” drawing conclusions that are individually valid yet partial.

None of these points is new in isolation. Scholars have long recognized that innovation, knowledge flow, and IP enforcement are intertwined yet distinct. The contribution here is to bring these conceptual distinctions together and consider what they imply for empirical research. A measure may accurately capture one part of a broader process while revealing little about others. What can be inferred from it depends not only on measurement validity, but also on how the observed evidence was generated and how far the inference extends beyond what the measure directly captures.

Organizational economics provides one useful way to connect these issues. Governance arrangements determine who participates, who contributes resources, and who holds claims to the resulting value (Bridoux and Stoelhorst, 2022; Klein et al., 2019). Applied to knowledge, these arrangements shape not only its creation, movement, and appropriation, but also the empirical traces those activities leave behind. As the autonomous-driving example illustrates, patent records, licensing arrangements, open-source contributions, employee mobility, and litigation reveal different aspects of an innovation process partly because they arise from different ways of organizing and governing knowledge.

The same logic applies across time and levels of analysis. Knowledge outflow can contribute to subsequent learning, commercialization can generate inputs for subsequent

innovation, and early breakthroughs can alter the subsequent trajectory of innovative activity. A cross-sectional observation may therefore capture only one stage of a recursive process. Similarly, management phenomena frequently span levels even when empirical studies observe them at a particular one (Hernaes, 2024; Hitt et al., 2007). Williamson's (1971) use of the transaction as the focal unit and Nickerson and Zenger's (2004) focus on the problem illustrate how changing the unit of analysis can change the theoretical question itself. When knowledge is distributed across technologies and organizations, the underlying knowledge or problem may be a more useful starting point than the firm's organizational boundary. The objective is not to identify a universally superior unit, but to align the unit of analysis with the theoretical mechanism and outcome being explained. Where feasible, triangulation across levels, measures, or methods can provide additional leverage (Cornelissen and Kaandorp, 2023; Jick, 1979).

Doing so also requires understanding the processes that generate observable evidence. Substantive knowledge of an industry, technology, location, or institutional environment can help identify where relevant processes operate and distinguish among processes that can generate similar observations. Such knowledge may come from interviews and fieldwork, archival and regulatory records, historical evidence, or sustained engagement with the empirical setting. Contextual expertise is not a substitute for careful research design; it helps determine what to measure, at what level, and what theoretical claims the resulting evidence can support.

The same conceptual distinctions matter when empirical findings are translated into managerial or policy recommendations. An observed increase in patenting, knowledge flows, or litigation does not map mechanically onto greater innovation, learning, or infringement. Policies that strengthen IP rights, for example, may change firms' incentives to innovate, disclose, patent, license, imitate, or litigate, while restrictions on cross-border knowledge flows may affect both

knowledge leakage and learning opportunities. Managers likewise respond strategically to these institutional changes, altering where and how they innovate and protect knowledge. Recommendations based on any single observable outcome should therefore be explicit about which part of the broader process that outcome captures and about the responses elsewhere in the process that the intervention may induce.

Not every study must see the whole elephant. No individual study can observe every stage, mechanism, and institutional setting, nor would doing so necessarily produce better research. Partial views are unavoidable and often analytically useful. The challenge is to be clear about which part of the elephant is being observed, why that part is theoretically relevant, what process made it observable, and how far the resulting inference can reasonably extend. Greater clarity on these questions can help different streams of strategy research speak more effectively to one another while preserving the distinctive insights that come from focused analyses.

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