

The Unexpected Importance of Trade Secrets: New Directions in International Trade Policy Making and Empirical Research

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Abstract

This article describes the importance of trade secrets to small and large firms in many industry sectors, and highlights their centrality in domestic and international policymaking. Given the practical and policy importance of trade secrets, the article describes gaps in the literature on the relationship between trade secret protection and innovation, trade, and investment that warrant research attention.

Introduction

What type of intellectual property (IP) do U.S. businesses care about most? Given all the news about software patent trolls or drug patent headaches, an educated observer might guess patents, at least for certain high-tech industries. Or, given the incidence of piracy and counterfeiting in the digital environment, one might guess copyrights or trademarks, particularly in the information sector. But the unexpected answer is trade secrets—what some commentators call “the other IP right.”² Precisely because trade secrets are secret in nature, empirical research on the topic is in early stages.

Firms, however, are keenly aware of trade secrets’ importance. Large and small firms in a wide variety of industry sectors are more likely to rate trade secrets as “very important” than all other types of IP protection. In practice, trade secrets have several identified advantages over other types of IP. First, they are broad in scope, covering virtually any type of commercially valuable information that has been subject to reasonable measures to protect secrecy. They are also a do-it-yourself IP right; firms can use internal measures (such as contracts and security procedures) to maintain protections from day one rather than waiting for the government review and approval required for patents and trademarks. Trade

¹ This article represents solely the views of the author and not the views of the United States International Trade Commission or any of its individual Commissioners. This paper should be cited as the work of the author only, and not as an official Commission document. Please direct all correspondence to Katherine Linton, Katherine.linton@usitc.gov.

² Pooley, “Trade Secrets: the Other IP Right.” June 2013.

secret protections are flexible as well—for example, firms need not file a new application to cover modifications, they simply incorporate them into their existing protections.

From a societal standpoint, trade secrets also can be considered “innovation friendly.” They can be shared with employees and commercial partners; so long as firms protect their trade secrets with contracts or other reasonable measures. Indeed, a large portion of U.S. IP exports consist of trade-secret-reliant industrial processes and software licensed to affiliates and third parties abroad. Moreover, trade secret laws permit independent discovery, reverse engineering, and other fair practices considered critical to innovation. Liability for trade secret misappropriation is generally limited to cases of wrongful conduct or violation of honest commercial practices.

As the importance of trade secrets becomes better understood, they are the subject of increased domestic and international policy making. Trade secret laws simultaneously are being strengthened in Europe and the United States. The Trans-Pacific Partnership Agreement (TPP) includes trade secret protections that are stronger than the minimum standards set by the World Trade Organization’s Trade-Related Aspects of Intellectual Property Agreement (TRIPS) and bilateral trade agreements. The TPP requires that the parties provide legal protections from misappropriation, including by state-owned entities, as well as criminal procedures and penalties in certain circumstances.³ These requirements are likely to spur current and prospective TPP members to strengthen their trade secret laws.

Notwithstanding these policy initiatives, to date empirical research on trade secrets is relatively scarce. Survey evidence on firms’ IP and innovation strategies is largely limited to developed countries. There is little research addressing whether and under what conditions firms in developing countries use trade secrets. Similarly, research on the way that changes in legal protections may affect innovation and technology transfer is in the early stages. This paper reviews the existing trade secret literature and

³ TPP, Article 18.78.

describes areas where additional research could inform the policy debate on the important connections between trade secrets, innovation, and international technology transfer.

Trade Secrets Explained

International definitions of trade secrets have converged around the requirements in TRIPS. Member countries must protect trade secrets or “undisclosed information” that is secret; has commercial value because it is secret; and has been subject to reasonable steps to keep it secret.⁴ This information must be protected from disclosure, acquisition, or use by others in a manner that is contrary to honest commercial practices.⁵ TRIPS does not specify a particular way of protecting trade secrets; in practice, member countries have stand-alone trade secret statutes, incorporate trade secret protections in their unfair competition or contract laws, and/or rely on common law.⁶

The range of intellectual materials that may be considered “trade secrets” is broad. They may include confidential business information, such as a firm’s customer lists, price lists, or marketing strategies; know-how, such as facts about manufacturing methods or processes for achieving certain results; and technical information, such as blueprints, algorithms, and chemical formulae.⁷ Trade secrets may be particularly valuable when a work that has potential commercial value is at an early stage of research and development (R&D)—and thus does not meet the requirements for obtaining a patent—or when changing legal standards make the availability of a patent unclear. For example, uncertainty about the

⁴ TRIPS Articles 39.1 and 39.2.

⁵ “Contrary to honest commercial practices” includes “practices such as breach of contract, breach of confidence or inducement to breach, and includes the acquisition of undisclosed information by third parties who knew, or were grossly negligent in failing to know that such practices were involved in the acquisition.” TRIPS, Article 39.2 n. 10.

⁶ Schultz and Lippoldt, “Approaches to Protection,” January 22, 2014, 7-8.

⁷ Schultz and Lippoldt, “Approaches to Protection,” January 22, 2014, 8, 12-13.

patent eligibility of certain pharmaceutical, biotechnology, business methods, and software inventions under U.S. law reportedly is pushing firms towards greater reliance on trade secrets.⁸

Trade Secrets and Patents Compared

Despite the potential overlap between trade secrets and patents, the protections provided by each are substantially different (see table 1). Not only do trade secrets cover a broader subject matter, they also can last longer. While patent terms are generally limited to 20 years, trade secret protections may last as long as secrecy is maintained. Moreover, trade secrets do not have to be filed with, or reviewed by, an administrative agency before they become effective. A firm protects its secrets by carrying out reasonable protection measures—for example, by giving only limited access to the information, and only to employees who “need to know” it. Whether the information meets the requirements for legal protection is not determined by an administrative official ahead of time but typically by a judge afterwards in a lawsuit.

On the other hand, trade secrets are narrower than patents in important ways. Trade secrets do not protect against a firm obtaining the information through fair and honest means, such as independent discovery or reverse engineering. Instead, violation of the law requires misappropriation—a breach of a duty of confidence (such as the employment relationship), a breach of contract, or other dishonest or wrongful action. Thus, inventions that can be discovered through reverse engineering—for example, some medicine-related inventions—cannot be effectively protected by trade secrets.⁹ Moreover, unlike patents, once a trade secret is disclosed, protection is often lost forever. A firm may bring suit, but

⁸ See, e.g., Aquino, “Attorneys Tell PTO,” September 15, 2015 (representatives of innovators in the field of biopharmaceutical diagnostics state that currently inventors are more likely to rely on trade secrets because of uncertainty about patent eligibility for inventions in the fields of diagnostics and personalized medicine due to court decisions and patent office guidelines); Barnhard and Klann, “Navigating the Sea Changes,” 2015, 16-27 (describing changes to U.S. and European patent law and procedures that may spur changes in IP protection strategies).

⁹ WIPO, “Patents or Trade Secrets?” n.d. (accessed June 17, 2016); Novartis AG, “Brief of Novartis AG as Amicus Curiae,” April 20, 2016, 21 (the robust generic pharmaceutical industry and growing biosimilars field demonstrate that few medicines are beyond the reach of reverse engineering).

“putting the genie back in the bottle” is often difficult. Instead, firms may seek court-ordered injunctions and other equitable relief to limit the damage.¹⁰

In patent law, by contrast, an independent inventor who develops a technology without knowledge of an earlier patent generally is liable if the invention falls within the scope of the patent’s claims. The first inventor to file a successful application is granted the right to exclude others from making, using, selling or importing the invention during the life of the patent. This exclusive right generally makes the infringer’s innocent intent or fair commercial practices irrelevant to the determination of infringement. Moreover, the ability to enforce exclusive rights continues regardless of whether the patent is infringed by others.¹¹

Table 1: Trade Secrets and Patents Compared

Element	Trade Secrets	Patents
Subject matter must be patentable, novel, non-obvious and useful	No	Yes
Prior registration and examination by government agency is required	No	Yes
Public disclosure is required	No	Yes
Process of acquiring the right may take years	No	Yes
Has only a defined term of protection	No	Yes
Only dishonest or wrongful conduct is prohibited	Yes	No
Internal controls are required to establish the right	Yes	No

Source: Compiled by author; see also Hall, Helmers, Rogers, and Sena, “The Choice between Formal and Informal,” 2014, 16 (identifying other differences).

To obtain these exclusive rights, however, the patent applicant must disclose the invention in “clear, concise, and exact terms” and set forth the best mode of carrying out the invention.¹² These disclosures are intended to have beneficial societal effects including increasing the public storehouse of knowledge and promoting incremental innovation; facilitating efficient bargaining by clarifying property rights; and

¹⁰ Thomas, “The Role of Trade Secrets,” January 15, 2014, 6.

¹¹ Cotropia and Lemley, “Copying in Patent Law,” 2009, 1425-26.

¹² See 35 U.S.C. § 112.

limiting the scope of patents by preventing over-claiming.¹³ While there is debate about whether patent disclosures actually have these positive effects,¹⁴ trade secrets do not permit public disclosures at all. Instead, by increasing the likelihood that investments in R&D and employee training will be protected from misappropriation, trade secret protections may positively incentivize firms to make these investments. Innovation policies related to patents and trade secrets may focus on maximizing potential advantages and minimizing disadvantages of these two types of IP.¹⁵

The Application of Trade Secret Protections to Regulatory Test Data

TRIPS provisions on trade secrets also address the issue of protections for regulatory test data. Under this language if a country requires the submission of undisclosed data that requires considerable effort to originate as a condition for the marketing of a new pharmaceutical or agricultural chemical product, then it must protect such data against unfair commercial use or disclosure, except where necessary to protect the public.¹⁶ Moreover, regulatory test data provisions have been strengthened beyond the minimum required by TRIPS via provisions of U.S. and EU free trade agreements (FTAs).¹⁷ U.S. FTAs generally mandate the protection of regulatory test data for specific lengths of time (5 years for new pharmaceuticals and 10 years for new agricultural chemicals). During these time periods, the firm originating the data has the exclusive right to rely on it.¹⁸ Most recently, the TPP has extended additional protections to test data supporting biologics, requiring that each TPP party provide at least 8 years of

¹³ See, e.g., Devlin, “The Misunderstood Function,” 2010, 402; and Hall, Helmers, Rogers, and Sena, “The Choice between Formal and Informal,” 2014, 16 (the role of disclosure is to prevent duplication and allow rapid diffusion once the patent has expired).

¹⁴ See, e.g., Devlin, “The Misunderstood Function,” 2010, 403-04 (patent disclosures often are ineffective at transmitting knowledge to others because the information disclosed is quite limited, search costs often outweigh likely gains, and because the fact of searching may be used to support a claim for willful infringement); and Hall, Helmers, Rogers, and Sena, “The Choice between Formal and Informal,” 2014, 42-43 (describing survey data showing that most firms do not conduct a prior art search before starting new R&D or product development).

¹⁵ Thomas, “The Role of Trade Secrets,” January 15, 2014, 4.

¹⁶ TRIPS, Article 39.3.

¹⁷ Roffe and Spennemann. “The Impact of FTAs,” 2006, 82-84.

¹⁸ Akhtar and Fergusson. “Intellectual Property Rights” April 2014, 23.

protection or 5 years plus “other measures” to deliver a comparable outcome.¹⁹ In the past, trade policy discussions on trade secrets have tended to focus on the exclusive rights provided to firms that originate regulatory test data. This focus has eclipsed recognition of the importance of ensuring standard trade secret protections to firms in a wide range of industry sectors, as set forth below.

Firms’ Preferences for Trade Secrets

U.S. government surveys consistently show that firms are more likely to identify trade secrets as “very important” to their operations than other types of IP. In 2014, for example, the U.S. International Trade Commission (USITC) surveyed more than 7,000 U.S. firms to study the economic effects of India’s trade and industrial policies. Based on the survey responses, 56 percent of internationally-engaged firms considered trade secrets “very important,” compared to 48 percent for trademarks, 37 percent for patents, and 31 percent for copyrights. Moreover, even in sectors generally considered patent intensive, such as chemicals and information and communications technology (ICT), firms were more likely to consider trade secrets “very important” than patents.²⁰ The importance of trade secrets was hinted at in an earlier survey the USITC conducted of approximately 5,000 U.S. firms regarding their IP experiences in China. There, firms listed their top IP concern as stolen trade secrets, ahead of lost sales, damage to their brands, and the costs of IP enforcement.²¹

These results are not unique to the surveys the USITC conducts in response to requests from Congress or the U.S. Trade Representative. Similar results are reported in the primary government survey of the R&D activities of U.S. firms, the annual Business Research and Development and Innovation Survey

¹⁹ Biologics are defined as, at a minimum, products that are or contain proteins produced using biotechnology processes for use in human beings for the prevention, treatment, or cure of a disease or condition. See TPP, Articles 18.50 and 18.52.

²⁰ USITC, *Trade, Investment, and Industrial Policies in India*, 2014, 140, 145.

²¹ USITC, *China: Effects of Intellectual Property Infringement*, 2011, 3-21.

(BRDIS), undertaken by the National Science Foundation (NSF) and the U.S. Census Bureau.²² According to the 2012 BRDIS, 58.3 percent of firms considered trade secrets “very important,” compared to lower shares for patents, trademarks and copyrights (see table 2). For example, in the manufacturing sector, firms in the chemical, computer and electronic products, machinery, and transportation equipment industries were more apt to consider trade secrets “very important” than they were patents, trademarks, or copyrights. Similarly, in the non-manufacturing sector, firms in the information industry (including publishing and software) and the professional, scientific, and technical services industries also favored trade secrets. Moreover, it’s not just large firms that care about trade secrets; 56.2 percent of firms with less than 500 employees considered trade secrets “very important,” compared to 45.4 percent for patents, 37.8 percent for trademarks, and 25.6 percent for copyrights.²³

Table 2: Percentage of firms that consider different IP types “very important,” selected industry sectors

Industry	Trade secrets	Patents	Trademarks	Copyrights
All industries	58.3	48.3	43.5	27.4
<i>Manufacturing</i>	62.1	55.9	50.1	26.1
Chemicals	69.7	67.6	54.4	26.1
Machinery	53.0	48.2	41.5	21.9
Computer and electronic Products	70.6	64.3	49.9	34.4
Transportation Equipment	47.8	42.8	38.5	22.1
<i>Nonmanufacturing</i>	54.3	40.1	36.5	28.7
Information	63.6	44.1	57.2	50.9
Professional, scientific and technical services	49.9	42.1	20.3	20.3

Source: NSF and NCSES, *BRDIS: 2012*, October 2015, Tables 53-57.

Academic research, including the 1994 Carnegie Mellon Survey on Industrial R&D in the U.S. manufacturing sector, similarly has found that firms consider trade secrets and other informal mechanisms to be the most effective means for protecting returns on innovative products and

²² The target population for the BRDIS consists of for-profit corporations with five or more paid employees in the United States that have at least one U.S. establishment in business during the survey year, and are classified within a specific set of industry sectors, with a particular focus on those companies that perform R&D in the United States. Detailed information on the sampling methodology and responses are available in the 2012 BRDIS technical notes. NSF and National Center for Science and Engineering Statistics (NCSES), *BRDIS: 2012*, October 29, 2015.

²³ NSF and NCSES, *BRDIS: 2012*, October 2015, tables 53-57.

processes. This is particularly true for small firms, who are more likely than large firms to forgo the use of patents because of their cost.²⁴

To shed additional light on the experiences of small firms, the 2008 Berkeley Patent Survey targeted small high-tech start-up companies in the United States.²⁵ The cost of getting and enforcing patents was the most common reason cited by all survey respondents for not patenting major technologies. Other reasons included the belief that particular innovations were not patentable, that trade secret protection was adequate, or a reluctance to disclose commercially valuable information. Reasons for not patenting varied by industry sector—for example reluctance to disclose and the sense that trade secret protections were sufficient were top reasons for small firms in the biotechnology sector, while cost concerns dominated in the software sector.²⁶

The fact that trade secrets may be protected without governmental help and are often attractive to resource-constrained firms, suggest that they may play an important role in the innovation strategies of developing-country firms. However, while there is a substantial body of survey evidence on the use of trade secrets in developed countries,²⁷ there is little survey information from developing countries. Instead, information on how developing-country firms use trade secrets generally is limited to case studies and anecdotal evidence.²⁸

New Trade Secret Protections in the United States and Europe

The United States and Europe adopted new trade secrets legislation In May of 2016 (only 15 days apart).

The U.S. Defend Trade Secrets Act of 2016 (DTSA) and the EU’s “Directive on the protection of

²⁴ These results have been reported even for firms in the pharmaceutical industry, often considered the most patent-reliant. Cohen, Nelson and Walsh, “Protecting their Intellectual Assets,” 2000, 25 and tables 1 and 2.

²⁵ Graham, Merges, Samuelson, and Sichelman, “High Technology Entrepreneurs,” 2009, 1260.

²⁶ Graham, Merges, Samuelson, and Sichelman, “High Technology Entrepreneurs,” 2009, 1310-1314.

²⁷ Hall, Helmers, Rogers, and Sena, “The Choice between Formal and Informal,” 2014, 6-13; Baker & McKenzie. “Study on Trade Secrets,” April 2011, 101-102.

²⁸ For example, the IP Advantage database of the World Intellectual Property Organization (WIPO) provides case studies on how firms (particularly SMEs) in different countries have used trade secrets and other types of IP to protect their competitive advantages. WIPO IP Advantage database (accessed June 15, 2016).

undisclosed know-how and business information (trade secrets) against their unlawful acquisition, use and disclosure” (the EU Directive) should make protections within and across the two markets more uniform.²⁹ U.S. and EU government representatives have cited the ongoing Transatlantic Trade and Investment Partnership (TTIP) negotiations as one impetus for strengthening trade secret protections at home.³⁰

The DTSA creates a federal civil cause of action for trade secret misappropriation. Before this, civil trade secret protections generally were governed by state law, with almost every state (excepting New York and Massachusetts) relying on a version of the Uniform Trade Secrets Act.³¹ The DTSA seeks to make the standards for trade secret misappropriation more consistent and to provide uniform remedies similar to those for other IPR violations (including injunctive relief, seizure of misappropriated information, compensatory damages, and punitive damages and attorneys’ fees in cases of willful misappropriation).³² In recognition of the international dimensions of the problem, the DTSA also requires the Attorney General to prepare biannual reports on the size and scope of theft of U.S. trade secrets abroad; the involvement of foreign governments; the legal and enforcement protections available abroad; and a list of the countries where problems are significant.³³

The U.S. and EU legislation harmonize approaches to trade secret protections by similarly defining trade secrets and the requirements for a finding of misappropriation. They also take similar approaches to civil remedies and the protection of trade secrets during litigation. An important difference, however, is the availability of criminal liability.³⁴ The DTSA amends the Economic Espionage Act of 1996, which

²⁹ See DTSA, Public L. No. 114-153, May 11, 2016 and European Commission, “Trade Secrets,” n.d. (accessed June 16, 2016).

³⁰ Akhtar and Jones, “Transatlantic Trade and Investment Partnership (TTIP) Negotiations,” February 4, 2014, 34.

³¹ Bombard, “Three Key Distinctions,” 2016, 23.

³² DTSA, Public L. No. 114-153, May 11, 2016, <https://www.congress.gov/bill/114th-congress/senate-bill/1890> (accessed June 16, 2016); see also Hatch, “Senators Hatch, Coons Urge Passage,” October 8, 2015 (listing numerous associations and firms supporting the DTSA).

³³ DTSA, Public L. No. 114-153, May 11, 2016.

³⁴ Patel, Pade, Cundiff and Newman, “A Quick Guide,” June 2016.

criminalizes: theft for the benefit of a foreign entity (economic espionage) and the intentional theft of a secret placed in interstate commerce with the intent to convert the trade secret and injure the owner.³⁵

By contrast, criminal liability is a matter for the EU Member States, and there is a lack of uniformity in their approaches.³⁶

A New Focus in Trade Policy Making

Notwithstanding some differences in domestic laws, trade agreements are moving the dial forward on harmonizing trade secret protections. The TPP's trade secrets provision begins by reiterating the requirements of TRIPS Article 39.2 that countries provide a legal means for protecting "undisclosed information" or trade secrets. It further requires that countries provide protections against the disclosure, acquisition, or use of trade secrets by others, explicitly including state-owned entities, in a manner contrary to honest commercial practices.³⁷ Additionally, for the first time in a trade agreement, the TPP requires that criminal procedures and penalties be available for trade secret misappropriation under certain circumstances.³⁸ While U.S. industry representatives have praised the enhancement of trade secret protections in the TPP, they have urged even stronger protections and greater harmonization in future agreements.³⁹

U.S. bilateral trade policy also reflects the importance of strong trade secret protection for U.S. firms doing business internationally, particularly in China and India. Recent meetings of the U.S.-China Joint Commission on Commerce and Trade, for example, have resulted in outcomes that focus on upgrading

³⁵ The law was revised in 2012 to expand the jurisdictional element of the trade secret provision and to increase available penalties. See Theft of Trade Secrets Clarification Act of 2012, Pub. L. No. 112-236, amending 18 U.S.C. §1832(a) and Foreign and Economic Espionage Penalty Enhancement Act of 2012, Pub. L. No. 112-269, amending 18 U.S.C. §1831(a), (b).

³⁶ Baker & McKenzie. "Study on Trade Secrets," April 2011, 61-66.

³⁷ TPP, Article 18.78.

³⁸ TPP, Article 18.78.

³⁹ Intellectual Property Rights Industry-Trade Advisory Committee (ITAC-15), "Report on the Trans-Pacific Partnership Agreement," December 3, 2015, 25-26.

substantive and procedural protections for owners of trade secrets in China.⁴⁰ In India, bilateral discussions have focused on enhancing trade secrets protections, which is particularly important given the absence of a standalone trade secret law in India. These efforts are buttressed by a shared understanding that improved trade secret protections are mutually beneficial.⁴¹ Empirical research on the potential economic effects of strengthening trade secrets protections could guide these and future efforts.

Emerging Research on the Effects of Strengthening Trade Secret Protections

A major argument made in favor of TRIPS by the United States and other developed countries was that a stronger and better-harmonized global IP system would improve incentives for technology transfer and contribute to economic development through trade in high-technology goods, foreign direct investment (FDI), and licensing.⁴² Based on recent economic studies, strengthening IP protection—in particular, patent reforms—has had positive effects in each of these areas.⁴³ While many of the studies involve IP reforms in larger and middle-income countries, benefits also have been shown in smaller and poorer countries when governments undertake complementary reforms to improve education, and the business and innovation climates.⁴⁴

Many empirical studies rely on the Ginarte and Park Index (GP Index), which measures the strength of patent protection in a large sample of countries over time.⁴⁵ One potential limitation of the GP Index, however, is that it measures the absence or presence of particular aspects of a country's patent law but does not take into account whether laws are effectively enforced. This limitation may be particularly

⁴⁰ USTR, "U.S. Fact Sheet," November 2015.

⁴¹ USTR, "United States and India Joint Statement," October 2015.

⁴² Maskus, "The New Globalisation," 2014, 276.

⁴³ See, e.g., Maskus, "The New Globalisation," 2014, 276 (more than 15 recent economic studies establish the positive effects of patent strengthening on inward trade in high-tech goods, FDI, and licensing); Maskus, *Private Rights and Public Problems*, 2012, 73-81 (summarizing this literature).

⁴⁴ Cepeda, Lippoldt, and Senft, "Policy Complements," 2010; and Zhang, Du, and Park, 2015, 26.

⁴⁵ See Ginarte and Park, "Determinants of Patent Rights," 1997, 283; and Park, "International Patent Protection," 2008, 761.

salient as the legal reforms required by TRIPS are completed but concerns about effective enforcement persist.⁴⁶ Some researchers address this limitation by combining the GP Index with measures of the effectiveness of legal institutions, such as the legal system and property rights index published by the Fraser Institute.⁴⁷

Until recently, there was no index measuring the potential effects of changes in trade secret protections. Pioneering work published by Lippoldt and Schultz in 2014 addresses this gap. Their Trade Secret Protection Index (TSPI) includes five elements that reflect the scope of trade secret protections and remedies, and that correspond well with TRIPS and TPP requirements. The elements are: (1) definitions and coverage; (2) specific duties and misappropriation; (3) remedies and restrictions on liability; (4) enforcement, investigation and discovery, and test data exclusivity; and (5) system functioning and related regulation. Like the GP Index, it is structured to enable scoring based primarily on objective criteria; however, it also specifically includes measures of enforcement and the effectiveness of legal institutions.⁴⁸

Lippoldt and Schultz test the hypothesis that increasing the protection of trade secrets promotes (1) expanded domestic innovative activities, as measured by R&D expenditures and intensity, and (2) expanded international activities, including more goods and services imports, imports of IP services, and FDI inflows. They find a positive relationship between the stringency of trade secret protection and domestic and international innovation indicators, particularly FDI inflows and imports of IP services.⁴⁹ Their research offers an excellent jumping-off point for further analysis of the relationship between trade secrets protection and innovation.

⁴⁶ See, e.g., USTR, *2016 Special 301 Report*, April 2016, 29-63(noting ongoing enforcement challenges in countries identified as having substantial IP problems).

⁴⁷ See, e.g., Zhang, Du, and Park, "How Private Property Protection," 2015, 4-5; Maskus and Yang, "The Impacts of Post-TRIPS Patent Reforms," April 2013.

⁴⁸ Lippoldt and Schultz, "Uncovering Trade Secrets," 2014, 11-12, 23.

⁴⁹ Lippoldt and Schultz, "Uncovering Trade Secrets," 2014, 16.

New Areas for Research

There is substantial room to improve understanding of the links between trade secrets and indicators of innovation, trade, and investment to support best practices in trade policymaking. Topics that would benefit from further research are described below.

Who uses trade secrets?

Substantial survey evidence from developed countries confirms the central importance of trade secrets to large and small firms in a range of industry sectors. However, there is little evidence about the IP strategies of firms in developing countries and, in particular, their use (or not) of trade secrets. These strategies may differ, for example, based on firm characteristics including size, industry sector, whether the firm is involved in creating new products and/or processes, and whether the firm is internationally engaged through trade, investment, and/or licensing.

Moreover, survey evidence from the United States and other developed countries points to the relative importance of trade secrets when compared to other types of IP. The reasons for this preference—including potential cost advantages and the broad scope and subject matter of trade secrets—suggest that they may play an important role in developing countries as well. Although there is some anecdotal evidence on developing country firms' use of trade secrets in certain circumstances, survey information could provide a more robust basis for trade secret policymaking.

Under what circumstances do firms rely on trade secrets in addition to or instead of patents or other types of IP protections?

Much of the research on IP and innovation has focused on patents because they are more visible due to the availability of data on applications and grants and thus more readily lend themselves to measurement. Moreover, the economic literature often assumes that patents and trade secrets are substitutes; that is, a firm can choose one or the other but not both.⁵⁰ In practice, however, there are

⁵⁰ Hall, Helmers, Rogers, and Sena, "The Choice between Formal and Informal," 2014, 14.

many instances of firms using both strategies. For example, trade secrets may be used to protect the know-how needed to implement a patented invention, acting as complements rather than substitutes.

From an innovation policy perspective, understanding the relationship between trade secrets and patents (as well as other types of IP) is critical to predicting how changes in one policy domain may affect others. In cases in which patents and trade secrets are substitutes, changes that make patents more difficult to obtain (for example for biotechnology or software inventions) may make trade secrets more desirable. Strengthening trade secret laws could similarly be expected to discourage patenting. By contrast, when patents and trade secrets are used as complements, they may be expected to respond similarly to policy changes.

One limitation of surveys in this regard is that they typically provide aggregated firm-level data rather than data at the level of a particular product or process innovation.⁵¹ Aggregated data can obscure the fact that a single invention may be protected differently at different stages of the product life cycle. For example, different aspects of a software program may be protected initially by trade secrets; further on by patents or copyrights; and at later commercialization stages, trademarks may be added to the mix. Collecting survey data at the product level—for example, seeking identification of all IP strategies used in connection with a particular innovation—could shed light on how different IP mechanisms complement and/or substitute each other. Case studies also could be useful to illustrate the use of different IP strategies throughout the life cycle of an innovation.

What relationships are visible between trade secrets and trade and investment indicators?

The empirical evidence reviewed here provides an untested basis for understanding the international activities of trade-secret-intensive industries. For example, using the NSF survey data, industry sectors could be categorized according to whether or not they are trade-secret-intensive. Goods trade data for these sectors could be used to explore and compare trade patterns and trends in trade-secret and non-

⁵¹ Hall, Helmers, Rogers, and Sena, “The Choice between Formal and Informal,” 2014, 41.

trade-secret -intensive industries, and the potential relationship of these patterns to the strength of trade secret protection as measured by the TSPI.

On the services side, a large portion of trade in IP services is for industrial processes and software—two categories that are believed to substantially rely on trade secrets (although more research is needed here as well). Currently, IP services trade involves mainly high-income countries; however, receipts and payments for IP services in middle-income countries, particularly China, are growing rapidly.⁵² Trade trends in IP services could be compared to those in non-IP services, including the potential relationship to trade secret protection levels.

With regard to FDI, further study of how the size, scope, and location of FDI are affected by trade secret protection levels is warranted. For example, the availability of trade secret protections may influence the way in which relationships are structured in global value chains. When trade secret laws are lax, a multinational corporation may rely on a wholly-owned affiliate rather than a non-affiliated entity because it can exert greater control over sensitive information. By contrast, joint venture partnerships, which generally rely on enforceable contractual relationships, may be facilitated by robust trade secret protections. The role that trade secret protections may play in the composition of FDI (for example, whether it is in manufacturing and R&D rather than simply distribution) also warrants further study.

Are legal institutions effectively protecting trade secrets?

Unlike patents, trade secrets do not necessarily require strong institutions *ex-ante*; firms protect their trade secrets themselves through internal measures. They do, however, require strong institutions *ex-post* in the event of a misappropriation. A judge must be able to identify the trade secret (without improperly disclosing it to third parties); order appropriate discovery, subject to confidentiality

⁵² The World Bank, “World Bank Open Data” (charges for the use of intellectual property reported for high, middle, and low income countries, 2006-14) (accessed June 19, 2016).

restrictions; determine if there has been a misappropriation; and, if there has, must be able to impose and enforce appropriate remedies.

Research on whether countries' legal institutions are meeting the challenge of protecting trade secret is in early stages. However, there is anecdotal evidence of inadequate and non-deterrent remedies; a lack of injunctive relief; difficulties protecting trade secrets during legal proceedings; and insufficient mechanism for participation between courts and government agencies within and across countries. These concerns have been noted with regard to China, India, and other markets.⁵³

To take into account the relationship between effective legal institutions and trade and investment, it may be appropriate to modify the TSPI to capture more information about the effectiveness of trade secret protections "on the ground." Moreover, further research can shed light on how firms' evaluations of countries' legal environments affect decision making, including choices between serving the market through exports, FDI, and/or licensing. Given the documented importance of trade secrets to firms and new domestic and international policy making in this domain, there is a substantial need for further research on the relationships between trade secrets, innovation, trade and investment.

⁵³ See, e.g., U.S. Chamber of Commerce. "The Case for Enhanced Protection," 2014, 13-18; Bai and Da, "Strategies for Trade Secret Protection, 2011, 351; Brant and Lohse, "Trade Secrets," 2014, 17-18; USTR, 2016 Special 301 Report, April 2016, 20.

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