Innovation, Imitation, and Political Cleavages in International Trade and Patent Protection

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Abstract

When do exporting firms impose trade barriers against their foreign competitors in global markets? In this paper, I contend that the decline of market power drives exporting firms' support for restrictive trade policies. I develop a theoretical model showing that product obsolescence leads incumbent firms to lobby for international intellectual property protection, which raises barriers to entry within their markets. To test the theory, I estimate product life cycles using millions of patent citations and analyze U.S. lobbying reports filed on U.S. trade agreements that adopt higher standards for global patent protection. I find that U.S. exporters that manufacture products with longer life cycles lobby Congress more to pass the trade agreements. Their lobbying reports also reveal the risk of imitation in international trade using keywords, such as `counterfeit`. The results imply that global businesses operating behind the technological frontier engage in political activity for entry deterrence.

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1 Introduction

Technological innovation is a defining feature of the modern economy. Yet, its protection under intellectual property (IP) laws has remained controversial in international trade relations over decades. According to the annual report written by the Office of the U.S. Intellectual Property Enforcement Coordinator (USIPEC) in March 2018, U.S. intellectual property infringement in other countries costs more than $300 billion to the U.S. economy each year. This led President Donald Trump to impose a 25 percent tariff on U.S. imports of Chinese products that contain critical technologies in June 2018.[1] Similarly, the Biden administration decided to raise tariffs on Chinese exports of electric vehicles by 25 percent in May 2024, retaliating "China's forced technology transfers and intellectual property theft" (White House, 2024).

Who advocates for global IP protection? A body of research on the political economy of IP laws and non-tariff barriers shows that IP holders favor more stringent IP rules and regulatory standards. These studies view IP protection as a barrier to entry in global markets imposed by exporting firms, and show that IP owners in the pharmaceutical and chemical industry attempt to secure their profits by absorbing higher compliance costs (Shadlen, 2017; Gulotty, 2020) and deploying scientific knowledge strategically (Perlman, 2023). The literature also documents that these firms work through the World Trade Organization (WTO) to promote more exclusionary IP rules (Sell, 2003) and support free trade agreements (FTAs) with stricter IP provisions than those within the WTO (Osgood and Feng, 2018; Shadlen, Sampat, and Kapczynski, 2020).

This paper is motivated by empirical regularities that contradict the prevailing focus on IP ownership in the literature. A primary example is the Prioritizing Resources and Organization for Intellectual Property (PRO-IP) Act, which created the USIPEC in 2008 and has helped the U.S. Department of State monitor U.S. IP infringement abroad since then. When the PRO-IP Act of 2008 was introduced, General Electric (GE) spent $36.6 million in lobbying Congress to pass the law, ranking it at the top of lobbying expenditures as of 2008. Yet, GE was far away

[1] White House. *Annual Intellectual Property Report to Congress.* March 2018.

from the technological frontier that year compared to other companies, such as Microsoft, who had been granted more patents (2,038 vs. 1,138) but spent far less in lobbying than GE ($17.76 million vs. $36.6 million).[2] This gap between IP ownership and U.S. lobbying intensity was not only evident within the PRO-IP Act of 2008, but also profound across other U.S. congressional bills that address patent, copyright, and trade secret-related issues in trade (Kim, 2018). I find that much of the variation in lobbying rises among U.S. firms with the same amount of patents, suggesting that IP holdings alone cannot fully represent their preferences for IP protection.

To account for this variation, I focus on an important yet understudied aspect of trade that facilitates new entry and undermines incumbent firms' market power: **imitation**. In particular, I argue that as exported products mature and imitation risks rise in global markets, exporting firms become more supportive of international IP protection, which raises entry barriers against counterfeit imports. That is, exporting firms that are not able to develop new products rapidly become more vulnerable to reverse engineering by import-competing firms, given the extended lifetimes of existing products. Accordingly, these firms seek more stringent global IP rules that prohibit the entry of counterfeit products into global markets.

In the case of the PRO-IP Act of 2008, Microsoft's product turnover rate in 2008—proxied by the ratio between new patents granted every year and the cumulative number of patents—was much higher than that of GE (0.33 vs. 0.15). Data on their patent profiles between 1980 and 2008 also demonstrate that Microsoft's product life cycles were, on average, shorter than those of GE. After 1995, Microsoft's new inventions primarily came from `DATA PROCESSING: DATABASE AND FILE MANAGEMENT OR DATA STRUCTURES` (USPC 707), which were mainly used to update their software, called Microsoft Windows. In contrast, most of GE's inventions came from `ELECTRICITY: MEASURING AND TESTING` (USPC 324) since 1985, and the company only announced the creation of a new business unit for software, called GE Digital, as of 2015.

I develop a theoretical model that illustrates how product obsolescence drives exporters to support international IP protection. In this model, a Northern firm exports an original product

[2] OpenSecrets. "Lobbying Database." Accessed July 20, 2024. https://www.opensecrets.org/federal-lobbying.

protected under IP laws, while a Southern import-competing firm tries to imitate that product through reverse engineering over time. It shows that a longer economic lifetime of the exported product increases the probability of imitation success by the Southern import-competing firm, which results in less stringent IP rules in the South. Anticipating this erosion of market power, the Northern exporting firm lobbies its home government to strengthen global IP rules to deter counterfeit entry into their markets.

To test the theory, I estimate life cycles of patented exports in manufacturing by using U.S. patent citations and collect lobbying reports filed in Congress after 2001. In particular, for each U.S. patent granted after 1975, I check the time lags between the first and last patent citations, aggregate them at the industry or firm level, and take their average as a proxy for product life cycle (Bilir, 2014). I did this by gathering and merging numerous patent datasets at a granular level (Hall, Jaffe, and Trajtenberg, 2001; Arora, Belenzon, and Sheer, 2021). Also, I collect U.S. lobbying reports filed on U.S. FTAs signed after the Doha Round (Kim, 2018),[3] whose patent terms I manually identify and differentiate by tracing all IP provisions in each U.S. FTA.

I find empirical evidence corroborating the theory. In particular, using granular patent-level data, I find that U.S. patent holders who manufacture products with longer life cycles are more likely to lobby Congress to ratify U.S. FTAs for patent protection. To better tease out the key mechanism, I also conduct sub-sample analyses and document that the relationship becomes more pronounced as the U.S. trade agreements adopt more stringent provisions for patent protection. A text analysis also reveals that the lobbying reports contain keywords representing an increased exposure to imitation in trade, such as `counterfeit` and `piracy`.

This paper advances our understanding of the distributive politics of international trade in the following ways. First, the results reveal that the global trade environment is more *dynamic* than previously assumed. Assuming that "trade expands or contracts so rapidly as to frustrate rational expectations" (Rogowski, 1987, 1133), existing studies adopt *static* approaches to trade preferences, exploring industry-, firm-, and product-level characteristics that are time invariant

[3]Most US lobbying reports filed on the PRO-IP Act of 2008 simultaneously address U.S. FTAs.

(Rogowski, 1987; Osgood et al., 2017; Baccini, Pinto, and Weymouth, 2017; Kim, 2017; Kim and Osgood, 2019). Yet, the global trade environment is far from constant, as factors of production cross sectoral boundaries across multiple time periods (Hiscox, 2002). Trade relations have also become increasingly interdependent in recent years, as global value chains (GVCs) shape firms' adjustments to political risks and trade restrictions (Johns and Wellhausen, 2016; Gulotty and Li, 2020) and foster new coalitions in response to climate change, trade wars, and unfair trade practices (Cory, Lerner, and Osgood, 2021; Zhang, 2023; Betz and Hummel, 2025). This paper provides further evidence on firms' forward-looking attitudes toward trade policy, highlighting their efforts to mitigate imitation risks in trade.

Next, this paper shifts the focus in trade politics from exporters' support for market access to entry deterrence. Based on new (new) trade theory (Krugman, 1979*b*; Melitz, 2003), existing political economy models conceptualize exporters as *entrants* seeking access to foreign markets, and show that differences in firms' fixed and variable costs of production determine their trade preferences (Osgood, 2016, 2017; Kim, 2017; Kim and Osgood, 2019). While providing valuable insights on lobbying for lower tariffs, this framework captures only part of trade competition in which exporters often possess technologies that other firms do not and thus act as *incumbents*. While research on non-tariff barriers stresses exporters' capacity to accommodate higher fixed costs as incumbent firms (Gulotty, 2020), it also overlooks technology spillovers that operate as externalities and hence do not incur fixed costs on new entrants' technological upgrading (Bilir, 2014; Santacreu, 2025). Drawing on the growth theory in trade (Grossman and Helpman, 1991, 1993), this paper shows that, in the face of technology diffusion to other competitors, exporters prioritize preserving market power over seeking market access in their political activity.

This paper proceeds as follows. After a brief overview of the literature viewing IP protection as part of trade policy, I present a formal model showing how product life cycles drive lobbying for international IP protection. Next, I outline the empirical strategy guided by the model, and test its observable implications. Finally, I conclude by highlighting avenues for future research.

2 Trade, Intellectual Property Rights, and Politics

With tariff and non-tariff barriers, intellectual property rights (IP) protection and enforcement have been key components of trade policy for decades. After 1995, more than 160 states joined the WTO and signed the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS). Under the TRIPS agreement, WTO members adopted a set of minimum standards for IP protection, such as extending the length of patent protection to 20 years. Unlike the WTO's most-favored-nation (MFN) tariffs, which promote reciprocal market access, these IP provisions subject to MFN treatment are designed to reward inventive efforts globally by granting market exclusivity for a limited amount of time. To mitigate the distributional consequences of market exclusivity, TRIPS also incorporates a set of trade remedies known as TRIPS flexibilities.

Nations have also signed trade agreements for IP protection outside of the WTO since the 2001 Doha Round, some of which went beyond the minimum standards. Known as TRIPS-plus, these higher standards include re-extending of the term of patent rights in the case of delayed regulatory approval and limiting the uses of TRIPS flexibilities. Many of U.S. trade agreements signed after 2001 incorporated TRIPS-plus provisions, albeit to varying degrees for patents.[4]

Which governments adopt more stringent IP policies in the world economy? Grossman and Lai (2004, 1636) theorize that "patent protection will be stronger in the (Global) North" due to lack of capabilities to innovate in the South. Empirical findings indicate that IP protection increases trade flows among nations (Maskus and Penubarti, 1995), but mainly from the North to the South (McCalman, 2001; Chaudhuri, Goldberg, and Jia, 2006). Firms from the South mainly imitate technologies invented in the North (Helpman, 1993), while governments in the South also promote knowledge spillover at the firm-level through foreign direct investment (FDI) (Branstetter, 2006; Branstetter, Fisman, and Foley, 2006). With regard to increased imitation risks in trade, Bilir (2014) finds that multinational corporations (MNCs) from the North locate their production facilities in the South only when those firms can manage the risks of imitation.

[4]For a more comprehensive overview, see Maskus (2000), Correa (2000), Abbott (2002), and Deere (2009).

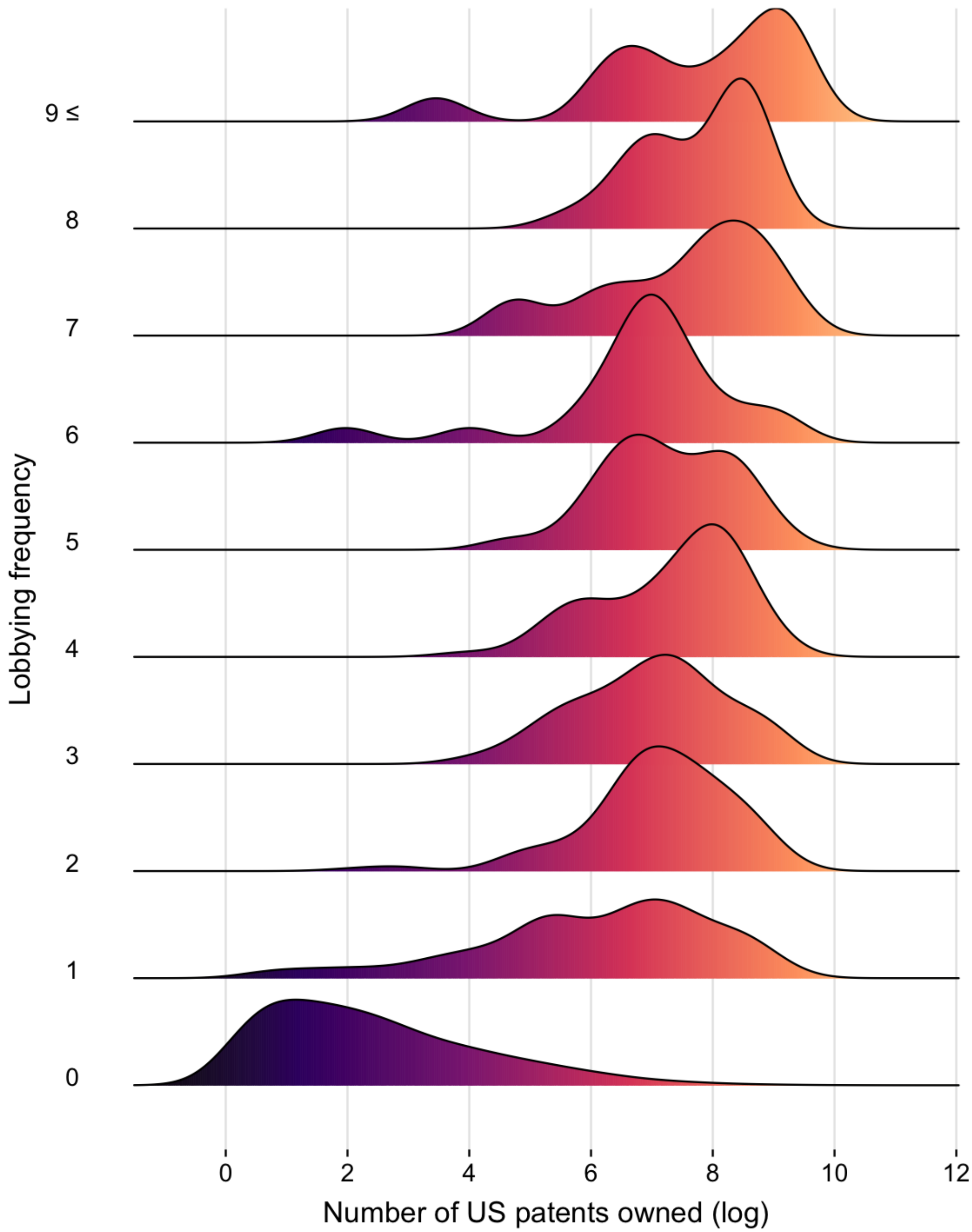

Figure 1: **U.S. Lobbying for IP Protection in Trade: The Extensive Margin**
This figure shows that much of the variation in U.S. lobbying frequency concerning trade and IP arises among U.S. companies with the same number of patents. All U.S. lobbying reports addressing `TRD (Trade, Domestic & Foreign)` and `CPT (Copyright/Patent/Trademark)` were downloaded from `LobbyView` (Kim, 2018) and matched with U.S. patent ownership data from Arora, Belenzon, and Sheer (2021). The final data set contains 3,435 publicly traded U.S. manufacturing firms from 1999 to 2015.

Without bridging the gap between the two, harmonization of IP regimes is seen to be infeasible unless the North applies external pressures (Sell, 1995; Shadlen, Schrank, and Kurtz, 2005) or mutual concessions are negotiated (Shadlen, 2005).

When IP protection benefits large, innovative firms from the Global North, should we infer that these firms demand stronger IP protection in trade? Existing studies on distributive politics find that the degree of market concentration, defined by firm sizes and productivity,[5] is a defining characteristic of firms' trade preferences (Baccini, Pinto, and Weymouth, 2017; Kim, 2017; Osgood et al., 2017; Osgood, 2017; Kim and Osgood, 2019; Kim et al., 2019). Existing research on non-tariff barriers shows that exporting firms absorb higher fixed costs to exclude import-competing firms from global markets and IP laws provide one means of achieving this end (Gulotty, 2020; Kennard, 2020; Perlman, 2023). Sell (2003), Shadlen (2007), and Osgood and Feng (2018) offer empirical evidence, showing that large exporting firms from industrialized countries primarily shape the global IP regime in their favor.

Yet, empirical studies using survey and patent datasets leave cautionary notes on whether the supply-and-demand logic based on firm size can be applied to IP and trade policy-making. Cohen, Nelson, and Walsh (2000), for example, conducted a survey with more than 1,000 US manufacturing firms' research and development (R&D) labs. They find that the firms care less about patents than they do about secrecy and lead time—the time remaining for patent holders to exploit their knowledge before other firms enter the market with similar products. Other analyses using patent-level datasets reveal that the lack of interest in patents among patent holders, known as the *patent paradox*, is associated with other quality aspects of patents. These include the rate at which the market value decays over time (Schankerman and Pakes, 1986) and whether patent holders build on their prior inventions when developing new scientific knowledge (Hall and Ziedonis, 2001).[6]

Figures 1 and 5 suggest that a mere emphasis on firm size, proxied by the number of patents

[5]Productivity refers to efficiency in producing existing goods at lower variable costs, while innovation entails fixed costs for developing new products.

[6]For a more comprehensive literature overview, see Cohen (2010) and Hall and Harhoff (2012).

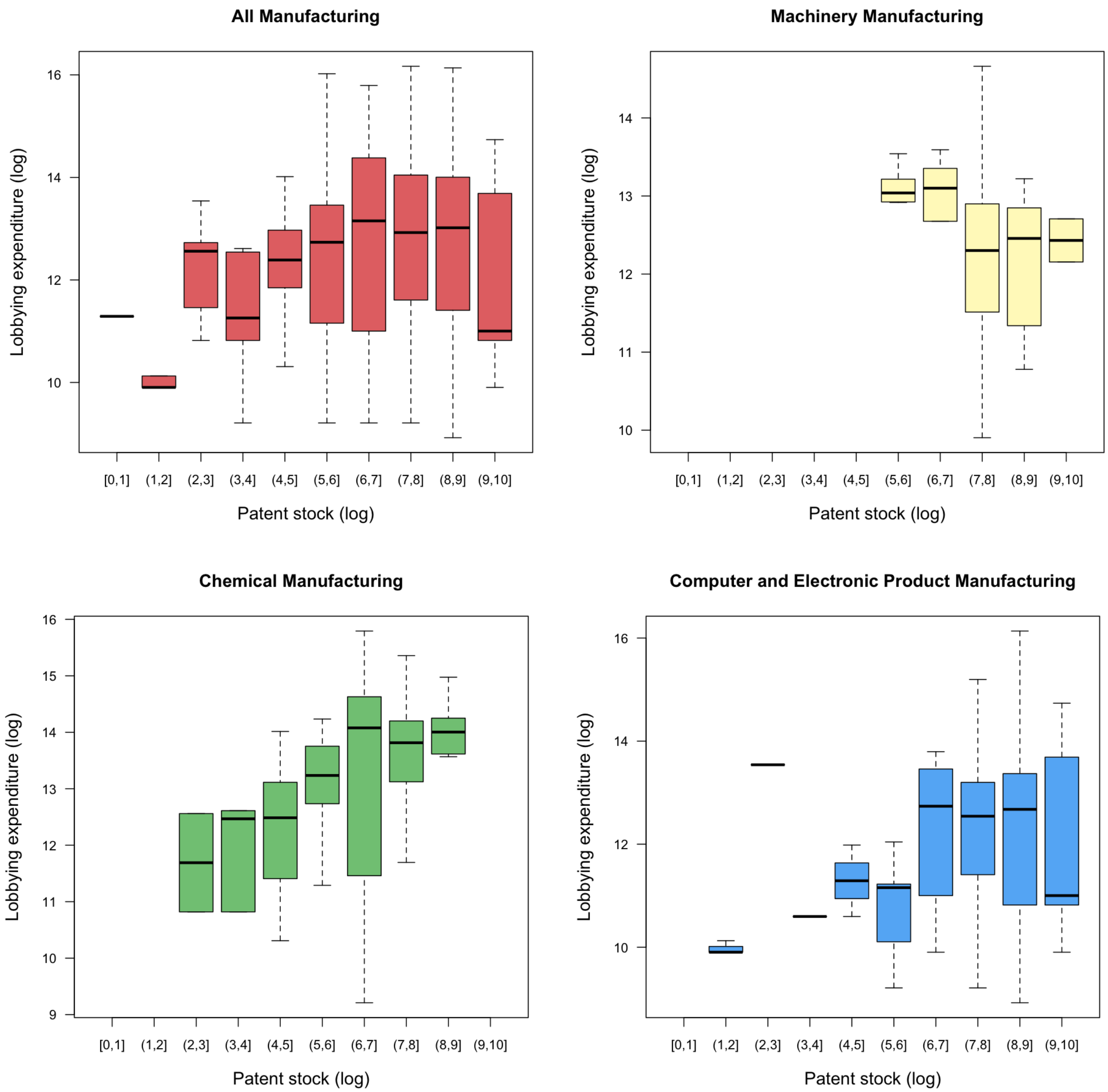

Figure 2: **U.S. Lobbying for IP Protection in Trade: The Intensive Margin**
This figure shows that much of the variation in U.S. lobbying expenses concerning trade and IP arises among U.S. companies with the same number of patents. All U.S. lobbying reports addressing `TRD (Trade, Domestic & Foreign)` and `CPT (Copyright/Patent/Trademark)` were downloaded from `LobbyView` (Kim, 2018) and matched with U.S. patent ownership data from Arora, Belenzon, and Sheer (2021). The final data set contains 1,595 publicly traded U.S. manufacturing firms from 1999 to 2015.

owned by each firm, cannot fully explain which firms seek IP protection in trade. Particularly, in Figure 1, there is a clear difference between lobbying and non-lobbying US manufacturing firms in their patent ownership. However, when it comes to the frequency with which the firms lobby on IP-related trade issues, there is no clear distinction in patent ownership among US manufacturing companies with varying lobbying frequencies. This means patent ownership can influence whether a firm lobbies, but does not necessarily determine the frequency of its lobbying.

Figure 5 indicates that the number of patents cannot predict how frequently US manufacturing firms lobby on IP-related trade issues, nor how much money they spend on their lobbying activities. Additionally, it indicates that such patterns are commonly found across different industries. Put together, these figures highlight multidimensional aspects of firms' IP and trade policy preferences and that they cannot be described solely by firm size.

3 Product Life Cycle and Lobbying for Entry Deterrence

In this section, I develop my argument based on the trade literature about product life cycle and the political economy of innovation. Next, I construct a new political economy model of trade where innovating and imitating firms in the same industry lobby on the terms of patents in an open economy and analyze how their products' life cycles relate to their lobbying behaviors. Last, I derive testable hypotheses from the theoretical model for empirical analysis.

The product cycle theory explains North-South trade as a result of on-going innovation in the North and its technology transfer to the South. Pioneered by Vernon (1966), the theory argues that newly invented products are manufactured first in the North and later in the South. This gives rise to the North exporting new products to, and importing old goods from, the South in a steady-state equilibrium (Krugman, 1979*a*). The rate of technological change was later endogenized by Segerstrom, Anant, and Dinopoulos (1990), who modeled new product development as profit-seeking activities among companies in the North.

The theory was further generalized by Grossman and Helpman (1991, 1993), who modeled innovation by companies in the North as a strategic reaction to costly imitation by firms in the South. Based on the theory, the product cycle decreases as a result of accelerated innovation by firms in the North to evade imitation by firms in the South. Ongoing innovation and imitation is considered a key determinant of harmonizing IP laws and MNCs' offshoring locations (Helpman, 1993; Yang and Maskus, 2001; Antràs, 2003; Branstetter and Saggi, 2011; Bilir, 2014).

Exporters differ in their capabilities to manage forced technology transfer as well as their demands for IP protection. Bloom, Draca, and Van Reenen (2016) and Hombert and Matray (2018), for instance, find that import penetration from China led to an increase in research and development (R&D) spending, but only among technologically advanced firms in the US and Europe. On the other hand, firms 'behind the technological frontier' engage in lobbying to insulate themselves from (forced) technology transfer in China (Bombardini, Rendina, and Trebbi, 2021). This is most likely because less productive, innovative incumbent firms cannot impose high markups without political participation (Akcigit, Baslandze, and Lotti, 2023).

These observations lead to my core argument: Exporters whose proprietary technology can be easily imitated by import-competing firms due to their long product cycles engage in political activities for IP protection. On the contrary, exporting firms who introduce new products soon after producing previous ones are less likely to have them imitated by import-competing firms. Therefore, these rapidly innovating firms whose products exhibit shorter life cycles do not feel the need to spend extra resources on lobbying to protect IP overseas. This is particularly true in global markets, I argue, as investment for innovation can pay off given new market access. On the other hand, engaging in political activities to secure profits is seen as less efficient and time-consuming from a rapidly innovating exporter's point of view.

3.1 Theory

In the following, I formalize my argument using a theoretical model. In this model, a firm from the North exports a product to the South and introduces a new product at a point in time. The arrival of new product in the North is random and follows a Poisson process, which determines the lifetime of a given product line. Until the new product is invented, a company in the South attempts to reverse-engineer the imported product. The time to imitation success in the South follows an independent Poisson process and leads to the entry of counterfeit products into both economies. The ability to sell counterfeits in the global economy is governed by the strength of international IP protection. Both the innovating firm in the North and the imitating firm in the South seek to influence the level of global IP protection through lobbying.

The model shows how longer product life cycles drive exporting firms' support for international IP protection. When innovation by the Northern exporter occurs at a lower rate and the lifetime of the imported product is extended, the probability of imitation success by the Southern import-competing firm increases accordingly. This heightened risk of imitation induces the Northern innovator to lobby for stronger IP protection that prohibits the entry of counterfeits, while the Southern imitator lobbies in the opposite direction.

3.1.1 Players and Payoffs: Flow Values

To show this, I analyze the following trading environment. In each state $i \in \{N, S\}$, a representative consumer has additively separable, quasi-linear preferences over a continuum of product varieties and a numeraire good. The representative consumer has quadratic utility for each variety, which implies linear inverse demand functions and allows monopoly profits to be written in closed form. The expression follows Eckel and Neary (2010) and ensures independence across varieties, allowing abstractions from cross-variety interactions and collective action problems in trade policymaking (Osgood, 2016; Kim, 2017; Kim and Osgood, 2019). Total utility is given by

$$U\big(x(\cdot)\big) = x_0 + \int_0^1 u_i\big(x(z)\big)dz, \quad u_i(x) = x(1-x)$$

where x_0 denotes the numeraire good and $x(z)$ represents consumption of product variety z. The indirect utility yields the following profit maximization problem for firm j given the cost of production, c_j. The Appendix offers closed-form solutions for monopoly profit π_j^i and consumer surplus s_j^i in country i under firm j's monopoly, using the market-clearing condition $y = x^*$.

$$\pi_j^i(y) = y\,p(y) - c_j y, \quad p(y) = 1 - 2y$$

Suppose that there are two producers $j \in \{E, I\}$: a constantly innovating exporter E from the North and a constantly imitating, import-competing firm I in the South who differ in their marginal costs of production ($c_E < c_I$). At a given time t, which firm supplies each product to both N and S depends on the timing of innovation T_V, imitation T_M, and how each government regulates these processes through IP policy ω_N, ω_S. Prior to imitation ($t < T_M$), the Northern innovator E is the sole supplier of the product in both N and S. Following imitation ($t \geq T_M$), the Southern imitator I supplies counterfeits that replace the original product in both markets. After new product development by the Northern innovator ($t \geq T_V$), however, the original and counterfeit products become obsolete and yield no profit to both E and I. This suggests that E is the producer for $t < \min\{T_M, T_V\}$, whereas I becomes the new producer for $T_M \leq t < T_V$.

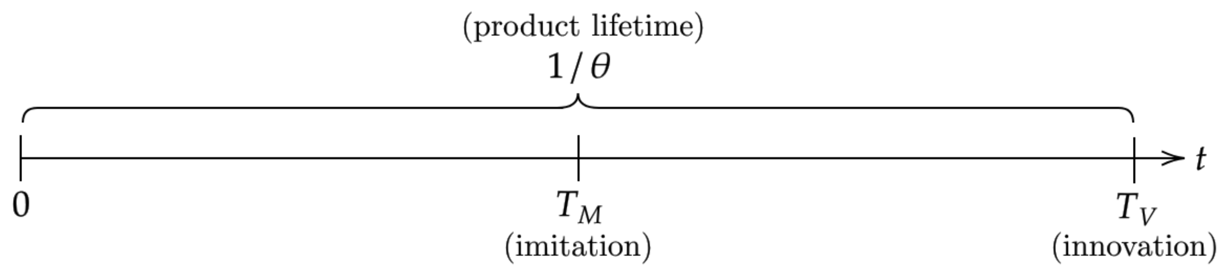

Figure 3: **Innovation in the North, Imitation in the South, and Product Life-cycle**

I model innovation and imitation as two independent Poisson processes with hazard rates θ and $h(\omega)$, as specified below. This implies the waiting times to innovation T_V and imitation T_M follow two independent exponential distributions. Under this assumption, the expected time to innovation equals the inverse of the hazard rate, θ^{-1}, which captures the expected life cycle of a product. The imitation hazard $h(\omega)$ is decreasing in the strength of IP protection in both the

North and the South (Helpman, 1993), because longer periods of protection delay the entry of counterfeit products into the market.[7] With $\omega_N, \omega_S \in [0, 1]$, the multiplicative structure allows for asymmetric IP policies between the North and the South (Grossman and Lai, 2004), where each side's IP policy serves as the disagreement point under the Nash bargaining framework.

$$T_V \sim Exp(\theta), \quad T_M \sim Exp(h), \quad h(\omega) = (1 - \omega_N)(1 - \omega_S)$$

3.1.2 Players and Payoffs: Present Values

Each state $i \in \{N, S\}$ chooses the level of IP protection by evaluating the present value of domestic welfare gains and political rents created under alternative IP regimes. In the short run, strong IP protection imposes static costs by reducing market competition and raising consumer prices. Over the long run, however, IP protection generates dynamic gains by stimulating investment in innovation and promoting knowledge diffusion through technology licensing (Cockburn, Lanjouw, and Schankerman, 2016; Santacreu, 2025). These costs and benefits accrue differently over the product life cycle, making intertemporal trade-offs central to international IP policy.

With discount rate $r > 0$, the present values of monopoly profits Π_j for firm $j \in \{E, I\}$ are expressed as follows using the memoryless property of exponential distributions and the law of iterated expectations. Because the time at which the existing product line becomes obsolete due to innovation or imitation is $\min\{T_M, T_V\}$, the discounted value of the innovator E's monopoly profit is equal to the flow monopoly profit $\pi_E \equiv \pi_E^N + \pi_E^S$, divided by the sum of the discount rate and the hazard rates. Conditional on imitation occurring before innovation, the imitator I earns the flow monopoly profit $\pi_I \equiv \pi_I^N + \pi_I^S$. This generates an additional discounted payoff, weighted by the probability that imitation precedes innovation $\Pr(T_M < T_V)$.

[7] IP protection also shifts firms' incentives away from imitation and toward alternative innovative activities, lowering the imitation hazard faced by IP holders (Gallini, 1992).

$$\Pi_E(\omega) = \int_0^{\min\{T_M, T_V\}} \pi_E e^{-rt} dt = \frac{\pi_E}{r + h(\omega) + \theta}, \quad \Pi_I(\omega) = \int_{T_M}^{T_V} \pi_I e^{-rt} dt = \frac{h(\omega)}{h(\omega) + \theta} \cdot \frac{\pi_I}{r + \theta}$$

The present values of consumer surplus S_i in country $i \in \{N, S\}$ are derived following the same logic. Prior to imitation or innovation, the innovator E is the sole supplier, so consumers in both states enjoy the flow surplus $s_E \equiv s_E^N + s_E^S$ until the arrival of either event. If imitation occurs before innovation, consumers in both states receive the flow surplus $s_I \equiv s_I^N + s_I^S$ until the next innovation renders the imitator I's counterfeit exports obsolete. Therefore, this payoff is weighted by the conditional probability that imitation precedes innovation.

$$S_i(\omega) = \int_0^{\min\{T_M, T_V\}} s_E e^{-rt} dt + \int_{T_M}^{T_V} s_I e^{-rt} dt = \frac{s_E}{r + h(\omega) + \theta} + \frac{h(\omega)}{h(\omega) + \theta} \cdot \frac{s_I}{r + \theta}$$

Each government's objective function Ω_i consists of aggregate social welfare W_i and rent L_j sought by the domestic firm. The social welfare includes the present values of consumer surplus S_i and revenue $R_i \equiv -\omega_i^2/2$, which captures other social costs and benefits associated with IP protection, such as IP licensing and the administrative efforts to monitor IP piracy and enforce IP laws (Gallini, 2002; Papageorgiadis and Sharma, 2016). Monopoly profits are excluded from the welfare term because similar to other non-tariff trade policies (Gulotty and Kronick, 2022), global IP protection allocates legal privileges—such as exclusive rights—to inventors worldwide at the expense of non-inventors. Lobbying is modeled as the price of policy distortion relative to a benchmark policy ω_i^o, which determines the magnitude of such privileges.

$$\Omega_i(\omega) = \alpha_i W_i(\omega) + L_j(\omega), \; W_i(\omega) = S_i(\omega) + R_i(\omega), \; L_j(\omega) = \max\big\{0, \Pi_j(\omega_i; \omega_{-i}) - \Pi_j(\omega_i^o; \omega_{-i})\big\}$$

3.1.3 A Sequence of Decision-Making

Given these payoffs, government $i \in \{N, S\}$ and firm $j \in \{E, I\}$ play a two-stage game similar to that in Grossman and Helpman (1994). In the first stage, both governments set the strength of IP protection ω_N^*, ω_S^* that maximizes their objective function. In the following second stage, each firm sets its lobbying expenditure L_E^*, L_I^* simultaneously. I assume $\alpha_N, \alpha_F > 0$ so that the two governments place non-trivial weights on their social welfare (Goldberg and Maggi, 1999).

3.1.4 Equilibrium

I apply backward induction to search for a Subgame Perfect Nash Equilibrium (SPNE). In the second stage, producers E and I take the strength of IP protection ω_i in each country $i \in N, S$ as given and choose lobbying expenditures to maximize their profits at the margin. In the first stage, each government i anticipates firms' lobbying responses and selects IP protection levels ω_i that maximize their objective functions given the other's policy ω_{-i}. Lobbying reveals firms' preferences for marginal changes around the equilibrium (Grossman and Helpman, 1994).

Given the asymmetry in payoffs, a closed-form solution is difficult to obtain and also would be hard to interpret. Therefore, I analyze equilibrium behavior by identifying conditions under which a unique SPNE exists. Let $F_i \equiv -\partial\Omega_i(\omega_i, \omega_{-i})/\partial\omega_i$ indicate the policy reaction function for government i. Then a locally unique SPNE exists if each government's objective function is strictly concave in its own policy choice and if cross-country policy externalities are sufficiently weak. These conditions are satisfied when the Jacobian matrix of the governments' first-order conditions with respect to (ω_N, ω_S) is positive definite.

Proposition 1 *There exists a locally truthful Nash Equilibrium under the following conditions, where* $F_N \equiv -\frac{\partial\Omega_N}{\partial\omega_N},\ F_S \equiv -\frac{\partial\Omega_S}{\partial\omega_S},\ F_{N,N} \equiv \frac{\partial F_N}{\partial\omega_N},\ F_{N,S} \equiv \frac{\partial F_N}{\partial\omega_S},\ F_{S,N} \equiv \frac{\partial F_S}{\partial\omega_N},\ F_{S,S} \equiv \frac{\partial F_S}{\partial\omega_S}$.

(F.O.C) $F_N = 0,\ F_S = 0$

(S.O.C) $F_{N,N} > 0,\ F_{S,S} > 0,\ F_{N,N}F_{S,S} - F_{N,S}F_{S,N} > 0$

3.1.5 Comparative Statics

I show how changes in product life cycles θ^{-1} shape equilibrium IP protection and lobbying behavior using the Implicit Function Theorem applied to the governments' first-order conditions. To isolate the mechanism of interest, I focus on the range of the innovation hazard θ for which product life-cycle lengths θ^{-1} are sufficiently long. In this case, the imitator's monopoly profit dominates welfare gains in the Global South, $\Pi_I > \alpha(s_E - s_I)$, yielding a corner solution with $\omega_N^* > 0, \omega_S^* = 0$.[8] This implies Southern consumers are indifferent between original and counterfeit products, and the Southern government's marginal welfare gains from IP protection are insufficient to offset the loss of political rents sought by the domestic imitator. Accounting for the South in this way, I analyze how counterfeit imports affect Northern consumer welfare and the innovator's profits, and how product life-cycle lengths alter the trade-off between the two.

Corollary 1 *There exists a threshold θ^* such that for sufficiently long product life cycles $\theta < \theta^*$, the North protects intellectual property $\omega_N^* > 0$, but the South does not $\omega_S^* = 0$.*

Lemma 1 shows that the Northern innovator's lobbying activity is shaped by the heightened risk of imitation associated with longer product life cycles. As the rate of innovation θ declines, the expected duration of the product line θ^{-1} increases. This affects the innovator's incentives through two channels. First, a longer economic life-time of existing products mechanically extends the innovator's monopoly period. Next, they also increase the probability that Southern imitation occurs before the next Northern innovation, thereby raising the expected losses from imitation. Because stronger IP protection directly reduces this imitation hazard, a decline in θ increases the marginal benefit of IP protection for the Northern innovator. In equilibrium, this higher marginal benefit translates into greater lobbying effort in favor of stronger IP protection.

Lemma 1 *As product life cycles become longer, the Northern innovator increases its lobbying for intellectual property protection.*

[8] The corollary follows from the asymmetric effects of product life cycles on the innovator's and the imitator's profits, where the imitator's profit decreases in θ more sharply than the innovator's profit due to $\Pr(T_M < T_V)$.

$$\frac{\partial L_E(\omega_N^*, \omega_S^*)}{\partial \theta} < 0 \quad \textit{for all} \quad \theta < \theta^*$$

It follows that, given longer product life cycles, changes in the innovator's profits dominate Northern consumer welfare gains, resulting in stronger IP protection in the North than in the South. Consistent with Grossman and Lai (2004), this finding follows directly from the government's first-order condition. A longer product life cycle θ^{-1} increases the duration under which imitation may occur, raising the marginal benefit of IP protection for the Northern government through increased lobbying by the innovating firm. Because the second-order condition implies $\partial F_N/\partial \omega_N > 0$, the sign of $\partial \omega_N^*/\partial \theta$ is determined by $\partial F_N/\partial \theta > 0$, yielding the result.

Lemma 2 *As product life cycles become longer, the Global North protects intellectual property more strongly than the Global South.*

$$\frac{\partial \omega_N^*}{\partial \theta} = -\frac{\partial F_N/\partial \theta}{\partial F_N/\partial \omega_N} < 0 \quad \textit{for all} \quad \theta < \theta^*$$

3.2 Testable Implications

The model yields the following testable implications. First, longer product life cycles are associated with higher lobbying expenditures by innovating exporters in the Global North. Second, the effect of product life cycles on lobbying intensity is conditional on exporters' IP ownership. This follows from an additional channel through which product life cycles increase innovators' demand for international IP protection: longer product life cycles also raise monopoly profits. To isolate the effect of product life cycles operating through imitation risk, empirical analyses should therefore account for exporters' IP ownership when examining their lobbying behavior.

Hypothesis 1 *IP holders who manufacture products with longer life cycles are more likely to advocate for international IP protection, conditional on their IP holdings.*

Hypothesis 2 *The impacts of product life cycles on IP lobbying are likely to be stronger under international trade agreements with longer IP protection lengths.*

4 Empirical Analysis

Testing the empirical implications poses some empirical challenges. First, for the independent variable, the model suggests that the effects of a product's life cycle will be conditional on patent ownership; this firm-level information is difficult to identify. The United States Patent and Trademark Office (USPTO) discloses patent profiles. Yet, as the National Bureau of Economic Research (NBER) patent data project famously shows (Hall, Jaffe, and Trajtenberg, 2001), the real obstacle to empirical research on patents is keeping track of changes in patent ownership when firms reorganize their boundaries through spin-offs, mergers, and acquisitions. This leads scholars to use the degree of concentration of patent ownership at an industry-level to keep their research on intellectual property rights up-to-date (Osgood and Feng, 2018).

The remaining challenge for the independent variable is how to operationalize the risk of imitation, using product life cycle. Product life cycles could be measured in a number of ways, including product turnover (Broda and Weinstein, 2010), and represent other quantities, like innovativeness. Yet, note that the quantity of interest in this paper is the spillover of scientific know-how among producers and how it raises disputes among firms in global markets, not how much consumers prefer development of new products. This requires a proxy that captures how market competition between patent and non-patent holders drives new product development.

Last, for the dependent variable, we must identify lobbying activities that target patent term extensions in the global economy to test the model. Existing research shows how patent policies, including patent length (Lerner, 2002; Ginarte and Park, 1997; Park, 2008), change across countries and years, but not how they are shaped by corporate political activities in other countries. A number of datasets on preferential trade agreements provide granular information on patent provisions, but they do not offer fine-grained information on how much patent terms are extended as a result of signing the trade agreements (Dür, Baccini, and Elsig, 2014; Elsig and Surbeck, 2016; Morin and Surbeck, 2020; Shadlen, Sampat, and Kapczynski, 2020).

4.1 Data Collection

I overcome those challenges by introducing new patent- and firm-level datasets and creating a new measure of product life cycles, using the datasets. I also check all patent-related sections under US FTAs signed after the 2001 Doha Round up to 2012, identify how far patent terms are extended under each US FTA, and collect US lobbying reports filed on the FTAs from `LobbyView` (Kim, 2017, 2018). Later, I categorize these trade agreements based on their level of patent term extension to control for US lobbying activities targeting non-patent related provisions under each FTA. After I merge this information with other financial datasets on all publicly traded US firms using `Compustat`, the final dataset has firm-industry-year as the unit of analysis.

Specifically, information on patent ownership is obtained from Arora, Belenzon, and Sheer (2021). Similar to the NBER patent dataset (Hall, Jaffe, and Trajtenberg, 2001), the authors fully identify changes in patent ownership among publicly traded US firms investing in R&D. This work is done by matching patent (re)assignee information disclosed by the United States Patent and Trademark Office (USPTO) with other subsidiary data, including SDC, 10-K SEC filings, and records available in other firm-level datasets, such as `Orbis`. This implies the output partly captures US patent ownership changes as a result of corporate reorganizations between publicly traded and private US companies between 1980 and 2015.

Next, I measure product life cycle using 45 million patent citations from 1975 to 2010, which covers more than 3.5 million patents granted in the US during this period. Specifically, for US patents granted between 1975 and 1995, I check their citations from 1975 to 2010 and average their time lags in different levels.[9] In doing so, I match different categories of US patents with industrial classifications following the official guidance provided by the USPTO. While prior work uses patent citations between 1976 and 2006 to estimate product life cycles using the Standard Industrial Classification (SIC) codes with 4-digits (Bilir, 2014), I revised this measurement by

[9] Less politically engaged companies can allocate more of their resources in R&D activity instead of lobbying, which could potentially lead to shorter product life cycles. To address this endogeneity issue, I selected patent application documents citing US patents granted before 1995 and chose US lobbying reports filed after 2002.

combining the patent citation data updated up to 2010 (Bhaven, 2011) with the USPTO concordance files using the North American Industry Classification System (NAICS) with 4 digits. This allows me to track changing exposure to imitation due to trade liberalization up to recent years.

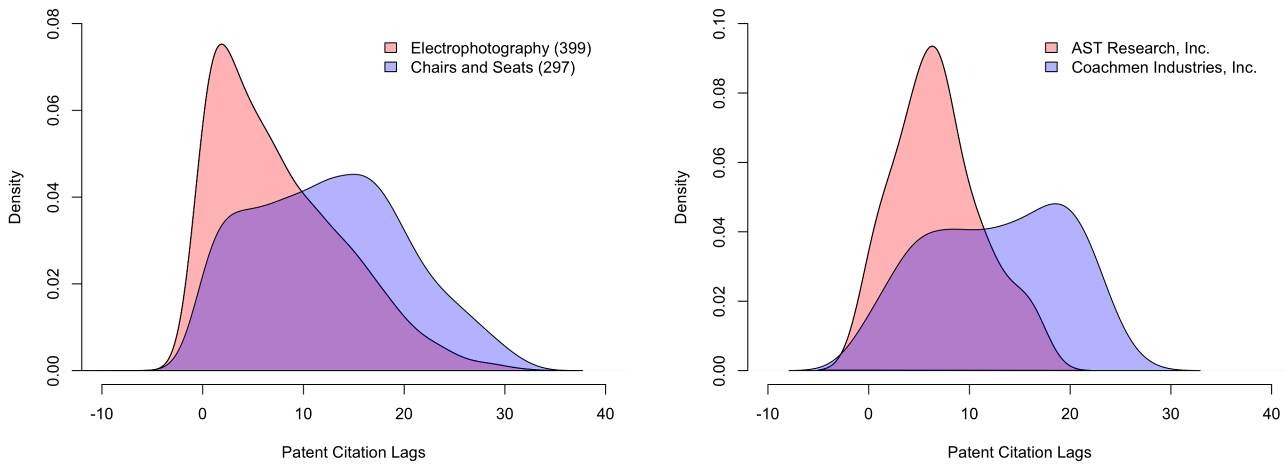

Figure 4: **Examples of Patent Citation Lags: Patent Class and Firm Levels**

Examples of patent citation lags aggregated at the patent-class or firm levels are shown in Figure 4; their industrial averages are also listed in Table 1. It should be noted from Figure 4 that the patent citations are not normally distributed. The distribution is often skewed to the right because patent citations are truncated in the last year of observation, 2010. It is also skewed to the left sometimes, as a result of patent holders' strategic behaviors. These include *patent holdup*, where firms in industries heavily dependent on standard-essential patents, such as telecommunication, can experience longer patent citation lags given the pervasive use of key technologies (Lerner and Tirole, 2004; Lemley and Shapiro, 2006). In the pharmaceutical industry, patent holders also extend the life cycle purposefully as the patent reaches its maturity; this monopolistic practice is known as *evergreening* (Hemphill and Sampat, 2012).

In the Appendix, I address some of the issues associated with the use of patent citations. First, I show that firms without patents have incentives to cite existing patents to the extent that those patents' economic lifetime has not fully matured (Bilir, 2014). Next, I present the findings using patent citation lags aggregated at the firm level in the Appendix, where I use robust statistics other than the mean, such as the median or the 25th percentile. To control for the patent holders' strategic behaviors conducted at the firm level but limited to each sector, I present the results using patent citation lags averaged at the industry level in this manuscript.

NAICS	Description	T
3341	Computer and Peripheral Equipment Manufacturing	9.365
3343	Audio and Video Equipment Manufacturing	9.469
3344	Semiconductor and Other Electronic Component Manufacturing	9.924
3342	Communications Equipment Manufacturing	10.274
3251	Basic Chemical Manufacturing	10.359
3254	Pharmaceutical and Medicine Manufacturing	10.366
3253	Pesticide, Fertilizer, and Other Agricultural Chemical Manufacturing	10.529
3252	Resin, Synthetic Rubber, and Artificial and Synthetic Fibers and Filaments Manufacturing	10.531
3311	Iron and Steel Mills and Ferroalloy Manufacturing	10.795
3361	Motor Vehicle Manufacturing	10.909
3111	Animal Food Manufacturing	10.988
3351	Electric Lighting Equipment Manufacturing	11.008
3345	Navigational, Measuring, Electromedical, and Control Instruments Manufacturing	11.010
3121	Beverage Manufacturing	11.031
3364	Aerospace Product and Parts Manufacturing	11.066
3331	Agriculture, Construction, and Mining Machinery Manufacturing	11.193
...	...	...

Table 1: **Examples of the Averaged Citation Lags: using the NAICS Concordance**

I download lobbying reports filed by all publicly traded US companies in manufacturing sectors from the `LobbyView` database (Kim, 2017, 2018) as the dependent variable. Specifically, I create an indicator variable, which equals 1 if each firm filed any lobbying report on US FTAs with patent provisions and signed after the 2001 Doha Round, and 0 otherwise. The trade agreements considered for empirical analysis are shown in Table 2. I manually collect the detailed information on patent terms and the circumstances in which they can be extended by both reading each FTA and using the criteria established in earlier studies on TRIPS-plus (Maskus, 2000; Correa, 2000; Deere, 2009; Shadlen, 2005; Shadlen, Sampat, and Kapczynski, 2020; Osgood and Feng, 2018). Later, using the information, I create sub-samples of lobbying reports filed on each FTA and test when the proposed relationship became significant.

Signatory	Year (effective)	Congress	Bills	Patent Term	Patent Term Extension									
					(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Singapore	2003 (2004)	108th	HR2739 S1417	20	4	2	5	5	NA	NA	10	10	NA	NA
Chile	2003 (2004)	108th	HR2738 S1416	20	5	3	5	NA	NA	NA	10	NA	NA	NA
Australia	2004 (2005)	108th	HR4759 S2610	20	4	2	5	5	3	3	10	10	10	10
Morocco	2004 (2006)	108th	HR4842 S2677	20	4	2	5	5	3	3	10	10	NA	NA
Dominican Republic & Central America	2004 (2006)	109th	HR3045 S1307	20	4	2	5	5	NA	NA	10	10	NA	NA
Bahrain	2004 (2006)	109th	HR4340 S2027	20	4	2	5	5	3	3	10	10	10	10
Oman	2006 (2009)	109th	HR5684 S3569	20	4	2	5	5	3	3	10	10	10	10
Peru	2006 (2009)	110th	HR3688 S2113	20	5	3	5	NA	NA	NA	10	NA	NA	NA
Colombia	2006 (2012)	112th	HR3078 S1641	20	5	3	5	5	NA	NA	10	10	NA	NA
South Korea	2007 (2012)	112th	HR3080 S1642	20	4	3	5	5	3	3	10	10	10	10
Panama	2007 (2012)	112th	HR3079 S1643	20	5	3	5	5	NA	NA	10	10	NA	NA

(1) Delays under marketing approval: from the date of filing
(2) Delays under marketing approval: after a request for examination
(3) Data privacy violation (pharmaceutical): marketing approval (domestic)
(4) Data privacy violation (pharmaceutical): marketing approval (foreign)
(5) Data privacy violation (pharmaceutical): new clinical information (domestic)
(6) Data privacy violation (pharmaceutical): new clinical information (foreign)
(7) Data privacy violation (agrochemical): marketing approval (domestic)
(8) Data privacy violation (agrochemical): marketing approval (foreign)
(9) Data privacy violation (agrochemical): new uses (domestic)
(10) Data privacy violation (agrochemical): new uses (foreign)

Table 2: **TRIPS-plus Provisions under U.S. FTAs (2003−2012): Patent Lengths**

It is not uncommon that nations bargain over a set of policies in trade negotiations simultaneously. Thus, the remaining challenge is how to uncover firms' preferences on patent terms under each US trade agreement. To address this issue, I sample companies whose industries are patent-intensive[10] using `Compustat` (Osgood and Feng, 2018), based on the report published by the USPTO (ESA, 2012), and add other firm attributes as controls. In the Appendix, I present the results adding more firm-level controls, including productivity. In the robustness check, I also compare lobbying reports filed on US FTAs with different patent lengths.

[10] Patent-intensive industries' ratio of patents to employees is larger than the industrial average.

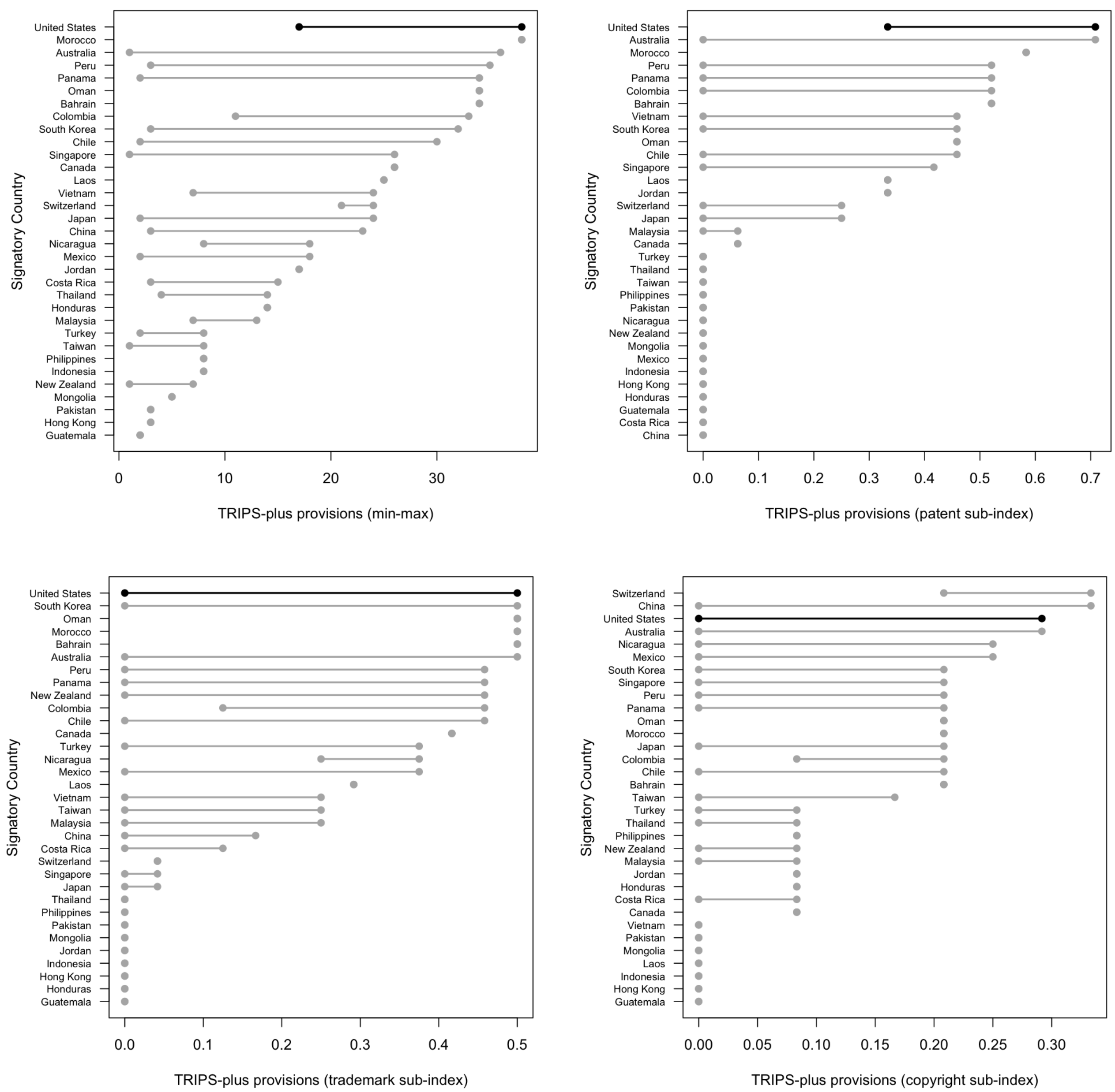

Figure 5: **Preferential Trade Agreements (PTAs) with TRIPS-plus Provisions**
This figure shows that both the North and the South have signed PTAs with more stringent IP rules than those in the WTO TRIPS Agreement, with the U.S. adopting the highest level of IP stringency for both patents and trademarks. These 518 PTAs with TRIPS-plus provisions were downloaded from Morin and Surbeck (2020).

4.2 Model Specification

To empirically test the theoretical predictions from the model, I use a panel logistic regression including the interaction term between the number of patents owned by each US company in the sample and the averaged patent citation lag as a proxy for product life cycle. In doing so, other firm-level attributes are log-transformed to account for their skewed distributions. I also use the linear term of product cycles T instead of the quadratic term, which was derived from the distributional assumption in the formal model and contains no substantive meaning other than the marginal rate of innovation. I also present the results using T^2 in the Appendix, which are statistically significant because $T > 0$. The empirical model is specified as follows:

$$Lobbied_{ijt} = \alpha + \beta_1 T_j + \beta_2 log(patents_{ijt} + 1) + \beta_3 T_j log(patents_{ijt} + 1) + \delta X_{ijt} + \theta_j + \gamma_t + \epsilon_{ijt}$$

where i, j, and t refer to firm, industry, and year, respectively. The key parameter of theoretical interest is β_3. To account for other attributes driving firms' lobbying intensity, such as their investment expenditure, a set of controls X_{ijt} capturing firm heterogeneity in addition to patent ownership is also included in the equation.

I added industrial- and year-fixed effects θ_j, γ_t to keep the empirical model consistent with the formal model, where I used 3-digit NAICS codes for θ_j so that β_1 could be identified and estimated. The industry-fixed effect is included in the empiric following the assumption of $T > \max\{\omega_H, \omega_F\}$ in the formal model, where the patent term $\omega_H^* = \omega_F^*$ chosen by both governments was sector-invariant. This allows me to isolate the impact of T_j on lobbying from other industrial-level characteristics. Also, the year-fixed effect was added because the focus is not on the timing of individual firms' transitions from non-lobbying to lobbying.

Later, I use other firm-level proxies for the rate of innovation and add the industrial-fixed effects using 6-digit NAICS codes. In the Appendix, I also examine the time-consistency of T_j and run other statistical models that account for firms' selection into lobbying activities.

4.3 Results

	Dependent Variable: Whether Lobbied					
	(1)	(2)	(3)	(4)	(5)	(6)
Product life cycle (T)		0.227***	0.259***			
× Patent (stock, thousands)		(0.055)	(0.068)			
Product life cycle (T)					0.243***	0.267***
× Patent (reassign, thousands)					(0.054)	(0.065)
Product life cycle (T)		0.647**	0.904***		0.571**	0.722**
		(0.254)	(0.341)		(0.253)	(0.330)
Patent (stock, thousands)	0.118**	−1.801***	−2.050***			
	(0.058)	(0.489)	(0.612)			
Patent (reassign, thousands)				0.110*	−1.942***	−2.128***
				(0.057)	(0.475)	(0.577)
Capital expenditure (log)	0.063	0.383	0.661**	0.079	0.441	0.709**
	(0.255)	(0.266)	(0.300)	(0.255)	(0.269)	(0.304)
Employees (log)	0.074	−0.006	0.031	0.066	−0.020	0.031
	(0.323)	(0.308)	(0.299)	(0.326)	(0.308)	(0.302)
Plants and equipment (log)	0.901***	0.625**	0.274	0.905***	0.586**	0.244
	(0.273)	(0.285)	(0.317)	(0.275)	(0.287)	(0.320)
Revenue (log)	−0.293	−0.298	−0.324	−0.306	−0.294	−0.320
	(0.232)	(0.248)	(0.215)	(0.230)	(0.245)	(0.215)
R&D expenditure (log)	0.371***	0.412***	0.487***	0.369***	0.382***	0.449***
	(0.140)	(0.146)	(0.147)	(0.140)	(0.142)	(0.145)
Industry FE (3-digit NAICS)	YES	NO	YES	YES	NO	YES
Year FE	YES	YES	YES	YES	YES	YES
Observations	6,175	6,175	6,175	6,175	6,175	6,175
Log Likelihood	-245.192	-344.716	-230.876	-245.381	-343.974	-230.744
Akaike Information Criterion	502.383	705.431	477.752	502.762	703.947	477.487

Note: Robust standard errors are shown in parentheses. *p<0.1; **p<0.05; ***p<0.01

Table 3: **The Effect of Product Life Cycle on Lobbying for Global Patent Protection**

The results are presented in Table 3, corroborating the theory. Specifically, consistent with the existing theory on firms in trade politics, column (1) shows that it is mostly big exporters, proxied by the number of patents and other tangible assets they own, who engage in lobbying activity to protect their patent in global markets. The next two columns (2) and (3) show who among the patent holders are more likely to lobby US legislators to protect their patents further. The results confirm that, given the same amount of patents, exporters whose patented technologies can be easily imitated by foreign firms due to their longer lifespans try to prevent the entry of counterfeits into their markets through political participation. Columns (4), (5), and (6) document that the results remain statistically significant when accounting for changes in patent ownership, led by firm reorganization.

It should be noted that the signs attached to $patent_{ijk}$ turn from positive to negative as I interact the term with the product life cycle T_j in columns (2), (3), (5), and (6). This is because as the rate of innovation increases, and the products' life cycles become shorter, the number of patents accumulated also increases. This is well aligned with Schankerman and Pakes (1986, 1053), who find that "inter-temporal changes in the quantity of patents were inversely correlated with changes in their quality." The impacts of firm size, represented by R&D expenditures and other fixed assets, are also consistent with the existing literature on firms in trade politics.

For the purpose of clarifying interpretation, in the Appendix I employ a new firm-level measure differentiating between the risks of imitation among companies within each industry. Evidently, companies within the same industry vary substantially in their rate of innovation, as evidenced by patent races between global pharmaceutical companies during the COVID-19 pandemic. Yet, using the mean patent citation lag as a proxy for the rate of innovation at the firm level poses new challenges, such as patent holdup and evergreening. To address those issues, I test how *patent thickets*—a bundle of overlapping, interoperable patents evolving over time (Shapiro, 2000; Lemley and Shapiro, 2005)—shape patent holders' incentives to allocate more of their resources to political activity. I find that firms that can establish higher scientific barriers against foreign competitors using patent thickets are less likely to engage in lobbying.

4.4 Robustness Checks

The findings presented above are not without limitations. Among the major issues is that a number of non-patent provisions, like environmental regulations, were also addressed as a part of the trade negotiations. This makes it difficult to isolate lobbying firms' preferences on patent terms from those on other provisions, despite the fact that the samples are selected from patent-intensive sectors. Also, it remains unclear whether averaged patent citation lags solely represent the risk of imitation that patent holders face abroad or their rate of innovation to evade such imitation. Patents may be cited by other firms for many years, not due to the absence of new technologies, but because they contain breakthroughs that shape future inventions.

	Dependent Variable: Whether Lobbied			
	2003–2008	2005–2008	US-Colombia	US-Panama
	(1)	(2)	(3)	(4)
Product life cycle (T)	0.281***	0.295***	0.302***	0.312***
× Patent (stock, thousands)	(0.101)	(0.101)	(0.092)	(0.108)
Product life cycle (T)	0.993**	0.982**	0.524	1.459
	(0.461)	(0.465)	(0.825)	(0.940)
Patent (stock, thousands)	−2.228**	−2.359***	−2.386***	−2.472***
	(0.896)	(0.895)	(0.810)	(0.935)
Capital expenditure (log)	1.057***	1.121***	0.321	0.621
	(0.374)	(0.380)	(1.224)	(1.310)
Employees (log)	−0.163	−0.143	0.626	1.004
	(0.438)	(0.446)	(0.969)	(0.904)
Plants and equipment (log)	0.130	0.014	0.890	0.663
	(0.451)	(0.450)	(1.141)	(1.042)
Revenue (log)	−0.301	−0.245	−0.099	−0.656
	(0.274)	(0.283)	(1.053)	(1.018)
R&D expenditure (log)	0.535***	0.542***	−0.311	−0.194
	(0.176)	(0.178)	(0.511)	(0.487)
Industry FE (3-digit NAICS)	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
Observations	4,884	3,193	1,291	1,291
Log likelihood	-142.572	-139.755	-27.643	-31.838
Akaike Information Criterion	301.144	295.509	71.2863	79.6757

Note: Robust standard errors are shown in parentheses. *p<0.1; **p<0.05; ***p<0.01

Table 4: **The Effect of Product Life Cycle on Lobbying for Global Patent Protection**

To distinguish firms' lobbying activities on patent provisions from non-patent provisions, I conduct sub-sample analyses where I differentiate the US trade agreements on the basis of the level of TRIPS-plus standards. Specifically, I sorted the US trade agreements by examining how far the terms of patents can be re-extended in the case of delays in regulatory approval. I did so because US trade agreements on patent protection are hardly distinguishable in the other aspects of patent regimes (Shadlen, 2005). Also, recall that the theory was about firms' heterogeneous preference on the duration of market exclusivity in global markets. For US FTAs signed between 2003 and 2012, the patent term re-extended for the delay gradually increased from six to eight years in total. The extension in the case of data privacy violation increased on average as well, which is only applicable for companies in pharmaceutical and agro-chemical industries and, therefore, not considered a criterion in the sorting.

The results are summarized in Table 4, where the term of re-extensions in the case of regulatory delays increases from column (1) to (4). As the TRIPS-plus standard becomes more stringent, the impacts of product life cycles on corporate lobbying become increasingly pronounced. Additionally, the indicators for the goodness of fit also suggest that the fewer but more targeted samples I select from the data, the larger the amount of variation in lobbying captured using the sub-samples. These results inform our understanding of which US patent owners lobby for patent provisions under the FTAs and, more importantly, why they do so.

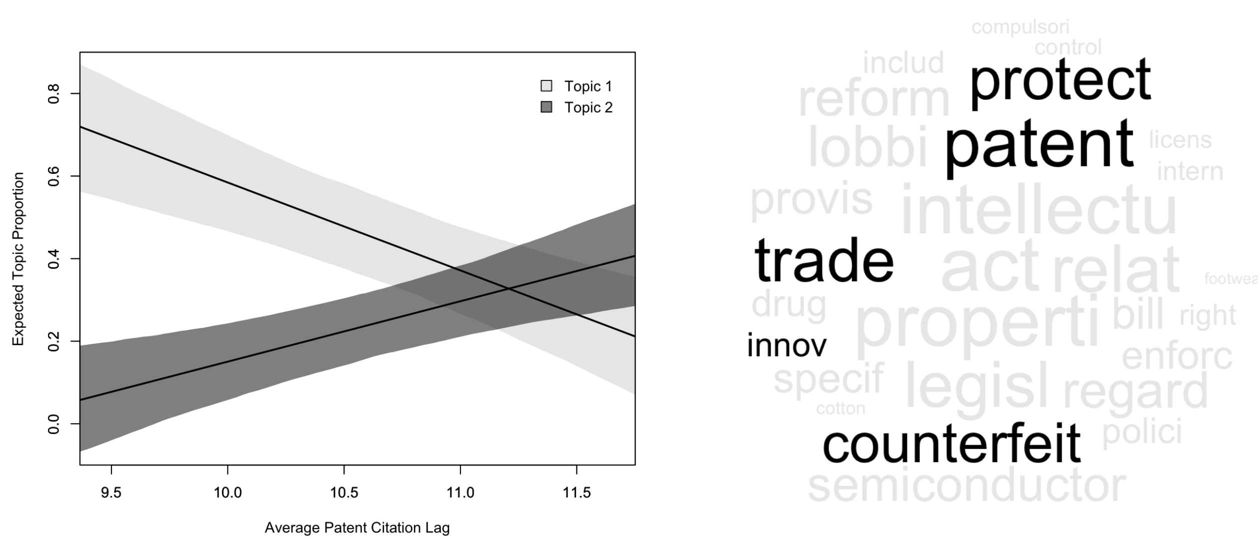

Figure 6: **Expected Topic Proportions ($K = 4$) and Top Keywords (Topic 2)**

Additionally, I test whether the product cycle proxy operationalizes the risks of imitation accurately by using text-as-data analysis. To do so, I download all lobbying reports and the contents on trade and IP from `LobbyView` sorted by the main topics. Then, using structural topic models (Roberts et al., 2014), I regress the latent topics on other document-level covariates observed in each lobbying report. These include sectors (4-digit NAICS) to which each firm belongs, their mean citation lags, and years when the reports were submitted. I also control for other lobbying issues as many client firms address multiple issues within the same lobbying report. Last, for the estimation, I select the number of latent topics using the residuals, semantic coherence, exclusivity, and congruence of alternatives.

The text analysis results are visualized in Figure 6, uncovering the reasons why companies exporting goods with long product cycles engage in lobbying. In Figure 6, I plot the latent topics whose correlations with the mean citation lags were statistically significant. Note that Topic 2 is positively correlated with the life-cycle index, and keywords include "`patent`," "`protect`," "`trade`," and "`counterfeit`," among others. Overall, the results offer suggestive, if not compelling, evidence that US firms inventing new products with long life cycles are more likely to be exposed to the illegal trade practices committed by foreign competing companies, leading the US firms to demand more stringent patent protection of trade from their government.

I also use semi-supervised topic models developed by Eshima, Imai, and Sasaki (2024) to identify lobbying activities aimed at international patent protection more accurately. In doing so, I first pre-specify keywords through which lobbying firms could reflect their preferences under the lobbying reports, such as "`theft`" and "`piracy`." Next, I test whether there is a strong connection between these keywords and the averaged patent citation lag using `keyATM`. Also, adopting the identification strategy proposed by Baccini, Osgood, and Weymouth (2019), I create a new indicator, which equals 1 if lobbying reports address `TRD` and `CPT` and if these reports contain any of the keywords, and 0 otherwise. I use it as the outcome variable and find strong evidence consistent with the main results, which I elaborate upon in the Appendix.

	Dependent Variable: Whether Lobbied					
	(1)	(2)	(3)	(4)	(5)	(6)
Patent (new, hundreds)		−0.050***	−0.042***			
× Patent (stock, thousands)		(0.010)	(0.011)			
Patent (new, hundreds)					−0.048***	−0.039***
× Patent (reassign, thousands)					(0.010)	(0.011)
Patent (new, hundreds)		0.321***	0.232**		0.340***	0.225**
		(0.075)	(0.100)		(0.070)	(0.098)
Patent (stock, thousands)	0.194*	0.325**	0.506***			
	(0.103)	(0.143)	(0.185)			
Patent (reassign, thousands)				0.213**	0.291**	0.459***
				(0.105)	(0.135)	(0.171)
Capital expenditure (log)	0.133	−0.095	0.047	0.120	−0.078	0.082
	(0.405)	(0.255)	(0.392)	(0.399)	(0.256)	(0.382)
Employees (log)	0.240	0.287	0.180	0.205	0.309	0.155
	(0.270)	(0.295)	(0.277)	(0.271)	(0.296)	(0.276)
Plants and equipment (log)	0.664*	1.067***	0.768**	0.674*	1.042***	0.764**
	(0.383)	(0.255)	(0.367)	(0.380)	(0.254)	(0.361)
Revenue (log)	−0.185	−0.346	−0.235	−0.176	−0.345	−0.259
	(0.291)	(0.237)	(0.265)	(0.290)	(0.234)	(0.263)
R&D expenditure (log)	0.145	0.024	0.034	0.135	0.011	0.041
	(0.236)	(0.119)	(0.207)	(0.229)	(0.119)	(0.199)
Industry FE (6-digit NAICS)	YES	NO	YES	YES	NO	YES
Year FE	YES	YES	YES	YES	YES	YES
Observations	6,175	6,175	6,175	6,175	6,175	6,175
Log Likelihood	-99.518	-352.080	-95.349	-99.150	-351.738	-95.775
Akaike Information Criterion	211.037	720.159	206.698	210.299	719.476	207.550

Note: Robust standard errors are shown in parentheses. *p<0.1; **p<0.05; ***p<0.01

Table 5: **The Effect of Product Turnover on Lobbying for Global Patent Protection**

Table 5 also illustrates the findings using product turnover—defined as the ratio between new patents granted by each company every year and the cumulative number of patents—as a proxy for the rate of innovation, instead of product life cycle. Consistent with the proposed theory, the results show that rapidly innovating firms engage less in lobbying for global patent protection. Controlling for the number of patents accumulated in each firm, as companies create new inventions, they are less likely to engage in the lobbying. The effects of other firm-level attributes, such as `plants and equipment`, remain statistically significant.

To probe the generalizability, I also conduct additional robustness checks, which are shown in the Appendix. I examine, for example, how the results change as more firms and their lobbying activities from less patent-intensive industries are included in the sample. I also check whether the results remain unchanged when the dependent variable is lobbying expenditures using the Heckman selection model. Additionally, I employ various proxies of product life cycles, using the SIC concordance, other years in the 1980s as a baseline for calculating the mean patent citation lags, and other robust statistics, such as the 75th and the 85th percentiles instead of the mean.

5 Conclusion

This paper considers who advocates for international IP protection. It is well established in the literature that exporting firms with concentrated IP ownership are key beneficiaries of stringent IP rules, which they can deploy to deter new market entrants that lack IP holdings. (Sell, 1995; Osgood and Feng, 2018; Gulotty, 2020). However, empirical evidence shows U.S. firms' support for global IP protection differs substantially among IP holders, particularly among U.S. firms with a large amount of patents. This pattern suggests that not all exporters are equally exposed to the threat of new entrants in global markets and that heterogeneous exposure to imitation is a key determinant of exporters' demand for IP protection.

To formalize this argument, I construct a formal model in which exporting firms face the risk of imitation by import-competing firms. The model predicts that exporters whose products exhibit longer life cycles are more vulnerable to imitation and therefore have stronger incentives to support global IP protection, which raises entry barriers in global markets. I then estimate product life cycles using patent citation lags and merge these measures with firm-level lobbying for U.S. free trade agreements with IP provisions to test the theory. The results lend support to the theory, showing that firms exporting longer-lived products are more likely to demand global IP protection. These findings illustrate how exporters mitigate the risk of imitation in trade.

The results presented in this paper introduce several avenues for future research. First, while the theory applies to IP protection broadly, the empirical analysis focuses on patent provisions within U.S. free trade agreements. It remains untested whether the product obsolescence argument holds for other forms of IP, such as copyright, whose market exclusivity lasts substantially longer than that of patents and extends for the life of the author plus an additional 70 years. Examining how such long protection interacts with imitation risks would help assess the generalizability of the findings presented in this paper.

Next, whether the logic of collective action articulated by Olson (1965) also applies to lobbying as an entry-deterrence strategy remains an open question. IP holders in global markets not only engage in individual lobbying, but also work through industry associations. These include the Pharmaceutical Research and Manufacturers of America (PhRMA), which represents firms with a substantial amount of patents in biotechnology and pharmaceuticals, as well as transnational advocacy groups including the International Intellectual Property Alliance (IIPA), which coordinates copyright-intensive industries in global IP policymaking. Future research should examine when those large companies engage in collective lobbying and whether such coordination is driven by complementarities in member companies' IP profiles.

Lastly, it should be noted that there remain various means of market entry deterrence other than reforming IP laws. For example, patent holders of pharmaceutical and agro-chemical products need to obtain regulatory approval from regulatory agencies prior to selling their products. In such circumstances, Perlman (2020, 2023) shows that incumbent firms deter generic entry by strengthening regulatory standards, which often become more stringent as patent terms expire. Similarly, Cha et al. (2025) also find that rapidly innovating U.S. firms rely more heavily on IP enforcement mechanisms, such as the U.S. International Trade Commission's Section 337 investigations, which blocks counterfeit imports into the United States. Unlike patent laws that alter the scope or duration of legal rights ex ante, these procedures operate ex post and work through enforcement speed. The distinction between de jure and de facto protection, and why IP holders may find enforcement-based channels more effective, warrants further investigation.

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