

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

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February 15, 2023

Abstract

The distributional consequences of intra-industry trade are well documented in the literature, yet exporting firms shape trade policy in their favor. How? I argue that exporters expect higher returns from lobbying when they face more intense import competition. I introduce a model of international patent protection, where patent holders influence the policy making process. In the equilibrium, companies whose exports are prone to reverse engineering by import-competing firms due to their long product lifetime seek strong patent protection by home government. To test the theory, I measure product cycles, using millions of patent citations, and collect lobbying reports filed on US trade agreements on patent protection, signed after the Doha Round. I find that US patent holders who manufacture products with long life-cycles lobbied the congress more to ratify the US trade agreements. This tendency becomes more pronounced as the agreements adopt higher standards of patent protection. The findings illustrate how the winners maintain the status quo in international trade.

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1 Introduction

Existing research in the politics of international trade identifies various groups of the winners and losers (Rogowski, 1987, 1990; Milner, 1999; Hiscox, 2001, 2002). Commonly, these studies explain how special interest groups engage in political activity to influence its policy making processes. The key motivation for research underlying the existing literature is often rephrased by the logic of collective action problem (Olson, 1965), asking why only some political actors form their coalition successfully and shape trade policies in their favor.

A growing body of research on firms in trade politics also follows the same line of inquiry. In particular, the existing findings uncover various origins of “the organizational advantage” of some corporations (Kim and Osgood, 2019, 408). These include firm heterogeneity, where intra-industry trade creates concentrated benefits to a handful of large and productive firms (Bombardini, 2008; Osgood et al., 2017; Osgood, 2017). Bombardini and Trebbi (2012), Osgood (2016), and Kim (2017) also theorize how product differentiation removes the collective action problem, where firms are less worried about their products being substitutes for one another.

Yet, less is known about how elimination of the collective action problem actually brings legislation of trade policy in favor of pro-trade firms, given the distributional consequences to other myriad, small companies. This research question merits further discussion as the extant research provides profound evidence on how small weights are put on political contributions in government’s welfare calculation (Grossman and Helpman, 1994b; Goldberg and Maggi, 1999). The existing findings also suggest that nevertheless, firms commit themselves to rent-seeking and shape public policies in their favor (Khwaja and Mian, 2005; Richter, Samphantharak, and Timmons, 2009; Kang, 2016; Huneeus and Kim, 2018). Then when do exporting firms engage more in political activity to protect their gains from trade against import-competing firms?

In this paper, I argue that there are increasing returns to lobbying for trade liberalization when exporters face more intense import competition. In specific, exporting firms face a wide

range of threats of market entry by import-competing firms in global markets and seek more political influence to secure their profits. This trend becomes more pronounced in monopolies whose highest degree of market concentration ensures more political power to be exercised by incumbent firms for entry deterrence.

My argument is distinguished from the extant literature on political cleavages in trade in the following ways. First, I endogenize what's often assumed away in the literature where the beneficiaries of free trade gain political power (Rogowski, 1987, 1990). To explain when trade liberalization persists, however, I claim we must go beyond asking who the winners are but also study when the winners make use of their influence (Milner, 1988, 1999). Next, I also complement the existing studies on firms in trade politics, which show when firms face less friction when opening up their economy (Bombardini and Trebbi, 2012; Osgood, 2016, 2017; Kim, 2017). When it comes to monopolistic markets, such as those of intellectual property rights, however, products cannot be substituted nor differentiated. In those cases, the policy making process becomes more contentious between exporting and import-competing firms for their heterogeneity (Bombardini, 2008; Osgood et al., 2017; Kim and Osgood, 2019).

I examine business influence on trade policies for one of the most widely known forms of oligopoly: international protection of intellectual property rights. In the world trading system administered by the World Trade Organization (WTO), countries agreed to protect the assets without discrimination under the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS). For its distributional impacts to the Global South, however, WTO members decided to ease enforcement of TRIPS during the 2001 Doha Development Round.

After the pushback from the South in 2001, what remains unclear is how the Global North have led some of their trading partners from the South to enforce more stringent intellectual property protection afterwards. A collection of these higher standards for intellectual property protections than those under TRIPS is called *TRIPS-plus*. Most of US free trade agreements signed after 2001 also contain TRIPS-plus provisions, albeit to varying degrees for patents.

To examine who pushed the boundaries of TRIPS and how they succeeded, I first build a formal model. In this model, the gains and losses from intellectual property protection¹ vary, depending on how much patent holders are threatened by foreign firms who reverse-engineer their proprietary technology. Modeling changing “exposure to the risk of imitation” in intra-industry trade (Grossman and Helpman, 1993, 282), I find that in the equilibrium (Grossman and Helpman, 1994b), exporting firms facing higher risks of imitation abroad for their long product life-time engage more in lobbying to deter others’ entry into their markets.

To test the theory, I then measure life-cycles of patented exports in manufacturing, using US patent citations, and collect lobbying reports filed to the congress since 2001. Specifically, for each US patent granted since 1975, I check the time lags between its first and last patent citations, whose average I calculate at each industry and use as a proxy for product life-cycle (Bilir, 2014). I do so by combining various patent datasets at a granular level (Hall, Jaffe, and Trajtenberg, 2001; Arora, Belenzon, and Sheer, 2021). I also collect all lobbying reports filed on US trade agreements signed after 2001 (Kim, 2017, 2018), whose various standards for patent protection I identify by tracing all relevant sections under each of the trade agreements.

I document empirical findings that corroborate the theory. In specific, using the granular, patent-level data, I find that US patent holders who manufacture goods with long life-cycles are more likely to lobby the congress to ratify the US trade agreements on patent protection. To better tease out the key mechanism, I also conduct sub-sample analyses and find that the correlation is more pronounced under the trade agreements implementing TRIPS-plus. A text analysis also reveals that their lobbying reports are more associated with latent topics whose keywords signify entry deterrence, such as “patent,” “protect,” and “counterfeit.”

This paper proceeds as follows. After an overview of the literature, I explain how the model works, where I highlight the key assumptions and their rationales. In the following sections, I delineate my empirical strategies to test the hypotheses, followed by the main results and robustness check. In conclusion, I recap my contribution to the literature.

¹In this paper, I take international protection of intellectual property rights as a case of trade liberalization.

2 Distributive Politics of International Trade

Who are winners and losers of liberal trade policy? The answer relies on a set of assumptions on market structure and domestic political processes. The latter includes how much political influence the winners can buy on the basis of their gains from trade (Rogowski, 1987, 1990; Frieden and Rogowski, 1996; Alt et al., 1996) and a set of institutional rules by which one's policy preferences are aggregated (Milner and Keohane, 1996; Milner, 1997, 1999).

The neo-classical models of trade define global markets, based on constant returns to scale and perfect competition. Who gains from inter-industry trade relies on the rest of other criteria thereafter. For instance, assuming that factors can cut across industries, the Heckscher-Ohlin model and the Stolper-Samuelson theorem show why low-skilled workers in capital-abundant countries fall victim to open trade. On the other hand, the Ricardo-Viner model adopts the premise that factors cannot move across sectors and identifies the winners and losers of inter-industry trade, using factors attached specifically to import-competing industries.

When North-South trade flourished between the 1960s and the 1980s, both models were empirically proven to be precise, the Heckscher-Ohlin and the Stolper-Samuelson (Scheve and Slaughter, 2001; Mayda and Rodrik, 2005) and the Ricardo-Viner models (Magee et al., 1989; Frieden, 1991). At the same time, Hiscox (2001, 2002) also demonstrated how inter-industry factor mobility could reconcile different projections made, using the neo-classical theories.

When North-North or South-South trade started to grow in the early 1990s, however, new trade theories emerged to explain who the winners and losers are in intra-industry trade. Also known as new trade theory (Krugman, 1979, 1980) and 'new' new trade theory (Melitz, 2003), the models characterize the world economy using increasing returns to scale and monopolistic competition. Product differentiation and firm heterogeneity became decisive factors in this era, also explaining why only some companies off-shore their production facilities (Antràs, 2003; Helpman, Melitz, and Yeaple, 2004).

Empirical evidence on how product- and firm-level characteristics shape firms' trade policy preferences abounds. When goods produced are sufficiently differentiated, for instance, firms serving the same industry need not compete against each other when exporting their products and face confrontation (Osgood, 2016, 2017; Kim, 2017). It is also empirically well documented that the degrees of market concentration, pinned down by the size and productivity of firms, shape their trade policy preference, including FDI, and decide how firms engage in political activity for trade liberalization (Bombardini, 2008; Bombardini and Trebbi, 2012; Weymouth, 2012; Jensen, Quinn, and Weymouth, 2015; Osgood et al., 2017; Osgood, 2018; Kim and Osgood, 2019; Kim et al., 2019).

Based on the micro-foundations, more recent studies in politics ask whether globalization will persist (Mansfield, Milner, and Rudra, 2021), given the distributional consequences of trade at both individual (Jensen, Quinn, and Weymouth, 2017) and firm-levels (Baccini, Pinto, and Weymouth, 2017). In so doing, these studies also illustrate how democracies as an institution are prone to its distributional impact, where the losers become a source of populism and bring democratic backsliding around the world (Milner, 2021; Broz, Frieden, and Weymouth, 2021; Baccini and Weymouth, 2021).

2.1 Trade, Intellectual Property Rights, and the Doha Round

Which individuals or firms do the existing political economy models of trade point out as its winners and losers, whose economic market is nor perfectly neither imperfectly competitive? New and 'new' new trade theories suggest firms who lack productivity to export may fall into the losers of trade within industry. So is the case for oligopolistic markets, such as those of intellectual property rights (Sell, 1995, 2003), where governments confer market exclusivity to inventors of new technologies for a finite duration to reward their efforts for innovation. Thus, it is a handful of firms who own resources to influence governments in their favor that become the winners of globalization (Milner and Yoffie, 1989; Kennard, 2020; Gulotty, 2020).

The distributional consequences of trade under oligopolistic markets raise a political issue when countries agree to enforce protection of those assets but firms in one of the parties lack enough capacity to compete. For intellectual property rights protection, for instance, “patent protection will be stronger in the North” for the discrepancy in market size and productivity (Grossman and Lai, 2004, 1636). Empirical findings suggest that harmonization of intellectual property rights protection increases trade flows among nations (Maskus and Penubarti, 1995), mainly from the North to the South (McCalman, 2001; Chaudhuri, Goldberg, and Jia, 2006).

The asymmetry in the costs and benefits of globalization, such as those of TRIPS, leads one side to imitate technologies invented on the other side (Helpman, 1993), whose incentives to innovate are hamstrung by the spillover effect (Aghion et al., 2001). It has been empirically shown that the incentives for innovation are modest in the South (Sakakibara and Branstetter, 1999; Chen and Puttitanun, 2005). This is due to their lack of other economic capabilities by which intellectual property protection must be backed up (Qian, 2007). As a result, the South are known to boost their engine for growth by combining intellectual property protection with knowledge spillover through FDI (Branstetter, 2006; Branstetter, Fisman, and Foley, 2006).

Unsurprisingly, the distributional impact brought the backlash against globalization in the early 2000s, where the conflict of interest between the North and the South culminated during the 2001 Doha Development Round. During the negotiation, developing countries and LDCs, such as India and Indonesia, criticized “intense economic and political pressure placed upon them by a number of powerful related business interest” and pointed out that the WTO “is not an organization, as is generally perceived, designed just to serve the business interests of big companies” (WTO, 2001, 71, 26). On the other hand, developed countries like the US called other nations’ attention to “the normal course of doing business” by their companies (WTO, 2001, 39, 40). Eventually, their discourse led to the Doha Declaration on TRIPS and Public Health, where WTO members recognized the freedom to use a set of options and safeguards under TRIPS for regulation, called *TRIPS Flexibilities* (Correa, 2000; Abbott, 2002, 2005).

3 The Growing Influence of Business

What remains unclear is, despite the pushback from the South after the early 2000s, how the business influence grew even more and the North went the extra mile for trade liberalization after Doha. In specific, developed countries signed bilateral trade agreements with developing nations, where both parties adopted higher standards of patent protection than TRIPS, called *TRIPS-plus*. These measures include extending periods of data protection, associating patent protection with regulatory approvals of drugs and agrochemicals, limiting the scope of TRIPS Flexibilities among many others (Maskus, 2000; Shadlen, 2005; Deere, 2009).

A body of literature describes proliferation of bilateral and regional trade agreements as a “stumbling block” of multilateral trade agreements (Bhagwati, 1991; Limão, 2006). Based on the logic, the North grant preferential market access only when the South “respect intellectual property” under preferential trade agreements (PTA) (Limão, 2007, 839). Considering the domestic politics (Mansfield and Milner, 1997, 1999), however, the analyses leave more puzzles than answers as political leaders of developing nations and LDCs have recipients of drugs and SMEs as their domestic audience. For this reason, the leaders in fact strive to maintain their autonomy over public policies by exploiting ambiguities of public health exception (Park and Konken, 2022) as well as other “policy space” for economic growth in TRIPS (Shadlen, 2005; Gallagher, 2007) rather than making concessions during bilateral trade negotiations.

Historical evidence also suggests that the success of TRIPS-plus cannot be fully analyzed, based on the conventional wisdom. Before the WTO was established in 1995 and TRIPS was included as a part of its multilateral agenda, industrialized countries tried to push forward the frontiers of intellectual property rights protection in the 1970s and 1980s, whose inefficiency in raising the bar led to the Uruguay Round (Deere, 2009). This implies that TRIPS-plus is not so much an example of a successful trade liberalization as a case of its failure, because it may increase the cross-national variation again back into the 1970s and the 1980s.

So how did countries go global after the 2001 Doha Round, in spite of the distributional consequences of trade liberalization in the mid-1990s? In the following subsection, I stress the importance of domestic politics to solve this puzzle. Specifically, I develop a formal model to demonstrate how big companies gain political leverage based on their earlier gains from trade and triumph over small firms in legislative decision making process. Focusing on the cases of patent protection, it illustrates how trade liberalization in the previous era increases the risks of imitation among exporters, who engage more in lobbying to mitigate their risks afterwards. This brings legislation of new trade policies leaning in favor of the winners consecutively.

3.1 Product Cycles and Increasing Returns

The main goals of this section are to delineate (1) conditions under which governments grant market exclusivity to exporting firms at the expense of import-competing firms and (2) when exporting firms engage more in political activities to maintain the status quo. Specifically, I model how the term of patent protection is extended in an open economy, where firms who export patented goods and import-competing firms whose entry into the market is forbidden until the term of patent protection expires schedule political contributions, simultaneously.

In the model, the gains from trade are captured by life-cycles of patented exports,² where firms who export goods with long life-cycles become the beneficiaries of trade openness. But instead, they do so at a high risk of reverse engineering by import-competing firms who can also secure more time to imitate their patented technologies and challenge the novelty. Thus, exporters try to block such illegal trade practices by extending the term of patent protection. In this case, if firms succeed in mimicing others' patented technologies early but the term of protection has not expired, then they cannot enter the market by patent laws and sell their counterfeit products (Bilir, 2014). This trade-off leads exporting (import-competing) firms to lobby their government to lengthen (shorten) the term of patent protection in the equilibrium.

²Notice that product cycles are distinguished from the term of patent protection enforced by governments. Grossman and Helpman (1991, 1993) show how the risk of imitation in trade gives rise to unique product cycles.

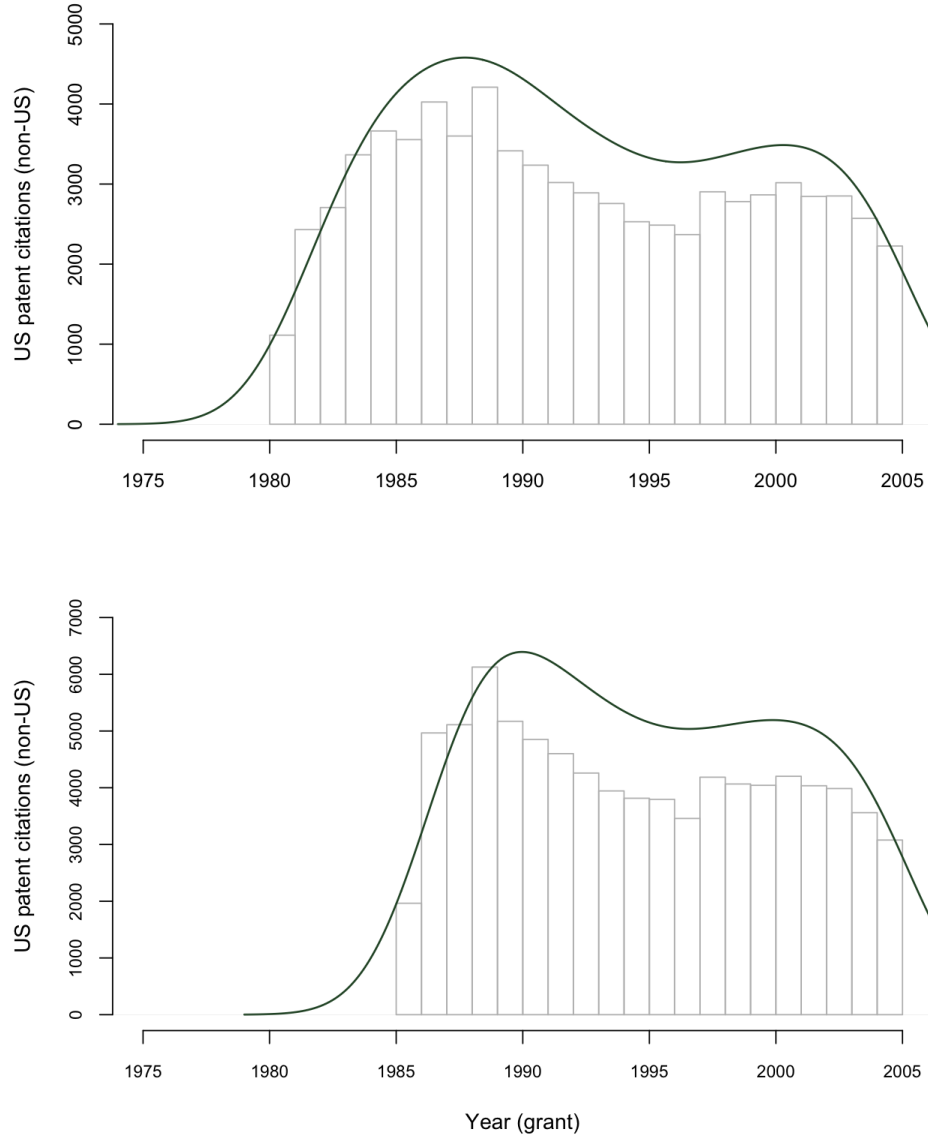


Figure 1: **Forward citations of US patents in manufacturing industry (1980, 1985)**

This figure visualizes distribution of US patent citations by non-US firms and individuals in the 1980s. The upper (lower) panel presents distribution of citations of US patents granted in 1980 (1985). Note that the life-cycles of US products patented in the 1980s, like the graphical user interface invented by the Xerox, did not reach their maturity in the early 2000s. Instead, their product life-cycles were extended in the late 1990s, due to their prolonged application to other new products, such as computers and mobile phones.

3.1.1 Players and Payoffs

There are 6 players in this game, government $i \in \{H, F\}$ and firm $j \in \{1, 2, 3, 4\}$, where firms 1, 2 and 3, 4 belong to the same industry and produce goods in country H and F , respectively. However, only firms 1, 3 hold patents indexed by $k \in \{1, 3\}$ and export their goods to other countries. Each government H, F confers market exclusivity to patent holders 1, 3 for a finite duration ω_H, ω_F . During this period, firm 1 can exclude market entries by import-competing firms 2 and 3, 4 in country H and F , respectively. Until the term of patent protection expires ($t < \omega_H$), firm 1 gains profit π_1 in both economies, while firms 2, 3, 4 earn no profit. After the patent expires ($t \geq \omega_H$), firms 1, 2 gain $\bar{\pi}_1 < \pi_1$ in country H and firms 1, 3, 4 earn $\tilde{\pi}_1 < \pi_1$ in country F . When the good becomes obsolete in each industry ($t \geq T$), however, it yields no profit. For simplicity, I assume $\pi_1 = \pi_3$, $\bar{\pi}_1 = \bar{\pi}_3$, and $\tilde{\pi}_1 = \tilde{\pi}_3$ so that the same expression holds for firm 3 and its export to country H by symmetry. I also assume $T > \max\{\omega_H, \omega_F\}$ so that the policy choice is driven by not other industry-level attributes but firm-level activities.

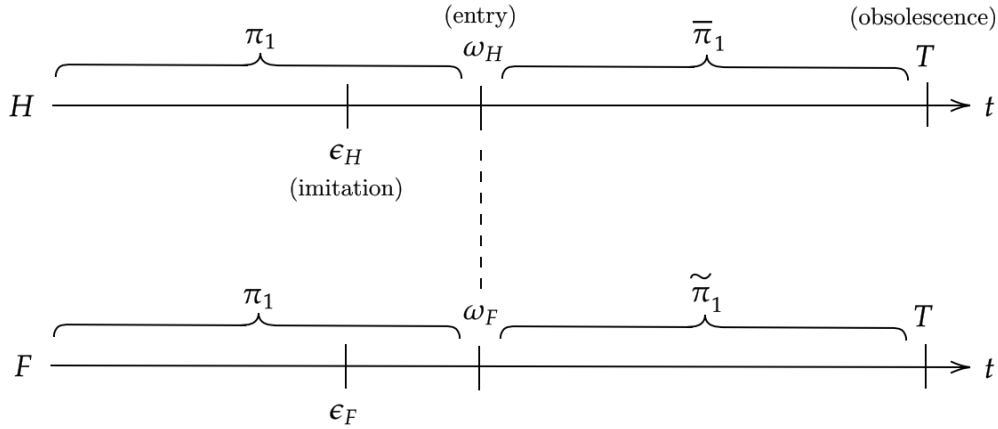


Figure 2: **Patent protection and the risks of imitation in an open economy**

When firms 1, 3 produce and export their patented goods, competing firms who do not own the patents can reverse engineer their products, imitate their technologies, and challenge their novelty as patents by producing counterfeits (Grossman and Helpman, 1991; Helpman, 1993).

I assume that the piracy taking place in each country $i \in \{H, F\}$ follows independent Poisson process. In each country, the arrival time independently follows $\exp(\lambda_j)$ for $j \in \{2, 3, 4\}$ when firms 2, 3, 4 mimic firm 1's patented product, and so does copying the good owned by firm 3. Conditioning on times $\bar{\epsilon}_H \geq T, \bar{\epsilon}_F \geq T$ fixed at a time horizon, the success time of imitation ϵ_H, ϵ_F in each region H and F then follows $Unif(0, \bar{\epsilon}_H)$ and $Unif(0, \bar{\epsilon}_F)$, respectively. However, it should be noted that any counterfeit cannot be sold until its patent expires nor can generic brands be introduced promptly after the term expires when the barriers of scientific knowledge are too high. These causes of the delay are captured by $\max\{\omega_i, \epsilon_i\}$ and $\min\{T - \omega_i, T - \epsilon_i\}$, respectively, where exports are also exposed to the risk of imitation by foreign firms and how other government enforces global patent protection, each of which is captured by ϵ_{-i} and ω_{-i} .

$$\begin{aligned}
\mathbb{E}_{\epsilon_H, \epsilon_F} [\pi_1(\omega)] &= \pi_1 \cdot \mathbb{E}_{\epsilon_H \leq T} [\max\{\omega_H, \epsilon_H\}] + \bar{\pi}_1 \cdot \mathbb{E}_{\epsilon_H \leq T} [\min\{T - \omega_H, T - \epsilon_H\}] \\
&\quad + \pi_1 \cdot \mathbb{E}_{\epsilon_F \leq T} [\max\{\omega_F, \epsilon_F\}] + \tilde{\pi}_1 \cdot \mathbb{E}_{\epsilon_F \leq T} [\min\{T - \omega_F, T - \epsilon_F\}] \\
&\quad + 0 \cdot \mathbb{E}_{\epsilon_H \leq T} [\max\{\omega_H, \epsilon_H\}] + \tilde{\pi}_3 \cdot \mathbb{E}_{\epsilon_H \leq T} [\min\{T - \omega_H, T - \epsilon_H\}] \\
\mathbb{E}_{\epsilon_H} [\pi_2(\omega)] &= 0 \cdot \mathbb{E}_{\epsilon_H \leq T} [\max\{\omega_H, \epsilon_H\}] + \bar{\pi}_1 \cdot \mathbb{E}_{\epsilon_H \leq T} [\min\{T - \omega_H, T - \epsilon_H\}] \\
&\quad + 0 \cdot \mathbb{E}_{\epsilon_H \leq T} [\max\{\omega_H, \epsilon_H\}] + \tilde{\pi}_3 \cdot \mathbb{E}_{\epsilon_H \leq T} [\min\{T - \omega_H, T - \epsilon_H\}]
\end{aligned}$$

In this game, consumers in each country H and F love invention of new product $k \in \{1, 3\}$ which cannot be substituted. Yet, how much consumers appreciate their new quality depends on their prices, which change as a result of market competition among firms $i \in \{1, 2, 3, 4\}$. I assume $S_1 < \bar{S}_1$ and $S_3 < \tilde{S}_3$, where S_1 represents consumer preferences on patented good $k = 1$ in country H when it is produced by firm 1 only, while \bar{S}_1 captures the utility when the same product is also produced by firm 2 after its market entry. Similarly, S_3 denotes the utility of importing $k = 3$ into country H when it is supplied by foreign firm 3, while \tilde{S}_3 represents the taste when the product is also produced by domestic firms 1, 2 at a lower price. For symmetry, I also assume $S_1 = S_3$, $\bar{S}_1 = \bar{S}_3$, and $\tilde{S}_1 = \tilde{S}_3$ so that the same argument holds for country F .

$$\begin{aligned}\mathbb{E}_{\epsilon_H}[S(\omega)] &= S_1 \cdot \mathbb{E}_{\epsilon_H \leq T}[\max\{\omega_H, \epsilon_H\}] + \bar{S}_1 \cdot \mathbb{E}_{\epsilon_H \leq T}[\min\{T - \omega_H, T - \epsilon_H\}] \\ &\quad + S_3 \cdot \mathbb{E}_{\epsilon_H \leq T}[\max\{\omega_H, \epsilon_H\}] + \tilde{S}_3 \cdot \mathbb{E}_{\epsilon_H \leq T}[\min\{T - \omega_H, T - \epsilon_H\}]\end{aligned}$$

Government $i \in \{H, F\}$ aggregates its consumer preferences over patented goods $k \in \{1, 3\}$ and its domestic firms' profits of exporting and importing the goods, which vary depending on its policy choice ω_H, ω_F . In so doing, each government also accounts for how much the term of patent protection fosters innovation (Grossman and Lai, 2004). This public policy objective is simplified under $\gamma(\omega) = \gamma\omega$, where $\gamma > 0$ so that the longer the term of patent protection, the more likely it is that firms invest more resources in R&D, bringing more product innovations.

$$W_i(\omega) = \mathbb{E}_{\epsilon \leq T}[S(\omega)] + \sum_j \mathbb{E}_{\epsilon \leq T}[\pi_j(\omega)] + \gamma(\omega)$$

3.1.2 A Sequence of Decision Making

Based on Grossman and Helpman (1994b), government $i \in \{H, F\}$ and firm $j \in \{1, 2, 3, 4\}$ play the two-stage game. In the first stage, both governments set the optimal term of patent protection $\omega^* = \omega_H^* = \omega_F^*$ that maximizes the following objective function before they collect political contributions from domestic firms in the next stage. In the following stage, each firm schedules its political contribution simultaneously, where V_j captures attractiveness of the alternatives when lobbying is described as an auction (Bernheim and Whinston, 1986) and determines the truthfulness of firms' political contributions. I also assume $\alpha > 0$ so that the two governments place non-trivial weights on their social welfare (Goldberg and Maggi, 1999).

$$\begin{aligned}\max_{\omega} \sum_j L_j(\omega) + \alpha \cdot W_i(\omega) \\ L_j(\omega; V_j) = \max\left\{0, \mathbb{E}_{\epsilon \leq T}[\pi_j(\omega)] - V_j\right\}\end{aligned}$$

3.1.3 Equilibrium

In this paper, I find a symmetric, subgame-perfect Nash equilibrium $\omega^* = \omega_H^* = \omega_F^*$ by using backward induction. [Grossman and Helpman \(1994b\)](#) provide its both sufficient and necessary conditions, which can be rewritten using the following equations. For the symmetry in payoffs, finding the equilibrium can be rephrased as a constrained optimization problem, where the solution ω^* maximizes the objective function of government i , given the contributions made by its exporting and import-competing firms j as constraints.

$$\begin{aligned} \sum_j \frac{\partial L_j}{\partial \omega}(\omega) + \alpha \cdot \frac{\partial W_i}{\partial \omega}(\omega) &= 0, \quad \forall i \\ \frac{\partial}{\partial \omega} \mathbb{E}_\epsilon[\pi_j(\omega)] - \frac{\partial L_j}{\partial \omega}(\omega) + \sum_j \frac{\partial L_j}{\partial \omega}(\omega) + \alpha \frac{\partial W_i}{\partial \omega}(\omega) &= 0, \quad \forall j \text{ given } i \end{aligned}$$

In the appendix, I show how to calculate the means of truncated distributions that characterize imitation by import-competing firms in each country H and F . To account for whose imitation succeeds early among import-competing firms, I also illustrate how $\tilde{S}_1, \tilde{\pi}_1$, and $\tilde{\pi}_3$ can be re-written using $\bar{S}_1, \bar{\pi}_1$, and $\bar{\pi}_3$, respectively, later in the appendix.

Proposition 1 *The optimal term of patent protection in international trade.*

$$\begin{aligned} \omega_H^* &= \frac{\alpha \gamma \bar{\epsilon}_H \bar{\epsilon}_F}{(\alpha + 1) [(\bar{\pi}_1 + \bar{\pi}_3) \bar{\epsilon}_F - (\pi_1 - \bar{\pi}_1)(\bar{\epsilon}_H + \bar{\epsilon}_F)] + \alpha \bar{\epsilon}_F [(\bar{S}_1 - S_1) + (\bar{S}_3 - S_3)]} \\ \omega_F^* &= \frac{\alpha \gamma \bar{\epsilon}_H \bar{\epsilon}_F}{(\alpha + 1) [(\bar{\pi}_1 + \bar{\pi}_3) \bar{\epsilon}_H - (\pi_3 - \bar{\pi}_3)(\bar{\epsilon}_H + \bar{\epsilon}_F)] + \alpha \bar{\epsilon}_H [(\bar{S}_1 - S_1) + (\bar{S}_3 - S_3)]} \end{aligned}$$

3.1.4 Comparative Statics

In the equilibrium, it is worth noticing that the term of patent protection ω_H^* varies, depending on the two criteria: the benefits of reverse engineering imports $\bar{\pi}_3$ and protecting exports π_1 . Consistent with [Grossman and Lai \(2004\)](#), states in the Global South had less incentives to

enforce intellectual property protection before the early 2000s, when their benefits of forcing technology transfer from the Global North outweighed those of protecting their own assets in global markets. However, as developing countries and LDCs became the beneficiaries of trade liberalization after the early 2000s, exporting firms from both the North and the South pushed forward the boundaries of global patent protection to secure their gains from trade openness at the cost of their import-competing firms.

Next, the equilibrium spending in lobbying for global patent protection $L_j^* \equiv L_j(\omega^*)$ relies on sector-specific life-span T of exports and imports, given the trade policies ω^* chosen in the first stage. Notice that in the case of country $i = H$, political contributions made by its exporter $j = 1$ increase as the term of patent protection is extended, because its gains from stronger patent protection are greater than the losses of import-competing firm $j = 2$. This tendency becomes more salient as firms export patented goods with long life-cycles as their exports are exposed to the risk of imitation by their competing firms at both home and host countries. The same illustration holds when firm $j = 3$ competes against firm $j = 4$ in protecting its patented exports in country $i = F$.

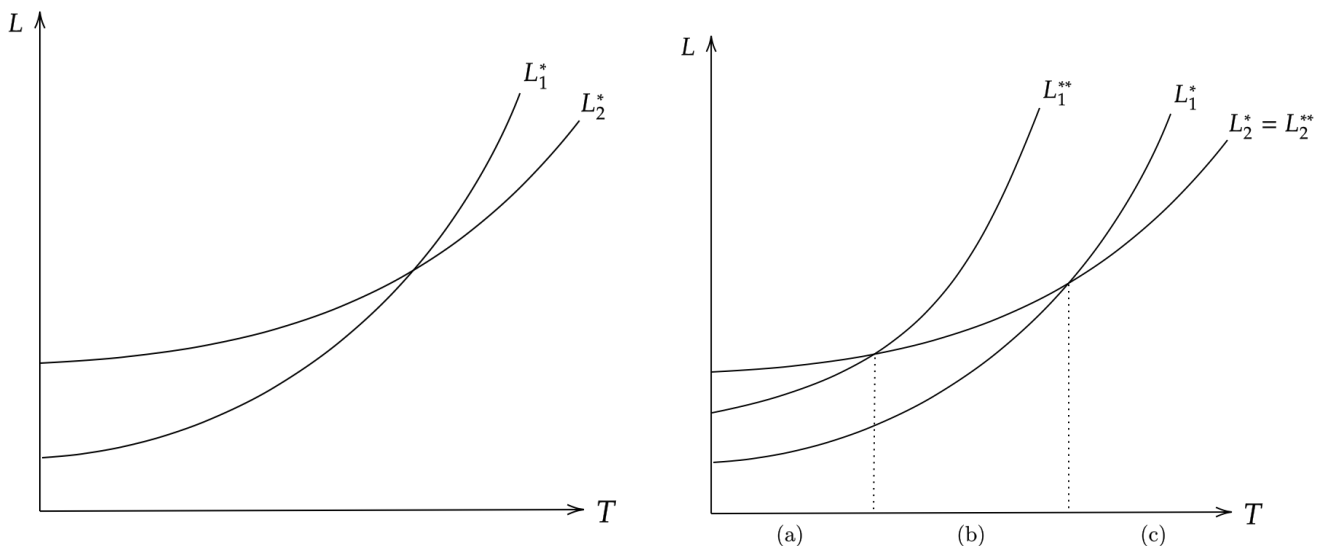


Figure 3: **Truthful Political Contributions: Exporting vs. Import-competing**

Figure 3 summarizes how the lobbying expenditures are adjusted as the parameters π_1, T change, where $\omega^{**} \equiv \omega_H^*(\pi_1') > \omega^* \equiv \omega_H^*(\pi_1)$ for $\pi_1' > \pi_1$. In Figure 3, the gains from trade π_1 accruing from patent ownership determines the intercept and its product life-cycle T defines the slope. The difference in their slopes represents exporting firms' increasing exposure to reverse engineering by import-competing firms in global markets. Exporters whose products exhibit short life-cycles (a) spend less money in lobbying than import-competing firms in both closed and open economies. However, firms who export goods with long life-cycles (b) expend more money on their political activities in an open economy than under a closed economy for their gains from trade. Firms who produce patented products with long life-cycles (c) assign more expenditures in lobbying than those who do not hold patents, as their risks of imitation are already large in a closed economy.

Corollary 1 *The distributional impacts of patent protection in international trade.*

$$\frac{\partial \omega^*}{\partial \pi_1} > 0, \quad \frac{\partial \omega^*}{\partial \pi_3} < 0$$

Corollary 2 *Firm-level lobbying for patent protection in international trade.*

$$\frac{\partial L_1^*}{\partial T} > \frac{\partial L_2^*}{\partial T} > 0, \quad \frac{\partial}{\partial \pi_1} \left(\frac{\partial L_1^*}{\partial T} \right) > \frac{\partial}{\partial \pi_1} \left(\frac{\partial L_2^*}{\partial T} \right) = 0$$

3.1.5 Testable Implications

One of the key observable implications of the theory is that the effects of product life-cycle on lobbying are conditional on patent ownership. As in the case of (a), when firms own a small number of patents, the amount of exposure to imitation attributed to their long product life-cycles is likely to be trivial. However, as shown in (b) and (c), when the number of patents owned by each firm increases, so does the risk of imitation, due to the long-term exposure to foreign firms. This tendency is likely to stand out when two governments extend the term of patent protection in international trade agreements as the gains from trade further empower patent holders in their political markets.

Hypothesis 1 *Patent owners who manufacture products with longer life-cycles are more likely to lobby their government to pass international trade agreements on patent protection.*

Hypothesis 2 *The effects of product life-cycle on corporate lobbying are more likely to be significant under international trade agreements on stronger patent protection.*

4 Empirical Analysis

To test the empirical implications directly poses several empirical challenges. First, for our independent variables, patent ownership is challenging to measure. The United States Patent and Trademark Office (USPTO) discloses all patent profiles, most of whose information is not digitized and thus remains not user-friendly. As the National Bureau of Economic Research (NBER) patent data project famously suggests (Hall, Jaffe, and Trajtenberg, 2001), the real obstacle to empirical research on patent is how to keep track of changes in patent ownership when firms reorganize their boundaries through spin-offs, mergers, and acquisitions. This led political scientists to use the degree of concentration of patent ownership at an industry-level instead (Osgood and Feng, 2018) for their research on intellectual property rights up to date.

The remaining challenge for our independent variables is how to operationalize the risk of imitation, using product life-cycles. Product life-cycles can be measured in a number of ways, such as product turnover (Broda and Weinstein, 2010). However, notice that the quantity of interest in this paper is the spillover of scientific know-how embedded in a product, not the product itself. Also, it is the exclusive nature of intellectual property rights that raises the conflict of interest between firms in its diffusion process. Thus, a proxy that captures both of the aspects, intellectual property as scientific knowledge versus assets, should be used for our hypothesis testing.

Last but not least, for our dependent variable, we need to measure provisions on patent protection under international trade agreements at a granular level. The existing studies show how patent policies change across countries and years (Lerner, 2002; Ginarte and Park, 1997;

Park, 2008) but not how they are affected by international trade agreements. Nor do other available datasets on preferential trade agreements provide fine-grained information we need, such as the term of patent protection (Dür, Baccini, and Elsig, 2014; Elsig and Surbeck, 2016). Only recently have some political scientists begun to identify the provisions in sufficient detail yet with a specific focus on pharmaceutical patents (Shadlen, Sampat, and Kapczynski, 2020).

4.1 Data Collection

I overcome these challenges by introducing new patent- and firm-level datasets and creating a new measure of product life-cycle, using the datasets. I also check all patent-related sections under each US trade agreement, signed after the 2001 Doha Round up to 2012. Collecting the information allows me to categorize the US trade agreements, based on their levels of patent protection. Combined with other financial datasets on all publicly-traded US companies from Compustat and their lobbying reports filed on each of the trade agreements under LobbyView (Kim, 2017, 2018), the final dataset has firm-year by industry 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 filing, and other records available in other firm-level datasets, such as Orbis. Therefore, the output also captures changes in US patent ownership, attributed to corporate reorganization among publicly as well as privately traded US companies between 1980 and 2015.

Next, product life-cycle is measured, 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, the empirical strategy proposed by Bilir (2014) is adopted to measure product obsolescence in this paper, where I average patent citation lags across firms within industry. To do so, I follow

the guidance provided by the USPTO to match different categories of patents with industrial classifications. While [Bilir \(2014\)](#) uses US patent citations between 1976 and 2006 to calculate the life-cycles using the Standard Industrial Classification (SIC) codes with 3-digits, I update the measurement by using US patent citations between 1975 and 2010 ([Bhaven, 2011](#)) and the USPTO concordance file using the North American Industry Classification System (NAICS) with 4-digits. The update allows me to keep track of ongoing innovation up to recent years. In this way, the life-cycle index also becomes compatible with other firm-level attributes that vary significantly across years. In the appendix, I demonstrate reliability of the average citation lag as a proxy for product life-cycle analytically.

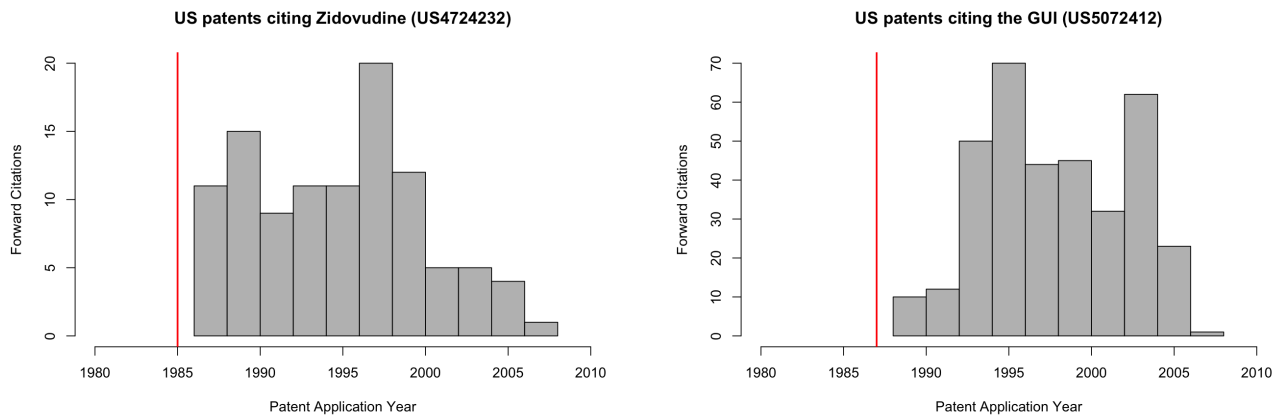


Figure 4: **Examples of patent citation lags: medicine vs. communication device**

Examples of patent citation lags and how they are aggregated at an industrial level are illustrated in Figure 4 and Table 1. As Figure 4 showcases, notice that their distributions are skewed to the right or not, depending on how far the life-cycles are extended. Hence, I use the 75th and other quantiles in my robustness check to measure more precisely how long each technology as proprietary information lasts in practice. Also, it should be noted in Table 1 that R&D intensive industries, such as computer, semi-conductor, and chemicals, exhibit the shortest product life-cycles. This is most likely so because the more investments in R&D, the more product innovations are achieved, shortening the life-time of other existing products.

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 mean citation lags: shortest vs. intermediate vs. longest**

Lobbying reports filed by all publicly traded US companies in manufacturing industry are downloaded from LobbyView database (Kim, 2017, 2018) and used as our dependent variable. In specific, I create an indicator variable that equals 1 if each firm filed any lobbying report on US trade agreements containing patent provisions and signed after the Doha Round, and 0 otherwise. The trade agreements considered for empirical analysis are listed in Figure 5, whose detailed provisions on patent protection I identify manually, based on the criteria established in other earlier works on TRIPS-plus (Maskus, 2000; Correa, 2000; Deere, 2009; Shadlen, 2005; Shadlen, Sampat, and Kapczynski, 2020; Osgood and Feng, 2018). Corporate lobbying reports filed on US congressional bills introduced to ratify the US trade agreements are the subject of our analysis. More details on their patent provisions are illustrated in the appendix.

It is not uncommon that states bargain over a set of policies in their trade negotiation at the same time. Thus, the remaining challenge would be how to flesh out firms' preferences on patent provisions within each trade agreement. To address this issue, not only do I compare lobbying reports filed on US trade agreements with different patent provisions later, but I also

sample firms whose industries are patent-intensive³ from compustat (Osgood and Feng, 2018), based on the report published by the USPTO (ESA, 2012), and add other firm attributes as our control variables. To ensure that I examine US firms' lobbying activities that are targeted at the US trade agreements on patent protection only, listed in Figure 5, I also compare the reports identified in LobbyView with those available in OpenSecret for data sanity check. The final dataset is a large panel of US firms, which covers the profiles between 2003 and 2012.

Negotiating party	Year (signed)	Year (effective)	Bills	Congress	Term of protection	Extension of protection									
						Delays under marketing approval		Violation of test data protection (Pharmaceutical)				Violation of test data protection (Agrochemical)			
						From the date of filing	After a request for examination	Marketing approval (domestic)	Marketing approval (foreign)	New clinical information (domestic)	New clinical information (foreign)	Marketing approval (domestic)	Marketing approval (foreign)	New uses (domestic)	New uses (foreign)
Singapore	2003	2004	HR2739, S1417	108	20 years	4 years	2 years	5 years	5 years	no	no	10 years	10 years	no	no
Chile	2003	2004	HR2738, S1416	108	20 years	5 years	3 years	5 years	no	no	no	10 years	no	no	no
Australia	2004	2005	HR4759, S2610	108	20 years	4 years	2 years	5 years	5 years	3 years	3 years	10 years	10 years	10 years	10 years
Morocco	2004	2006	HR4842, S2677	108	20 years	4 years	2 years	5 years	5 years	3 years	3 years	10 years	10 years	no	no
Dominican Republic - Central America	2004	2006	HR3045, S1307	109	20 years	4 years	2 years	5 years	5 years	no	no	10 years	10 years	no	no
Bahrain	2004	2006	HR4340, S2027	109	20 years	4 years	2 years	5 years	5 years	3 years	3 years	10 years	10 years	10 years	10 years
Oman	2006	2009	HR5684, S3569	109	20 years	4 years	2 years	5 years	5 years	3 years	3 years	10 years	10 years	10 years	10 years
Peru	2006	2009	HR3688, S2113	110	20 years	5 years	3 years	5 years	no	no	no	10 years	no	no	no
Colombia	2006	2012	HR3078, S1641	112	20 years	5 years	3 years	5 years	5 years	no	no	10 years	10 years	no	no
Republic of Korea	2007 (2010)	2012	HR3080, S1642	112	20 years	4 years	3 years	5 years	5 years	3 years	3 years	10 years	10 years	10 years	10 years
Panama	2007	2012	HR3079, S1643	112	20 years	5 years	3 years	5 years	5 years	no	no	10 years	10 years	no	no

Negotiating party	Patentability				Revocation of patent			TRIPS Flexibilities		Enforcement of protection					
	New uses of products	Plants	Animals	Excludable for moral, health, and safety reasons	Only for the reasons of granting patent	For other misconducts	Not before granting patent	Allowing compulsory licensing	Banning parallel imports	No excuse for resource constraints	Border measures		Civil and administrative procedures	Criminal procedures and remedies	
Singapore	no	no	no	no	yes	yes	yes	yes (provisions)	no	yes	yes	yes	yes	yes	no
Chile	no	no	no	no	yes	no	no	not explicit	no	yes	yes	yes	yes	yes	no
Australia	yes	not explicit	not explicit	yes	yes	yes	no	yes (provisions)	yes	no	yes	no	yes	yes	yes
Morocco	yes	yes	yes	no	yes	yes	yes	not explicit	yes	yes	yes	yes	yes	yes	yes
Dominican Republic - Central America	no	yes	yes	no	yes	yes	no	not explicit	no	yes	yes	yes	yes	yes	yes
Bahrain	yes	not explicit	not explicit	yes	yes	yes	yes	yes (provisions)	no	yes	yes	yes	yes	yes	yes
Oman	yes	not explicit	not explicit	yes	yes	yes	yes	not explicit	no	yes	yes	yes	yes	yes	yes
Peru	no	yes	yes	no	yes	yes	no	yes (exceptions)	no	yes	yes	yes	yes	yes	yes
Colombia	no	yes	yes	no	yes	yes	no	yes (exceptions)	no	no	yes	yes	yes	yes	yes
Republic of Korea	yes	not explicit	not explicit	yes	yes	yes	yes	yes (exceptions)	no	no	yes	yes	yes	yes	yes
Panama	no	yes	yes	no	yes	yes	no	yes (exceptions)	no	no	yes	yes	yes	yes	yes

Figure 5: TRIPS-plus provisions under the US trade agreements (2003–2012)

³A sector is classified as patent-intensive if the ratio of patents to employees is greater than the average across all US industries (Osgood and Feng, 2018). See ESA (2012) for more details.

4.2 Model Specification

To close the gap between the theory and empirical model, I use a multiple logistic regression where I include an interaction between the number of patents owned by each US firm in our sample, $patents_{ijk}$, and the mean citation lag T_j as a proxy for product life-cycle. Notice that $patents_{ijk}$ is log-transformed as the majority of patents are held by a handful of big firms. The life-time of patented technology is also squared for there is no linear term of T_j specified in the equilibrium. Since $T_j > 0$, the significance level would stay the same if we use its linear term instead, yet only the magnitude would change. The model is specified as follows:

$$Lobbied_{ijk} = \alpha + \beta_1 T_j^2 + \beta_2 \log(patents_{ijk} + 1) + \beta_3 T_j^2 \log(patents_{ijk} + 1) + \delta X_{ijk} + \theta_j + \gamma_k + \epsilon_{ijk}$$

where i, j and k refer to firm, industry, and year, respectively. The key parameter of our theoretical interest is β_3 , where $\beta_3 = 0$ in our null hypothesis. To account for other factor that also shapes firms' trade policy preference, such as their size and productivity, a set of control variables X_{ijk} capturing firm heterogeneity, other than patent ownership, is also included.

Industrial- and year-fixed effects θ_j, γ_k are also added to keep the results consistent with the theory, where NAICS 4-digit codes are used for industrial classifications. Specifically, the industry-fixed effects stem from the previous assumption of $T > \max\{\omega_H, \omega_F\}$ in our model, where the term of protection $\omega_H^* = \omega_F^*$ chosen by the governments is sector-invariant but only political contributions made by each firm within industry depend on T_j . Therefore, β_1 attached to T_j^2 in the equation will not be estimated in the model when θ_j is added to control for other unobservable industrial attributes that are beyond the scope of our theory. In a similar vein, the year-fixed effects are added as the theory is not so much about when firms spend money in political activities as about whether they do so. However, because each firm files lobbying reports on the same congressional bill multiple times over a time horizon, I construct a panel data and instead opt to partial out any time-specificity by adding the fixed effect γ_k .

4.3 Results

	Dependent Variable: Lobbied					
	(1)	(2)	(3)	(4)	(5)	(6)
product life-cycle (squared)				0.049***		
× patent (stock, thousands)				(0.014)		
product life-cycle (squared)						0.040***
× patent (reassign, thousands)						(0.012)
patent (stock, thousands)		1.226***	0.225**	−4.593***		
		(0.121)	(0.097)	(1.425)		
patent (reassign, thousands)					0.232**	−3.710***
					(0.097)	(1.158)
capital expenditure (log)	0.497*		0.245	0.247	0.260	0.335
	(0.379)		(0.408)	(0.429)	(0.405)	(0.426)
employees (log)	0.361		0.238	−0.161	0.217	−0.108
	(0.402)		(0.412)	(0.453)	(0.414)	(0.446)
plants and equipments (log)	0.383		0.519	0.608*	0.517	0.522
	(0.437)		(0.455)	(0.468)	(0.454)	(0.467)
revenue (log)	−0.325		−0.230	−0.092	−0.221	−0.074
	(0.426)		(0.435)	(0.467)	(0.435)	(0.459)
R&D expenditure (log)	0.479**		0.343	0.159	0.316	0.103
	(0.217)		(0.233)	(0.239)	(0.233)	(0.234)
Year FE	YES	YES	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES	YES	YES
Observations	7,663	6,175	6,175	6,175	6,175	6,175
Log likelihood	−141.889	−203.602	−137.335	−130.543	−137.150	−130.689
Akaike Information Criterion	293.778	409.203	286.669	275.085	286.299	275.379

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

Table 2: **The Effect of Product Life-cycle on Lobbying for Global Patent Protection**

The main results are summarized in Table 2, which are consistent with the theory. In specific, column (1) reaffirms the existing findings that it is mainly large firms, proxied by their size of R&D investments, who engage more in political activities for trade liberalization. The next two columns (2) and (3) highlight another aspect of firm heterogeneity, the number of patents possessed by each company, and demonstrate how the amount of intangible assets owned by individual firms also affects their propensity of political participation to protect the assets in

global markets. Column (4) demystifies who among patent owners are more likely to petition home government to protect their intellectual property rights abroad. As the theory suggests, those who manufacture products with long life-cycles face higher risk of imitation by import-competing firms abroad and thus seek more patent protection under their lobbying activities. (5) and (6) show that the results stay the same, when we account for how patent ownership is shifted across the boundaries of publicly-traded US firms as a result of their reorganization, including spin-offs, mergers, and acquisitions.

The reversal of the signs attached to $patent_{ijk}$ and the magnitude of the effects of product life-cycle T_j under (4) and (6) should be interpreted with caution. To begin with, the negative signs of $\hat{\beta}_2$ are mainly ascribed to the fact that the effect of patent ownership is conditional on the life-time of patents, whose proxy T_j was constructed at an industrial-level. It is worthwhile recalling that US patents in manufacturing industry are predominantly possessed by US firms who produce computers, other communication devices, semi-conductors, and pharmaceutical and agrochemical compounds, and these sectors exhibit the shortest life-time in terms of their proprietary technologies under Table 1, due to their high R&D intensity. Therefore, given the negative correlation between concentration of patent ownership $patent_{ijk}$ and the life-cycle T_j across sectors, the negative signs of $\hat{\beta}_2$ should also be flipped when interpreting the marginal effects of $patent_{ijk}$ on corporate lobbying, which are conditional on the values of T_j .

The seemingly small magnitude of $\hat{\beta}_3$ in (4) and (6) can also be understood by following the same chain of reasoning, where firm-level and industry-level covariates $patent_{ijk}, T_j$ are put together in the empirical specification. Thus, the size of the interaction effects in (4) and (6) should be translated into the magnitude at an industrial level. To keep the confusion in their interpretation to a minimum, in the appendix I also construct a firm-level proxy for product cycles. I do so by calculating the mean citation lags by averaging them across patents within the boundary of each firm. Using the new proxy, I find that the results still remain consistent.⁴

⁴As illustrated in Figure 4, the downside of using such a firm-level measurement is that the average citation lag does not remain stable across years in that case.

4.4 Robustness Checks

However, there remain good reasons to be skeptical about the main results presented above. Among the remaining challenges is that a number of other provisions that are irrelevant for patent protection, such as environmental regulation, are also included as a part of the trade agreements. This makes it difficult to isolate lobbying firms' preferences on patent provisions from those on other provisions, despite the fact that our samples are selected from patent-intensive sectors only. Also, after we tease out firms' preferences on those patent provisions, it still remains unclear whether product life-cycles fully capture the risks of imitation exporting firms are facing abroad or represent other underlying factors of firms' trade policy preferences.

	Dependent Variable: Lobbied			
	2003–2008	2005–2008	2011–2012	2011–2012
	(1)	(2)	(3)	(4)
product life-cycle (squared)	0.032*	0.040**	0.060***	0.083***
× patent (stock, thousands)	(0.025)	(0.020)	(0.022)	(0.035)
patent (stock, thousands)	−3.016*	−3.842**	−5.530***	−7.538***
	(2.452)	(1.996)	(2.169)	(3.414)
capital expenditure (log)	0.638	0.923*	−0.912	−1.157
	(0.742)	(0.572)	(0.749)	(1.757)
employees (log)	−0.091	−0.160	0.054	1.322***
	(0.863)	(0.675)	(0.659)	(1.200)
plants and equipments (log)	0.288	0.083	1.294***	2.677***
	(0.795)	(0.627)	(0.726)	(1.981)
revenue (log)	0.063	0.110	−0.032	−0.944
	(0.865)	(0.688)	(0.667)	(1.235)
R&D expenditure (log)	0.303	0.195	0.0004	−1.022*
	(0.426)	(0.328)	(0.367)	(0.634)
Year FE	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES
Observations	4,023	3,193	1,291	1,291
Log likelihood	−43.025	−75.593	−47.790	−13.122
Akaike Information Criterion	100.051	165.185	109.580	40.245

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

(1) US-Chile & US-Peru FTAs excluded, (2) US-Peru FTA excluded, (4) US-Panama FTA

Table 3: **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, based on their adoption of TRIPS-plus standards. In specific, the US trade agreements are ordered, based on the term of extension in the case of delays in regulatory approval. This is not only because US trade agreements on patent protection are hardly distinguishable in the other dimensions of patent policies (Shadlen, 2005), but because the theory is also about firms' heterogeneous responses to the term of market exclusivity granted by home government in trade. Except for US-Chile and US-Peru free trade agreements (FTA), the term of patent protection extended for the delay gradually increases from 6 to 8 years in total. So does the extension in the case of violation of data protection, whose rule is only applied to companies in applied chemistry and thus considered as a secondary criterion in the sorting.

The results are again summarized in Table 3, where the term of extensions in the case of regulatory delays increases, starting from columns (1) to (4). As the TRIPS-plus standard becomes more stringent, notice that the effects of product life-cycles on corporate lobbying become much more pronounced, and so does their magnitude. Additionally, the indicators for the goodness of fit suggest that the less but more targeted samples are selected from our data, the larger amount of variation in lobbying is captured by our empirical specification.

Also, I test whether product life-cycle operationalizes the risk of imitation accurately and drive the outcomes in a meaningful way, using a text analysis. To do so, I first download all lobbying issues and their contents on trade and intellectual property from LobbyView. Then, using structural topic modeling (Roberts et al., 2014), I regress their latent topics on other document-level covariates observed in each lobbying report. These include industries (NAICS, 4-digits) each client belongs to, their average citation lags, and years in which the report was filed. I also control for other lobbying issues for most client firms address multiple issues within the same lobbying report at the same time. Lastly, the number of topics was chosen, based on the residuals, semantic coherence, exclusivity, and congruence of alternatives.

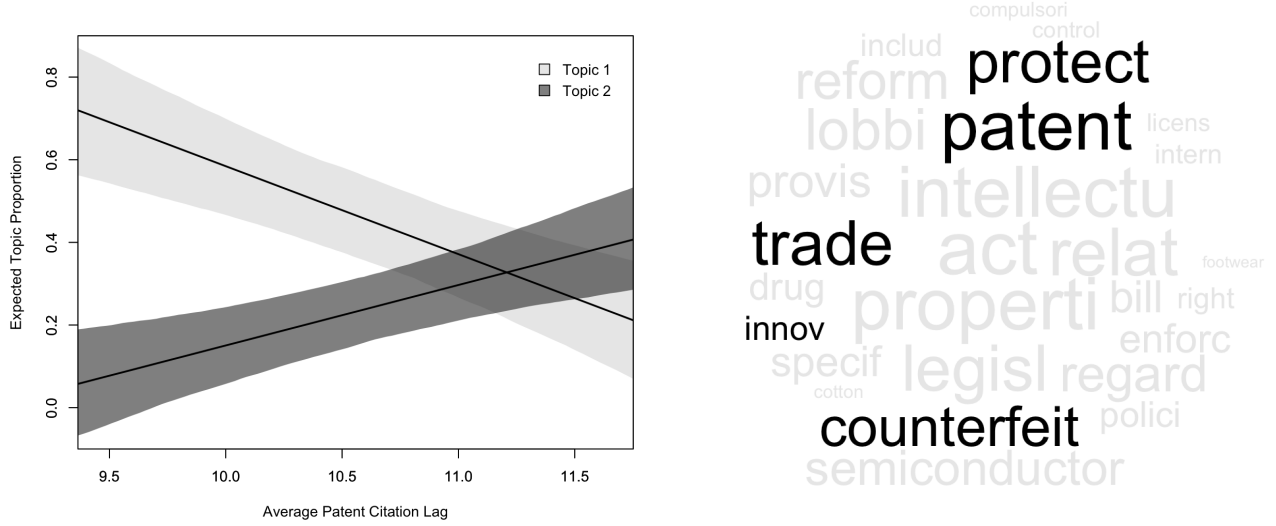


Figure 6: **Expected topic proportions ($K = 4$) and the top keywords (Topic 2)**

The text analysis results are displayed in Figure 6, uncovering the underlying reasons why firms exporting goods with longer life-times engage in lobbying. In Figure 6, I plot the latent topics whose associations with the mean citation lags are statistically significant. Notice that Topic 2 is positively correlated with the life-cycle index, and its keywords include “patent,” “protect,” “trade,” and “counterfeit” among others. Overall, the results provide suggestive, if not compelling, evidence that US companies who produce goods with long life-cycles are more likely to be exposed to illegal trade practices committed by foreign competing firms, leading them to seek more support from home government for protection of their assets exported.

To probe generalizability of my argument more broadly, I conduct additional robustness checks in the appendix. For instance, I examine how the results change as more firms and their lobbying activities from non-patent intensive industries are also included in our sample. I also check whether the results also remain unchanged when the amount of corporate lobbying spending is considered, using the Heckman selection model. Last but not least, I employ other proxies of product life-cycles to test the same hypotheses. These include SIC codes (3-digits), other years in the 1980s used as a benchmark to calculate the mean patent forward citations, and the 75th and the 85th percentiles to account for stability of each index across years.

5 Conclusion

It is well documented in the literature that trade liberalization creates both the winners and losers in intra-industry trade. As to why big and productive companies become the winners, the existing research puts emphasis on *the organizational advantage* of exporting firms, whose economic profits in an open economy are highly concentrated, eliminating the collective action problem (Olson, 1965; Bombardini, 2008; Osgood et al., 2017; Kim and Osgood, 2019). On the other hand, the benefits of protection are much more diffused among producers who are not productive enough to afford the fixed costs, making their voices heard less loudly throughout their political activities. When consumers in global markets love more differentiated varieties, large and productive firms' ability to meet their demand adds on to their political advantage (Bombardini and Trebbi, 2012; Osgood, 2016, 2017; Kim, 2017).

This paper provides an alternative perspective on political advantages of exporting firms, especially when products traded within industry cannot be differentiated. Specifically, I focus on economic advantage of the incumbent in global markets and provide the micro-foundation of how *the incumbency advantage* is translated into their political advantage (Rogowski, 1987, 1990). I illustrate the dynamics by focusing on a set of trade policies on intellectual property rights protection, where patent ownership captures the incumbent status and product life-time seizes the extent to which their market share is threatened by entrants in the global economy. By testing the business influence on their legislation procedure, I demonstrate how economic integration increases private returns from lobbying but only for exporting firms.

The conflict between innovating and imitating firms in an open economy is grounded in the endogenous growth theory in trade (Grossman and Helpman, 1991; Helpman, 1993). Explaining intra-industry reallocation of profits as a result of “ongoing imitation and innovation in the same industries” in the economy (Grossman and Helpman, 1993, 282), the theory explains how companies who can speed up their innovation to escape from imitation by foreign competitors

exhibit short product cycles and trade liberalization “can accelerate innovation and growth in the global economy” (Grossman and Helpman, 1994a, 42). In this paper, I theorize and test the effects on political coalition formation in international trade empirically, where those who cannot accelerate innovation petition home government more to protect their profit overseas. The inefficiency rises from their political advantage as incumbent firms in global markets and showcases how the distributional impact of intra-industry trade becomes more solid over time.

To be sure, this paper is not the first one in the field of international political economy, illustrating how MNCs influence the policy making process to shape foreign policies in their favor (Kim and Milner, 2019). More recent findings on firms in regulatory politics also show how MNCs make use of their profit (Gulotty, 2020) and large firms mobilize their competitive advantages, such as low adjustment costs (Kennard, 2020) and scientific knowledge (Perlman, N.d., 2020), to crowd out other small companies. But instead, building on the extant research, this paper illuminates when big firms seek more political influence to protect their gains from trade. Focusing on product life-cycles, the results demonstrate that it is when the losers pose a challenge in the form of import competition that the winners explore such capabilities further.

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