Home Country Bias in the Legal System: Empirical Evidence from the Intellectual Property Rights Protection in Canada*

Joseph Mai† Andrey Stoyanov‡

Abstract

Are judges concerned, in the same way as policy makers, with the effects of their decisions on national welfare? In this paper we analyze this question by examining the outcomes of intellectual property rights (IPR) litigations between domestic and foreign firms. We develop a simple model of oligopoly where foreign firms have access to more efficient production technology and show that discriminatory weak protection of foreign-owned IPR always increases national welfare. We also show that the positive welfare effect increases with the size of the foreign innovator, as well with in the size of the domestic imitator. The predictions of the model are tested using the data on all Canadian IPR cases over a four-year period. We find that a domestic firm is substantially more likely, by 17 percentage points, to succeed in litigations with a foreign firm than with another Canadian firm. We also find evidence supporting the hypothesis of the home bias in the legal system. Specifically, we establish that courts' decisions are aligned with welfare maximization principles so that foreign firms are less likely to win in those cases when the implied welfare effects of not protecting foreign IPR are greater.

1 Introduction

With the continuous rise in the number of intellectual property rights (IPR) suits and associated damages awards worldwide, there is a pronounced trend for firms involved in cross-border litigations to file complaints with, and often receive favor from, a home country jurisdiction. In the recent

*We are very grateful to Tasso Adamopoulos, Elie Appelbaum, Sam Bucovetsky, Nils-Petter Lagerlof, Philip Curry, as well as seminar and conference participants at York University, the 2013 Canadian Economics Association Meetings, and 2013 Canadian Law and Economics Association Conference for helpful comments.

†York University, Department of Economics, Faculty of Liberal Arts and Professional Studies, 738 Atkinson, 4700 Keele St., M3J 1P3, Toronto, Canada. E-mail: jkonmak@econ.yorku.ca

‡York University, Department of Economics, Faculty of Liberal Arts and Professional Studies, 1084 Vari Hall, 4700 Keele St., M3J 1P3, Toronto, Canada. E-mail: andreyst@yorku.ca

intellectual property battles between the U.S.-based Apple Inc. (Apple) and the South Korea-based Samsung Electronics Co. (Samsung), Apple sued Samsung for patent infringements over the design and technology of its mobile devices in several countries, and the outcomes vary substantially across different jurisdictions. The U.S. court ruled in favor of the U.S. firm and on August 24, 2012 awarded Apple over a billion dollars in damages.[1] However, when the same claim was filed with the Seoul Central District Court in South Korea, the decision was in largely favor of Samsung. Moreover, a counterclaim by the South Korean firm that Apple had violated some of its own patents resulted in several of Apple's devices being banned from sale in Korea. Yet the same claim was denied by the U.S. jury. Another patent infringement case between the Canadian Research in Motion (RIM) and the U.S. Visto share many similarities. Visto brought RIM to the U.S. court, and although Visto's patents were broadly considered invalid, the lawsuit was settled with RIM paying 267.5 million dollars to Visto in 2009. In contrast, when RIM brought Visto to the Canadian Federal Court for patent violation, the decision was in favor of RIM.

The above prominent cases suggest that the legal system may become a form of protectionism, whereby firms involved in cross-country IPR litigations may have a significant advantage over foreign firms in their home country jurisdiction. In this study, we set out to investigate whether foreign firms are systematically disadvantaged in IPR litigations with domestic firms. We test this hypothesis using novel data on all IPR litigation cases in Canada that took place between 2007 and 2010. With 1079 litigation cases in our data, we identify the country of residence for 2,502 firms involved in those cases, and relate it to the probability of winning the case in Canadian courts. We find that the nationality of a firm is a statistically and economically significant determinant of success rate in a courtroom. Foreign firms litigating in Canada have a much smaller likelihood of winning a case: while a Canadian firm has a 50% probability of winning in IPR litigation against another Canadian company, the probability of winning against a foreign firm is 60%. This result is very persistent and is remarkably robust to the definition of a foreign firm, to inclusion of a variety of case-related fixed effects, and to firm size controls.

We next attempt to identify whether foreign firms' disadvantage in IPR disputes can be driven by welfare-consideration concerns. A large body of literature analyzes welfare gains from the discrimination of foreign IPR owners. The success of a foreign firm in IPR litigation with a domestic firm implies a transfer of intellectual property along with its associated market value to a foreign jurisdic-

[1] The damage amount was later revised to half a billion dollars.

tion, which may have a negative impact on both domestic profits and consumer surplus. Therefore, a welfare-maximizing policy maker may want to protect domestic innovators more rigorously than foreign ones. However, the room for discrimination of foreign IPR owners is substantially reduced by several international treaties on IPR protection. Most importantly, the Agreement on Trade Related Aspects of Intellectual Property Rights (TRIPS), to which all member countries of the World Trade Organization must adhere, determines the minimum standards for IPR protection and empowers legal authorities to grant relief by way of injunction or damages. Yet implementation of these agreements by the national legal system may not be completely unbiased towards foreign IPR owners. In particular, being concerned about the impact of their orders on national well-being, judges may factor welfare considerations into their decisions. If domestic firms are more likely to win in those IPR cases which result in larger welfare gains, it would imply that, despite international treaties, countries can achieve better social outcomes by violating national treatment in patent protection. Whether the legal system fosters discrimination of foreign innovators or is independent of national welfare considerations is an empirical question, which we try to answer in this study.

To test whether home bias is present in the legal system, we develop a simple partial equilibrium model where domestic and foreign firms compete in an oligopolistic market with a homogeneous good. A foreign firm is assumed to have access to a more efficient production technology, associated with lower production costs, that domestic firms may try to imitate. Using this model, we identify several economic factors that increase welfare gains from weak protection of foreign IPR. First, the model predicts that a social planner would choose not to protect foreign IPR when the domestic imitator is larger, in which case imitation has a stronger negative effect on domestic prices and a positive effect on consumer surplus. Second, the welfare gains from not protecting foreign IPR are increasing with the size of the foreign firm due to a stronger profit reallocation effect from foreign to domestic firms. Therefore, the model predicts that if welfare considerations lead to home country bias in the legal system, we should expect the size of the firm to be positively (negatively) related to the likelihood of success in IPR litigation for domestic (foreign) firms.

Testing these two predictions of the model empirically, we find support for the home country bias hypothesis in the data. The analysis reveals that the size of a firm, measured either by revenue or employment, has a positive (negative) association with the probability of winning a case for domestic (foreign) firms. This relationship is statistically significant and economically sizable: a one standard deviation increase in log revenue is linked to a 13.3 percentage point increase in success probability for

domestic firms and a 16.1 percentage point decrease for foreign firms. This result implies that courts' decisions are aligned with welfare maximization principles. Although this result admits alternative explanations, we believe that the provocative relationship between courts' decisions and the implied welfare effects will promote the research agenda and stimulate more research on identification of the factors behind foreign firms' disadvantage in IPR litigations.

Yet our empirical methodology does allow us to rule out some alternative interpretations of the home bias hypothesis. First, this finding cannot be explained by different effort levels and resources that domestic and foreign firms put into litigation. For both types of firms, there is a positive relationship between the firm size and the private gains from IPR protection; hence, we would expect to see large foreign firms spending more resources on protecting their IPR. Therefore, the negative relationship between foreign firms' revenue and likelihood of success in a courtroom, observed in the data, cannot be rationalized by different efforts of domestic and foreign firms in IPR litigations. However, it is consistent with the home bias hypothesis because private gains of foreign firms are not part of national welfare, and the welfare gains from imitating the foreign firm's technology are increasing in the size of the foreign firm. Second, we find that our results are not driven by differences in familiarity with the Canadian legal system between domestic and foreign firms. In one of the robustness tests, we control for firms' prior litigation experience and find that our main results remain qualitatively unchanged. Third, we show that being registered in a country that has good political relations with Canada does not reduce the bias against foreign firms, suggesting that political factors are unlikely to explain our main finding. Finally, the results are robust to the inclusion of a wide range of fixed effects such as industry, location and type of jurisdiction, subject of litigation, and time period.

Our study provides several contributions to the literature on IPR protection. While the evidence of the presence of home bias in national policies abounds, whereby governments vary the intensity of IPR protection in order to increase national welfare at the expense of foreign agents, most of the previous literature assumes national treatment of foreign IPR owners. Our study is the first to show that discrimination against foreign firms can take place not only at the policy level but also at the implementation level as foreign innovators may not be able to protect their intellectual property as effectively as domestic ones. It implies that stringent IPR laws at the country level do not guarantee that the interests of foreign innovators is well protected.

This paper is also the first study that analyzes the role of the legal system in differential treatment of foreign and domestic IPR owners. We show that even if the policies conform to the national treatment

principle and do not discriminate against firms based on their country of origin, the legal system can serve as a channel for violation of the national treatment if courts implement policies differently for domestic and foreign firms. Although courts are supposed to prevent any discrimination against foreign IPR holders, this may not be the case if judges take into account the effect of their decisions on national well-being. Given the evidence we find in the Canadian data, home bias in the judicial system can be a more serious issue in developing countries where institutions are less efficient and legal systems are not completely independent from government influences.

The paper proceeds as follows. Section 2 surveys the literature on discrimination against foreign nationals in general and in IPR in particular. Section 3 presents the theoretical model on the effect of discrimination against foreign IPR owners on national welfare. Section 4 outlines the empirical strategy, which is followed by the data description in Section 5. The baseline results are reported in Section 6. Section 7 presents several extensions, and Section 8 concludes.

2 Literature Review

It is commonly agreed that government incentives to protect IPR vary across countries. In the theoretical literature, a number of studies show that countries actively involved in innovation activities are keener on protecting IPR than countries with low levels of innovation. Chin and Grossman (1991) and Grossman and Lai (2004) show that the interests of developed and developing countries conflict in the matter of IPR protection due to opposite impacts of stricter IPR enforcement on welfare in the two groups of countries. The innovative countries benefit from extension of stronger IPR rules to developing ones because stronger IPR protection increases the rent transferred from the latter to the former and the ability to recoup investments in R&D by innovating firms. In contrast, tightening of the IPR rules in the developing countries increases the monopolistic power of foreign firms and restricts the opportunity of domestic firms to produce inexpensive imitations using foreign technologies (also see Helpman, 1993; Diwan and Rodrik, 1991; Hunt, 2006).[2]

Since policymakers tend to support domestic firms in competition with foreign ones, they are typically less interested in protecting IPR owned by foreign firms. It is thus not surprising that incentives for adoption and enforcement of IPR protection rules vary between countries depending

[2] Deardorff (1992) adds to the above literature that the global welfare as a whole decreases if stricter IRP rules extend globally because increased market power of firms in developed countries could eventually exhaust the market share of resource-constrained firms from developing countries. Due to the downside of extensive IPR protection, McCalman (2001) alert to the danger of the global spread of stronger IPR rules and advocate weaker IPR rules for developing countries.

on the relative innovation intensity of foreign and domestic firms.[3] Prior to the Uruguay Round of the WTO negotiations, the standards for IPR protection had varied a lot across the WTO members and this variation was closely related to their level of economic development. Developed countries were characterized by higher IPR standards designed to stimulate local innovation. A vast majority of developing countries, on the other hand, had weak IPR rules, with many of them lacking any adequate mechanisms for IPR protection. Rising welfare costs to the countries where innovative firms reside, implied by globalization and weak IPR rules in developing countries, led a group of developed countries to form a campaign for a global standardization of IPR protection, which resulted in Trade Related Aspects of Intellectual Property Rights (TRIPS) agreement.

The TRIPS agreement, which came into force in 1996, is a system of rules that governs the practices of IPR protection among all WTO member countries. The TRIPS outlines the minimum protection standards for the length and the width of each type of intellectual property (e.g. trademarks, patent, industrial designs, and etc.) and details the enforcement procedures. Each WTO member country is required to meet the minimum standards of the TRIPS within a specified deadline, and most of the developing countries have undertaken substantial reforms to their legal systems in order to meet these standards. In contrast, the majority of the developed WTO member countries already had IPR protection laws that met or exceeded the TRIPS standards before the agreement became effective (Deere, 2008). Overall, the TRIPS has only mitigated the variation in international IPR protection but hardly eliminated the incentives of countries to deviate from the TRIPS standards. Large variation in TRIPS implementation persisted even ten years after the TRIPS had been in force. For example, developing countries often miss the deadline for domestic law reforms for TRIPS implementation or exploit the TRIPS flexibility which offers some degree of freedom in adjusting their policies to domestic needs (Maskus, 2000). Furthermore, developed and developing countries often interpret the TRIPS provisions differently to their own advantage (Musungu and Oh, 2006).

The above studies highlight the incentives of policymakers to adopt different levels of IPR protection depending on the relative stock of domestic and foreign-owned intellectual property. Developed countries stick to stricter IPR protection standards in order to prevent leakage of productive knowledge to other countries, while developing countries tend to encourage domestic firms to imitate foreign intellectual property by adopting weaker standards. Thus far, the majority of empirical studies on IPR

[3] Geng and Saggi (2013) point out that even countries at the same level of economic development may be better off from weaker global IRP protection in the presence of trade frictions. In this case domestic become more important than foreign markets and firms gain more from discreminatory treatment of foreign firms at home.

in international context have focused on this relationship between the level of IPR protection standard and its associated impact on national welfare (e.g., Maskus, 1995; Yang & Kuo, 2008). However, as the TRIPS agreement has narrowed the room for differences in IPR protection standards across countries, policymakers may have switched to alternative means of favoring domestic firms in order to either increase the transfer of foreign technologies or decrease the outflow of technologies to other countries. For example, there can be varying degrees of rigor with which policymakers enforce IPR protection rules, depending on the nationality of the IPR owner.

Discrimination against foreign firms in various aspects of government policies is well documented in the literature. McAfee and McMillan (1989) discuss how the 1933 Buy American Act has impacted the international trade pattern in the US and increased national welfare by favoring local businesses with government procurement contracts. Branco (1994) shows that a government's home bias against foreign firms, whereby foreign firms are required to cut the prices of domestic firms by a certain margin, is necessary in order to induce lower market price and to boost consumer surplus.[4] A number of papers demonstrate that trade policies and regulations are used to discriminate against foreign firms in order to shift consumers' expenditure from foreign to domestic products (e.g., Maggi and Goldberg, 1999 ; Gawande and Bandyopadhyay, 2000). The above studies illustrate how the bias against foreign firms can arise in various policies set by welfare-maximizing policymakers.

In the IPR context, a number of papers have demonstrated the presence of home bias. For example, several studies have shown that commercial and civil laws in some countries are designed to discriminate against foreign patentees in favor of domestic ones. Lerner (2002) shows that in a large number of countries discrimination against foreign patentees takes the form of higher registration costs, shorter duration periods, more limitations on extensions, and premature patent expirations. Liegsalz and Wagner (2013) argue that discrimination against foreign patentees can exist even after the implementation of the TRIPS by empirically showing that the Chinese State Intellectual Property Office favors domestic patentees by granting patents to foreign firms for a significantly shorter period of time. Webster et al (2014) investigate patent examination outcomes in European and Japanese patent offices and show that foreign inventors are less likely to obtain a patent grant than domestic inventors, and that the bias is stronger in areas of technological specialization of the domestic economy.

[4] Countries such as the US, Canada, Australia, and New Zealand have explicit laws that give domestic firms price advantages in auctions for government procurement contracts. European and Japanese governments have rather implicit rules and requirements that reduce the chance for foreign firms to win government procurement contracts (McAfee and McMillan, 1988).

3 Theoretical analysis

In this section we develop a simple model to study the factors that determine the effect of foreign IPR protection on welfare. Predictions of this model will be used to test whether the bias that foreign firms may face in court can be explained by national welfare maximization concerns. Consider an oligopolistically competitive market with firms producing a homogeneous good traded at price p. On the demand side, preferences of a representative consumer are characterized by a quadratic utility function:

$$U = \alpha Q - \beta Q^2, \tag{1}$$

where $Q = \sum_i q_i$ is the total consumption of the homogeneous good and q_i is the quantity purchased from firm i. Maximizing utility function subject to the standard budget constraint, we obtain the inverse demand function

$$p = \alpha - \beta Q. \tag{2}$$

Suppose there are $N + 2$ firms in the market. Firm 1 (F1) is a home country firm which may attempt to imitate the production technology of a foreign firm. Firm 2 (F2) is the foreign firm exporting to the home country market and utilizing a potentially more advanced production technology. The remaining N firms are symmetric in terms of costs and represent the rest of the industry. We assume they are all domestic firms. Denote a representative firm from the rest of the industry by F3. We further assume that each firm i has a constant marginal costs c_i. Profit function of firm i is then given by

$$\pi_i = (p - c_i)q_i. \tag{3}$$

Using first-order conditions for profit maximization and the market demand function, we obtain the industry total output, price, consumer surplus (CS), and welfare (W):

$$\begin{aligned} Q &= \frac{\alpha(N+2) - c_1 - c_2 - Nc_3}{\beta(N+3)} \qquad (4) \\ p &= \frac{\alpha + c_1 + c_2 + Nc_3}{(N+3)} \\ CS &= \frac{\beta}{2}Q \\ W &= CS + \pi_1 + N\pi_3 \qquad (5) \end{aligned}$$

Suppose a foreign firm possesses a more advanced production technology, which lowers marginal

costs by $\epsilon > 0$.[5] Let W_0 be the value of the welfare function when the domestic legal system protects IPR of the foreign firm and does not allow F1 to imitate its technology. In this case, the marginal costs of the three firms are $(c_1, c_2 - \epsilon, c_3)$. Also, let W_1 be the value of the welfare function when the legal system favors a domestic firm and allows it to imitate technology of F2, so that the marginal costs of the three firms become $(c_1 - \epsilon, c_2 - \epsilon, c_3)$. Then $\Delta W = (W_1 - W_0)$ reflects the welfare gain from not protecting the IPR of the foreign firm, and in our model ΔW is always positive. This result is very intuitive. Since π_1 enters the national welfare function and π_2 does not, an increase in relative productivity of F1 raises its market share at the expense of other firms, including F2, and decreases the market price, thus raising both consumer surplus and aggregate profit of domestic producers. Therefore, in the partial equilibrium framework, when the effect of IPR protection on incentives to innovate is not taken into account, allowing domestic firms to imitate advanced foreign technologies is always in a country's best interest.

In what follows we perform some comparative-static exercises to derive the implications of the relative size of domestic and foreign firms for the gain from not protecting foreign firm's IPR. Since a firm's relative size is determined by relative marginal costs, we first differentiate ΔW with respect to c_2:

$$\frac{\partial \Delta W}{\partial c_2} = -\frac{(2N+3)\,\epsilon}{\beta\,(N+3)^2} < 0. \tag{6}$$

Equation (6) implies that for small c_2 (when foreign firm is large and efficient) allowing F1 to imitate technology of F2 will have a stronger positive impact on home country welfare. This effect stems from reallocation of market shares from foreign to domestic firm, which is increasing in the size of the foreign firm. Similarly, the relationship between ΔW and the size of F1 is

$$\frac{\partial \Delta W}{\partial c_1} = -\frac{2\,(N+2)}{\beta\,(N+3)}\epsilon + \frac{3}{\beta\,(N+3)^2}\epsilon < 0. \tag{7}$$

Therefore, when a domestic firm is originally larger and more efficient (c_1 is small), the positive effect of allowing it to imitate foreign technology on welfare is stronger. This result is driven by reallocation of market shares from F2 to F1, which is increasing in relative productivity of F1, and by the effect on prices, which is stronger when the domestic imitator is larger.

The above results lead us to the following proposition:

[5] The case when a domestic firm possesses a superior technology and F2 tries to imitate it is symmetric and all predictions of the model continue to hold.

Proposition 1 *If discrimination against foreign IPR owners by the judicial system is driven by national welfare considerations, then in IPR litigations between foreign and domestic firms, the following must hold:*

(a) Domestic firms have higher likelihood of success

(b) The probability of winning against a domestic firm must decrease in the size of a foreign firm

(c) The probability of winning against a foreign firm must increase in the size of a domestic firm

Proposition 1 allows as to test the hypothesis that welfare considerations are present in the legal system and can thus explain the bias against foreign IPR holders. Part (a) relates to the fact that ΔW is always positive; hence, a welfare-motivated judge would always tend to protect domestic IPR more stringently than foreign. Parts (b) and (c) relate to equations (6) and (7), and state that the bias of a welfare-motivated court against foreign IPR owners is increasing in the size of both domestic and foreign firms.

4 Econometric Specifications

In this section we discuss the empirical strategy that we use to identify home bias in IPR enforcement in a legal system. The simplest structure to study the relationship between the country of origin of a firm and the likelihood of winning a court case is the following probit model:

$$\Pr(Y_{ij} = 1) = \Phi(\beta_1 Nat_{ij}) \tag{8}$$

where Y_{ij} is an indicator variable for success in court, which is equal to one if firm j succeeded in winning the case i, and Nat_{ij} is an indicator variable that takes the value of one when firm j involved in case i is foreign. The coefficient β_1 in equation (8) measures the relationship between nationality and the likelihood of winning the case. If foreign and domestic firms are treated on equal footing in Canadian courts, β_1 would be statistically indistinguishable from zero. Negative β_1 would support the hypothesis, formulated in Proposition 1(a) that foreign firms are in general more likely to lose in IPR litigations with domestic firms. Yet, $\beta_1 < 0$ could also signal the presence of some other factors, not necessarily related to bias, which could disadvantage foreign firms in litigation processes, such as information asymmetry.

In order to test parts (b) and (c) of Proposition 1, we include the size of domestic and foreign firms

in equation (8):

$$Pr(Y_{ij} = 1) = \Phi(\beta_1 Nat_{ij} + \beta_2 Rs_{ij} + \beta_3 Nat_{ij} \times Rs_{ij}). \tag{9}$$

where Rs_{ij} is the log of revenue of firm j. If Canadian courts are more likely to favor domestic firms when the implied welfare gains are larger, as predicted by the model, we would expect the likelihood of winning the case to increase in the revenue for domestic firms ($\beta_2 > 0$) and to decrease in the revenue for foreign firms ($\beta_3 < 0$).

Previous literature has demonstrated that the outcome of the court's hearing can be affected by the relative size of litigating firms for reasons unrelated to national welfare. Lanjouw and Schankerman (2004) argue that legal costs imply a greater financial burden for smaller firms relative to larger ones, thus lowering the probability of a successful outcome. In addition, larger firms can afford lawyers with better legal expertise and experience, which may influence a court's decisions (Szmer et al., 2007; McGuire, 1995 and 1998; Haire et al., 1999). Therefore, positive β_2 estimate may reflect both the bias in the legal system and the negative impact on firms that lack financial resources. However, these channels have an opposite effect on β_3 and its estimate can thus be used to gauge the relative importance of these two factors.

To account for other factors that may affect a court's decisions, we add a number of fixed effects to equation (9). Specifically, we include fixed effects for the type of the jurisdiction interacted with location,[6] the subject of litigation,[7] and the 6-digit NAICS industry in which firm j operates. The 2012 Patent Litigation Study by PricewaterhouseCoopers[8] shows that the success rates and the median damage awards varies widely by industry, court's location, and the subject of litigation. For example, patent holders in medical devices and electronics have the highest success rate, while those in service business have the lowest success rate in litigation among industries. We also include year fixed effects to control for variation in IPR regulations and a court's willingness to enforce IPR over time (North, 1990). This rich array of fixed effects allows us to control for many unobservable and resolve omitted variable bias stemming from any possible variation in courts' decisions over jurisdictions, industries, and time.

Finally, we also include a plaintiff indicator variable ($Plaintiff_{ij}$) as a control which is equal to

[6] The types of the jurisdictions are municipal court, provincial court, federal court, court of appeal, supreme court, superior court, Canadian International Trade Tribunal, Trade-marks Opposition Board. Provincial courts and courts of appeal are interacted with provincial dummy variables. More than 80% of all cases come from federal court and Trade-marks Opposition Board.

[7] This includes copyright infringement, intellectual propterty violation, patent application opposition, patent infringement, trademark infringement, trademark opposition.

[8] This study is available on-line at http://www.pwc.com/en_US/us/forensic-services/publications/assets/2012-patent-litigation-study.pdf.

one if firm j involved in case i is a plaintiff and zero if it is a defendant

$$\begin{aligned} Pr(Y_{ij} &= 1) = \Phi(\beta_1 Nat_{ij} + \beta_2 Rs_{ij} + \beta_3 Nat_{ij} \times Rs_{ij} + \beta_4 Plaintiff_{ij} \\ &\quad + Jur + Subj + Indust + Year). \end{aligned} \tag{10}$$

This control is important because of the selection effect in litigation, arising from asymmetric information between the parties. While a plaintiff has a choice of whether to initiate a litigation process or not, a defendant has no such choice. Since litigation is costly, plaintiffs will not file a claim unless the expected success rate is high enough for positive economic return. Therefore, plaintiffs may be better informed than defendants about the odds of winning the litigation process and this information asymmetry may be correlated with the nationality of a firm.

5 Data

Estimation of equation (10) requires information on the outcomes of a large number of IPR litigations and on the firms involved in those litigations. We construct a database of all IPR-related cases which took place in Canada in four consecutive years between 2007 and 2010. The data is retrieved from the Canadian Legal Information Institute (CanLII), which records all litigations across all Canadian jurisdictions.[9] For this study we select only those cases which relate to IPR and involve disputes over patents, copyrights, trade marks, and industrial designs.[10] The final data include $2,502$ firms involved in $1,079$ cases, where each case may comprise multiple claims. For every case and firm, we record information on the name of the firm, jurisdiction and location of the court, and the litigation subject. We also record information on the court's decision for every claim of a case and keep track of all cases in which the Canadian government is involved.

The data on IPR cases is complemented with firm-level information using three different sources: firms' annual reports, the Canadian Company Capabilities (CCC) database, and Manta. The data for publicly traded companies come from their annual reports, and include the firm's country of ownership, annual revenue, number of employees, and industrial affiliation, which we record using the 6-digit NAICS industry classification. For firms that are not publicly traded, our primary source of information is the CCC database maintained by the Industry Canada. It provides information on the

[9] Appeals are recorded as different cases in the CanLII databases and we treated them accordingly.
[10] We exclude all cases which involve individuals.

same information as above, although the data on revenue is not as detailed.[11] Our secondary source of information for non-publicly traded firms is Manta, an on-line business service directory which collects data directly from the companies. The objective of this on-line business listing service is to build a network of companies and connect possible partners, vendors, and suppliers. Manta provides the same information as the CCC database and covers a large number of smaller firms, which are often missing in the CCC database.[12] Using these three sources of information, we were able to obtain required data for 74% of firms in our sample.

To construct the nationality indicator variable, we employ two methods. Our first measure, Nat_{ij}, is based on the CCC's classification of firms into domestic and foreign, which defines nationality based on the location of a firm. Therefore, a subsidiary of a foreign firm located in Canada is recorded as a Canadian company according to CCC. As the second measure, Nat_HQ_{ij}, we define nationality of a firm based on the country of residence of its headquarters, which information we obtained either from the firm's annual report or from the company's website.[13] For example, AstraZeneca Canada Inc., a subsidiary entity of a multinational pharmaceutical company AstraZeneca plc., is classified as a Canadian firm in the CCC database because it has manufacturing facilities in Canada. However, it will be classified as a foreign firm in the second measure because its global headquarters is located in the United Kingdom. If the bias against foreign firms is present in the Canadian legal system, these two measures will allow us to say whether it is driven by the foreign ownership or by the geographical location of a firm. Figures 1 and 2 compare the kernel density for the log of employment and revenue between domestic and foreign firms respectively based on Nat_HQ definition. The figures show that foreign firms are considerably larger, employing four times more workers and earning seven times more revenue than an average domestic firm.

Construction of the dependent variable, which is an indicator variable for success in a case, is straightforward for cases which include a single claim. For multi-claim cases, which are relatively scarce in our data,[14] the task is more challenging since only some of the claims may be granted to

[11] The CCC database records firms' revenues in ten size brackets. When CCC information on firm's revenue is used in our data, we take the average of the lower and upper value of the bracket. For example the revenue of the National Forming Systems Inc. is reported in CCC as "between $10 and $25 million", so we record 17.5 million for its annual revenue.

[12] The information provided by Manta is self-reported and is thus not as accurate as annual reports or Industry Canada's administrative records. However, for firms which are present in both Manta and CCC we did not find considerable discrepancies in reported revenue or employment.

[13] It should be noted that not in all cases it is possible to identify the presence of a headquarters abroad. Out of 1,458 firms in our sample which are registered in Canada, we managed to identified 117 with a headquarters in another country.

[14] We have 165 firms involved in multiple claims, of which 124 involved in 2 cliams, 36 involves in 3 claims, only 5 involved more than 3 claims. Most of these multi-claim cases are multiple IPR violations, or one violation with improper use in multiple areas.

a plaintiff. Ideally, for such cases we would like to have information on the relative importance of different claims for the case, which would allow us to evaluate whether the main objective of the claim was achieved by the plaintiff. Unfortunately, this information is unavailable to us and we rely on several approaches to classify cases in order to make sure that our results are not driven by the way the dependent variable is constructed. First, we consider a plaintiff firm to win and the defendant to lose the case if at least one of the claims is successful. Second, a plaintiff firm is considered to win and the defendant to lose the case if at least half of the claims in a case are successful. The summary statistics for the two success indicators, Y_{ij}^1 and Y_{ij}^2, are presented in Table 1. The two definitions produce very similar measures of Y_{ij} with the means around 0.5 the correlation coefficient of 0.99. This similarity suggests that our results will not vary much with the definition of Y_{ij}. Yet we report estimation results from using several alternative ways of constructing the dependent variable in Section 7 and demonstrate that our main findings are not sensitive to the definition of success in a case.

6 Baseline results

Table 2 reports the probit regression of the baseline econometric specifications (8)-(10). Columns (1)-(4) show regression results when the case is assumed to be successful for the plaintiff if at least one claim is granted. The results for specification (8) show that β_1 is negative and statistically significant. This result implies that foreign firms have a lower probability of winning an IPR-related case in a Canadian court. Moreover, β_1 estimate has similar magnitude for both measures of nationality, Nat_{ij} (column 1) and Nat_HQ_{ij} (column 2), suggesting that having production facilities in Canada does not eliminate the bias. The average foreign firm in our sample is 12 percentage point less likely to succeed in IPR litigation in Canada relative to the average Canadian firm (column 2). In other words, while two local firms have equal chance of success in litigation with each other, in cases involving domestic and foreign firms, the odds are 0.56 and 0.44 in favor of the domestic firm.

The finding that foreign firms are less likely to successfully protect their IPR in Canada than local firms provides first support for the hypothesis of the legal system's bias against foreign firms. While this result may have other interpretations, columns (3) and (4) provide further evidence for the bias hypothesis. Regression results reveal a significant and positive link between revenue of domestic firms and their likelihood of winning against foreign IPR owners. This is consistent with the prediction of our theoretical model, summarized in Proposition 1(b), that welfare gains from imitating foreign IPR are greater when the domestic imitator is larger. Yet this result can also be explained by correlation

between a firm's revenue and some unobserved firm-level characteristics. Most importantly, larger firms may have more to gain from a case and thus be more inclined to put more effort and resources into litigation.[15] However, the negative and significant coefficient on foreign firms' revenue is at odds with this explanation. Indeed, if the positive coefficient on domestic revenue were due to the stronger effort by larger firms, driven by positive correlation between size and private gains from IPR protection, then the coefficient on foreign firms' revenue would also be positive because larger foreign firms are losing more from imitation of their technologies. At the same time, $\beta_3 < 0$ is consistent with the bias hypothesis because private gains of foreign firms is not part of national welfare, while the negative effect of imitation of foreign IPS by domestic firms on prices is increasing with size of foreign firms.[16]

Turning to the quantitative assessment of the effect of revenue on courts' outcomes, evaluated at sample means, the coefficients $\beta_2 = 0.035$ and $\beta_3 = -0.025$ in column (4) suggest that a 10 percent increase in revenue is associated with a 0.14 percentage point increase in the probability of success in litigation for domestic firms but only with a 0.04 percentage point increase for foreign firms.[17] It is important to note that foreign firms' disadvantage in Canadian courts operates entirely through the revenue term as the coefficient on the foreign status dummy variable becomes insignificant in column (4). Nevertheless, the estimates in column (4) imply that a foreign firm with average revenue is 9.18 percentage point less likely to win against a domestic firm, which is comparable to a 13.2 percentage point disadvantage identified in column (2).

In columns (5)-(8) of Table 2 we report estimates of specification with Y_{ij}^2 as the dependent variable. The results are very similar to those in columns (1)-(4), indicating that classification of multi-claim cases into successful or not does not play a major role in our analysis. Because of the high degree of similarity, in the analysis that follows we only report the results with Y_{ij}^2 as the dependent variable. Columns (9)-(11) present results for the benchmark specification with a full set of year, location of jurisdiction, industry, and subject of litigation fixed effects. The results do not suggest that industrial affiliation, jurisdiction and location of a court, or subject of litigation affect foreign firms' disadvantage in Canadian courts. That said, these additional fixed effects do help explain the variation in success rates among firms, since many of the binary variables are statistically significant and including them

[15] For example, Lanjouw and Schankerman (2004) and Szmer et al. (2007) show that larger firms have more advantages than smaller firms in litigation.

[16] By the same argument, we can rule out the possible correlation between revenue and the amount of available resources as the alternative interpretation for $\beta_2 > 0$ because the effect of resources on the likelihood of winning should be the same for domestic and foreign firms.

[17] One standard deviation increase in log revenue is linked to a 13.3 percentage point increase in success probability for domestic firms and a 16.1 percentage point decrease for foreign firms. Marginal effects of interaction terms are calculated by the procedures outlined in Ai, Chunrong, and Norton (2003).

in the model increases pseudo R-sqared from 0.017 to 0.03. Adding a plaintiff indicator variable in column (11) reveals that plaintiffs are less likely to succeed, with the average success rate being 6.3 percentage points below of that for defendants. At the same time, the main coefficients of our interest are unaffected by inclusion of this variable in the regression.

7 Extensions

7.1 Prior litigation experience

Previous studies argue that process expertise, which is accumulated through past litigation experience, could play an important role in courts' outcomes because knowledge of institutional rules and practices may place a litigant in a better position (McGuire, 1995 and 1998; France, 1998; Szmer et al., 2007). If domestic firms, being more exposed to the local judicial system, have on average more experience with the Canadian courts than foreign firms, difference in experience levels could explain our previous results that foreign firms have a lower likelihood of success in litigations. Indeed, in our data, over 60% of the foreign firms have no prior litigation experience in Canada compared to only 45% for the domestic firms. To control for firms' prior litigation experience, we expand equation (10):

$$\begin{aligned} Pr(Y_{ij} &= 1) = \Phi(\beta_1 Nat_{ij} + \beta_2 Rs_{ij} + \beta_3 Nat_{ij} \times Rs_{ij} + \beta_4 Plaintiff_{ij} \\ &\quad \beta_5 Exp_{ij} + Jur + Subj + Indust + Year). \end{aligned} \tag{11}$$

where Exp_{ij} is a legal experience indicator for firm j. To construct this indicator, we searched the CanLII database for the number of cases in which firm j had been involved in ten years prior to case i. Summary statistics for prior litigation experience are provided in Table 1. Figure 3 illustrates the difference in prior litigation experience between domestic and foreign firms. An average firm in our sample had been involved in 24 cases with the median being equal to one. We classify firms into experienced and not experienced using different thresholds on the number of prior cases in order to investigate the robustness of our results to the definition of Exp_{ij}. In columns (1)-(5) of Table 3 we use the thresholds of 1, 5, 10, and 30 on the number of previous cases, and for each definition we report the number of firms classified as experienced at the bottom of the table.

The results show that when firms' prior experience is controlled for, the coefficients on the key

variables, such as domestic and foreign revenue, remain close to the benchmark values. The coefficients on prior experience variables are statistically insignificant for all definitions of Exp_{ij}, although they are always positive. Contrary to previous studies, we failed to find a specification where the previous court experience would have a statistically significant effect on the dependent variable. In column (6) we differentiate firms in terms of the intensity of prior legal experience. In particular, we use four quartiles of the prior experience distribution to categorize all firms into four groups, using the firms without prior experience as a control group. More experienced firms are found to have a higher likelihood of success in a court but this pattern is also not statistically significant.

In columns (3)-(6) we use the log of a firm's age as a proxy for its outside-of-court experience. The intuition for using this variable is that it captures the effect of a firm's relative experience in business operation and knowledge in the industry. Again, this measure of experience is positive but not statistically significant, and adding it to the benchmark specification does not affect our main results. Overall, we failed to find any evidence for the hypothesis that prior legal experience has a positive impact on success in a courtroom and that the difference in success rates between domestic and foreign firms is driven by difference in legal experience.

7.2 The role of political connections

In Section 3 we hypothesized that the legal system may factor in welfare considerations, as a government would do, in IPR disputes between domestic and foreign firms. The objective of this section is to test whether the government plays any role in the mechanism that leads to the disadvantage of foreign firms in Canadian courts. If both the courts and the government share welfare-maximization concerns, can firms rely on the latter to increase their chances in a courtroom? If they can, then we would expect politically connected firms to be more likely to succeed in litigations, and since domestic firms have stronger ties to the government, it could explain the findings of the previous section.[18]

To construct a measure of a firm's political influence, we use information on lobbying activity obtained from the Office of the Commissioner of Lobbying of Canada. Lobbying expenditure has long been used in the political economy literature to assess the degree of industrial political activity. However, since the data on lobbying expenditure by firms are unavailable in Canada, we approximate

[18] While we do not expect politicians in Canada to be able to put direct pressure on the judiciary, indirect influence may be possible. For example, judges can be responsive to the media's reporting of legal proceedings, which may also represent the government's political agenda. Alternatively, if politically connected firms are also more likely to win in a court, it may simply reflect similarity in values of political and judicial powers rather than a formal relationship between the two.

it by the number of officially registered lobbyists representing each firm. In Canada, every person seeking a conversation with a public office holder regarding any modifications to current legislation or policies is required to register with the Lobbyist Registrar and fill out a registration form. The form includes information on the beneficiaries of the lobbying activity (firms) and on the subjects of communication with the office holders, selected from a list of 46 descriptors. We use the subject of communication to categorize all lobbyists into three groups according to their relevance to IPR. We define a lobbyist as "highly relevant" for IPR when the subject of communication is related to "intellectual property", "law and justice enforcement", or "research and development"; lobbyists with subjects related to "industry", "international relations", and "science and technology", are classified as "relevant"; the remaining lobbyists are treated as "irrelevant". If political connections matter for IPR litigations, we would expect lobbyists proposing changes to the existing IPR regulations to have stronger impact on the outcomes of litigations.

We measure the degree of political connectivity with a binary variable which takes the value of one if a firm is connected and zero otherwise. Since firms differ in the number and the degree of relevance of lobbyists who represent them, we classify a firm as connected using different thresholds on the number of lobbyists. In column (1) of Table 4 a firm is considered to be politically connected if it is represented by at least one lobbyist of any relevance. With this definition, 15% of all firms are classified as connected; however, the coefficient on the indicator variable is negative and insignificant. This result is preserved for alternative definitions of political connectivity in columns (2)-(5). Only when firms with at least ten highly relevant lobbyists are classified as connected in column (6) does the coefficient on political connectivity variable become positive and significant. However, with this definition only 11 firms are defined as connected, and the coefficient of interest may not be well identified.

Results in Table 4 provide no evidence that the intensity of communications between litigating firms and policymakers is associated with a higher likelihood of winning a case. Therefore, we find no support for the hypothesis that firms can use the legislative branch to influence a decision in a courtroom. To test whether the results are robust to different ways of constructing the success indicator, we provide the estimation results of the key independent variables in this study against the success indicator defined at different thresholds, and report in Table 5. We find that our main findings are consistent with various definitions of success in a case.

7.3 Favoritism over close political partner countries

Another possible explanation for foreign firms being disadvantaged by the Canadian legal system is nationalism of Canadian judges. In such a case one could expect judges to act differently towards foreign firms from different countries. In particular, if a foreign firm is from a country which enjoys good political relations with Canada and is viewed positively by the Canadian public, it may be more favored by Canadian courts than other foreign firms. Protecting the interests of firms from ally countries may also be in Canada's national interests since souring political relations can damage economic ties.

Testing the relationship between the strength of countries' political ties with Canada and the likelihood of success of foreign firms in Canadian courts requires a measure of bilateral political relations. We use three different measures of political relations to ensure that uncertainly about this measure does not drive the results. The first one is the affinity score index constructed by Voeten (2013) from the United Nation General Assembly Voting Data. The database records voting information on General Assembly resolutions for each UN member country. Countries can approve, abstain, or disapprove of each resolution. Based on these voting data, the dyadic affinity score is the number of times a country voted like Canada in the UN General Assembly divided by the total number of votes. The affinity scores index is often used to measure the degree of similarity in the economic and geopolitical interests of a pair of countries (Alesina and Dollar, 2000). The magnitude of the affinity index for Canada and its main political allies (US, UK, Germany, Australia) ranges from 0.65 to 0.91, while for countries such as China, India and Brazil, the share of similar votes ranges from 0.53 to 0.59.

Common political interests between countries is an important indicator of good international relations, yet not a perfect one. As Voeten (2013) points out, some countries may have similar voting patterns in the UN on global matters but have poor political relations (e.g. India and Pakistan). Our second measure of political relations is an indicator variable based on the presence of a formal alliance between two countries. We retrieve alliances data from the Correlates of War Formal Alliance (COWFA) data set constructed by Small and Singer (1969). The COWFA divides Canada's alliances into 3 categories - defense pact, neutrality (non-aggression) treaty, and entente agreement. We classify countries as Canada's allies if there is a defence pact, which is the highest level of military commitment among the three classes that requires intense political cooperation.

For the third measure of political relations, we use the frequencies of bilateral events and interactions from the Conflict and Peace Data Bank (COPDAB), which records actions of approximately 135

countries toward one another on a daily basis. The majority of the international events that involve Canada and other countries are related to political relations (37.6%), economic relations (27.5%), military and strategic relations (14.9%), and cultural and scientific relations (10.0%). The bilateral interactions are categorized as cooperative, neutral or uncooperative. The events are recorded for the period from 1948 to 1978, nearly thirty years prior to the litigation cases in our database, and the relevance of these events for the current political relations is certainly a concern. However, Canada's international relations have remained relatively stable since the Second World War and the frequency of diplomatic interactions in the 1970s can still be informative of the current international relations.[19]

In order to isolate the role of political relations from other influences of the frequency of bilateral events, such as the relative size of two countries, we first regress the number of diplomatic cooperative interactions on the log of population, GDP, geographic area, and the log of distance from one another using the full sample of country-pairs.[20] Because the dependent variable is a count variable with a large dispersion, the model is estimated with a negative binomial regression with country-year fixed effects. Our measure of political relations is the residuals from this regression, which is essentially the frequency of bilateral events purged from the scale effect. Figure 4 plots this index against the affinity scores for all countries in our sample. It reveals that the frequency of diplomatic interactions is negatively correlated with affinity scores, suggesting that the two measures capture different aspects of political relations.

In Table 6 we report estimation results for the benchmark specification (11) augmented with various measures of political relations between Canada and the country of origin for foreign firms. Columns (1) - (5) show the results for the sub-sample of foreign firms in order to check whether the extent of the bias varies by nationality of foreign firms. If affiliation with a country which has a good public image in Canada provides foreign firms an advantage in Canadian courts, we would expect to find a positive coefficient on the political relations indicator. Column (1) shows that the coefficient estimate of the UN voting similarity score is insignificant at 10%. The closeness of political relations is also insignificant when relations are measured with the defense treaty (column 2) or with the residual frequency of bilateral events (column 3).

In column (4) and (5) of Table 6 we report results with using two alternative political relation indicators, *Affinity* and *Affinity**. *Affinity* indicator equals 1 if a country's affinity and diplomatic

[19] This may not be the case for relationship with countries from from the former Soviet Block, so we excluded them from this analysis.

[20] These variables are retreived from Research and Expertise on the World Economy (CEPII).

interaction scores are both in the top quartile of a respective distribution. *Affinity** is an interaction of *Affinity* indicator with a defence treaty indicator. The coefficients on these two stricter indicators also remain insignificant in our estimations. Finally, in column (6) and (7) we report the estimate on *Affinity* and *Affinity** indicators using the full sample of firms. Again, there is no indication that political relation matters for home bias in litigations. Thus, we fail to find any support for the hypothesis that international political relations have an impact on litigation outcomes.

8 Conclusions

The objective of this study is to investigate whether or not foreign firms are disadvantaged by the Canadian legal system in IPR disputes with domestic firms, and whether economic incentives play any role in discrimination against foreign IPR owners. Using the Canadian litigation data on IPR disputes, we find several notable results. First, domestic firms are more likely to win in IPR litigations with foreign firms. The difference in litigation success rate between domestic and foreign firms is both economically and statistically significant: foreign firms have about a 15 percentage point lower probability of winning against domestic firms. Second, using a simple model, we show that discrimination against foreign IPR owners bring larger welfare gains when either the foreign innovator or domestic imitator is large. Our empirical results reveal that courts' decisions are aligned with welfare maximization principles: a 10 percent increase in the size of a domestic firm increases the litigation success rate by 2 percentage points, while a similar increase in size of a foreign firm decreases its success rate by 2.5 percentage points. In our empirical analysis we rule out some of the interpretations of the home bias result which are alternative to welfare-maximization behavior of Canadian judges. In particular, we show that discrimination against foreign firms cannot be explained by better familiarity of domestic firms with the local legal system, by stronger political connections of domestic firms, or by nationalism of Canadian judges.

The findings of this study are important because they open a new window to an alternative way to look for potential flaws in the IPR protection, which so far has been largely overlooked. The earlier theoretical and empirical literature on IPR protection under the North-South trade framework has mostly focused on IPR protection policy. It has been confirmed that developing countries tend to discriminate against foreign firms by adopting weaker IPR standards, because intellectual property is mostly generated overseas and protecting it would only increase the rent transferred to the North. With the proliferation of TRIPS, the scope for discrimination of foreign IPR owners has decreased

substantially. Our study demonstrates that countries can violate national treatment in IPR protection since courts implement policies differently to domestic and foreign firms. As a result, even countries which adhere to TRIPS policies on IPR protection can still discriminate against foreign IPR owners by applying those rules discretionarily to domestic and foreign firms. Therefore, this study shows that raising international standards of IPR protection does not guarantee complete elimination of the home bias, and the proper analysis of international IPR protection should look not only at the IPR protection policies but also at the implementation of those policies by the legal system.

References

Ai, C., and E. C. Norton (2003): "Interaction Terms in Logit and Probit Models," *Economics Letters*, 80(1), 123–129.

Alesina, A., and D. Dollar (2000): "Who Gives Foreign Aid to Whom and Why?," *Journal of Economic Growth*, 5(1), 33–63.

Branco, F. (1994): "Favoring Domestic Firms in Procurement Contracts," *Journal of International Economics*, 37(2), 65 – 80.

Chin, J. C., and G. M. Grossman (1991): "Intellectual Property Rights and North-South Trade," Working Paper 2769, National Bureau of Economic Research.

Deardorff, A. V. (1992): "Welfare Effects of Global Patent Protection," *Economica*, 59(233), 35–51.

Deere, C. (2008): "The TRIPS Implementation Game: a Fight for Ideas," *The Implementation Game: The TRIPS Agreement and the Global Politics of Intellectual Property Reform in Developing Countries*, pp. 1–25.

Diwan, I., and D. Rodrik (1991): "Patents, Appropriate Technology, and North-South Trade," *Journal of International Economics*, 30(1), 27–47.

France, S. (1998): "Takeover Specialists: Why Many Litigators Hand Their Cases to High Court Pros," *American Bar Association Journal*, 84(10), 38–41.

Gawande, K., and U. Bandyopadhyay (2000): "Is Protection for Sale? Evidence on the Grossman-Helpman Theory of Endogenous Protection," *Review of Economics and Statistics*, 82(1), 139–152.

Geng, D., and K. Saggi (2013): "The Case for Non-Discrimination in the International Protection of Intellectual Property," Discussion Paper No. 13-00017, Vanderbilt University Department of Economics.

Goldberg, P. K., and G. Maggi (1999): "Protection for Sale: An Empirical Investigation," *American Economic Review*, 89(5), 1135–1155.

Grossman, G. M., and E. L.-C. Lai (2004): "International Protection of Intellectual Property," *American Economic Review*, 94(5), 1635–1653.

Haire, S. B., S. A. Lindquist, and R. Hartley (1999): "Attorney Expertise, Litigant Success, and Judicial Decisionmaking in the U.S. Courts of Appeals," *Law and Society Review*, 33(3), 667–685.

Head, K., and T. Mayer (2013): "Gravity Equations: Workhorse, Toolkit, and Cookbook," *Handbook of International Economics*, 4, 131–196.

Helpman, E. (1993): "Innovation, Imitation, and Intellectual Property Rights," *Econometrica*, 61(6), 1247–80.

Hunt, R. M. (2006): "When Do More Patents Reduce R&D?," *American Economic Review*, 96(2), 87–91.

Lanjouw, J. O., and M. Schankerman (2004): "Protecting Intellectual Propert Rights: Are Small Firms Handicapped?," *Journal of Law and Economics*, 47(1), 45–74.

Lerner, J. (2002): "150 Years of Patent Protection," *American Economic Review*, 92(2), 221 – 225.

Liegsalz, J., and S. Wagner (2013): "Patent Examination at the State Intellectual Property Office in China," *Research Policy*, 42(2), 552–563.

Maskus, K. E. (2000): *Intellectual Property Rights in the Global Economy*. Peterson Institute.

Maskus, K. E., and M. Penubarti (1995): "How Trade-related Are Intellectual Property Rights?," *Journal of International Economics*, 39(3), 227–248.

McAfee, R. P., and J. McMillan (1989): "Government Procurement and International Trade," *Journal of International Economics*, 26(3), 291–308.

McCalman, P. (2001): "Reaping What You Sow: An Empirical Analysis of International Patent Harmonization," *Journal of International Economics*, 55(1), 161 – 186.

McGuire, K. T. (1995): "Repeat Players in the Supreme Court: The Role of Experienced Lawyers in Litigation Success," *Journal of Politics*, 57(1), 187–196.

——— (1998): "Explaining Executive Success in the U. S. Supreme Court," *Political Research Quarterly*, 51(2), 505–526.

Musungu, S. F., and C. Oh (2005): "The Use of Flexibilities in TRIPS by Developing Countries: Can They Promote Access to Medicines?," Discussion paper, Commission on Intellectual Property Rights, Innovation and Public Health, Study 4C (Geneva: WHO).

North, D. C. (1990): *Institutions, Institutional Change and Economic Performance*. Cambridge University Press.

Small, M., and J. D. Singer (1969): "Formal alliances, 1816-1965: An extension of the basic data," *Journal of Peace Research*, 6(3), 257–282.

Szmer, J., S. W. Johnson, and T. A. Sarver (2007): "Does the Lawyer Matter? Influencing Outcomes on the Supreme Court of Canada," *Law and Society Review*, 41(2), 279–304.

Voeten, E. (2013): "Data and Analyses of Voting in the United Nations General Assembly," *Routledge Handbook of International Organization. London: Routledge*, pp. 54–66.

Webster, E., P. H. Jensen, and A. Palangkaraya (2014): "Patent Examination Outcomes and the National Treatment Principle," *The RAND Journal of Economics*, 45(2), 449–469.

Yang, C.-H., and N.-F. Kuo (2008): "Trade-related Influences, Foreign Intellectual Property Rights and Outbound International Patenting," *Research Policy*, 37(3), 446–459.

9 Appendix I

Partial equilibrium model with one industry producing homogeneous product traded at price p.

Assume that preferences of a representative consumer are characterized by a quadratic utility function:

$$U = \alpha Q - \beta Q^2$$

where $Q = \sum_i q_i$ is the total consumption of the homogeneous good and q_i is quantity purchased from firm i. Maximizing utility function subject to the standard budget constraint we obtain inverse demand function

$$p = \alpha - \beta Q$$

Suppose there are $(N + 2)$ firms in the market. Firm 1 (F1) is a home country firm which will attempt to imitate production technology of a foreign firm, firm 2 (F2) is the foreign firm exporting to the home country market utilizing a potentially more advanced production technology, and the remaining N firms are symmetric in terms of costs and represent the rest of the industry. We assume they are all domestic firms although this assumption is not critical. A representative firm from the rest of the industry we call firm 3 (F3). We further assume that each firm i has a constant marginal costs c_i. Profit function of firm i is then given by

$$\pi_i = (p - c_i)\, q_i$$

If all equilibrium quantities are positive, then the first-order conditions for profit maximization give the following best response functions

$$\begin{aligned} q_1 &= \tfrac{\alpha - c_1}{2\beta} - \tfrac{q_2 + N q_3}{2} \\ q_2 &= \tfrac{\alpha - c_2}{2\beta} - \tfrac{q_1 + N q_3}{2} \\ q_3 &= \tfrac{\alpha - c_3}{(N+1)\beta} - \tfrac{q_1 + q_2}{(N+1)\beta} \end{aligned}$$

Solving this system of equations we obtain equilibrium output of each firm:

$$q_1 = \frac{\alpha-(N+2)c_1+c_2+Nc_3}{\beta(N+3)}$$
$$q_2 = \frac{\alpha+c_1-(N+2)c_2+Nc_3}{\beta(N+3)}$$
$$q_3 = \frac{\alpha+c_1+c_2-3c_3}{\beta(N+3)}$$

Total output, price and consumer surplus:

$$Q = \frac{\alpha(N+2)-c_1-c_2-Nc_3}{\beta(N+3)}$$
$$p = \frac{\alpha+c_1+c_2+Nc_3}{\beta(N+3)}$$
$$CS = \frac{\beta}{2}Q$$

Suppose foreign firm possesses a more advanced production technology characterized by lower marginal costs. We want to compare two cases: when domestic legal system protects IPR of the foreign firm and does not allow F1 to imitate its technology; when the legal system favors domestic firm and allows it to imitate technology of F2. We want to analyze the relationship between size of F1 and F2 and the change in welfare from technology transfer. Since in our model a firm's relative size depends on relative marginal costs, we want to know how welfare change varies with c_1 and c_2.

Some partial derivatives:

$$\begin{aligned}
\frac{\partial Q}{\partial c_1} &= \frac{\partial Q}{\partial c_2} = -\frac{1}{\beta\left(N+3\right)} \\
\frac{\partial p}{\partial c_1} &= \frac{\partial p}{\partial c_2} = \frac{1}{\left(N+3\right)} \\
\frac{\partial CS}{\partial c_1} &= \frac{\partial CS}{\partial c_2} = -\frac{Q}{\left(N+3\right)} \\
\frac{\partial q_1}{\partial c_1} &= \frac{\partial q_2}{\partial c_2} = -\frac{N+2}{\beta\left(N+3\right)} \\
\frac{\partial q_1}{\partial c_2} &= \frac{\partial q_2}{\partial c_1} = \frac{\partial q_3}{\partial c_2} = \frac{\partial q_3}{\partial c_1} = \frac{1}{\beta\left(N+3\right)} \\
\frac{\partial \pi_1}{\partial c_1} &= \frac{q_1}{\left(N+3\right)} - q_1 - \left(p-c_1\right)\frac{\left(N+2\right)}{\beta\left(N+3\right)} \\
\frac{\partial \pi_1}{\partial c_2} &= \frac{q_1}{\left(N+3\right)} + \left(p-c_1\right)\frac{1}{\beta\left(N+3\right)} \\
\frac{\partial \pi_3}{\partial c_1} &= \frac{\partial \pi_3}{\partial c_2} = \frac{q_3}{\left(N+3\right)} - \left(p-c_3\right)\frac{1}{\beta\left(N+3\right)}
\end{aligned}$$

Welfare:

$$W = CS + \pi_1 + N\pi_3$$

$$\begin{aligned}\frac{\partial W}{\partial c_2} &= -\frac{Q}{(N+3)} + \frac{q_1}{(N+3)} + (p-c_1)\frac{1}{\beta(N+3)} + \frac{q_3}{(N+3)} - (p-c_3)\frac{1}{\beta(N+3)} \\ &= -\frac{q_2}{(N+3)} + \frac{N+1}{\beta(N+3)}p - \frac{1}{\beta(N+3)}c_1 - \frac{1}{\beta(N+3)}c_3\end{aligned}$$

Consider the case when F2 has access to production technology which reduces marginal costs by $\varepsilon > 0$. Denote by Δx the change in variable x when we move from the equilibrium in which F1 is not allowed to imitate this technology to the one where it is allowed. Then

$$\frac{\partial \Delta W}{\partial c_2} = -\frac{\Delta q_2}{(N+3)} + \frac{N+1}{\beta(N+3)}\Delta p - \frac{1}{\beta(N+3)}\Delta c_1$$

shows the extent to which the size of the foreign firm affects the benefit of not protecting its IPR. Using the following conditions:

$$\begin{aligned}\Delta q_2 &= -\frac{\varepsilon}{\beta(N+3)} \\ \Delta q_1 &= \frac{(N+2)\varepsilon}{\beta(N+3)} \\ \Delta p &= -\frac{\varepsilon}{(N+3)} \\ \Delta c_1 &= -\varepsilon\end{aligned}$$

we obtain the result:

$$\frac{\partial \Delta W}{\partial c_2} = -\frac{(2N+3)\varepsilon}{\beta(N+3)^2} < 0$$

This result implies that for small c_2 (when foreign firm is large and efficient) allowing F1 to imitate IPR of F2 will have a stronger positive impact on home country welfare.

Similarly,

$$\begin{aligned}\frac{\partial \Delta W}{\partial c_1} &= -\Delta q_1 - \frac{\Delta q_2}{(N+3)} - \frac{2}{\beta(N+3)}\Delta p + \frac{(N+2)}{\beta(N+3)}\Delta c_1 \\ &= -\frac{2(N+2)}{\beta(N+3)}\varepsilon + \frac{3}{\beta(N+3)^2}\varepsilon < 0\end{aligned}$$

Therefore, when domestic firm is originally larger and more efficient (c_1 is small), the positive effect of allowing it to imitate foreign IPR is stronger.

As a result, if a court has welfare-maximizing objectives, it would tend to favor domestic firms in their litigations against foreign when both domestic and foreign firm tend to be larger.

Table 1. Summary statistics

Variable	Mean	Standard deviation	Min	Max	Observations
Decision (Y)	0.508	0.5	0	1	2502
Decision (Y*)	0.524	0.5	0	1	2502
Foreign indicator	0.361	0.48	0	1	2340
Foreign indicator (HQ)	0.411	0.492	0	1	2335
Log employees	5.053	3.1	0	13.21	1985
Log revenues	17.881	4.016	9.99	26.637	1856
Plaintiff indicator	0.482	0.5	0	1	2502
Gov. with domestic Firms	0.031	0.173	0	1	2335
Gov. with foreign Firms	0.039	0.194	0	1	2335
Experience	24.19	87.906	0	705	2337
Lobbying	0.452	1.882	0	40	2502

Source: CanLII, Industry Canada, Office of the Commissioner of Lobbying of Canada, Manta, and firms' annual reports. Decision(Y) is the court decision which equals 1 if any of claim succeed. Decision(Y*) equals 1 if at least half of the claims succeed. Nat is a foreign indicator if no research or manufacturing facilities, and subsidiary entities present in Canada. Nat_HQ is a foreign indicator if headquarter is outside of Canada. Plaintif equals 1 indicating for firms being as plaintif in litigation. Dom_gov indicates for cases that government is on the side of domestic firms while foreign_gov indicates for government on the side of foreign firms in the litigation. High_lobb, Low_lobb, and Irre_lobb indicate the number of lobbyists hired for high relevent, low relevent, and irrelevent lobbying activities respectively. Lob_H equals 1 if at least 1 high relevent lobbyists hired.

Table 2. Probit regression estimation of court outcomes on firms' country of origin

	Y				Y*						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Foreign indicator	-0.304***				-0.285***						
	(0.054)				(0.054)						
	[-0.121]				[-0.114]						
Foreign indicator (HQ)		-0.335***	-0.480***	-0.030		-0.321***	-0.476***	0.004	-0.505***	0.105	0.107
		(0.053)	(0.067)	(0.301)		(0.053)	(0.067)	(0.301)	(0.071)	(0.316)	(0.317)
		[-0.132]	[-0.191]	[-0.012]		[-0.128]	[-0.190]	[0.002]	[-0.201]	[0.042]	[0.043]
Log revenue			0.022***	0.035***			0.023***	0.037***	0.029***	0.047***	0.049***
			(0.008)	(0.011)			(0.008)	(0.012)	(0.010)	(0.013)	(0.013)
			[0.009]	[0.014]			[0.009]	[0.015]	[0.012]	[0.019]	[0 .020]
Foreign (HQ) x log revenue				-0.025				-0.026		-0.033**	-0.033*
				(0.016)				(0.016)		(0.017)	(0.017)
				[-0.010]				[-0.010]		[-0.012]	[-0.012]
Plaintiff indicator											-0.158**
											(0.062)
											[-0.063]
Jurisdiction FE	No	No	No	No	No	No	No	No	Yes	Yes	Yes
Subject FE	No	No	No	No	No	No	No	No	Yes	Yes	Yes
Industry FE	No	No	No	No	No	No	No	No	Yes	Yes	Yes
Year FE	No	No	No	No	No	No	No	No	Yes	Yes	Yes
Wald chi2	30.233	35.540	43.092	46.645	25.462	31.366	40.563	44.281	73.128	78.735	85.250
Log likelihood	-1607	-1600	-1264	-1262	-1609	-1602	-1265	-1263	-1229	-1227	-1224
N	2340	2335	1855	1855	2340	2335	1855	1855	1829	1829	1829

Notes: Marginal effects are calculated at the sample means of the variables. The marginal effect of the interaction terms are calculated by following the procedures in Ai, Chunrong, and Edward C. Norton (2003). Partial effect of the dummy variables is calculated as the increase in the probability of litigation success rate with a change in the dummy variable from zero to one. Standard errors and marginal effects are reported in round brackets and square brackets respectively. Y is the court decision which equals 1 if any of the claims succeeds. Y* equals 1 if at least half of the claims succeed. Nat is a foreign indicator if no research or manufacturing facilities, and subsidiary entities present in Canada. Nat_HQ is a foreign indicator if headquarter is outside of Canada. Plaintif equals 1 indicating for firms being as plaintif in litigation. ***, **, and * indicate p<0.01, p<0.05, and p<0.1 respectively.

Table 3. Probit regression estimation of court outcome on firms' nationalities takeninto account effects from prior experience.

	(1) 1X	(2) 5X	(3) 5X	(4) 10x	(5) 30x	(6)
Foreign indicator (HQ)	0.106	0.096	0.322	0.305	0.339	0.313
	(0.317)	(0.317)	(0.343)	(0.344)	(0.348)	(0.347)
	[0.042]	[0.038]	[0.081]	[0.075]	[0.089]	[0.080]
Log revenue	0.049***	0.044***	0.044***	0.044***	0.050***	0.045***
	(0.014)	(0.014)	(0.016)	(0.016)	(0.016)	(0.016)
	[0.020]	[0.017]	[0.019]	[0.019]	[0.021]	[0.019]
Foreign (HQ) x log revenue	-0.033*	-0.031*	-0.039**	-0.038**	-0.041**	-0.039**
	(0.017)	(0.017)	(0.018)	(0.018)	(0.019)	(0.019)
	[-0.012]	[-0.012]	[-0.013]	[-0..013]	[-0.014]	[-0.013]
Plaintiff indicator	-0.159**	-0.164***	-0.161**	-0.160**	-0.155**	-0.160**
	(0.063)	(0.062)	(0.066)	(0.066)	(0.066)	(0.067)
	[-0.063]	[-0.065]	[-0.062]	[-0.062]	[-0.060]	[-0.061]
Log firm age			0.011	0.011	0.014	0.011
			(0.036)	(0.036)	(0.036)	(0.036)
			[0.003]	[0.003]	[0.004]	[0.003]
Court experience	0.007	0.079	0.086	0.099	0.001	
	(0.070)	(0.080)	(0.083)	(0.090)	(0.116)	
	[0.003]	[0.031]	[0.029]	[0.035]	[0.006]	
Exper.(1st - 25th per)						-0.025
						(0.096)
						[-0.010]
Exper. (26th - 50th per)						0.027
						(0.109)
						[0.005]
Exper. (51th - 75th per)						0.054
						(0.108)
						[0.017]
Exper. (76th - up)						0.074
						(0.123)
						[0.021]
Number of firms [(a)]	1354	828	828	646	410	[373,241,282,458]
Wald chi2	94.675	94.927	85.196	85.440	85.163	85.071
Log likelihood	-1219	-1219	-1101	-1101	-1101	-1101
No. of observation	1830	1830	1655	1655	1655	1655

Notes: Marginal effects are calculated at the sample means of the variables. The marginal effect of the interaction terms are calculated by following the procedures in Ai, Chunrong, and Edward C. Norton (2003). Partial effect of the dummy variables is calculated as the increase in the probability of litigation success rate with a change in the dummy variable from zero to one. Standard errors and marginal effects are reported in round brackets and square brackets respectively. Exp_5x indicates for firms that have at least 5 litigation involvements last 10 year prior to litigation. All regressions are controlled for subject, jurisdiction location, industry, and time trend fixed effects. The experience indicator is specified by each column for the number of involvements. The number of firms satisfying the specification is summarized in "Number of fims". ***, **, and * indicate p<0.01, p<0.05, and p<0.1 respectively. (a) This value indicates the number of firms in the sample that satisfy the criteria to be experienced firms in litigation in Canada.

Table 4. Robustness checks for probit regression estimation of court outcome on firms' nationalities taken into account effects from prior experience and lobbying.

	(1)	(2)	(3)	(4)	(5)	(6)
	Any	High_Low	High	High X 2	High X 5	High X 10
Foreign indicator (HQ)	0.103	0.098	0.100	0.095	0.146	0.136
	(0.317)	(0.317)	(0.317)	(0.317)	(0.319)	(0.317)
	[0.041]	[0.039]	[0.040]	[0.038]	[0.058]	[0.054]
Log revenue	0.046***	0.045***	0.045***	0.044***	0.045***	0.045***
	(0.015)	(0.015)	(0.014)	(0.014)	(0.014)	(0.014)
	[0.018]	[0.018]	[0.018]	[0.018]	[0.018]	[0.018]
Foreign (HQ) x log revenue	-0.032*	-0.031*	-0.032*	-0.031*	-0.035**	-0.034**
	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)
	[-0.012]	[-0.012]	[-0.012]	[-0.012]	[-0.013]	[-0.013]
Plaintiff indicator	-0.164***	-0.164***	-0.164***	-0.163***	-0.166***	-0.169***
	(0.062)	(0.062)	(0.062)	(0.062)	(0.062)	(0.062)
	[-0.065]	[-0.065]	[-0.065]	[0.065]	[-0.066]	[-0.068]
Court experience (5x)	0.101	0.096	0.091	0.090	0.065	0.067
	(0.083)	(0.083)	(0.082)	(0.082)	(0.081)	(0.080)
	[0.040]	[0.038]	[0.036]	[0.036]	[0.026]	[0.027]
Lobbying	-0.094	-0.081	-0.071	-0.067	0.210	0.805*
	(0.105)	(0.107)	(0.114)	(0.120)	(0.184)	(0.436)
	[-0.038]	[-0.032]	[-0.028]	[-0.027]	[0.084]	[0.321]
Number of firms [(a)]	278	261	217	188	60	11
Wald chi2	95.535	95.221	95.032	94.970	96.541	97.989
Log likelihood	-1218	-1218	-1219	-1219	-1218	-1217
No. of observation	1830	1830	1830	1830	1830	1830

Notes: Marginal effects are calculated at the sample means of the variables. The marginal effect of the interaction terms are calculated by following the procedures in Ai, Chunrong, and Edward C. Norton (2003). Partial effect of the dummy variables is calculated as the increase in the probability of litigation success rate with a change in the dummy variable from zero to one. Standard errors and marginal effects are reported in round brackets and square brackets respectively. Exp_10x and Exp_30x indicate litigation involvements of 10 and 30 times respectively in the past prior to litigation. Lob is 1 if the firm hires any lobbyists (regardless relevent or not). Lob_HL and Lob_H2 indicate the firm hires any lobbyists of high or low relevence, and at least 2 high relevent lobbyists respectively. All regressions are controlled for subject, jurisdiction location, industry, and time trend fixed effects. The specification of the lobbyist indicator is defined by each column and the number of firms satisfying the specification is summarized in "Number of fims". ***, **, and * indicate p<0.01, p<0.05, and p<0.1 respectively. (a) This value indicates the number of firms in the sample that satisfy the criteria to be political connected firms.

Table 5. Robustness checks for different thresholds of win-ratio for probit estimation of court outcome on nationality.

	Y_01	Y_25	Y_50	Y_75	Y_90
	(1)	(2)	(3)	(4)	(5)
Foreign indicator (HQ)	-0.004	0.002	0.100	0.414	0.350
	(0.316)	(0.316)	(0.317)	(0.319)	(0.319)
Log revenue	0.038***	0.040***	0.045***	0.049***	0.049***
	(0.014)	(0.014)	(0.014)	(0.015)	(0.015)
Foreign (HQ) x log revenue	-0.026	-0.026	-0.032*	-0.047***	-0.045***
	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)
Plaintiff indicator	-0.162***	-0.172***	-0.164***	-0.162***	-0.175***
	(0.062)	(0.062)	(0.062)	(0.062)	(0.062)
Court experience (5x)	0.099	0.094	0.091	0.126	0.123
	(0.082)	(0.082)	(0.082)	(0.083)	(0.083)
Lobbying (high relevent)	-0.097	-0.095	-0.071	-0.005	-0.004
	(0.114)	(0.114)	(0.114)	(0.115)	(0.115)
No. of observation	1835	1835	1830	1830	1830
Log likelihood	-1219	-1221	-1219	-1211	-1209
Wald chi2	97.906	96.035	95.032	103.221	107.012

Notes: Standard errors are reported in round brackets. Y_01, Y_25, Y_50, Y_75 and Y_90 are success indicators which equal 1 if win ratios are at least 0.01, 0.25, 0.50, 0.75 and 0.90 respectively. All regressions are controlled for subject, jurisdiction location, industry, and time trend fixed effects. ***, **, and * indicate $p<0.01$, $p<0.05$, and $p<0.1$ respectively.

Table 6. Estimation for the effect of political relation on Canadian court outcomes.

	Only foreign firms					foreign and domestic	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Log revenue	-0.006	-0.007	-0.006	-0.004	-0.004	0.045***	0.045***
	(0.023)	(0.023)	(0.023)	(0.023)	(0.022)	(0.014)	(0.014)
Plaintiff indicator	0.038	0.041	0.029	0.001	-0.001	-0.166***	-0.167***
	(0.170)	(0.170)	(0.171)	(0.171)	(0.171)	(0.062)	(0.062)
Court experience (5x)	0.860***	0.886***	0.876***	0.848***	0.858***	0.089	0.089
	(0.240)	(0.243)	(0.243)	(0.242)	(0.243)	(0.082)	(0.082)
Lobbying (high relevent)	-0.201	-0.216	-0.234	-0.251	-0.263	-0.077	-0.081
	(0.315)	(0.315)	(0.313)	(0.312)	(0.313)	(0.114)	(0.114)
Foreign indicator (HQ)						-0.031	-0.137
						(0.367)	(0.370)
Foreign (HQ) x log revenue						-0.031*	-0.030*
						(0.017)	(0.017)
UN voting similarity scores	0.681						
	(0.711)						
Defense treaty indicator		-0.144					
		(0.217)					
No. of diplomatic interactions			-0.099				
			(0.161)				
Affinity				-0.195		-0.124	
				(0.245)		(0.176)	
Affinity*					-0.284		-0.222
					(0.245)		(0.182)
Wald chi2	18.699	17.931	17.881	16.067	16.956	95.451	96.275
No. of observation	242	242	242	243	243	1830	1830
Log likelihood	-158	-158	-158	-159	-159	-1218	-1218

Note: Notes: Partial effect of the dummy variables is calculated as the increase in the probability of litigation success rate with a change in the dummy variable from zero to one. Standard errors are reported in round brackets. All regressions are controlled for subject, jurisdiction location, industry, and time trend fixed effects. ***, **, and * indicate p<0.01, p<0.05, and p<0.1 respectively.

Figure 1. Comparison of log employment between domestic and foreign firms

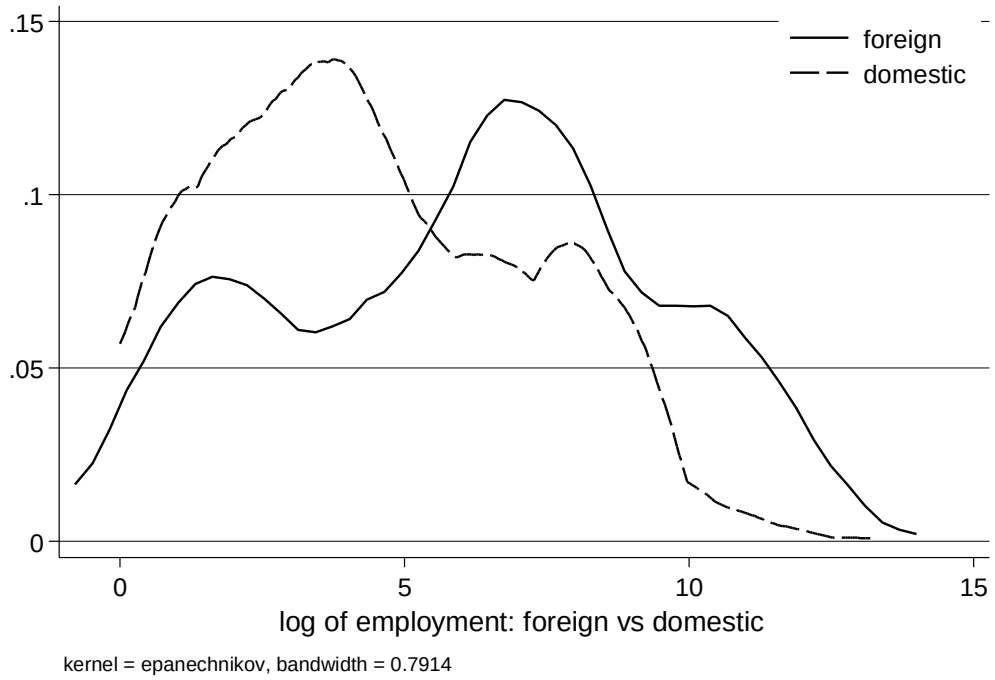

Figure 2. Comparison of log revenue between domestic and foreign firms

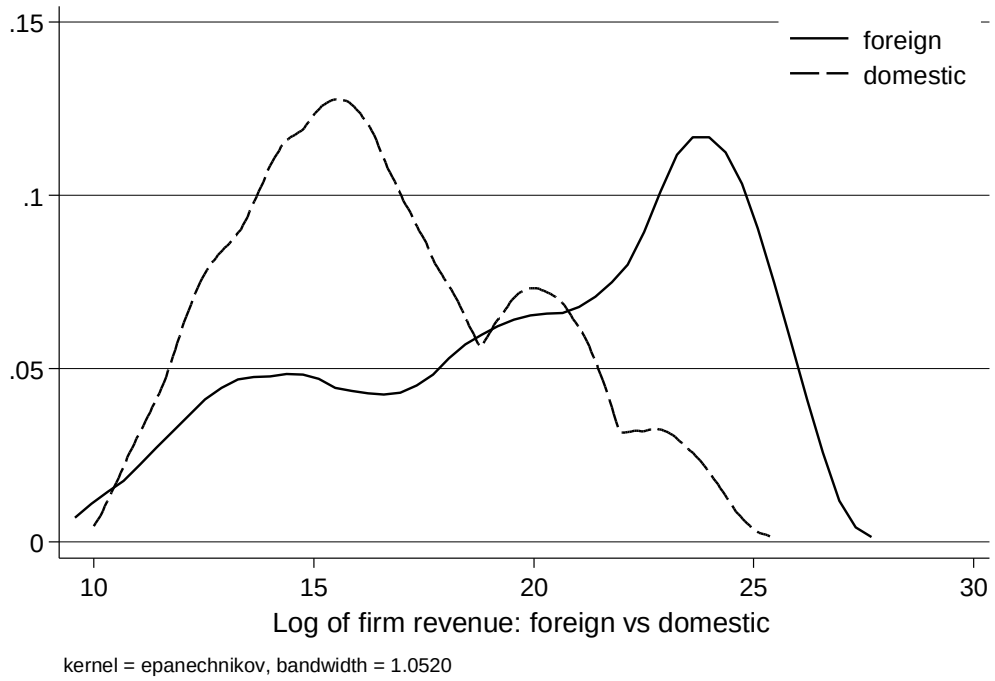

Figure 3. Comparison of prior litigation court experience between domestic and foreign firms

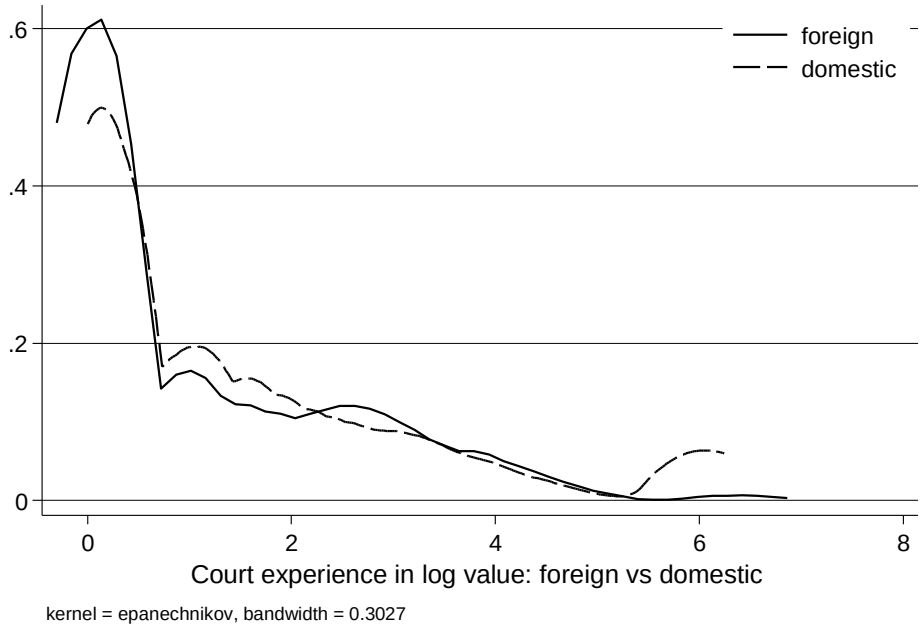

Figure 4. UN voting similarity scores against frequency of diplomatic interactions