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THE TPP AND THE NEW INTELLECTUAL PROPERTY REGIME

IMPLICATIONS FOR CANADA

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THE TPP AND THE NEW INTELLECTUAL PROPERTY REGIME: IMPLICATIONS FOR CANADA

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ABOUT THE GLOBAL ECONOMY PROGRAM

Addressing limitations in the ways nations tackle shared economic challenges, the Global Economy Program at CIGI strives to inform and guide policy debates through world-leading research and sustained stakeholder engagement.

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Through its research, collaboration and publications, the Global Economy Program informs decision makers, fosters dialogue and debate on policy-relevant ideas and strengthens multilateral responses to the most pressing international governance issues.

ABOUT THE AUTHOR

Olena Ivus joined CIGI's Global Economy Program in April 2016, focusing on the innovation and trade research theme. Her research explores the interface between Canada's domestic innovation and international trade.

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Her work has been published in leading journals, including the *Journal of International Economics*, *Canadian Journal of Economics*, *Economic Inquiry* and the *Journal of International Business Studies*.

She received a Thomas Edison Innovation Fellowship for 2016-2017 from the Center for the Protection of Intellectual Property at George Mason University School of Law. In 2010, she won the World Trade Organization Essay Award for Young Economists.

Olena holds a Ph.D. in economics from the University of Calgary.

ACRONYMS

CP	copyright protection
DRM	digital rights management
IP	intellectual property
IPRs	intellectual property rights
NAICS	North American Industry Classification System
NAFTA	North American Free Trade Agreement
OLS	Ordinary Least Squares
PRs	patent rights
R&D	research and development
TDO	Trade Data Online
TPP	Trans-Pacific Partnership
TRIPS	Trade-related Aspects of Intellectual Property Rights
TSI	trade specialization index
WTO	World Trade Organization

EXECUTIVE SUMMARY

The Trans-Pacific Partnership (TPP) is a mega-trade agreement signed on February 4, 2016, by Canada, the United States and 10 other countries. Relative to existing Canadian law and treaty obligations, the TPP trade agreement represents an expansion of intellectual property rights (IPRs) and protections, in particular in the areas of patents, trademarks and copyright protection. For Canada, ratifying the TPP means granting these additional benefits to intellectual property (IP) owners. Canada's comparative advantage over other TPP signatories currently lies in the low-innovation, resource-intensive sectors. These industries are most likely to benefit from reductions of trade barriers under the TPP. Assuming Canada ratifies the TPP, specialization in resource-intensive sectors will rise, which might seem like good policy, but this would yield benefits only in the short term, and come at the cost of contractions in Canada's high-margin innovation-intensive sectors — as Canadian trade yields to the comparative advantages of Canada's TPP partners — and so might actually undermine Canada's prospects for long-term, sustainable economic growth. Canada suffers a comparative disadvantage in innovation-intensive sectors among countries with relatively strong IP laws, such as the United States, Japan and Chile. Canada's imports in innovation-intensive sectors from these countries are expected to rise, creating more competition domestically for Canadian innovation-intensive firms. Canada is a net exporter of innovation-intensive products into Australia, Singapore, Mexico, Malaysia, New Zealand, Vietnam and Peru — countries with relatively weaker IPRs. As these countries bring their IP legislation into compliance with the TPP, Canada's innovation-intensive exports to these countries might rise, provided that Canadian firms can compete with the exports of other TPP countries. The TPP's provisions on IP will primarily benefit large IP-intensive firms, the majority of which are US-based corporations. The benefits accruing to Canadian firms, by contrast, will be disproportionately small. Stronger IPRs abroad will most likely benefit large Canadian exporting firms, but such benefits will be diluted by more fierce competition from foreign firms. Small domestic Canadian firms not heavily engaged in exporting will be further disadvantaged in protecting their IP. They will not enjoy any direct benefit from stronger IPRs abroad and, meanwhile, their legal exposure for IP-related transgressions increases. Taken alone, the TPP's more stringent IP rules will not stimulate innovation in Canada, but could complement policy and regulatory reforms aimed at strengthening Canada's capacity for innovation. Patents are a more potent instrument for promoting innovation in countries with relatively high productivity in innovation. Countries that contribute a larger share to global innovation have a stronger incentive to strengthen their IPR protection and are expected to gain most from the IP provisions in the TPP. It is imperative for Canada to ensure that key complementary factors (for example, innovation policies) are in place.

INTRODUCTION

The TPP is a mega-trade agreement signed on February 4, 2016, by Canada, the United States and 10 other countries. It is the product of seven years of negotiations among the member countries (called "parties" in the agreement) and is intended to liberalize many aspects of trade, market access and investment. Each signatory has two years to ratify the agreement and bring its own IP laws into accord with TPP obligations. If all the currently eligible parties ratify the agreement, the TPP will govern the largest trading bloc in the world, and approximately 40 percent of the world economy.

The IP provisions of the TPP have been branded as the "new gold standard" for IP protection in trade agreements (Braga 2016), and would extend IP owners' rights further than any trade agreement in history. Discussion over which parties and stakeholders are best served by the TPP has already boiled over into mainstream debate across the Pacific Rim. Among academics and media in Canada, much of the discussion has turned on whether the new IP rules will be a net gain or net drain for Canadians.

So what are the implications of the TPP for Canada's trade, competitiveness and prosperity? To answer this question, the paper begins by summarizing the ways that the TPP expands IP rights in Canada. Guided by the theory of

comparative advantage, it examines the impact of these expansions and trade liberalization on Canada's national welfare and across sectors. Using data on Canadian exports and imports across 23 manufacturing sectors,[1] sectors are ranked by innovation intensity, as measured by the number of registered Canadian patents per sector, and TPP partners are ranked by the strength of their existing patent rights (PRs). Following this analysis, the economics literature on the relationship between PRs, patenting activity, international trade and innovation is reviewed. The paper concludes with policy recommendations.

A SUMMARY OF CHANGES FROM THE TPP

The TPP's IP provisions are found in chapter 18 of the agreement.

Scope and Existing Agreements

All TPP signatories must have ratified or acceded to the Patent Cooperation Treaty, Paris Convention (covering industrial IP) and the Berne Convention (covering artistic works) prior to the February 2016 signing,[2] as well as several other IP-related agreements prior to the TPP coming into force.[3] The TPP is meant to coexist with these agreements, and analysis of the TPP's IP provisions is best understood as either affirming or extending the existing IP rights.

Objectives

The stated objective of chapter 18 is that "the protection and enforcement of intellectual property rights should contribute to the promotion of technological innovation and to the transfer and dissemination of technology, to the mutual advantage of producers and users of technological knowledge and in a manner conducive to social and economic welfare, and to a balance of rights and obligations."[4]

The Declaration on the TRIPS [Trade-related Aspects of Intellectual Property Rights] Agreement and Public Health, commonly known as the Doha Declaration, was a 2001 amendment to the TRIPS Agreement stipulating that nothing in the agreement prevented members from taking steps to protect public health and promote access to medicines for everyone.[5] The TPP acknowledges and reaffirms the Doha Declaration, but does not supplement the flexibilities provided to members in a health crisis, or expand the declaration's scope to other areas of public interest.

It should be noted that the final text of the chapter's objective differs markedly from the numerous objectives specified in earlier drafts (up to May 16, 2014), which were supported by all signatories except the United States and Japan, and included "maintain a balance between the rights of intellectual property holders and the legitimate interests of users and the community in subject matter protected by intellectual property."[6] It is apparent from the final text that the United States and Japan prevailed. While the final wording still speaks of balance, it is in a much more limited way, and reference to the legitimate interests of users and communities has disappeared entirely.

Trademark

Under the new rules, trademark registration would no longer be restricted to "visually perceptible" signs, and the grounds for denying registration would be more limited.[7]

The TPP expands trademark protection to certification marks, which are imprimaturs used to designate goods as certified by a specific collective or originating from a specific association.[8] Geographical indications are used to designate goods from a particular geographical origin.[9]

The TPP expands the scope of "well-known trademarks" by eliminating some of the conditions used to establish "well-known" status[10] and by removing the condition, originating in the Paris Convention, requiring that in order to obtain well-known status in a member country, the trademark must be well-known in that country.[11]

Copyright

The TPP would extend copyright protection to the creator's life plus 70 years.[12] Currently, Canadian law provides protection for the term of the creator's life plus 50 years.

1 More precisely, the data are classified according to the North American Industry Classification System (NAICS) and cover 21 sectors (at three-digit NAICS codes) and two industry groups (at four-digit NAICS codes).

2 TPP, chapter 18, article 18.7.1. The TPP final text can be downloaded at: https://ustr.gov/sites/default/files/TPP-Final-Text-Intellectual-Property.pdf.

3 Ibid., article 18.7.2.

4 Ibid., article 18.2.

5 See www.wto.org/english/thewto_e/minist_e/min01_e/mindecl_trips_e.htm.

6 See https://wikileaks.org/tpp-ip2/.

7 TPP, article 18.18.

8 Ibid., article 18.19.

9 Ibid., article 18.30.

10 Ibid., article 18.22(1).

11 Ibid., article 18.22(2).

12 Ibid., article 18.63.

Digital rights management (DRM) schemes restrict usage of copyright-protected works. DRM is protected under existing Canadian law, prohibiting the circumvention of DRM or marketing of products or services that would do the same. The TPP extends these protections to rights management information,[13] which is typically used with documents, and which might prevent users from making legitimate, non-commercial modifications to the goods they purchase.

Patents

Article 18.37 governs patentable subject matter, and includes provision for patents for "new uses of a known product, new methods of using a known product, or new processes of using a known product." This language allows for patent linkage, and was not included in the North American Free Trade Agreement (NAFTA).

The TPP provides two avenues of extending the term of a given patent. The first, referred to as patent term adjustments, provides that unreasonable delays in processing patent registrations should not eat into the patent's lifetime.[14] It applies to all technologies. The second is referred to as patent-term restoration and provides the same relief, but in the specific case of the pharmaceutical industry and potential delays in the regulatory or approval process.[15] The semantics of "adjustment" and "restoration" aside, these provisions serve to further protect the patent holder's monopoly, and ensure it is not unreasonably curtailed by a party's slow approval process. The Canada-EU Comprehensive Economic and Trade Agreement does not provide patent term adjustments.

The TPP creates and protects property rights in test data submitted to TPP partners as a requirement for regulatory approval. Under the new regime, such test data remains the property of the submitting firm, and outsiders would be prohibited from marketing the same or a similar product based on such test data. The period of protection is 10 years for test data on agricultural chemical products,[16] five years for that on new chemical drugs[17] and eight years for that on new biologics.[18] These provisions further protect the IP owner's monopoly and make it harder for the makers of generic drugs to bring their cheaper alternatives to market.

13 Ibid., article 18.69.

14 Ibid., article 18.46.

15 Ibid., article 18.48.

16 Ibid., article 18.47.

17 Ibid., article 18.50.1(a).

18 Ibid., article 18.51.

Other Thoughts

Like all other parties, Canada is forbidden from promoting homegrown IP by giving more favourable or streamlined treatment to Canadian registrants (article 18.8.1).

Any party not happy with the TPP can rescind the agreement on six months' notice; however, the political and economic ramifications of rescinding the partnership are hard to measure.

Pursuant to TRIPS, any World Trade Organization (WTO) (which includes all the TPP partners) member that grants expanded IP rights to one or more countries is deemed to grant the expanded rights to all WTO member countries. This is the principle of most-favoured nation status and it serves to ensure that IP rights and protections only grow stronger across the globe (Maskus 2012).

The United States Trade Representative's promotional materials on the TPP are liberally splashed with "Made in America" imagery,[19] and for good reason. There is little room to argue that the TPP is centred on the interests of the United States and its large, best-connected commercial corporations.

WHAT TO EXPECT FROM TPP RATIFICATION?

Ratifying the TPP means further aligning IPRs with those of the United States and others countries. The trade and welfare effects of this move for Canada are complex. On the one hand, national differences in IPR laws and their enforcement arguably are themselves a barrier to innovation-intensive trade and multinational activity. Firms entering new foreign markets via exporting, licensing or foreign direct investment are faced with varying national levels of IP protection, local imitation and risks of technology misappropriation in weak IP environments. Strengthening IP protection under the TPP would reduce this variance and effectively lower this barrier, and thereby promote trade flows among the partners.

On the other hand, IPRs have countless complex relationships with other aspects of economic activity, including market concentration, firms' production and pricing decisions, investment, technology transfer, innovation and growth. These relationships also influence the trade and welfare impacts of stronger IPRs, and are key to understanding the TPP's implications for Canada's prosperity.

It is also reasonable to assume that costs for each TPP partner to bring its IP laws in line with the TPP will differ for each partner, depending on whether it is a net IP exporter or importer. Another challenge is that the

19 See https://ustr.gov/tpp/.

immediate responses to the new, more stringent IP laws may be markedly different than the long-term effects. It is possible that the TPP's stronger IP provisions will promote innovation and growth across all countries in the long run, but in the short term the more IP-intensive sectors in some countries will contract and give way to the expansion of those same sectors in other countries.

To shed more light on the implications of TPP ratification for Canadian trade, prosperity and well-being, it is essential to understand Canada's comparative trade position across sectors of varying innovation intensity. Canadian trade and patent data are used to describe Canada's patterns of trade with other TPP signatory countries and then to analyze the findings based on the assumption that national differences in IP laws are effectively a barrier to trade, and that the strengthening of IP standards across TPP partners would serve to lower this barrier. This assumption is then relaxed in the discussion of other effects of stronger IPRs found in the literature.

CANADA'S COMPARATIVE TRADE POSITION

In this section, Canada's pattern of trade with other TPP signatories is described using data on Canadian exports and imports across 23 manufacturing sectors.[20] The focus is on Canada's comparative trade position across sectors of varying innovation intensity, as measured by the number of registered Canadian patents in a sector.[21] Only data from 2013 is used in the analysis, as this is the most recent year for which Canadian patent data is available.

Table 1 summarizes Canadian aggregate export and import data by the TPP signatory countries. It is apparent that these Pacific Rim countries accounted for a large share of Canada's trade in 2013: Canadian exports to them totalled CDN$379 million or 80.44 percent, while imports from them totalled CDN$301 million or 63.29 percent. Trade with the United States accounts for the vast majority of imports and exports. The data show that as much as 94.28 percent of the total TPP exports and 82.32 percent of the total TPP imports were destined for or originated from the United States. The strong Canada-US trade relationship is hardly surprising given that Canada-US trade barriers have already been reduced by NAFTA. By contrast, Canada's trading relationship with the other TPP signatories is much weaker: only 4.60 percent of Canada's world exports and 11.19 percent of Canada's world imports were destined for or originated from these other countries.

Table 1: Canada's Aggregate Trade by TPP Signatory Countries in 2013

	Exports ($)	Imports ($)	Export share (%)	Import share (%)
United States	357,908,916	247,796,033	75.84	52.10
Japan	10,632,104	26,728,283	2.25	5.62
Chile	799,771	2,142,161	0.17	0.45
Australia	1,652,412	3,075,771	0.35	0.65
Singapore	974,667	2,180,395	0.21	0.46
Mexico	5,434,929	13,739,650	1.15	2.89
Malaysia	779,893	1,795,181	0.17	0.38
New Zealand	395,513	513,480	0.08	0.11
Peru	606,082	1,757,014	0.13	0.37
Vietnam	427,288	1,298,035	0.09	0.27
Brunei Darussalam	23,922	6,570	0.01	0.00
Total, TPP signatory countries	379,635,496	301,032,571	80.44	63.29
Total, world	471,939,992	475,660,695	100.00	100.00

Data source: Author's own calculations using data from TDO.

For more detail, individual manufacturing sectors listed in columns (1) and (2) in Table 2 are considered next. The sectors are ordered by their innovation intensity, as measured by the number of Canadian patents in column (3). Column (4) reports Canada's trade specialization index (TSI), calculated for each sector as follows:

$$TSI_{ij} = \frac{X_{ij} - M_{ij}}{X_{ij} + M_{ij}} \times 100,$$

where X_{ij} is Canada's exports into region j in sector i, and M_{ij} is Canada's imports from region j in sector i. The TSI is the ratio (in percent) of Canada's net exports into (imports from) region j to Canada's total trade with region j. The index varies from its maximum of +100% (when Canada does not import in sector) to its minimum of –100% (when Canada does not export in sector i). The region j encompasses all 11 TPP signatory countries in Table 2.

It is apparent from Table 2 that compared to all TPP countries taken together, Canada has a strong revealed comparative advantage in the Wood Product Manufacturing sector, with the TSI equal to 64 percent. This finding is not surprising, given that the Wood Product Manufacturing sector intensively uses Canada's abundant factors of production — in this case, natural forest resources. The data further shows that Canada has a strong revealed comparative disadvantage, compared to TPP signatories, in the Medical Equipment & Supplies Manufacturing sector, with the TSI equal to 64 percent. This outcome can be explained by

20 The data is obtained from Statistics Canada and the US Census Bureau and available at Trade Data Online (TDO) (www.ic.gc.ca/eic/site/tdo-dcd.nsf/eng/Home).

21 Patent counts are calculated for each sector using data in the C.D. Howe Patent Database (Brydon et al. 2014), which includes all patent applications to the Canadian Intellectual Property Office from 1980 to 2013.

Table 2: Canada's Trade Specialization Index, as Compared to All TPP Signatory Countries in 2013

NAICS	NAICS Description	Number of patents	TSI, all TPP countries
(1)	(2)	(3)	(4)
334	Computer & Electronic Products Manufacturing	1,989	–31
333	Machinery Manufacturing	311	–23
325	Chemical Manufacturing	236	–9
3254	Pharmaceutical and Medicine Manufacturing	115	–9
336	Transportation Equipment Manufacturing	228	–5
311	Food Manufacturing	221	9
332	Fabricated Metal Product Manufacturing	177	–28
339	Miscellaneous Manufacturing	147	–20
3391	Medical Equipment & Supplies Manufacturing	103	–64
315	Clothing Manufacturing	133	–19
327	Non-Metallic Mineral Product Manufacturing	109	–25
326	Plastics & Rubber Product Manufacturing	83	3
335	Electrical Equipment, Appliance & Component	71	–35
331	Primary Metal Manufacturing	67	24
337	Furniture & Related Product Manufacturing	53	8
316	Leather & Allied Product Manufacturing	50	–7
322	Paper Manufacturing	44	34
321	Wood Product Manufacturing	24	64
324	Petroleum & Coal Products	12	16
313	Textile Mills	11	–12
312	Beverage & Tobacco Product Manufacturing	8	–38
323	Printing & Related Support Activities	7	–14
314	Textile Product Mills	2	–39

Data source: Author's own calculations using data from TDO and in the C.D. Howe Patent Database.

countries' technological differences, with the United States and Japan having comparative advantage in technological innovations.

The findings in Table 2 point to important sectoral differences that depend on innovation intensity. Across innovation-intensive sectors (i.e., above the median number of Canadian patents), Canada has a revealed comparative advantage in only one sector — Food Manufacturing — and the TSI in this sector is a mere nine percent. Meanwhile, across sectors with low innovation intensity (i.e., below the median number of patents), Canada has a revealed comparative advantage in six such sectors, including Primary Metal Manufacturing, Paper Manufacturing, Wood Product Manufacturing and Petroleum & Coal Products.

The index of trade specialization in Table 2 was calculated using trade data aggregated across all TPP signatories and, to provide further detail, the index is recalculated for Canada's trade with each individual partner. The results, reported in Table 3, show important differences in Canada's TSI across countries, as well as across sectors. Four TPP signatories stand out — the United States, Japan, Australia and Mexico. Compared to these countries, Canada has a revealed comparative disadvantage in the majority of innovation-intensive sectors. The exceptions are Transportation Equipment Manufacturing and Food Manufacturing, for which the TSI is positive in some of these countries, but generally low. Canada's revealed comparative advantage versus these four signatories lies in the sectors with low innovation intensity, such as Paper Manufacturing and Wood Product Manufacturing. In these two resource-intensive industries, Canada's TSI is highly positive across all TPP signatories (except for Peru in Wood Product Manufacturing). By contrast, in the Computer & Electronic Products Manufacturing sector, where the number of Canadian patents is the highest, Canada's TSI is negative across all TPP parties, except Peru, Vietnam and Brunei.

In summary, the data in Tables 1–3 reveals that Canada's comparative advantage relative to the other TPP signatories lies primarily in resource-intensive sectors, where innovation activity has historically been low. These low-innovation sectors in Canada are most likely to benefit from reductions of tariff and non-tariff barriers under the TPP, as Canadian exports in these sectors are expected to rise. At the same time, Canadian exports in innovation-intensive sectors are expected to fall, as Canadian trade yields to the comparative advantages of Canada's TPP partners. Canada's increased specialization in resource-intensive sectors may be beneficial in the short term, but it will keep the economy fixed on low-margin sectors that do not generate sustainable competitive advantage. It also comes at the cost of contractions in Canada's high-margin innovation-intensive sectors, and so potentially limits Canada's specialization in sectors with dynamic benefits and development potential and undermines Canada's prospects for long-term, sustainable economic growth.

Differences in Patent Systems across the TPP Parties

National differences in IPR standards are an important determinant of international trade in innovation-intensive

Table 3: Canada's Trade Specialization Index by TPP Signatory Countries in 2013

NAICS	NAICS Description	Number of patents	US	Japan	Chile	Australia	Singapore	Mexico	Malaysia	New Zealand	Peru	Vietnam	Brunei
(1)	(2)	(3)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
334	Computer & Electronic Products Manuf.	1989	–10	-80	-11	-77	-42	-81	-46	–2	88	98	99
333	Machinery Manufacturing	311	–19	3	18	–77	33	–63	70	26	54	99	56
325	Chemical Manufacturing	236	–8	–28	–42	–42	32	–1	12	27	–32	45	–96
3254	Pharmaceutical and Medicine Manufacturing	115	–5	–62	–47	–28	12	–54	98	93	100	100	100
336	Transportation Equipment Manufacturing	228	6	18	42	–93	22	–82	79	71	–18	85	64
311	Food Manufacturing	221	7	71	–37	–7	–37	31	–59	–34	–51	–32	100
332	Fabricated Metal Product Manufacturing	177	–25	–7	13	–77	21	–64	23	30	25	42	100
339	Miscellaneous Manufacturing	147	–13	–77	72	–50	–64	–45	93	–12	–52	–59	86
3391	Medical Equipment & Supplies Manufacturing	103	–59	–87	–77	–75	–93	–87	–81	–87	100	94	99
315	Clothing Manufacturing	133	25	–92	–75	–93	–77	–80	13	–83	–40	42	55
327	Non-Metallic Mineral Product Manufacturing	109	–21	–53	18	–29	–10	–84	–84	21	17	–2	100
326	Plastics & Rubber Product Manufacturing	83	6	–30	–30	–73	–5	–49	–16	3	–48	–42	100
335	Electrical Equipment, Appliance & Component	71	–24	–74	27	–83	–38	–88	34	84	–5	98	99
331	Primary Metal Manufacturing	67	26	6	–53	–59	–20	20	–80	–37	18	–33	100
337	Furniture & Related Product Manufacturing	53	26	–87	22	–83	–66	–89	–1	29	21	55	97
316	Leather & Allied Product Manufacturing	50	24	–86	–42	–95	-46	–43	–67	–27	–55	–45	65
322	Paper Manufacturing	44	32	67	92	93	93	72	96	87	92	100	98
321	Wood Product Manufacturing	24	61	89	56	50	59	49	43	39	–7	56	100
324	Petroleum & Coal Products	12	18	–85	100	–89	93	–45	100	100	100	100	.
313	Textile Mills	11	–9	–55	–51	–85	–61	–12	–40	–50	–68	–37	100
312	Beverage & Tobacco Product Manufacturing	8	–21	–86	–90	–93	–60	–96	–4	–27	–76	–89	.
323	Printing & Related Support Activities	7	–12	74	62	37	–28	26	3	–62	84	82	100
314	Textile Product Mills	2	–35	–39	–92	–38	–90	–54	–5	–38	–27	–42	100

Data source: Author's own calculations using data from TDO and in the C.D. Howe Patent Database.

products,[22] and so no analysis of the TPP's IP provisions would be complete without considering these differences. As the TPP would strengthen the protection and enforcement of IPRs, each partner will face unique costs and benefits in bringing its IPRs up to the new standard. To understand how this will impact Canada, Canada's PRs must be compared with those of other TPP signatory countries. Those TPP countries that have weaker PRs than Canada will have to increase their PRs relatively more in order to comply with the TPP and, as a result, Canada's exports of innovation-intensive products to these countries may rise.

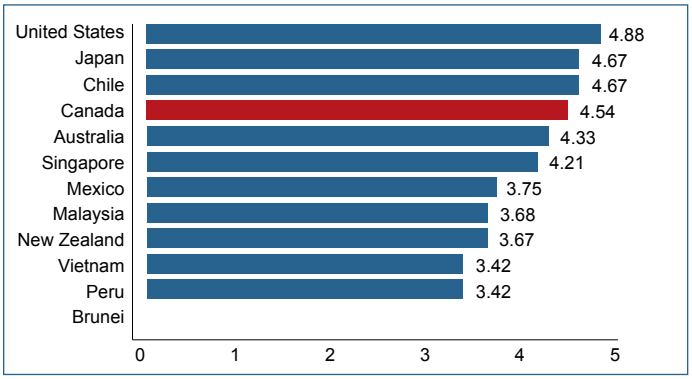
A useful measure of countries' strength of PRs is the Juan Ginarte and Walter G. Park (1997) index of patent rights.[23] Spanning five measures of patent laws (patent

22 There is a large literature studying the trade-related aspects of IPRs (see, for example, Ferrantino 1993; Maskus and Penubarti 1995; Smith 1999; Rafiquzzaman 2002; Co 2004; and Ivus 2010). The literature has established that IPRs are indeed trade relevant. Olena Ivus (2010), for example, concludes that PRs have real, measurable and economically significant effects on international trade flows. This conclusion is supported by the study's finding that the TRIPS-mandated strengthening of PRs over the 1994–2000 period added about $35 billion (US dollars in 2000) to the value of developed countries' patent-sensitive exports into 18 developing countries. This amount is equivalent to an 8.6 percent increase in these developing countries' annual value of patent-sensitive imports, and is driven by an expansion in quantity, rather than an increase in price of exported goods.

23 The index was subsequently expanded in Park (2008).

coverage, membership in international treaties, duration of protection, method of enforcement and restrictions on patent rights), the index score takes a value between zero and five, depending on the number of conditions satisfied. Figure 1 plots the index scores for the 11 TPP signatory countries in the year 2010.[24] Across the TPP signatories, the United States had the strongest PR score (4.88) and Peru and Vietnam had the weakest PR scores (3.42). Canada scored 4.54, behind the United States, Japan and Chile.

Figure 1: The Index of Patents Rights by TPP Signatory Countries in 2010



Data source: Ginarte and Park (1997) and Park (2008). The data for Brunei is missing.

Taken together, the results in Table 3 and Figure 1 point to important differences in Canada's revealed comparative advantage across countries below and above its PR strength. Canada offers relatively weak PR protection compared to the United States, Japan and Chile, and is on average a net importer of innovation-intensive products to and a net exporter of low innovation-intensive products from these countries. The opposite is true for the other TPP signatory countries, namely Australia, Singapore, Mexico, Malaysia, New Zealand, Vietnam and Peru. Canada's PR protection is relatively strong, and Canada is on average the net exporter of innovation-intensive products and the net importer of products in sectors with low-innovation intensity across these countries. These relationships between TPP signatories' strength of PRs and Canada's TSI are not due to random chance alone. The relationship is highly statistically significant, which is explained next.

Table 4 shows the regression results from three different models. In Model 1, the following regression is estimated:

$$TSI_{ij} = \alpha + \beta \log\left(PRs\ index_j\right) + \varepsilon_{ij}, \quad (1)$$

where Canada's trade specialization index in sector i with respect to a TPP signatory j is the dependent variable and the strength of j's patent rights — as measured by the log of the index of PRs, log ($PRs\ index_j$) — is the independent variable of interest. The data are a balanced panel of 10 countries by 23 sectors. It is apparent that the coefficient on the index of PRs is negative (–91.168) and statistically significant at the one percent level, implying that stronger PR protection in a TPP partner is associated with a reduction in Canada's TSI.

In Model 2, the sector difference in the number of Canadian patents is further accounted for and the following regression is re-estimated:

$$TSI_{ij} \times Pat_i = \alpha + \beta \log\left(PRs\ index_j\right) + \varepsilon_{ij}, \quad (2)$$

where the dependent variable is now the product of Canada's TSI in sector i and the number of Canadian patents in that sector. The coefficient on the PRs index is again negative –428.844) and highly statistically significant, but now its magnitude is nearly five times greater.

In Model 3, the differential effects of stronger PRs across sectors are further examined. If an observed reduction in Canada's TSI is in fact associated with an increase in TPP signatories' strength of PRs (rather than with factors correlated with the PR index), the association should be strongest for sectors with the highest number of patents. To explore the differential effects, two groups of sectors are formed, below and above the median number of Canadian patents, and the following regression is re-estimated:

$$TSI_{ij} \times Pat_i = \alpha + \beta_1 \log\left(PRs\ index_j\right) + \beta_2 \log\left(PRs\ index_j\right) \times High\ Patent_i + \beta_3 High\ Patent_i + \varepsilon_{ij}, \quad (3)$$

where $High\ Patent_i$ is the indicator variable that equals one for sectors with an above-median number of Canadian patents and equals zero otherwise, and log ($PRs\ index_j$) x $High\ Patent_i$

Table 4: Canada's TSI and PR Strength

	Canada's TSI	Canada's TSI x Number of Patents	
	Model 1	Model 2	Model 3
PRs index	–91.168*** (29.323)	–428.844*** (125.652)	-153.879 (133.416)
PRs index x high-patent sectors			-574.926** (252.728)
High-patent sectors			758.410** (362.029)
Constant	118.309*** (41.646)	564.303*** (179.668)	201.585 (187.985)
R^2	0.039	0.046	0.074
Observations	230	230	230

Source: Author.
Notes: Ordinary Least Squares (OLS) estimation. 230 observations (10 countries by 23 sectors). The PR data for Brunei is missing. Outcome variables: Canada's TSI in Model 1 and the product of Canada's TSI and the number of Canadian patents in Models 2 and 3. PRs index is in logs. High-patent sectors is the indicator variable that equals one for sectors with above-median number of Canadian patents and equals zero otherwise. *** and ** denote 1% and 5% significance levels. Robust standard errors are in parentheses.

24 The Ginarte and Park (1997) index spans from 1960 to 2010 and is broken into five-year increments. The data for Brunei is missing.

is the interaction (i.e., product) of the high-patent indicator variable with the strength of *j*'s PRs. The interaction term is negative (–574.926) and statistically significant at the five percent level, implying that the negative association between the strength of TPP signatories' PRs and Canada's TSI is most pronounced among sectors with the highest number of patents.

Sensitivity Analysis

In this section, the sensitivity of the results reported in Table 4 is examined. Three sensitivity checks are performed: add sector (and in one specification, country) fixed effects; use the index of copyright protection for the year 2011; and use the index of perceived strength of IPRs for the year 2013.

In Table 5, sector fixed effects are added to (1)–(3) and Models 1–3 are re-estimated. The sector fixed effects allow observed and unobserved sector effects, which do not vary across the TPP signatory countries (for example, technological intensity) and that might confound the analysis, to be controlled for. Country fixed effects are also added to Model (3) in order to control for any country effects that do not vary across sectors (e.g., level of development). The use of country fixed effects sweeps out a concern that the index of PRs is picking up the effects of other factors that differ across the TPP signatories in a manner correlated with country differences in the strength of PRs. This third specification is the most stringent (in terms of remaining degrees of freedom), as the fixed effects absorb all cross-sectional (cross-sector and cross-country) variation in the data. In this specification, the effect of stronger PRs is identified purely from differential effects across the two groups of sectors within a country. The results remain the same: the relationship between the strength of TPP signatories' PRs and Canada's TSI is negative and most pronounced among sectors with the highest number of patents.

In Table 6, the copyright index established in Taylor Reynolds (2003) and Walter G. Park (2005) is employed. The index covers four measures of copyright protection (CP): coverage, usage, enforcement and membership in international treaties, and ranges from zero to four. The index for the year 2011 is used (the most recent year for which the index is available). Across the TPP signatories in 2011, the United States had the strongest CP score (4) and Vietnam had the weakest CP score (2.32). Canada scored 2.96, ahead of only Vietnam, Malaysia and Mexico. Models 1 and 2 are re-estimated, replacing $PRs\ index_j$ in (1) and (2) with $CP\ index_j$ and running regressions with and without sector fixed effects. The estimated coefficient on the index of CP is negative and statistically significant in all specifications. As with regard to PR protection, stronger CP in a TPP partner is associated with a reduction in Canada's TSI.

In Table 7, the index of perceived strength of IPRs is employed as an alternative measure. This data is derived from the Executive Opinion Survey by the World Economic Forum in its World Competitiveness Report. Respondents to the survey are asked to answer the following question: "In your country, to what extent is intellectual property protected? [1 = not at all; 7 = to a great extent]." Across the TPP signatories in 2013, Singapore had the highest index (6.09) and Peru had the lowest index (2.58). Canada scored 5.44, falling behind only Singapore and New Zealand. The United States and Japan scored 4.97 and 5.38, respectively. It is important to keep in mind, though, that the index is subjective and does not necessarily reflect the structure of IP laws. Also, the responses could have been influenced

Table 5: Canada's TSI and PRs Strength (Sensitivity to Fixed Effects)

	Canada's TSI	Canada's TSI x Number of Patents	
	Model 1	Model 2	Model 3
PRs index	–91.168*** (25.313)	–428.844*** (119.983)	
PRs index x High-patent sectors			–574.926** (222.851)
Sector fixed effects	Yes	Yes	Yes
Country fixed effects	No	No	Yes
Constant	81.977* (46.846)	388.699* (219.842)	740.687** (344.672)
R^2 Observations	0.393 230	0.289 230	0.455 230

Source: Author.
Notes: OLS estimation. 230 observations (10 countries by 23 sectors). The PRs data for Brunei is missing. Outcome variables: Canada's TSI in Model 1 and the product of Canada's TSI and the number of Canadian patents in Models 2 and 3. PRs index is in logs. High-patent sectors is the indicator variable that equals one for sectors with above-median number of Canadian patents and equals zero otherwise. ***, **, and * denote 1%, 5% and 10% significance levels. Robust standard errors are in parentheses.

Table 6: Canada's TSI and Copyright Protection Strength

	Canada's TSI		Canada's TSI x Number of patents	
	Model 1		Model 2	
CP index	–53.940** (22.959)	–53.940*** (20.221)	–248.511** (102.372)	–248.511** (98.304)
Sector fixed effects	No	Yes	No	Yes
Constant	52.352* (26.966)	16.019 (34.180)	248.122** (120.915)	72.519 (161.996)
R^2 Observations	0.024 230	0.378 230	0.027 230	0.269 230

Source: Author.
Notes: OLS estimation. 230 observations (10 countries by 23 sectors). The CP data for Brunei is missing. Outcome variables: Canada's TSI in Model 1 and the product of Canada's TSI and the number of Canadian patents in Model 2. CP index is in logs. ***, **, and * denote 1%, 5% and 10% significance levels. Robust standard errors are in parentheses.

by other factors not closely related to the strength of IPRs, such as market environment and government regulation (Maskus 2000). On the plus side, the index is updated annually and, therefore, might measure more accurately current differences in countries' strength of IPRs. The index for the year 2013 is used in the analysis, since this is the year of the trade and patent data used. When Table 7 is compared to Table 5, it is apparent that the results are qualitatively unchanged. Stronger perceived IPRs in a TPP partner are negatively associated with Canada's TSI, with the effect being particularly strong in sectors with high levels of patenting.

Summary of Estimation Results

The results in Tables 4–7 confirm the previous finding that compared to the other TPP signatory countries, Canada has a revealed comparative disadvantage in innovation-intensive sectors. The results further show that Canada's strength of PRs is lagging behind the United States, Japan and Chile. In order to comply with the IP provisions in the TPP, Canada will have to increase the strength of its PRs disproportionately more. Consequently, Canadian firms in innovation-intensive sectors will face increased competition in the domestic market from US, Japanese and Chilean firms, as Canadian imports of innovation-intensive sectors from these IPR leaders are expected to rise. Offsetting this pressure on Canadian firms is the prospect of Canada's export expansion into Australia, Singapore, Mexico, Malaysia, New Zealand, Vietnam and Peru, i.e., those countries that must make the biggest leaps in PR strength to comply with the TPP.

Table 7: Canada's TSI and the Index of Perceived Strength of IPRs

	Canada's TSI	Canada's TSI x Number of Patents	
	Model 1	Model 2	Model 3
Perceived IPRs strength	–32.764*** (10.846)	–155.119*** (53.401)	
Perceived IPRs x High-patent sectors			–198.065** (99.109)
Sector fixed effects	Yes	Yes	Yes
Country fixed effects	No	No	Yes
Constant	2.670 (30.559)	17.114 (143.826)	226.811 (185.436)
R^2	0.383	0.277	0.449
Observations	230	230	230

Source: Author.
Notes: OLS estimation. 230 observations (10 countries by 23 sectors). The perceived IPR data for Brunei is missing. Outcome variables: Canada's TSI index in Model 1 and the product of Canada's TSI and the number of Canadian patents in Models 2 and 3. The perceived IPRs is in logs. High-patent sectors is the indicator variable that equals one for sectors with above-median number of Canadian patents and equals zero otherwise. *** and ** denote 1% and 5% significance levels. Robust standard errors are in parentheses.

Is it reasonable to project that as the TPP partners raise their IPRs to the new standard, Canada will enjoy an increase in exports of innovation-intensive products to partners with relatively weaker IPRs? Such a projection would be in line with Canada's revealed comparative advantage, but is far from guaranteed. Stronger IPR protection may impact trade through various channels, beyond a simple trade cost reduction, and these impacts must be accounted for in order to truly understand the consequences of Canada's ratification of the TPP. The existing economic research is relied on for this.

REVIEW OF THE LITERATURE

The leading study on Canada's circumstances is by Mohammed Rafiquzzaman (2002). Using data on manufacturing exports from Canadian provinces to 76 importing countries in the year 1990, Rafiquzzaman examined the impact of strengthening PRs in foreign countries on Canadian exports. The research shows that stronger patent protection abroad promotes Canadian manufacturing exports on average, but with differing impacts across importing countries depending on their level of economic development and the ability of local firms to imitate the imported technology.

Stronger PRs induce Canadian firms to export relatively more to high-income countries than to low-income countries. Canadian exports also tend to rise in response to strengthening PRs in importing countries that pose a strong threat of imitation, but tend to fall when importing countries with a weak threat of imitation strengthen their PRs. A country's threat of imitation is considered strong if its ability to imitate technology is strong while its PRs are weak. A country's imitation ability depends on its level of imitative resources and equals the country's research and development (R&D) expenditure as a percentage of its gross national product. According to this definition, the threat of imitation is strongest in Chile and weakest in Malaysia.[25]

The findings of Rafiquzzaman (2002) are encouraging, although it would be interesting to see if the same predictions hold true using more recent data. Unfortunately, the author is not aware of a more recent study on the trade impact of IPRs in the Canadian context; however, more recent empirical studies that use detailed US data offer a valuable insight. Using detailed product data on US exports from 1990 to 2000, Ivus (2015) found that PR protection is a significant factor in US firms' business decisions over the introduction of new products into a developing country marketplace. Weak PRs influence the behaviour and multinational strategies of US firms, and changes in firms' cross-border operations ultimately impact global trade. Lee Branstetter, Ray Fisman and C. Fritz Foley (2006) used affiliate-level data on US

25 Brunei Darussalam and Vietnam are not among the countries analyzed in Rafiquzzaman (2002).

multinational firms and found that royalty payments and R&D expenditures of US multinational affiliates increase following major patent reform in host countries. Olena Ivus, Walter Park and Kamal Saggi (2016) used data on US firms' technology licensing and found that stronger PRs in developing countries encourage US firms to increase their engagement in arms-length technology licensing. Stronger PRs also increase the attractiveness of affiliated licensing, but this effect is limited to firms producing technologically simple products, such as chemicals.

When relying on these findings to draw conclusions about the possible impacts of the TPP, it is important to keep in mind that TPP parties with relatively weak PRs — Australia, Singapore, Mexico, Malaysia, New Zealand, Vietnam and Peru — will increase their PRs disproportionally more, with respect not only to Canadian firms but also with respect to firms in the rest of the world. In order for Canadian exports to rise in response to these reforms of PRs, Canadian firms need to be able to compete with other firms exporting to these markets. Are Canadian firms up to the challenge?

For one thing, the playing field is not even. According to the Forbes Global 2000 list, the current global business landscape is largely dominated by US firms. Among the world's 2,000 largest public firms (measured by revenues, profits, assets and market value), as many as 579 firms are US based.[26] Many of these firms are intensive users of IP and are expected to greatly benefit from a stronger global IP regime. At the same time, only 52 Canadian firms are on the Forbes Global 2000 list. Canadian firms are on average smaller and use IP protection relatively less.

The use of IPRs by Canadian manufacturing firms is studied in Petr Hanel (2008). Using data from the Statistics Canada Survey of Innovation 1999, the study confirmed a previous finding in the literature that the use of IP protection increases with the size of firm. One reason for this relationship is that the cost of patenting hurts small firms more. The cost of patenting includes the costs of applying for and maintaining the patent, the costs of enforcement, the costs of defending a patent in court and the like (Cohen, Nelson and Walsh 2000). Furthermore, firms with small patent portfolios are at a significant disadvantage in protecting their PRs because their patents face much higher litigation risks, and that greater litigation risk is not offset by more rapid resolution of their lawsuits (Lanjouw and Schankerman 2004).

A formal model in which firms differ in size and IP use is required to obtain definitive predictions regarding the impact of the TPP's IP provisions on the business and patenting activity of Canadian firms. In the absence of such a model, the above evidence can be relied upon to hypothesize that the TPP's provisions on IP will primarily benefit large IP-intensive firms, the majority of which are located in the United States. The benefits accruing to Canadian firms, by contrast, will be disproportionately small. Stronger IPRs abroad will most likely benefit large Canadian exporting firms, but such benefits will be diluted, if not completely washed away, by more fierce competition from large US and Japanese firms. Small Canadian firms, which do not engage in exporting activity, will be further disadvantaged in protecting their IP. Stronger IP laws abroad will not directly benefit these firms; meanwhile, their risk of being involved in patent infringement litigation rises.

The discussion so far has omitted one key aspect of IP protection: the effect of IP enforcement on R&D incentives and innovation. TPP proponents argue that ratification will have a substantial impact on individual firms' decisions to invest in R&D and innovate. If this argument sounds familiar, it is because it was similarly evoked during the TRIPS negotiations in the 1990s. Then, as now, the promise of increased innovation no doubt motivates signatories toward ratification, but have stronger PRs actually stimulated domestic innovation in the uniform patenting environment? This question was analyzed in Yi Qian (2007), using data on 26 countries over the period 1978–2002. The study found that national PRs alone do not stimulate domestic innovation, but could complement a country's strong innovative capacity to stimulate domestic innovation. It is thus imperative to ensure that complementary factors (e.g., innovation policies) are in place.

Qian (2007) also observes an optimal level of PR regulation, above which further enhancement reduces innovative activities. The optimal level is a middle ground that strikes a balance between providing creators with incentive to innovate and imposing the social costs of creating monopolies. Naturally, this optimal level of PR regulation varies across countries, and so too do the countries' incentives to protect IP. Gene M. Grossman and Edwin L.-C. Lai (2004) emphasize that patents are a more potent instrument for promoting innovation in countries with relatively larger market size and higher productivity in innovation. A country such as Canada, which contributes a smaller share to global innovation relative to the United States and Japan, will have a weaker incentive to strengthen its IPR protection. Grossman and Lai further add that "the country that can more effectively stimulate innovation with a given strengthening of its patent protection will have an incentive to provide stronger protection, all else equal" (ibid.).

RECOMMENDATIONS

The Canadian government will continue to enjoy some discretion in establishing the country's IPRs and enforcing the new rules. To the extent allowed under the new rules, that discretion should be exercised in the best interests of Canadian stakeholders.

26 See www.forbes.com/sites/liyanchen/2015/05/06/the-worlds-largest-companies/#32a08a624fe5.

Canada should consider overhauling some of its regulatory processes. Canadian government regulations, the Canadian patent process and a lack of manufacturing facilities have been characterized as "the greatest barrier to innovation" (Hall and Bagchi-Sen 2002). Reducing the costs of IP protection would encourage Canada's innovation-intensive sectors and better position the firms in those sectors to compete globally. Given that Canada cannot treat Canadian IP registrants differently, reducing costs for Canadians might be achieved through tax credits or grants.

Based on the analysis of Canada's comparative trade position across sectors of varying innovation intensity, and given how the TPP affects various economic sectors differently depending on their innovation intensity, Canada would be well served to focus future government spending on fostering a dynamic comparative advantage. If there is no new money for this purpose, then the government should give serious consideration to reallocating funding for resource-intensive sectors to innovation-intensive sectors.

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