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Intellectual Property Proliferation: Strategic Roots and Strategic Responses

Dan Ciuriak



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About the Author

Senior Fellow **Dan Ciuriak** joined CIGI's Global Economy Program in April 2016, focusing on the innovation and trade research theme.

At CIGI, Dan is exploring the interface between Canada's domestic innovation and international trade and investment, including the development of better metrics to assess the impact of Canada's trade agreements on innovation outcomes.

Based in Ottawa, Dan is the director and principal of Ciuriak Consulting Inc. He is also a fellow in residence with the C. D. Howe Institute and an associate with BKP Development Research and Consulting GmbH of Munich, Germany.

Previously, he was deputy chief economist at Canada's Department of Foreign Affairs and International Trade (DFAIT) (now Global Affairs Canada), with responsibility for economic analysis in support of trade negotiations and trade litigation, and served as contributing editor of DFAIT's Trade Policy Research series (2001-2007 and 2010 editions). He has also held several other positions at DFAIT, including as deputy to the chair of the Asia-Pacific Economic Cooperation Economic Committee and as finance counsellor at Canada's embassy in Germany.

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.

With experts from academia, national agencies, international institutions and the private sector, the Global Economy Program supports research in the following areas: management of severe sovereign debt crises; central banking and international financial regulation; China's role in the global economy; governance and policies of the Bretton Woods institutions; the Group of Twenty; global, plurilateral and regional trade agreements; and financing sustainable development. Each year, the Global Economy Program hosts, co-hosts and participates in many events worldwide, working with trusted international partners, which allows the program to disseminate policy recommendations to an international audience of policy makers.

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.

Acronyms and Abbreviations

GATT	General Agreement on Tariffs and Trade
IP	intellectual property
IPRS	intellectual property rights
KBE	knowledge-based economy
OECD	Organisation for Economic Co-operation and Development
R&D	research and development
SALT	Strategic Arms Limitation Treaty
TPP	Trans-Pacific Partnership
TRIPS	Agreement on Trade-Related Aspects of Intellectual Property Rights
WIPO	World Intellectual Property Organization
WTO	World Trade Organization

Executive Summary

Intellectual property (IP) is essential for commercialization in the knowledge-based economy (KBE).¹ However, the creation of intellectual property rights (IPRs), which were originally developed for a world of sparse and sporadic invention, has led to potential stumbling blocks for industrialized research and development (R&D) and continuous and massively parallel innovation. This potential has been actualized through the untrammelled proliferation of IPRs in recent decades. This paper argues that this proliferation has strategic roots at the national level, based on the potential to capture global rents through the internationalization of IPRs. This gives rise to a collective action problem for exit strategies, which, in turn, requires strategic solutions. The key protagonists are the United States and China. For the United States, the post-1980 focus on IP development was perceived to be a game-changing economic policy decision, and the enhancement of IPR protection became a central feature of its international commercial policy. China, which made technological progress the cornerstone of its economic modernization policy, has long since passed the point where its national interests lay principally in minimizing payments to foreign technology, and has become the most prolific issuer of patents, with a growing potential to appropriate payments to itself. China's emergence in this area creates the rivalry conditions that could underpin a mutual retreat from the current regime, which is damaging growth globally but generating large rents for vested interests, including by raising barriers to entry. In a rules-based system, a World Trade Organization (WTO) agreement, championed by the United States and China, modelled conceptually on the Strategic Arms Limitation Treaty (SALT) agreement between the United States and the Soviet Union, would establish disciplines on the creation of IP, provide for a timely retirement of non-performing IP (modelled on mutual tariff elimination under the General Agreement on Tariffs and Trade [GATT]) and establish an international IP court for the adjudication of cross-border infringement claims. This would reduce innovation costs, in particular

¹ This term is in common use, although not usually in the sense intended here as a distinct model compared to feudalism or capitalism. The term for each form of economic organization is based on the source of income of the principal asset of the age that gave rise to it.

for start-ups, address the “tragedy of the anti-commons” and contribute to the policy reforms required to address the “stag-deflation” to which IP proliferation has been a contributing factor.

Introduction

Today's economic model in the advanced industrialized countries is often referred to as the KBE. A defining feature is the institution of IP. IP is clearly a fundamental requirement for a KBE to flourish, since the model depends on the commercialization of knowledge. Yet the enclosure of the knowledge commons through the creation of private IP for commercial exploitation can also be a problem, in that one person's IP can hinder related innovation by others and thus can create barriers to entry that undermine the dynamism of the KBE. A dynamic KBE thus depends on a balance being struck.

Whether an appropriate balance is being struck is hotly debated. IP protection dates back to the Renaissance, when innovations were sporadic and the written word was scarce. Innovation has expanded enormously and innovation modalities have multiplied. R&D has been industrialized; innovation has become continuous and massively parallel; innovation modes now include open-source, co-creation and follow-on innovation; and the written word has become ubiquitous (Ciuriak and Curtis 2015).

Overworked IP offices are processing a rapidly rising number of filings in ever-shorter review periods, notwithstanding the increasing level of difficulty in establishing claims of originality due to the expansion of the existing portfolio. They are making mistakes and issuing overly broad patents and patents covering prior art, leading to a mounting litigation burden.

Unintended consequences of incentivizing innovation are now disincentivizing innovation. For innovating firms, the sheer proliferation of IP has ratcheted up the cost of innovation because of the increased difficulty of establishing “freedom to operate” — that is, reaching a determination that a course of action is non-infringing on third-party IPRs and identifying the strategies to lock in that freedom (for example, filing own patent claims,

publishing the method to pre-empt third parties from patenting and so forth). The proliferation has also resulted in the emergence of patent thickets — “dense web[s] of overlapping IP rights that a company must hack its way through in order to actually commercialize new technology” (World Intellectual Property Organization [WIPO] 2015) — as well as patent trolls who game the system for rent appropriation and thus create risk for innovators who are actively developing markets. Litigation costs have risen; for some firms, these costs can even exceed R&D budgets.

The bottom line for economic policy in a KBE is business dynamism: in the major KBEs, business dynamism is waning (see, for example, Hathaway and Litan 2014). While this is the result of many contributing factors (Ciuriak 2015), a plausible causal link can be drawn to rising costs of innovation and the emergence of disincentives. Accordingly, the question arises as to why corrective action has not been taken.

The argument advanced in this paper is that this inaction reflects the strategic roots of the problem: in a KBE world that features international agreements for the enforcement of IPRs created by counterparties, it is in each country’s interest to maximize the amount of IPRs created in order to capture global rents, even in the face of diminished innovation at the national level. As the KBE model is mimicked internationally, this sets up the potential for an IP arms race, which eventually generates a lose-lose outcome and a collective action problem of implementing the necessary reforms, since unilateral disarmament transfers rents to competitors.

The analogy to an arms race also points us to the nature of the exit strategy: a strategic arms limitation agreement. The model is provided by the SALT on nuclear weapons between the United States and the Soviet Union. The conditions for such a treaty are now emerging.

The United States pioneered the KBE model and championed international agreements to enforce IPRs to maximize the ability of US companies to capture global rents. China, which made technological progress the cornerstone of its economic modernization policy, recognized the strategic value of IP, strongly promoted innovation domestically and has now surged to the lead in global IPR creation with over one million patent applications filed in 2015, almost double the US

total and more than in the United States and Japan combined. China has also surged to the lead in patent issuance with almost 360,000 patents granted in 2015, compared to just under 300,000 in the United States (WIPO 2016). Most patent filings in China are by domestic applicants seeking protection in their domestic markets, but multinational firms also increasingly need to file for patent protection in China — and face the prospect of litigating in Chinese courts to enforce their claims. Chinese firms are also rapidly increasing their filings abroad. The rivalry conditions have thus been set up to enable the solution to an otherwise runaway cost-escalating and dynamism-sapping proliferation of IPRs.

The rest of this paper develops these claims and draws conclusions for innovation policy at the international and national levels. The next section develops the case that IP proliferation has become a drag on the innovation and dynamism of KBEs. The third section outlines the strategic roots of this proliferation. The fourth section draws out the policy implications, including the improbability of a multilateral solution, and hence the need for a strategic solution, given the highly skewed distribution of IPRs internationally.

Is IP Slowing Innovation?

There are many reasons to believe that the expansion of IPRs has contributed to the tepid growth of the global economy during the period of stag-deflation since the great recession by throwing up stumbling blocks to innovation. This section briefly outlines seven basic reasons.

Industrialization of R&D

The industrialization of R&D generates a continuous stream of sub-patentable, borderline patentable and weakly patentable innovations through systematic exploration of already-identified research space. Since these next-generation ideas are implicit in the existing knowledge base (“follow-on innovation”), they typically are discovered more or less simultaneously by many researchers in the ordinary course of their work. Awareness of this is a factor in the rush to patent, a pattern of behaviour frequently observed and remarked upon. See, for

example, the recent “rush to patent” in respect of blockchain technology (*The Economist* 2017).

The grant of exclusive rights to one reduces the value of the concurrent work of the others and generates a requirement for additional research effort to work around the new patent. This raises the overall cost of R&D, which necessarily reduces innovation overall. J. H. Reichman (2000, 1756) argues that: “a different calculus of social costs and benefits applies when small grain-sized innovation is at stake. Without the big social pay-offs expected from major innovations — patentable inventions and copyrightable works of authorship — one may question *a priori* the use of powerful exclusive rights to elicit technical contributions within the reach of routine engineers...There is likewise a compelling need to seek alternative solutions to the problem of appropriability so as to encourage investment without necessarily entitling the first- or the second-comer to all the returns from follow-on innovation.”

Alberto Galasso and Mark Schankerman (2015) study patent invalidation cases and show that marginal patents can impede follow-on innovation, especially in areas such as electronics, information technology and biotechnology, which are characterized by extensive incremental innovation. The effect of patent invalidation is strongest when patents owned by large corporations are invalidated, as these patents appear to block follow-on innovation by small and medium-sized enterprises. Heidi Williams (2013) documents a negative impact of follow-on innovation in gene research. Brid-Aine Parnell (2011) emphasizes the issues created by patent thickets for entrant firms. On issues related to proliferation of weak patents, see also Allison and Lemley (1998); Anton, Greene and Yao (2006); and Jaffe and Lerner (2006), among many others.

Finally, it is important to note that patent proliferation of this sort provides prima facie proof of a breakdown in the balance between protection of innovation and competition. As WIPO points out in its comment on this issue, patenting systems are supposed to protect only genuine “inventions” as opposed to “discoveries.”² This distinction is made largely moot by industrialized R&D.

The situation is exacerbated by the impact of patent proliferation on patent offices. Brian Fung (2014) suggests that the large number of weak

patents is due to overworked patent officers, who, at least in the United States, have been and continue to be inundated by patent applications. Finding and citing prior art, for example, in order to reject an application takes time they do not have, especially if they want to be promoted.

Use of Patenting for Exclusion Purposes

Since both competition and protection can induce innovation, the optimal balance between promoting competition and strengthening IPRs is not readily identifiable analytically, and practical determinations are highly case-specific. The area is controversial, and surveys of the literature tend to be inconclusive. However, in an era when patent proliferation is occurring in a context of waning business dynamism and stagnant R&D expenditures, there is a presumption that the balance has swung too far in terms of creating IPRs.

In this regard, it has long been established that firms have incentives to obtain patents that are neither used nor licensed to others (so-called “sleeping patents”) simply to block their rivals from obtaining the patents (see, for example, Gilbert and Newbery 1982). Colleen Chien (2010) argues that this strategic behaviour is now rampant in high-technology industries as firms amass patents not for their intrinsic value, but to provide themselves with freedom to operate in terms of protection from infringement claims. This contributes to what amounts to a patent arms race, since large stocks of patents deter legal attacks. Clearly, this strategy works to the advantage of the already large firms and to the disadvantage of smaller start-ups, which are much less able to afford the cost of such patent-acquisition strategies.

While competition policy does address various practices involving patents and copyrights that might restrict competition — including potentially restrictive practices related to licensing, denying interoperability, patent pooling, use of litigation threats, standard-essential patents and others³ — the patent arms race itself seems outside the ambit of competition policy. Notably, an extension of acquiring patents to block competition is acquiring start-ups with future potential to become rivals. Steven Davidoff Solomon (2016) observes that such acquisitions face little discipline from competition policy.

² See www.wipo.int/patentlaw/en/developments/competition.html.

³ For a general overview of this interface and practice, see Organisation for Economic Co-operation and Development (OECD) (1989).

Patents for Rent Extraction, Not Profit Exploitation

The proliferation of weak patents that have not been exploited for productive purposes has created a market opportunity for entities to accumulate such patents — not to develop products, but to claim infringement by companies that do succeed in commercializing a product. This constitutes free-riding on the hard work of others in identifying which of the many patents in the possession of the patent accumulation entity actually have real value. Indeed, rather than paying the innovator for establishing the value of the patent, the entity sues the innovator. This raises the value of patenting but, by raising the risk of leakage of benefits of innovation, reduces innovation. This inversion — making the patent the source of value, not the innovation — is at the heart of the gaming of the system that gives rise to the strategic nature of the problem. On the impact of patent enforcement entities on innovation, see, for example, Bessen, Ford and Meurer (2011); Levy (2012); and Bessen (2014).

The Cost of Establishing Freedom to Operate

The proliferation of weak patents raises the cost of establishing freedom to operate by expanding the level of effort required to review existing patent portfolios and to implement strategies to establish the necessary freedom (which may include acquiring patent portfolios). The higher cost of establishing freedom to operate and the higher risk entailed reduce innovation. On the cost of obtaining freedom to operate opinions, see, for example, Quinn (2010).

The Cost of Litigation

The proliferation of weak (and often vague and overly broad) patents increases the cost of litigation to defend a company's freedom to operate. This raises the risk associated with innovation and thus reduces innovation. On the cost of defending a patent suit, see Jaffe and Lerner (2006, 31); on the non-litigation costs of dealing with patent assertions, see Bessen and Meurer (2014).

The Anti-Commons Effect

The proliferation of IP reduces the knowledge commons, which reduces the utility of the accumulated stock of knowledge (the “tragedy of the anti-commons” hypothesis). This reduces innovation. On the anti-commons hypothesis, see Murray and Stern (2007, 35), who themselves cite Eisenberg (1996), Heller and Eisenberg (1998), Shapiro (2001), David (2000; 2003) and Lessig (2002).

Temporal Delay

The temporal extension of IPRs (in particular copyright) delays derivative innovation (for example, movies based on books). On the cost of copyright extension, see the Amicus Curiae brief submitted to the US Supreme Court on the subject (Akerlof et al. 2002). On the fall-off of investment in the face of rising IPRs issuance, see Pagano (n.d.).

Summary

There is enough smoke to suggest there is a fire: in plain terms, the proliferation of IPRs is creating headwinds for new entrants. Meanwhile, established firms are sitting on war chests of retained earnings and not investing. Accordingly, the premise on which current policy is framed — that more IPRs are better for growth than less — is increasingly called into question.

While the problem may be largely concentrated in some patent-dependent sectors (that is, pharmaceuticals and electronics), problems have been identified in other sectors and with other types of products.

From a long-term perspective, the evolution of the innovation system — in particular the industrialization of R&D and the emergence of new forms of innovation, such as co-creation, open-source and others — meant that the IP policy framework required renovation in any event. However, while there have been some reforms, it is not clear that the right choices have been made. See Ciuriak (2015) and Ciuriak and Curtis (2015) for a survey of these issues.

The Strategic Nature of the Problem

A precise date can be fixed for the birth of the KBE model and the origins of today's problem: the signing into US law by President Jimmy Carter on December 12, 1980 of the Patent and Trademark Law Amendments Act, otherwise known as the Bayh-Dole Act. The retrospectives on this seemingly innocuous piece of legislation, which dealt with the ownership rights to IP created by publicly funded research, are glowing. *The Economist* (2002) calls it "possibly the most inspired piece of legislation to be enacted in America over the past half-century," citing the following evidence: "Overnight, universities across America became hotbeds of innovation, as entrepreneurial professors took their inventions (and graduate students) off campus to set up companies of their own. Since 1980, American universities have witnessed a tenfold increase in the patents they generate, spun off more than 2,200 firms to exploit research done in their labs, created 260,000 jobs in the process, and now contribute \$40 billion annually to the American economy."

These results in innovation statistics pale, however, in comparison to the impact on the economic fortunes of the United States. *The Economist* (2002) started with this teaser: "Remember the technological malaise that befell America in the late 1970s? Japan was busy snuffing out Pittsburgh's steel mills, driving Detroit off the road, and beginning its assault on Silicon Valley. Only a decade later, things were very different. Japanese industry was in retreat. An exhausted Soviet empire threw in the towel. Europe sat up and started investing heavily in America. Why the sudden reversal of fortunes? Across America, there had been a flowering of innovation unlike anything seen before...More than anything, this single policy measure helped to reverse America's precipitous slide into industrial irrelevance."

While *The Economist's* analysis may exaggerate the *actual* importance of Bayh-Dole to the innovation system, something that is *perceived* as transforming the fortunes of a country — and not just any country but the reigning global economic hegemon — captures the attention of policy makers. As *The Economist* (2002) notes:

"Having seen the results, America's trading partners have been quick to follow suit."

America doubled down on the new business model. Promoting IPRs became a cornerstone of the US negotiating mandate in international trade and investment negotiations, leading to the landmark IP provisions in the Canada-US free trade agreement, which served as the model for the WTO Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS), which in turn became the launch platform for TRIPS-plus IP chapters in the wave of preferential trade agreements that followed, including the Trans-Pacific Partnership (TPP). Former US President Barack Obama (2010) clearly identified the strategic intent of the United States in this domain: "America's greatest asset is IP.. We're going to aggressively protect our IP. IP is the cornerstone of innovation. It is essential to our prosperity and it will only become more so in this century...That's why the U.S. Trade Representative is using the full arsenal of tools available to crack down on practices that blatantly harm our businesses, and that includes negotiating proper IP protections and enforcing our existing agreements, and moving forward on new agreements."

Initially, the United States did not have a genuine strategic rival in the pursuit of its KBE strategy — not even the European Union, which was fragmented in this domain. Japan, Germany and Switzerland were the only states typically mentioned in the same breath as the United States in this area — until China came along.

There have been few genuine economic miracles, if this term is limited to episodes where countries transformed themselves from an essentially pre-industrial state to a technologically advanced state within a lifetime. Post-Meiji Restoration Japan and post-Mao China qualify: in both instances, a largely peasant-based economy was transformed into an industrial power in a dramatic surge in which a powerful centralized state government relentlessly pursued technological modernization essentially for national security reasons.

The primacy that China has put on technology acquisition cannot be overstated. Every element of its economic strategy incorporated technology development and acquisition. The country welcomed foreign direct investment but used its economic clout to obtain technology transfer commitments. As China restructured its economy into a market model, its firms

— many of them still state-owned — began to invest abroad at scale, with technology acquisition a key objective. Huawei, China's leading technological firm, has some 20 overseas R&D centres to tap into technology developments abroad. And China promoted homegrown technology development, initially through "introduction, digestion, absorption, and re-innovation" (Kwan 2015), but also through heavy investment in R&D and education.

China spends 2.1 percent of GDP, or about US\$220 billion, on R&D, which is second only to that of the United States in dollar terms. In terms of education, by 2020, China will have almost 200 million graduates from its 2,900 community colleges and universities, which currently feature an enrolment of 37 million, some 40 percent in science and technology (Ciuriak 2017). China's active R&D workforce is now in the four million range (Wong 2016). China has not only quantity but also quality: Shanghai placed first in the 2012 Program for International Student Assessment in mathematics, reading and science.

But even as it pursued technology and innovation, China also learned the patent game. It invested heavily in its IP infrastructure, including through patent examiner recruitment and training, and by upgrading its IP laws to global standards. The results are striking. According to WIPO, China now accounts for about one-third of global patent filings (United States: 22 percent), 50 percent of new industrial designs (United States: nine percent) and 76 percent of new trademarks (United States: 13 percent). While IPRs infringement in China still runs high, IPRs enforcement is also strong: domestic litigation is intense, and China's courts are delivering sophisticated rulings (Harvey 2015).

In short, the strategic rivalry is already in place and could in due course create the conditions to bring both parties to the negotiating table.

This is because the strategic nature of the emergence of the problem points to the need for a strategic solution. The key point appears to be the zero-sum element in capturing available rents: if one country declines to create IPRs that would allow the capture of those rents and its rival

moves to appropriate those rents, there is a loss of advantage. This stays the hand of the former. A similar situation exists in the context of any arms race. In an arms race, there is a socially ruinous expansion of investment in munitions, which are not welfare-enhancing in and of themselves. However, neither side can afford to fall behind.

The overexpansion of IPRs was arguably a problem before China emerged on the scene. Yet, for the main proliferators, it was a source of global strategic benefit, which compensated for the loss of some business dynamism domestically. Accordingly, decisive measures to correct the problem were not taken. When there is strategic rivalry, the calculus changes. Once all parties are in the lose-lose outcome space, a negotiated exit becomes attractive to all.

Conclusions

The foregoing analysis establishes on a prima facie basis that IPRs proliferation is a problem, in the sense that it is a contributing factor to waning economic dynamism, and that there is a collective action problem in exiting this situation.

There are strategic policy roots to this problem. For the United States, the economic hegemon of the postwar era, the focus on IP was perceived to be a game-changing business decision. The expansion of IPRs was entrenched in US domestic policy and rolled out internationally through trade and investment agreements. The adoption of the same policy by other players — in particular by China, which has the capacity to scale up the rivalry — reduces the benefits of this policy to the United States. At the same time, this rivalry creates the need — as well as the basis — for a strategic solution.

International agreements, such as TRIPS, commit countries to enforce the IPRs created by other countries without any safeguards to ensure that they are taking appropriate steps to ensure the IP created is genuinely original.

This is a classic case of imposing responsibility without granting commensurate authority to discipline. Not surprisingly, the inclusion of rent protection in international law through TRIPS has led to the inevitable attempt to expand and extend protected rents, as in recent TPP negotiations.

The WTO could — and should — serve its classic role of solving collective action problems in international commerce by erecting disciplines on the unfettered creation of IPRs by national authorities.

Further, since the specific form of IPRs that trade agreements are promulgating intervenes in the battle of business models enabled by technology — often on the side of the mature models that are on the exit ramp, rather than on the side of the new challengers — such disciplines would also establish neutrality on the determination of which business models will succeed, leaving this to the market rather than to lobby-driven trade agreements.

How to get to the negotiating table is the issue.

For the United States, as the leading holder of IPRs, maintaining a system in which it holds the winning hand, and extending it internationally through trade and investment agreements such as the TPP, offsets the damage to itself and generates wealth effects that greatly benefit the stakeholders who fund political campaigns. However, the stag-deflation that has emerged under the current system is raising political reaction that was felt seismically in the 2016 US election. A bookend to Bayh-Dole that corrects the one-sided nature of the former while preserving the element that gave it its power would thus be one part of a potential US response to stag-deflation. This is not inconceivable and could bring the United States to the table.

However, history generally suggests that myopia prevails in such cases and that the necessary reforms are only undertaken after the crisis, not pre-emptively before it. This seems to pull the United States out of a collective action initiative (which would be, in any event, a virtual impossibility under the current Trump administration); in turn, the absence of the United States would kill any conceivable multilateral initiative.

There is an instructive counter-example: the SALT between the United States and the Soviet Union. Both had assembled enough nuclear weapons to incinerate each other and all of humanity several times over. At one point, it was grasped that less was more. The result was the SALT.

The emergence of China as the largest issuer of patents creates the rivalry conditions that could underpin a mutual retreat from the current regime, which is globally ruinous but profitable for vested interests. A WTO agreement, championed by the United States and China, would establish disciplines on the creation of IPRs, provide for a timely retirement of non-performing IP (modelled on mutual tariff elimination under the GATT), and establish an international IP court for the adjudication of cross-border infringement claims.

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