Routledge
Taylor & Francis Group

Review of International Political Economy

ISSN: 0969-2290 (Print) 1466-4526 (Online) Journal homepage: https://www.tandfonline.com/loi/rrip20

Intellectual monopoly in global value chains

Cédric Durand & Wiliiam Milberg

To cite this article: Cédric Durand & Wiliiam Milberg (2019): Intellectual monopoly in global value chains, Review of International Political Economy, DOI: 10.1080/09692290.2019.1660703

To link to this article: https://doi.org/10.1080/09692290.2019.1660703

Published online: 05 Sep 2019.

REVIEW OF INTERNATIONAL POLITICAL ECONOMY
https://doi.org/10.1080/09692290.2019.1660703

Intellectual monopoly in global value chains

Cédric Durand[a] and Wiliiam Milberg[b]

[a]Centre d'Economie de l'Université Paris-Nord, Universite Paris 13, Villetaneuse, France; [b]New School for Social Research, New York, NY, USA

ABSTRACT

This paper analyses the role of intangibles in global value chains (GVCs). We find that the intensification of the use of *intangible assets* within these chains has created new sources of market power. The analysis builds the notion of Intellectual Monopoly Capitalism, where government protections of intellectual property have the effect of locking in the monopoly power from intangible asset creation. We extend it to 'information rents' arising from the presence of scale economies and network externalities associated with the production of intangible assets. GVC integration requires a dense circulation of information flows to communicate specifications, standards, technical know-how in addition to costs and other operational details. The expansion of GVC trade is thus linked to a rising mobilization and circulation of intangibles and the monopoly dynamics arising from intangibles need to be assessed in this context.

KEYWORDS Global value chains; intellectual property rights; intangible assets; monopoly; rents; development

1. Introduction

In this paper we analyze the role of intangible assets in global value chains. Our aim is to clarify the mechanisms through which the use of intangible rather than tangible capital assets in production allows lead firms to enhance their market power. Intangibles are nonfinancial assets that lack a physical substance, are nonrival in consumption and are at least partially appropriable. Computerized information, technological know-how, artistic original arts, design and new products, brands, employer-provided training and organizational structure are among the main kind of intangibles (Corrado, Haskel, Iommi, & Jona Lasinio, 2012). The growing relevance of intangibles for the functioning of our contemporary economies has attracted much interest in recent years (Haskel & Westlake, 2018). The analysis in this paper builds on Pagano's (2014) notion of "intellectual monopoly capitalism", where government protections of intellectual property have the effect of locking in the monopoly power from intangible asset creation. We extend it to "information rents" (Foley, 2013) arising from the presence of scale economies and network externalities associated with the production of intangible assets. We also

CONTACT Cédric Durand cdurand@ehess.fr Centre d'Economie de l'Université Paris-Nord, Universite Paris 13, Villetaneuse 93430, France.

consider innovation rents arising from Schumpeter "Mark II" innovation patterns (Malerba & Orsenigo, 1995) accruing from the centralization of data.

Network externalities and scale economies are international in scope, so it is important to put the analysis of intellectual monopoly within the context of international trade and international trade agreements. The global value chain analytical framework, with its emphasis on market structures and the international distribution of value added, is particularly well-suited for studying the impact of intellectual property rights protections and intangibles-related network dynamics. By focusing on intellectual monopoly, this article contributes to the effort to better understand the mechanisms of rent accrual that are potentially important for the uneven distribution of value along global value chains. Rents from other sources, such as resource rents, exogenously defined rents (e.g. those provided by governments) and monopoly power over input and output markets are not considered here in any detail (Davis, Kaplinsky, & Morris, 2018). In sum, we do not claim to provide a comprehensive analysis of the dynamics of the distribution of value among firms, classes and countries, just the issues associated with intellectual assets. We argue that these have become increasingly important as a share of rents generated in the functioning of global value chains.

The second section introduces the concepts of intangible assets and intellectual monopoly in the context of global value chains. The third section presents the hypothesis of endogenous asymmetries of market structure in global value chains with intangibles. The fourth section analyses the parallel expansion of intellectual property rights and global value chain trade. Trade agreements are no longer mainly about traditional trade restrictions but aim at deeper integration between countries through regulatory standards convergence (Rodrik, 2018), in particular intellectual property matters, which we show are closely related to the expansion of global value chains. Section five explains vertical natural monopoly dynamics arising from the combination of chains network complementarities and the fixed and sunk costs of intangibles assets deployed in order to integrate fragmented activities. The next sections examine uneven returns to scale along the chains resulting from the uneven distribution of intangibles (section 6) and monopolization dynamics arising from Schumpeter Mark II innovation patterns resulting from the centralization of data generated by the integration process (section 7). The eighth section discusses some implications of our analysis for development prospects in developing and high-income economies. Section nine concludes.

2. Intangible capital in global value chains

Within the global value chain (GVC) literature, numerous works have examined some aspect of the rising importance of knowledge management and intangible assets, including the interaction between innovation systems and GVCs (De Marchi, Giuliani, & Rabellotti, 2018; Lee & Malerba, 2017), and the limitations of knowledge transfers between multinational corporations (MNCs) and local suppliers in developing economies (Saliola & Zanfei, 2009). Case studies have observed that the capture of value added is largely detached from the flow of physical goods and mainly related to intangible aspects of the supply chain, in particular in the case of smartphones (Ali-Yrkkö, Rouvinen, Seppälä, & Ylä-Anttila, 2011; Dedrick & Kraemer, 2017). Empirical research on intangibles and GVCs at the industry

level indicates that the share of intangibles in the value of final products increased from 2000 onward. Moreover, it shows a growing concentration of intangibles in lead segments of the chains, i.e. in the distribution stage for buyer-driven GVCs and in activities before the final production stage for producer-driven GVCs (Chen, Los, & Timmer, 2018).

In total, the research suggest that intangible assets have an important role in the functioning and outcomes of GVCs. Nonetheless, to the best of our knowledge, there has been no systematic treatment from a theoretical or historical perspective of the place of intangible assets in GVCs dynamics.

2.1. Intangibles and monopolization in the digital age

Intangibles are not a new phenomenon. Friedrich List, writing in the mid-19th century, identified "intellectual capital" as part of the "productive forces" that lay the ground for the production of value and the growth of firms and countries (List, 1856, Chapter 2). However, the conditions for the production and uses of intangibles have changed radically in the past 20 years. With the massive reduction of computation, communication and data storage costs, the ubiquity of intangibles became a defining character of the modern "information economy." (Nordhaus, 2015).

The appropriability of intangible assets is limited by the strengthening and broadening of intellectual property rights regulations (IPRs) that restrict the use of intable assets in production and consumption. According to the World International Property Organization, IPRs comprise copyrights on artistic and scientific works, industrial property such as trademarks, and patents on new inventions. These IPRs protect what WIPO calls « knowledge and reputational assets » (WIPO, 2016) because they ascribe the legal right to control the use of the intangibles they describe to their sole legal owner. Not all intangibles can be covered by IPRs, but the scope of IPRs has expanded over time.

The issue of intellectual monopoly gained prominence in the late 1990s. Intellectual monopoly is defined as "the power of producers of ideas to control how their products are used" (Boldrin & Levine, 2004, p. 328). Ugo Pagano argues that the tightening of property rights has created a new era – the era of "intellectual monopoly capitalism" – in which "monopoly is not simply based on the market power due to the concentration of skills in machines and management; it becomes also a legal monopoly over some items of knowledge". This monopolization has dramatic consequences, since "knowledge is not an object defined in a limited physical space (…) the full-blown private ownership of knowledge means a global monopoly that limits the liberty of many individuals in multiple locations" (Pagano, 2014, p. 1413). A result of this monopolization, Pagano argues, is a slowdown in investment as envisioned in the traditional theory of monopoly (Pagano & Rossi, 2009).

The problem of intellectual monopoly is not limited to the issue of IP, but extends to the economics of intangibles more generally. Indeed, natural monopoly market structure emerges under various combinations of (1) scale economies arising from high fixed costs and low or zero variable costs and (2) network externalities and complementarities (Haskel & Westlake, 2018; Mosca, 2008). Numerous studies have found these features present in internet companies (Haucap &

Heimeshoff, 2014; Khan, 2016) and they have been discussed more generally in the context of "two-sided markets" or even "multiple-sided markets", in which transactions in one side support business on the other side (Armstrong, 2006; Rochet & Tirole, 2006). One side may subsidize the other or, more generally, enhance the quality product in the other, as anticipated by the literature on user-led innovation (Von Hippel, 1978). According to Hal Varian, Google chief economist, careful data analysis and online live controlled experiments are crucial to enhance user experience, intensify use and maximize the effectiveness of advertisement targeting (Varian, 2010, 2014). The general notion is that success on one side of the market reinforces success on the other, with the possibility of spiraling processes as in the case of Google:

> consumers that appreciate customised search results and ads provided by Google's search and webmail platform will spend more time on the platform. This allows Google to gather even more valuable data about consumer behaviour, and to further improve services for consumers as well as advertisers. These self-reinforcing effects may increase with the number of applications provided on a platform (e.g. bundling email, messaging, video, music and telephony). Data gathered while providing one application can be used for improving other applications, thereby increasing the number of markets that interact. (OECD, 2015, p. 147)

The virtuous cycle in these multi-sided markets can support an "acceleration to scale" (Schmidt & Cohen, 2014, p. 10), in which the ability to generate, control and manage data through multiple complementary services and strategically balance pricing can quickly bring market power. Such an acceleration to scale has fueled the explosive growth of digital platforms such as Google, Facebook, Amazon, Tencent and Alibaba and put them among the world's biggest corporations in terms of market capitalization. As of February 2018, seven of the ten biggest firms by market capitalization were tech companies. These were, in descending order: Apple, Alphabet, Microsoft, Amazon, Facebook, Tencent, and Alibaba.

2.2. Intangibles and coordination of global value chains

Richard Baldwin (2016) has introduced the term the "second unbundling" to describe how the information and computer technology revolution boosted globalization, mainly by expanding the possibility of and lowering the costs of international communication. Manufacturing processes can now be dispersed internationally without huge efficiency losses. (The first unbundling was the period of expanding final goods trade in the 19th century). Baldwin argues that international fragmentation of production "didn't end the need to coordinate the various stages of production – it internationalized it." He continues, that "to ensure the operation operated as one, the offshoring firms moved their managerial, marketing, and technical know-how along with the offshored stages" (Baldwin, 2016, p. 134).

The "need to coordinate" activities previously done in-house by large corporations is the issue of value chain integration. Integrating business and labor processes that are distributed across a variety of locations and legal systems is difficult: "the decoupled tasks involved in producing a single order or customer request remained interdependent. Decoupled tasks need to be linked and coordinated in order to secure seamless processes. Geographical distance added complexity to

these coordination requirements because remote communication and interventions are more complex and prone to misunderstanding than collocated interaction" (Ramioul & Van Hootegem, 2015, p. 108). There are also implications for workers, who may be confronted with the loss of a comprehensive overview of the workflow and lack the resources to resolve new problems arising from the dispersion. The example of logistics outsourcing for a food processing company from the Benelux to a newly-created Business Shared Service Center (BSSC) illustrates this dynamics:

> work organization was fundamentally redesigned and shifted from an order-based to an operation-based division of labour. In the original (Benelux) set-up each customer had had a single point of contact for the entire order process. In other words, all operations for processing one order were grouped. In the new BSSC set-up, by contrast, individual employees were each only responsible for one subtask which they had to perform for a number of customer groups (…). As a result, they had neither an overview of the whole logistics process for a specific order nor the potential to solve any problems occurring during order processing. (Ramioul & Van Hootegem, 2015, p. 99)

The deployment of the new organization was painful. The firm faced a rise of unexpected problems such as errors in the calculation of the container load, missing information on delivery schedules, missing custom forms and inadequate communication with customers. To deal with these problems, management installed a 'rescue team' to fire-fight and temporarily help out the BSSC in order to minimize performance losses. However, the more fundamental diagnosis was that the troubles resulted from the loss of uncodified knowledge previously accumulated and mobilized on a personal basis by experienced workers in charge of the complete order processing. To compensate for that loss of tacit knowledge, management intensified the codification, standardization and monitoring of the workflow process. ICT tools were thus more intensively used in order to track and systematically analyze performance and errors.

Another study, this one of back-office restructuring in Northern England, documents the dynamics leading to offshoring in India and Eastern Europe of these activities for insurance, logistics and business services firms. In this case, IT tools were put in place before the fact, as a way of preparing for offshoring by standardizing the work flow:

> Once back office tasks are standardized, quantification becomes more straightforward since each element of the process is rendered comparable. When work is simplified, fragmented and measured by performance outputs, then it need not necessarily be carried out in the same location or even by the same organization. In essence, standardized tasks become commodified as they are separated out into tradable, quantifiable entities in a division of labour that can be sourced elsewhere. This can lead to changes either within an organization as back office work is merged, centralized and possibly relocated into a separate cost centre, or the work is outsourced elsewhere. Contractual and spatial restructuring is manifest in numerous configurations, but the key point is that the greater the degree of standardization, then the greater the scope for reconfiguration and the more potentially complex the global division of labour. (Howcroft & Richardson, 2012, p. 112)

The business process re-engineering perspective has for a long time been mobilized in order to deal with uncertainty in the context of supply chain management (Burgess, 1998). What both studies just mentioned suggest is that the deployment of ICT tools and the demand for more standardized work operations are closely linked to the fragmentation of labor processes in GVCs. ICT tools are mobilized to preserve the integrity of the labor process in conditions of a heightened dispersion of the workflow. In other words, to realize the matching of production teams and

ideas, GVC integration requires a dense circulation of information flows to communicate specifications, standards, technical know-how in addition to cost and other operational details (Gereffi et al., 2005). The expansion of GVC trade is thus linked to a rising mobilization and circulation of intangibles and the monopoly dynamics arising from intangibles need to be assessed in the context of GVCs.

3. Endogenous asymmetry of market structure with intangibles

The so-called "smile curve"[1] offers a stylized representation of the distribution of value-added share in GVCs, in which heightened global competition in fabrication leads to a deepening of the curve, limiting possibilities to capture value at the central assembling-executing segment of the product formation (Figure 1). This deepening of the curve can result from a simple cost-accounting effect (Baldwin, 2012, pp. 18–19): if a stage's cost is reduced by offshoring, its share in value added falls since a stage's value added is based on costs, and predominantly labor costs. But this cost-accounting effect is both fueled and amplified by changes in relative market power.

The polarization between oligopolistic lead firms with markup pricing power and lower-tier supplier firms exposed to intense competition, nurtures an "endogenous asymmetry of market structures" (Milberg & Winkler, 2013, pp. 124–130). As more developing countries enter low- and medium-tech industries in manufacturing and services, lead firms are able to induce competition among their suppliers. The induced competition among suppliers acts also as competition among labor. Workers must compete against unemployed workers in their home market as well as against workers across geographically dispersed labor markets, which may dramatically weaken their bargaining power (Nathan & Sarkar, 2011; Peoples & Sugden, 2000). The decline in the wage share in numerous countries that accompanied the expansion of GVC trade after 1995 is consistent with this weakening position of labor due to the segmentation of the workforce – and largely

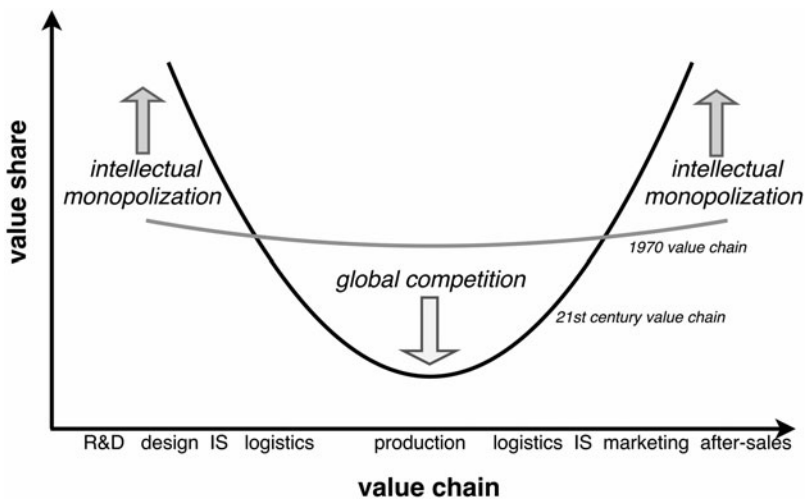

Figure 1. Intellectual monopoly versus global competition in the smile curve (authors' elaboration of original by Shih, 1996).

inconsistent with the Heckscher-Ohlin trade theory predictions (Milberg & Winkler, 2013, chapter 7; Timmer, Erumban, Los, Stehrer, & de Vries, 2014, pp. 106–109).

Intellectual monopoly reinforces the deepening of the smile curve depicted in Figure 1. But rather than being characterized by further downward pressure in the middle – fabrication portion – of the curve, intellectual monopolization points to a steepening at both ends of the curve, where control over intangible assets is concentrated. We contend that this steepening on both ends of the curve comes from a variety of sources that we analyze below. They are (1) tighter IPRs and legally-enforced proprietary control over standards, technologies and brands; (2) natural monopoly forces arising from GVCs network externalities and increasing returns on intangibles; (3) differential rent arising from uneven distribution of intangibles assets along GVCs and (4) innovation advantages resulting from a heightened control over chain activities. The remainder of the paper discusses these four sources of intellectual monopoly in the context of GVCs.

4. The simultaneous expansion of IPRs and global value chains

Legal intellectual monopoly has resulted from the strengthenening of intellectual property protection worldwide that occurred through the negotiation of international trade agreements in the 1990s and 2000s. During this same period GVC trade expanded rapidly (Gereffi, 2018; Miroudot & De Baeker, 2014; Taglioni & Winkler, 2016; Timmer et al., 2014). Stricter IPRs promoted the expansion of GVCs trade with the distribution of rents from this trade expansion skewed toward lead firms.

4.1. The making of a restrictive global IP regime

The 1980s represented a period of dramatic change toward a more extensive and stricter US intellectual property law (Coriat & Orsi, 2002). This new regime progressively spread through the global economy. US IP-based industries realized that their software, recorded music, videos, and pharmaceuticals were vulnerable to low-cost replication technologies. These industries successfully lobbied the US government to use threats of unilateral trade sanctions to force developing countries to increase their IP protection. They enlisted business associations in Europe and Japan to oppose what they characterized as "piracy" and in favor of a stricter international IP regime (Sell & Prakash, 2004, pp. 154–160).

The new intellectual property regime began to expand internationally with the inclusion of an IP chapter in the North America Free Trade Agreement (NAFTA) in 1994. The following year, the agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS) was adopted by the World Trade Organization (WTO). The TRIPS agreement only requires countries to provide "minimum" standards of intellectual property protection and gives room for the pursuit of domestic priorities that might support lax enforcement. Indeed, from a legal point of view TRIPs allow for great flexibility. According to Ho (2015, p. 229):

> "although TRIPS requires nations to grant patents on "inventions" that meet patentability standards, it does not define what constitutes an invention. Accordingly, nations can

> properly exclude software, for example, from patentability if they do not consider software to be an invention. Similarly, although TRIPS requires nations to provide patents on inventions that are useful, new, and nonobvious, it does not define any of these terms. (…) The lack of inclusion of any specific definitions permits nations to provide their own definitions."

Under TRIPS, India, for example, significantly reduced the patenting criteria by barring from patentability new uses of known compounds (Ho, 2015, p. 230).

To circumvent this flexibility and the reluctance of developing countries at the WTO to raise standards of IP protection, developed economies explored new venues. In order to secure their IP related economic advantages, they championed IP provisions within bilateral and regional preferential trade agreements (PTAs) and bilateral investment treaties (Abbott, 2006; Sell, 2010; Shadlen, 2008).

IP provisions progressively became a standard feature of bilateral trade agreements (Figure 2) (Dür, Baccini, & Elsig, 2014). The US, its close Latin American allies and European countries were the first to adopt this norm, but the practice spread to Asia in the 2000s, as Japan and China entered into several PTAs with IP provisions. China is still not involved in any such agreement with the US or the EU. US businesses and government officials point to China as the main culprit globally of "IP theft" related to counterfeit tangible goods, pirated software, theft of trade secrets and forced technology transfers with estimated losses of several hundred billions of US dollars per annum (Blair et al., 2017; USTR, 2017), and the Trump administration has made this an important focus of trade negotiations with China. China has clearly used the flexibility of WTO IP norms to preserve some developmental space to sustain its catching-up. And US frustration over Chinese IP reforms should not obscure the fact that China has dramatically strengthened its IP framework in the past decades (Yu, 2017). In 2014 and 2015, China signed agreements containing comprehensive chapters on IPRs with Australia, Switzerland and Korea, all reflecting a general global convergence towards the strict international IP regime championed by high-income countries (Guo, 2016).

In sum, since the turn of the millennium, IP protection has become a global issue. While the level of protection is uneven, there is a general trend toward more

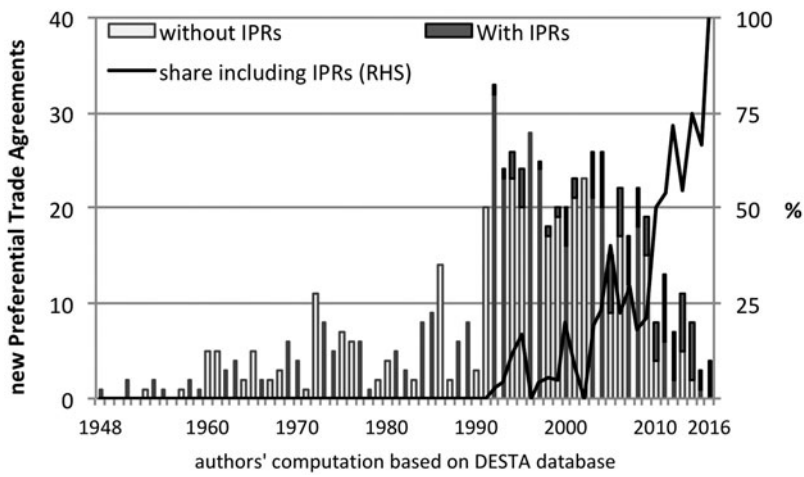

Figure 2. IPRs provisions in preferential trade agreements (1948–2016).

patenting of research results and stricter enforcement of IPRs. And IP claims increased: patents and industrial design filings worldwide tripled between 2001 and 2015 and trademarks applications more than doubled over the same period (WIPO, 2016). Moreover, investment treaties and chapters dedicated to investment protection in trade agreements opened additional routes for IP protection, in particular through exposure to the risk of costly investor-state arbitration disputes related to IPRs violations (Ho, 2015, 2016; Kasolowsky & Leikin, 2017).

4.2. Complementarity between GVC trade and IPRs

The internationalization of a stricter IP regime and the expansion of GVC trade have been driven by separate factors. However, the two trends are both related to the growing role of intangible assets in production. GVC trade is qualitatively different from the traditional exchange of final goods or primary products because it requires intense information flows to coordinate complementary tasks across countries (see section 2.2). The density of these information flows entails a risk of appropriation by would-be competitors, even more than in traditional trade of finished products, where a costly process of reverse engineering is required prior to any imitation (Mansfield, Schwartz, & Wagner, 1981). In GVCs, lead firms have to weigh the advantages of disaggregating the production process and the cost reduction this can bring against the risk of losing control over some of their proprietary intangible assets. This is a problem of "appropriability hazard" in the terminology of transaction cost economics (Oxley, 1997; Teece, 1986).

This problem is clearly acknowledged by businesses. For example, Rick White, head of the US industry lobby group TechNet declared in 2004 that executives "would never offshore unless [they] were sure [they] were going to get the same kind of quality as [they] would get elsewhere – and even then, [they] wouldn't do it if [they] weren't sure [they] could protect [their] intellectual property (Ghelfi, 2005). UNICE, the main European Business association, similarly proclaims that it "firmly believes that implementation of TRIPs will promote North-South transfers of technology » (UNICE, 2000, p. 36)

The causal relation between IPRs and internationalization of businesses goes both ways. Firms eager to engage further in internationalization will lobby for stricter IP norms. Conversely, the diffusion of stricter IP norms diminishes the appropriability risk and thus enhances firms' willingness to engage in the international fragmentation of production. Thus, the strengthening of IP norms in international treaties can contribute to an expansion of GVC trade.

This notion that GVC trade and stricter IPRs are mutually reinforcing is supported by empirical studies that show that stronger IPRs are associated with trade increases, especially for imports in countries with high imitative ability (Awokuse & Yin, 2010; Falvey, Foster, & Greenaway, 2009; Maskus & Penubarti, 1995; Rafiquzzaman, 2002; Weng, Yang, & Huang, 2009).

4.3. The dominance of the North over intellectual property and its rents

The complementarity between trade and IP protection pushes the case for IPRs beyond the narrow piracy concern and towards the idea that the introduction of

global IP standards favor transfer of technology by multinational corporations to developing countries (Hanel, 2006, pp. 915, 924). Research showing that the strengthening of IP protection favors imports of more technology-intensive products suggests that increasing IP protection should benefit economic development by promoting technological transfer and technological progress in developing countries (Chen, 2017). Empirical studies, however, do not offer much support. There is no evidence of a positive effect of stricter IPRs on innovation or productivity. Sweet & Eterovic Maggio (2015) use an indicator of "export sophistication" for 94 countries from 1965 to 2005 and find that for developing countries, IPRs strengthening "has at best a nonsignificant effect on economic complexity and most often has a negative effect."

In addition, there is no empirical support for the view that stricter IPRs increase FDI inflows (Nunnenkamp & Spatz, 2004). A study of the impact of accession to the regional patent system established by the European Patent Convention (EPC) confirms that the relationship with FDI inflow is "economically negligible"(Hall & Helmers, 2018, p. 30). These findings echo research on US firms partnering with firms in other countries that shows that the degree of hierarchical control is inversely related to the strength of intellectual property protection (Oxley, 1999, p. 288) and other work documenting that a strengthening of IP protection leads to more licensing of technology at the expense of FDI (Yang & Maskus, 2001). Indeed, weak protection of intellectual property in the foreign country will tend to raise the cost of relying on contract-based alliances relative to equity joint ventures, thereby encouraging the use of joint ventures – a form of FDI – for a wider range of transactions.[2]

The view that short term welfare costs for developing countries could be overcome by medium- to long-term dynamic gains (Maskus, 2000) has also been opposed by trade economists. As early as 1993 Helpman noted that IPRs "only strengthen the monopoly power of large companies that are based in industrial countries, to the detriment of the less developed countries" (Helpman, 1993, p. 1248). More recently, Rodrik (2018) has written that "one needs to assume an implausibly high elasticity of global innovation to developing countries' patents to compensate for what is in effect a pure transfer of rents from poor to rich countries "(Rodrik, 2018, p. 5) Stricter IPRs may also limit developing countries' policy options, shrinking their 'development space' by limiting the ability to design and implement industrial policies (Wade, 2003, pp. 624–627).

These statements from prominent trade economists are consistent with the observation that patents and international trademark are overwhelmingly concentrated in developed economies, mainly Japan, the US and the EU. Together, these three entities accounted for 82.5% of triadic patents – i.e. patents registered at the three major patents offices (US, EU, and Japan) – in 2013 (Figure 3). This was a dropoff from a share of 93% in 2000. Among developing countries only China made its way into the top ten but in 2014 accounted for just 3.5% of these patents. International trademarks are also heavily concentrated in the US, Japan and the EU (Dernis et al., 2015, Figure 2.8). The OECD indicator of the international intensity of trademarks relative to GDP shows that no developing country is ranked in the top 20 (Figure 4)[3].

Balance of payment receipts from the use of intellectual property further testify to the dominance of developed countries over IP. From the mid-1980s to the early

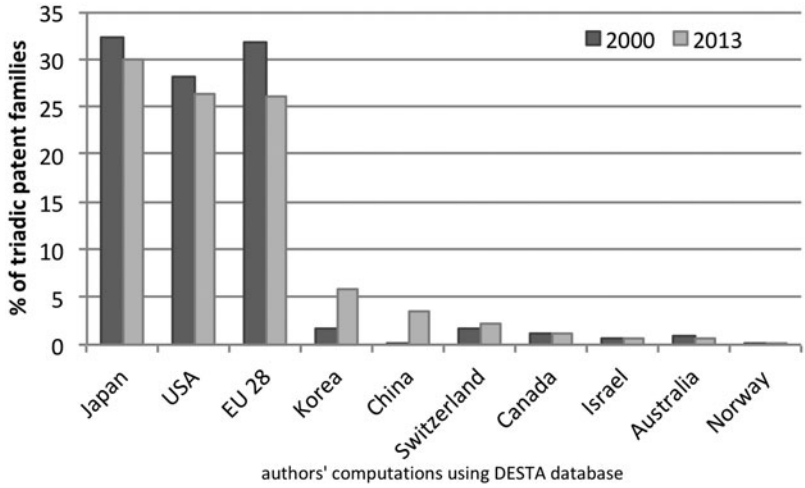

Figure 3. Main countries contributing to Triadic patent families.

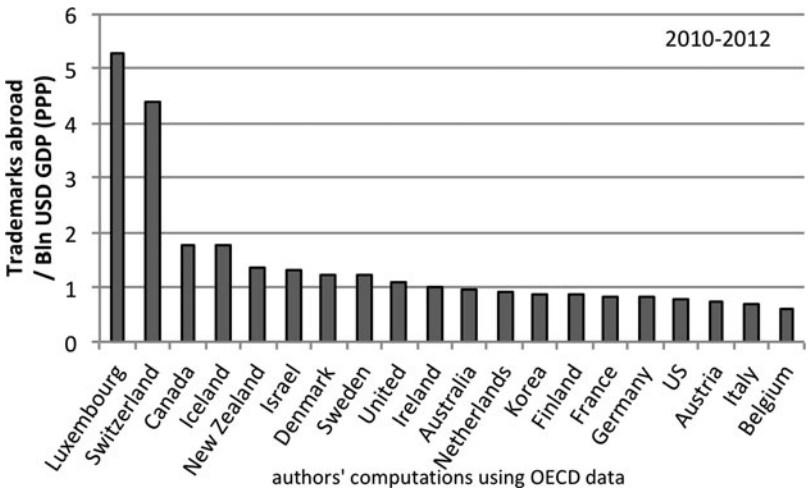

Figure 4. International trademarks intensity in 2010–2012.

2010s, the spectacular increase of international IP income has gone mostly to industrialized countries. In 2016, industrialized countries' receipts of international IP payments were more than 100 times higher (US$323 billions) than those going to low- and middle-income countries (US$3 billion) (Figure 5). Moreover, receipts are heavily concentrated in a handful of rich countries, with the US alone accounting for 38.4% of total international payments in 2015 (Figure 6).

In sum, the stricter IP regime initiated by the US in the early eighties spread rapidly across the world economy in the 1990s and 2000s while GVCs trade expanded. These two trends are complementary. The extension of legal intellectual monopoly mostly benefited firms based in high-income economies. The international distribution of IP-related payments shows the dominance of enterprises based in high-income countries, which is both the rationale for, and the result of, their efforts to broaden and tighten IPRs during the past decades.

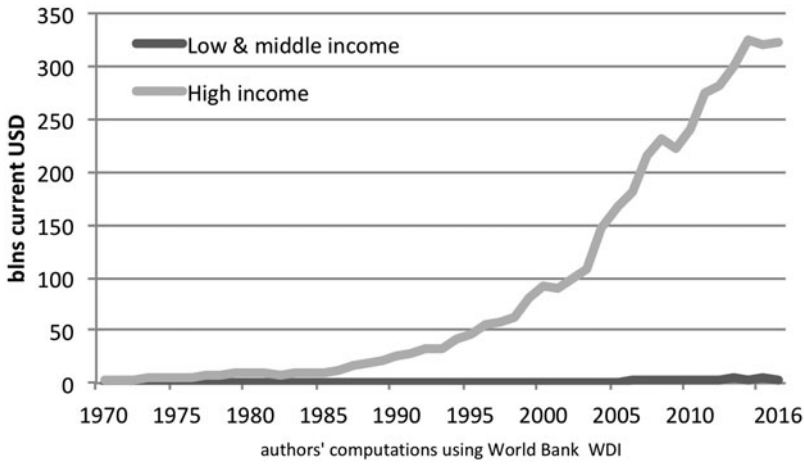

Figure 5. High income and Low and Middle Income countries receipts from the use of intellectual property (1970–2016).

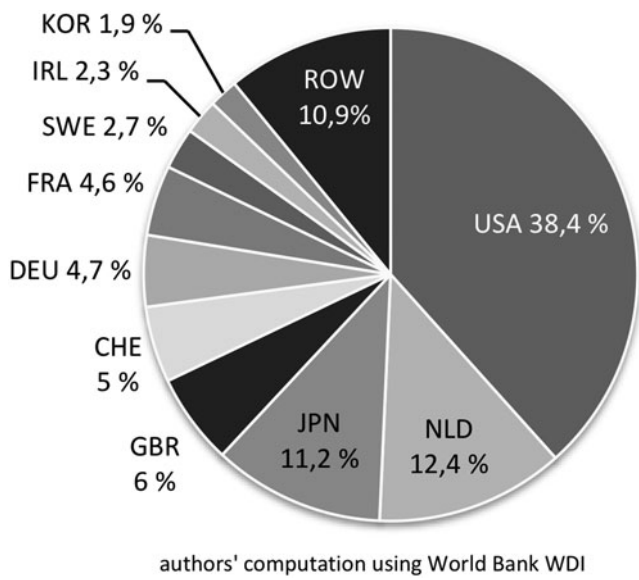

Figure 6. Share of main receiving countries in total receipts for the use of intellectual property (2015).

5. Natural monopoly in GVC formation

A natural monopoly is a market structure where some combination of positive network externalities (complementarities between uses), economies of scale (high start-up costs and low marginal costs), and sunk costs (irreversibility of the initial investment) result in a situation where only one firm finds it profitable to produce (for a review see (Mosca, 2008)). All these forces contributing to the formation of natural monopoly are likely to be present in the process of GVC formation.

Within GVCs, the value of output in each "link" in the chain is realized – and enhanced –by its combination with other components: product conception and

development, manufacturing, assembly, logistics, marketing, branding, sales, after-sales service etc. are interdependent stages of a production process. It is the network nature of the GVC that results in value being realized. That is, GVCs exhibit network externalities: the diverse contributions articulated within a value chain have a higher value when they are combined than if they were sold separately (Carballa-Smichowski, Durand, & Knauss, 2018). In addition, there are significant fixed costs associated to the building of the informational and organizational infrastructure of a value chain. As discussed above (section 2.2), the network complementarity in GVCs requires enormous oversight to guarantee "adherence to specific technical compatibility standards" (Economides, 1996, p. 677) that enables the functioning of the chain. Because of this, the expansion of GVCs in world trade coincided with a sophisticated process of information integration (for a historical timeline of the introduction of the technologies see (Stevens & Johnson, 2016, pp. 22–24)). Initially, information sharing was mainly concerned with final product demand and inventory control. It expanded to other items such as quality control in the automotive industry (Batson & McGough, 2007) and reactive design in the fashion industry (Tokatli, 2007). More recently, Germany's Industry 4.0 and US-based *industrial internet consortium* were set-up to foster the application of internet-connected technologies for coordinating the many parts circulating across industries, enabling a more holistic, real-time management of entire value chains (Aronow, Ennis, & Romano, 2017; Hermann, Pentek, & Otto, 2016). The set-up costs of these informational infrastructures are to a large extent sunk: they are designed to for very specific production networks and cannot be redeployed from one context to another without major losses.

In contrast with the traditional natural monopoly literature, natural monopoly forces in GVCs are not about horizontal competition between producers but vertical competition between firms contributing to the production of the same family of goods. These forces affect the vertical distribution of the gains arising from the cooperation along the chain as they allow lead (integrator) firms to capture a disproportionate share of the mutual gains of cooperation. Due to the overlapping of various chains and the unevenness of the historical process of integration, these natural monopoly power are generally dispersed across a few firms. Hence, the share of the positive externalities arising from network complementarities that firms involved in GVCs can appropriate depends positively on their contribution to the GVC's integration process.

Apple's role in the telecom GVC is a paragon of vertical natural monopoly dynamics. The firm abandoned its factories of Fountain in Colorado Springs and Elk Grove in Sacramento in 1996 and 2004 (Barlett & Steele, 2011) and experienced a historic business renaissance based on careful value chain management, becoming the most renown factory-less goods producer in the world (Bernard & Fort, 2015). All manufacturing is performed by firms in China and elsewhere and the firm built "a closed ecosystem where it exerts control over nearly every piece of the supply chain, from design to retail store." (Satariano & Burrows, 2011). Apple innovation capabilities goes beyond product design and development, marketing and the creation of the software. They also include the technical features of the parts of its products and include also the improvement of the means of producing these products. What is at stake in this panopticon control over the value chain is the ability of Apple to differentiate its devices from competitors'. Such a complex and well-managed value chain is a key asset of Apple suppliers must comply to get

access to their enormous consumer end market. The value chain process allows Apple to capture the lion's share of value produced in the chain.

Natural monopoly dynamics in GVCs arise from the complementarity between producers involved in the chains, and the scalability and sunkness of the intangible assets that support the integration of fragmented operations. Nonetheless, it is important to note that in GVCs it is often not the case that one single firm takes responsibility for the integration of the whole chain (Gibbon, 2008, pp. 37–38). Most of the time, several lead firms are involved in the oversight of the chain, each with varying degrees of control over the whole integration process. In many cases the leading subcontractor takes full responsibility for the coordination of some part of the upstream segments. This is the case of giant contract manufacturers or traders such as Foxconn in electronics, Yue Yuen in footwear and Li & Fung in the textile and apparel industry (Gereffi, 2014, p. 16). Natural monopoly dynamics allow thus, to some extent, space for contestation. For example, at the turn of the millennium a wave of consolidation of assemblers in the automotive sector, creating strategic opportunities for first-tier suppliers such as Bosch, Valeo, and Delphi to improve their relative position vis-à-vis traditional assemblers. They took on innovation and design, engineering and logistics for a wide variety of components and modules and deployed their manufacturing capacity of integrated systems on a world-wide basis (Caputo & Zirpoli, 2002; Frigant, 2009; Humphrey, 2003; Humphrey & Memedovic, 2003; Pavlínek, 2019; Sturgeon and Van Biesebroeck, 2011).

Another factor behind the dispersion of integration power is horizontal overlapping between chains. For example, enterprises like SAP, Oracle or Dassault System provide business software for a wide range of firms in different industries. Such software companies, like consulting firms, are suppliers to lead firms, but their position is specific as they prescribe organizational design and thus have some oversight of the integration process in several chains.

6. Intangibles intensity and uneven distribution of returns to scale

Scale economies are different in the case of intangibles-intensive production compared to traditional, tangible capital intensity. Intangibles such as standards, specifications, R&D achievements, as well as software and organizational know-how are typically scalable assets. They impose negligible marginal costs following the initial investment made to create them. This results in nearly infinite returns to scale.

The role of intangible assets looms large in current competitive dynamics, for example, in the growing rivalry between Walmart and Amazon. According to a report in *The New York Times*:

> Retailers need to figure out how to manage sophisticated supply chains connecting Southeast Asia with stores in big American cities so that they rarely run out of product. They need mobile apps and websites that offer a seamless user experience so that nothing stands between a would-be purchaser and an order. (…). Larger companies that are good at supply chain management and technology can spread those more-or-less fixed costs around more total sales. (Irwin, 2017)

This feature is in striking contrast with tangible assets: even if tangible assets exhibit some increasing returns, these are certainly finite, and their physical nature makes them subject at some point to diseconomies of scale. Now consider the fact that along GVCs some segment are intensive in tangible assets – the manufacturing of clothes, the assembling of food processors, a semi-conductor fabrication plant,

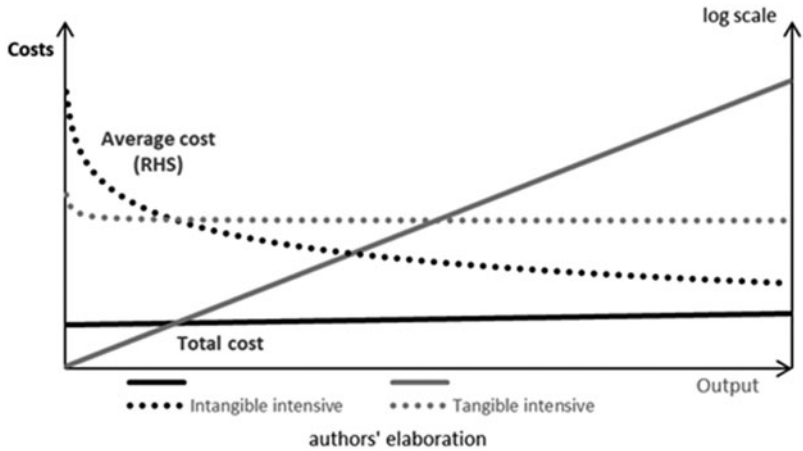

Figure 7. Total and average cost dynamics for tangible intensive and intangible intensive segments.

railway transportation. Other segments are intensive in intangible assets – fashion design, integrated circuit or web design, marketing, software coding, supply chain management information system. As the output of the GVC expands, cost of its intangible- and tangible-intensive segments expand at different rates. Due to the uneven distribution of fixed costs, total costs grow more rapidly for tangible-intensive segments and average costs diminish much more rapidly for the intangible-intensive segment. This is illustrated in Figure 7. The difference in scale economies between tangible and intangible assets means that those firms controlling the intangible-intensive parts of the chain will receive a disproportionate share of the gains from the network as output expands. Intangible- intensive segments thus benefit more from increasing GVC output than tangible-intensive firms.

7. Innovation capabilities enhanced by data centralization

The accumulation of data is at the heart of the business model of giant internet companies such as Google, Facebook, Amazon, Tencent and Alibaba. User-generated data allows these firms to enhance user experience and to design focused advertisements that they sell to other businesses. The "acceleration to scale" (Schmidt & Cohen, 2014, p. 10) that is at the root of the explosive growth of the digital platforms[4] derives from their ability to generate, control and manage data. AI technologies and AI learning also require data, and government policy is quite important in this regard. For example, the Chinese firm Megvii Face++ benefits from training its algorithms on China's national photo identification database of more than 1bn records – the largest database of this sort in the world – which has allowed the firm to surpass its western competitors in the testing of image recognition (Yang, 2017). Considering that AI is a general-purpose technology, its development entails the possibility of dramatic changes to value chains structuration. The rise of the Robotaxis and its potential to disrupt the entire automotive industry is a case point in this respect (McGee, 2019).

The importance of data for innovative processes is thus relevant beyond just internet and tech companies as it applies to the management of GVCs. Value chain integration generates huge amounts of data through information systems

supporting the functional linking of marketing, logistics, operations and sourcing applications. Wal-Mart, for example, gathers data from the activities of its 245 million customers at a rate of one million transactions every hour. This is in addition to logistics and operational data generated from its more than 17,500 suppliers. Suppliers can improve their operations given their access to point-of-sale data concerning their own products. But the advantage that Wal-Mart gets in return is much greater since the firm gets a panoptic view of the operations of *all suppliers*, concerning their production planning, the design and the conditioning of their products in addition to customer information for all of their products (Sanders, 2016, pp. 32–34; Wang, 2006).

At the root of Wal-Mart's informational advantage is its central position vis-à-vis its supply and customer base. Using an SAP software called "HANA business intelligence platform", the retailer assembles data from different parts of the enterprise in real time. According to Wal-Mart CIO Karenann Terrell, "HANA is floating on our ERP system[5]. Innovation doesn't rest in the back office" (Wilson, 2015). In Data Café, the firm's analytics-hub located at its headquarter in Bentonville, Arkansas, 2.5 petabytes of data fueled by 200 internal and external streams (including meteorological, social media, economic telecom, and local event data) are processed every hour. Teams from every department are invited to bring their problems to the analytics experts, helping them to solve complex business questions through statistical queries completed in a few seconds (Marr, 2017).

Lead firms try to expand their knowledge of the value chain by asking their suppliers details of their business operations in the course of the contractual negotiations, as has been reported for Apple:

> Life as an Apple supplier is lucrative because of the high volumes but painful because of the strings attached. When Apple asks for a price quote for parts such as touchscreens, it demands a detailed accounting of how the manufacturer arrived at the quote, including its estimates for material and labor costs, and its own projected profit. (Satariano & Burrows, 2011).

Another illustration of the hunt for data is the fact that established information technology enterprises, such as IBM, SAP, Microsoft, Intel, and Cisco as well as manufacturers such as Rolls-Royce, GE and Siemens, have been investing heavily in "predictive maintenance", i.e. real-time monitoring of equipment in order to optimize scheduling of maintenance work and prevent unexpected equipment failure. For these firms, this is "one of the myriad ways they capture data across the value-chain to improve efficiencies and automate work." (McGee, 2017). Bernd Leukert, SAP executive board member and steering committee chairman of the *Plattform Industrie 4.0 initiative*, describes the tensions resulting from the intertwining of information systems implied by predictive maintenance:

> Companies need to be sure that connecting their machines with the machine vendor or a service provider doesn't result in leaks of important customer or production data. A service provider does not need to know which CAD [Computer Aided Design] files you are running on your milling machine, but on the other hand, he needs enough information about the machines, devices, and assets to be able to provide proactive maintenance, thus avoiding costly downtimes in your production environment. (Leukert, 2017)

Siemens CEO Joe Kaeser echoes this statement when he explains the strategic issues related to the uses of data resulting from the co-evolution of machinery and digital systems:

> We manufacture products that generate power, that automate manufacturing processes, that scan people (like CT and MRI machines), and that move people and goods from place A to place B. That's a lot of products, and all those products have sensors. (…), once we get the data, we have the data analytics platform and the cloud. We have a proprietary cloud, for example, an on-site cloud. Our customers care about manufacturing and engineering data and intellectual property rights because [this type of data] is the holy grail of innovation. (…) You'd better know what you can do with your data and cut someone else out rather than get cut out yourself. The issue isn't just that your suppliers might try to cut you out. Your customers might try to cut you out because they say, "I've got the data, so why do I need you?" That's the paradigm shift…. (Kaeser & Gross, 2016)

There is thus a vertical competitive struggle for the control of data. On the one hand, letting data circulate is a pre-condition for the integration and optimization of business processes along GVCs. On the other hand, such integration gives disproportionate data access to those who initiate and organize the chain integration. Due to the asymmetric design of information systems and the uneven bargaining power in contractual negotiations, dominant firms are able to learn from their partners' business processes and use these data to enhance their innovation capabilities. The vertical natural monopoly dynamics resulting from an uneven contribution to the integration process is thus reinforced by the enhancement of innovation capabilities arising from data centralization produced with digital tools supporting GVC integration.

8. Towards a taxonomy of rents from intangibles in GVCs

Intellectual monopoly in global value chains is fueled by four distinct but partially overlapping and cumulative processes. It results from the complementarity between the fragmentation of production and stricter intellectual property rights, positive network externalities and the scalability of intangibles assets used to foster GVC integration.

Table 1 summarizes these four distinct sources of rent. *Legal monopoly rents* arise from patents, copyrights, and trademarks. They require juridical enforcement

Table 1. Intellectual monopoly in GVCs: A taxonomy of rents related to intangible assets.

Type	Description	Example
Legal IP rent	Rationing via exclusive rights on product production, process uses, cultural and scientific items, and marketing investment	Patents on pharmaceuticals, software copyright on features and coding, trademark protection (Nike, Louis Vuitton)
Vertical natural monopoly rent	Returns on intangibles underlying the integration Network complementarities within GVC Sunk costs resulting from asset specificities	Apple supply chain management Valeo, Bosch supply chain management of auto parts
Intangibles-differential rent	Uneven returns to scale on intangibles versus tangibles allow intangibles intensive segments of the chain to capture a large share of the gains	Apple and Nike fabless manufacturing versus assembling factories Nespresso versus coffee producers
Data-driven innovation rent	Central control of data generated along GVCs via asymmetric information systems Data access fuels innovation	Siemens sensors on machinery, Goodyear tires sensors Wal-Mart retailink software Amazon shopping histories

that protects R&D and marketing expenses of their owners by artificially rationing the use of the protected knowledge. *Vertical natural monopoly rents* result from network externalities when the investment supporting the network exhibits return to scale and sunk costs, which is the case for information system and supply chain management know-how. *Intangibles-differential rent*s are the rents accruing from an uneven distribution of intangibles intensity between participants in a given GVCs and the resulting uneven cost dynamics. (The name echoes the notion of differential land rent analyzed by classical economists to account for the difference of income accruing from unevenly fertile lands (Ricardo, 1817, Chapter 2)). Finally, *data-driven innovation rents* are the benefits accruing from the enhancement of innovation capabilities derived from data centralization. This centralization fosters a cumulative advantage in terms of the ability to innovate.

9. Consequences of intellectual monopoly for development and distribution

Below we focus briefly on three consequences of the these relatively new sources of monopoly rents. First, the uneven geographical distribution of intangibles may limit economic and social upgrading by developing countries. Second, monopolization may exacerbate trends in high-income economies concerning financialization and a slowdown of capital investment. Finally, the capture of value via control over intangibles can exacerbate the erosion of national tax bases, an issue that concerns both high- and low-income developing countries.

9.1. Uneven geographical distribution of intangibles

There is a highly skewed distribution of intangible-intensive and nonintangible-intensive firms across the world, with the former heavily concentrated in industrialized countries. Figure 8 shows the mean and the median of industry-country intangible-asset intensity for advanced economies and the rest of the world. This ratio

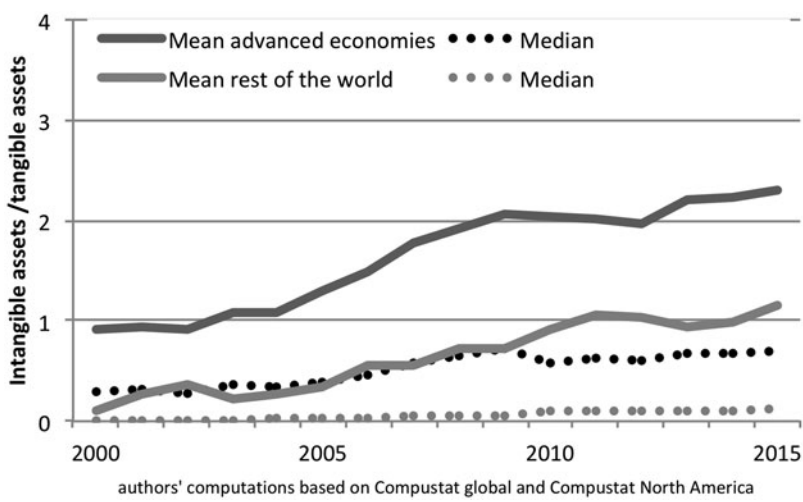

Figure 8. Relative intangible asset intensity in advanced and developing countries, (2000–2015)[6].

of intangible to tangible assets increased significantly for both groups since 2000; however, there is a huge gap between them, and this gap grew larger in favor of advanced economies. Note that the mean is well above the median in both cases, indicating a concentration of intangible asset intensity in a small number of firms.

The skewed distribution of intangible assets limits value capture opportunities by tangible-intensive producers from the developing economies and thus limits their ability for "social upgrading," that is improvement in wages and labor standards. An example is the coffee GVC, which is largely buyer-driven and dominated by a relatively small number of multinational companies headquartered in the large coffee-consuming countries (WIPO, 2017, pp. 12–13). Patent data suggest that the most innovative value chain stages are those closer to the consumer, including the modern espresso machines and coffee capsules. As a result, direct intellectual property barriers and indirect barriers arising from branding impede Southern producers from directly entering the final market. Modern marketing techniques allowing the collection of consumer data play an additional role in preventing producers from climbing the value chain, while the uneven distribution of intangibles allows lead firms to reap a disproportionate share of the benefits of output expansion.

9.2. Financialization and stagnation

Intellectual monopoly in GVCs can also be linked to the financialization of non-financial corporations and this can lead to a disconnect between profits and investment (for a review see (Durand & Gueuder, 2018). US firms in particular have had high levels of profit and cash flow in the past 15 to 20 years associated with a disproportionately large payout to shareholders in the form of dividends and share buybacks and sluggish investment (Gruber & Kamin, 2015; Gutiérrez & Philippon, 2016; Lee, Shin, & Stulz, 2016). This dimension of financialization has been linked in the US to GVC participation to the extent that large oligopoly firms manage to expand their profits as they capture value through cheaper imports (Auvray & Rabinovich, 2017; Milberg, 2009; Milberg & Winkler, 2013).

Our emphasis on intellectual monopoly extends this earlier research the by specifying the origin of market power by lead firms and the ways that intellectual monopoly in GVCs in particular may be associated with financialization. First, legal intellectual monopoly raises income of IP-intensive firms and reduces investment opportunities as IPRs foreclose some possibilities (Pagano, 2014; Pagano & Rossi, 2009). Second, market power means limited competitive pressure on lead firms, so that these firms are less compelled to invest (Shapiro, 1988). Together, these mechanisms can contribute to low reinvested earnings and higher financial payout, resulting in a lower rate of economic growth and higher income and wealth inequalities.

9.3. Tax avoidance in GVCs

Another related issue concerns the weakening of national tax bases as the lack of harmonization of tax structures among countries provides opportunities to arbitrage tax regimes. Existing studies unanimously report evidence in line with tax-motivated profit shifting via transfer pricing in intra-firm trade, debt shifting, and the strategic location of valuable intellectual property (Riedel, 2018). At the beginning of the 2010s, it is estimated that profit shifting was costing the US

government between $77 and $130 billion annually in corporate tax revenue. These revenue losses have increased significantly over time as today close to 40% of multinational profits are shifted to low-tax countries each year (Clausing, 2016; Tørsløv, Wier, & Zucman, 2018).

Fiscal optimization involving tax burden shifting is often integrated into firm strategy. Some information systems designed to manage GVCs incorporate fiscal information's and automatically adjust the flow of products and transfer prices accordingly (Prasad & Sounderpandian, 2003, p. 243). Because intangible assets are largely free from any constraint on location, intangibles-intensive firms can better exploit transfer pricing opportunities. Apple Inc., for example, transferred intellectual property, sales rights and licensing rights to low-tax jurisdictions such as Ireland, which has allowed the corporation to shield international income and part of its US income from tax liability (Ting, 2014).

10. Conclusion

Markets for intellectual property became increasingly subject to monopoly power in the past thirty years. We have shown that this has contributed to the expansion of GVCs and to rising IP income in favor of firms from developed economies. Accordingly, the tails of the smile curve reflecting the international division of labor have steepened because of the monopoly power of those controlling IP. Legal intellectual monopoly is just one among several forms of intellectual monopolization arising within GVCs. The main contribution of this paper is to identify three additional forces: Vertical natural monopoly benefits firms organizing GVCs trade because of the combination of network complementarities along the chains and scale economies and sunk costs related to the development of technological tools and management know-how necessary to integrate dispersed activities. Intangibles-differential rents result form the uneven distribution of returns to scale depending on a variation in the degree of intangible-asset intensity across firms in any chain. Finally, Data driven innovation rents results from Schumpeterian innovation that favors firms centralizing the data generated by the process of integration.

Taken together, these four forms of intellectual monopoly contribute to the endogenous generation of assymetric market structures in GVCs in favor of intangibles-intensive segments. They may also constrain development prospects in low- and middle-income economies, favor financialization in high income economies and contribute to a global tax base erosion.

Policy implications of this analysis are beyond the scope of this paper. Legal intellectual monopoly may be addressed by a weakening IPRs and policies in favor of data openness. The dilemma of a natural monopoly is of course that it requires regulation rather than antitrust policy (Boyd, 2013, pp. 1635–1658). How this might be addressed within the complex entanglement of international vertical interdependencies that characterize GVCs today is an issue for future research.

Notes

1. This representation, originally used by Acer's founder Stan Shih (Shih, 1996) to illustrate challenges for Taiwanese industries in the IT sector, is extremely widely used to illustrate GVCs dynamics in case studies and macro-research.

2. A counter example may be the wine GVC. In some specific cases such as some mid-quality and high-quality segments of the wine industry, labels and Indication of geographical origin can increase developing country producers ability to build market power through branding (Ponte & Daviron, 2011; Staricco & Ponte, 2015).
3. In terms of total patent filings in all national offices worldwide, China is catching up. Trademarks and industrial design filings at China's office took off in the 1990s, and at the turn of the millennium China's office became the largest in the world in terms of applications received. China's office also ranks first for patent filings since 2011. Despite the gains, Chinese intellectual property does not match the quality of its richer counterparts (WIPO, 2016).
4. As of February 6 2018, 7 of the 10 biggest firms by market capitalization where tech companies. These were, by descending order: Apple, Alphabet, Microsoft, Amazon, Facebook, Tencent and Alibaba.
5. ERP stands for *Enterprise Ressource Planning*. An ERP is a business-management software solution that integrates core business functions in real-time into a single platform. Oracle and SAP are the leaders in this market.
6. Average and median industry/country by country group based on revenue weighted average obervations (a particular firm in a particular year, weighted by the revenue of that year for that firm). All sectors except ISIC A, B, K and O: agriculture, mining and carrying, financial and insurance activities and public administration. IMF Advanced countries versus the rest of the world. Top 1% eliminated, only positive values observations. Intangible intensity: intangible/tangible assets (Tangible assets as Property, Plant, and Equipment (Net Total) (PPENT)). Intangibles assets as defined in Compustat include goodwill and other nonmaterial assets including intellectual property, trademarks, trade names, noncompetition agreements, construction permits franchise agreements and patented technology. In 2000, information is available for 385 industry/country in advanced economies and 113 in developing countries; on 2015, these occurrence are respectively 660 and 368. Oriol Vallès Codina provided research assistance for the realization of this graph.

Disclosure statement

No potential conflict of interest was reported by the authors.

Funding

Cédric Durand would like to recognize the generous support of the IFRIS

References

Abbott, F. M. (2006). Intellectual property provisions of bilateral and regional trade agreements in light of US federal law. *UNCTAD-ICTSD Project on IPRs and Sustainable Development*, *Issue Paper*, (12).

Ali-Yrkkö, J., Rouvinen, P., Seppälä, T., & Ylä-Anttila, P. (2011). Who captures value in global supply chains? Case Nokia N95 smartphone. *Journal of Industry, Competition and Trade*, *11*(3), 263–278. doi:10.1007/s10842-011-0107-4

Armstrong, M. (2006). Competition in two-sided markets. *The RAND Journal of Economics*, *37*(3), 668–691. doi:10.1111/j.1756-2171.2006.tb00037.x

Aronow, S., Ennis, K., & Romano, J. (2017). *The Gartner Supply Chain Top 25 for 2017 (No. 13).* Gartner Consulting. Retrieved from https://www.gartner.com/doc/3728317/gartner-supply-chain-top.

Auvray, T., & Rabinovich, J. (2017). The financialisation-offshoring nexus and the capital accumulation of US nonfinancial firms, (hal-01492373, version 1). Retrieved from https://hal.archives-ouvertes.fr/hal-01492373/

Awokuse, T. O., & Yin, H. (2010). Does stronger intellectual property rights protection induce more bilateral trade? Evidence from China's imports. *World Development*, *38*(8), 1094–1104.

Baldwin, R. E. (2012). Global supply chains: Why they emerged, why they matter, and where they are going. CEPR Discussion Papers 9103, C.E.P.R. Discussion Papers.

Baldwin, R. E. (2016). *The great convergence: Information technology and the new globalization*. Cambridge, MA: The Belknap Press of Harvard University Press.

Barlett, D. L., & Steele, J. B. (2011, November 20). Apple's American job disaster – Philly. Retrieved March 13, 2018, from http://www.philly.com/philly/opinion/20111120_Apple_s_American_job_disaster.html

Batson, R. G., & McGough, K. (2007). A new direction in quality engineering: Supply chain quality modelling. *International Journal of Production Research*, *45*(23), 5455–5464. doi:10.1080/00207540701325140

Bernard, A. B., & Fort, T. C. (2015). Factoryless goods producing firms. *American Economic Review*, *105*(5), 518–523. doi:10.1257/aer.p20151044

Blair, D., Huntsman, J., Barrett, C., Lynn, W., Gorton, S., Wince-Smith, D., & Young, M. (2017). update to the IP commission report. The Commission on the Theft of American Intellectual Property by The National Bureau of Asian Research.

Boldrin, M., & Levine, D. K. (2004). 2003 Lawrence R. Klein lecture the case against intellectual monopoly. *International Economic Review*, *45*(2), 327–350. doi:10.1111/j.1468-2354.2004.00128.x

Boyd, W. (2013). Public utility and the low-carbon future. *UCLA Law Review*, *61*, 1614–1710.

Burgess, R. (1998). Avoiding supply chain management failure: Lessons from business process re-engineering. *The International Journal of Logistics Management*, *9*(1), 15–23. doi:10.1108/09574099810805717

Caputo, M., & Zirpoli, F. (2002). Supplier involvement in automotive component design: Outsourcing strategies and supply chain management. *International Journal of Technology Management*, *23*(1/2/3), 129–159. doi:10.1504/IJTM.2002.003002

Carballa-Smichowski, B., Durand, C., & Knauss, S. (2018). *Participation in global value chains and varieties of development patterns*. (Working Paper No. hal-01817426). HAL. Retrieved from https://hal.archives-ouvertes.fr/hal-01817426

Chen, W. (2017). Do stronger intellectual property rights lead to more R&D-intensive imports? *The Journal of International Trade & Economic Development*, *26*(7), 865–883. doi:10.1080/09638199.2017.1312493

Chen, W., Los, B., & Timmer, M. P. (2018). *Factor incomes in global value chains: The role of intangibles* (Working Paper No. w25242). National Bureau of Economic Research.

Clausing, K. (2016). The effect of profit shifting on the corporate tax base in the United States and beyond. *National Tax Journal*, *69*(4), 905–934. doi:10.17310/ntj.2016.4.09

Coriat, B., & Orsi, F. (2002). Establishing a new intellectual property rights regime in the United States: Origins, content and problems. *Research Policy*, *31*(8–9), 1491–1507. doi:10.1016/S0048-7333(02)00078-1

Corrado, C. A., Haskel, J., Iommi, M., & Jona Lasinio, C. (2012). Intangible capital and growth in advanced economies: Measurement and comparative results. (Discussion Paper No. DP9061). CEPR. Retrieved from SSRN: https://ssrn.com/abstract=2153512

Davis, D., Kaplinsky, R., & Morris, M. (2018). Rents, power and governance in global value chains. *Journal of World-Systems Research*, *24*(1), 43–71. doi:10.5195/JWSR.2018.662

De Marchi, V., Giuliani, E., & Rabellotti, R. (2018). Do global value chains offer developing countries learning and innovation opportunities? *The European Journal of Development Research*, *30*(3), 389–407. doi:10.1057/s41287-017-0126-z

Dedrick, J., & Kraemer, K. L. (2017). *Intangible assets and value capture in global value chains: The smartphone industry*. Economics and Statistics Division 41. Geneva: World Intellectual Property Organization.

Dernis, H., Dosso, M., Hervás, F., Millot, V., Squicciarini, M., & Vezzani, A. (2015). *World corporate top R&D investors: Innovation and IP bundles* (Working Paper No. JRC94932). Seville, Spain: Joint Research Centre.

Dür, A., Baccini, L., & Elsig, M. (2014). The design of international trade agreements: Introducing a new dataset. *The Review of International Organizations*, *9*(3), 353–375. doi:10.1007/s11558-013-9179-8

Durand, C., & Gueuder, M. (2018). The profit–investment nexus in an era of financialisation, globalisation and monopolisation: A profit-centred perspective. *Review of Political Economy*, *30*(2), 126–153. doi:10.1080/09538259.2018.1457211

Economides, N. (1996). The economics of networks. *International Journal of Industrial Organization*, *14*(6), 673–699.

Falvey, R., Foster, N., & Greenaway, D. (2009). Trade, imitative ability and intellectual property rights. *Review of World Economics*, *145*(3), 373–404. doi:10.1007/s10290-009-0028-z

Foley, D. K. (2013). Rethinking financial capitalism and the "information" economy. *Review of Radical Political Economics*, *45*(3), 257–268. doi:10.1177/0486613413487154

Frigant, V. (2009). Winners and losers in the auto parts industry: Trajectories followed by the main first tier suppliers over the past decade. In M. Freyssenet (Ed.), *The second automobile revolution* (pp. 419–442). London: Palgrave Macmillan.

Gereffi, G. (2014). Global value chains in a post-Washington Consensus world. *Review of International Political Economy*, *21*(1), 9–37. doi:10.1080/09692290.2012.756414 doi:10.1080/09692290.2012.756414

Gereffi, G. (2018). *Global value chains and development: Redefining the contours of 21st century capitalism* (1st ed.). Cambridge, UK: Cambridge University Press.

Gereffi, G., Humphrey, J., & Sturgeon, T. (2005). The governance of global value chains. *Review of International Political Economy*, *12*(1), 78–104. doi:10.1080/09692290500049805

Ghelfi, D. (2005). The 'Outsourcing Offshore' conundrum: An intellectual property perspective. Retrieved January 25, 2019, from https://www.wipo.int/sme/en/documents/outsourcing_fulltext.html

Gibbon, P. (2008). Governance, entry barriers, upgrading: A re-interpretation of some GVC concepts from the experience of African clothing exports. *Competition & Change*, *12*(1), 29–48. doi:10.1179/102452907X264511

Gruber, J. W., & Kamin, S. B. (2015). *The corporate saving glut in the aftermath of the global financial crisis* (Discussion Paper No, 1150). FRB International Finance. doi:10.17016/IFDP.2015.1150

Guo, S. (2016). A story of convergence of IPR regimes: The IPR chapter in the China-Korea free trade agreement. *The Chinese Journal of Global Governance*, *2*(2), 164–194. doi:10.1163/23525207-12340020

Gutiérrez, G., & Philippon, T. (2016). *Investment-less growth: An empirical investigation* (Working Paper No. w22897). Cambridge, MA: National Bureau of Economic Research.

Hall, B., & Helmers, C. (2018). *The impact of international patent systems: Evidence from accession to the European Patent Convention* (Working Paper No. w24207). Cambridge, MA: National Bureau of Economic Research.

Hanel, P. (2006). Intellectual property rights business management practices: A survey of the literature. *Technovation*, *26*(8), 895–931. doi:10.1016/j.technovation.2005.12.001

Haskel, J., & Westlake, S. (2018). Capitalism without capital the rise of the intangible economy. Retrieved from http://ebookcentral.proquest.com/lib/macewan-ebooks/detail.action?docID=5131978

Haucap, J., & Heimeshoff, U. (2014). Google, Facebook, Amazon, eBay: Is the internet driving competition or market monopolization? *International Economics and Economic Policy*, *11*(1–2), 49–61. doi:10.1007/s10368-013-0247-6

Helpman, E. (1993). Innovation, imitation, and intellectual property rights. *Econometrica*, *61*(6), 1247–1280. doi:10.2307/2951642 doi:10.2307/2951642

Hermann, M., Pentek, T., & Otto, B. (2016). Design principles for industrie 4.0 scenarios (pp. 3928–3937). Presented at the System Sciences (HICSS), 2016 49th Hawaii International Conference on, IEEE, Hawaii.

Ho, C. (2015). Sovereignty under siege: Corporate challenges to domestic intellectual property decisions. *Berkeley Technology Law Journal*, *30*, 213–304.

Ho, C. (2016). A collision course between TRIPS flexibilities and investor-state proceedings. *UC Irvine L. Rev.*, *6*, 395–468.

Howcroft, D., & Richardson, H. (2012). The back office goes global: Exploring connections and contradictions in shared service centres. *Work, Employment and Society*, *26*(1), 111–127. doi:10.1177/0950017011426309

Humphrey, J. (2003). Globalization and supply chain networks: The auto industry in Brazil and India. *Global Networks*, *3*(2), 121–141. doi:10.1111/1471-0374.00053

Humphrey, J., & Memedovic, O. (2003). The global automotive industry value chain: What prospects for upgrading by developing countries. UNIDO Sectorial Studies Series Working Paper.
Irwin, (2017, June 7). The Amazon-Walmart showdown that explains the modern economy. *New York Times*. Retrieved from https://www.nytimes.com/2017/06/16/upshot/the-amazon-walmart-showdown-that-explains-the-modern-economy.html
Kaeser, J., & Gross, D. (2016, February 9). Siemens CEO Joe Kaeser on the next industrial revolution. *Strategy and Business*. Retrieved from https://www.strategy-business.com/article/Siemens-CEO-Joe-Kaeser-on-the-Next-Industrial-Revolution?gko=efd41
Kasolowsky, B., & Leikin, E. (2017). Eli Lilly v. Canada: A patently clear-cut dismissal on the facts, but opening the door for future claimants on the law. *Journal of International Arbitration*, *34*(5), 889–900.
Khan, L. M. (2016). Amazon's antitrust paradox. *The Yale Law Journal*, *126*, 710.
Lee, D., Shin, H., & Stulz, R. M. (2016). *Why does capital no longer flow more to the industries with the best growth opportunities?* (Working Paper No. w22924). Cambridge, MA: National Bureau of Economic Research.
Lee, K., & Malerba, F. (2017). Catch-up cycles and changes in industrial leadership: Windows of opportunity and responses of firms and countries in the evolution of sectoral systems. *Research Policy*, *46*(2), 338–351. doi:10.1016/j.respol.2016.09.006
Leukert, B. (2017, September 18). Digitalization, Industry 4.0 and the future of industrial production. Retrieved March 14, 2018, from https://blogs.sap.com/2017/09/18/digitalization-industry-4.0-and-the-future-of-industrial-production/
List, F. (1856). *National system of political economy*. Philadelphia, PA: JB Lippincott & Company.
Malerba, F., & Orsenigo, L. (1995). Schumpeterian patterns of innovation. *Cambridge Journal of Economics*, *19*(1), 47–65.
Mansfield, E., Schwartz, M., & Wagner, S. (1981). Imitation costs and patents: An empirical study. *The Economic Journal*, *91*(364), 907–918. doi:10.2307/2232499
Marr, B. (2017, January 23). Really big data at Walmart: Real-time insights from their 40+ Petabyte Data Cloud. Retrieved March 14, 2018, from https://www.forbes.com/sites/bernardmarr/2017/01/23/really-big-data-at-walmart-real-time-insights-from-their-40-petabyte-data-cloud/
Maskus, K. E. (2000). *Intellectual property rights in the global economy*. Washington, DC: Institute for International Economics.
Maskus, K. E., & Penubarti, M. (1995). How trade-related are intellectual property rights? *Journal of International Economics*, *39*(3–4), 227–248. doi:10.1016/0022-1996(95)01377-8
McGee, P. (2019, January 31). Robotaxis: Can automakers catch up with Google in driverless cars? *Financial Times*. Retrieved from https://www.ft.com/content/dc111194-2313-11e9-b329-c7e6ceb5ffdf
McGee, P. (2017, April 27). Germany's Mittelstand joins revolution in big data. *Financial Times*. Retrieved from https://www.ft.com/content/eef01b16-2b21-11e7-9ec8-168383da43b7?mhq5j=e2
Milberg, W., & Winkler, D. (2010). Financialisation and the dynamics of offshoring in the USA. *Cambridge Journal of Economics*, *34*(2), 275–293. doi:10.1093/cje/bep061
Milberg, W. (2009). Shifting sources and uses of profits: Sustaining US financialization with global value chains. *Economy and Society*, *37*(3), 420–451. doi:10.1080/03085140802172706
Milberg W., & Winkler, D. (2013). *Outsourcing economics: Global value chains in capitalist development*. Cambridge, MA: Cambridge University Press.
Miroudot, S., & De Baeker, K. (2014). Mapping global value chains. *ECB Working Paper*, (1677).
Mosca, M. (2008). On the origins of the concept of natural monopoly: Economies of scale and competition. *The European Journal of the History of Economic Thought*, *15*(2), 317–353. doi:10.1080/09672560802037623
Nathan, D., & Sarkar, S. (2011). A note on profits, rents and wages in global production networks. *Economic and Political Weekly*, *46*(36), 53–57.
Nordhaus, W. D. (2015). *Are we approaching an economic singularity? Information technology and the future of economic growth* (Working Paper No. w21547). Cambridge, MA: National Bureau of Economic Research.
Nunnenkamp, P., & Spatz, J. (2004). Intellectual property rights and foreign direct investment: A disaggregated analysis. *Review of World Economics*, *140*(3), 393–414. doi:10.1007/BF02665982
OECD (2015). *Digital economy outlook*. Paris: Author.

Oxley, J. E. (1997). Appropriability hazards and governance in strategic alliances: A transaction cost approach. *The Journal of Law, Economics, and Organization*, *13*(2), 387–409. doi:10.1093/oxfordjournals.jleo.a023389

Oxley, J. E. (1999). Institutional environment and the mechanisms of governance: The impact of intellectual property protection on the structure of inter-firm alliances. *Journal of Economic Behavior & Organization*, *38*(3), 283–309. doi:10.1016/S0167-2681(99)00011-6

Pagano, U. (2014). The crisis of intellectual monopoly capitalism. *Cambridge Journal of Economics*, *38*(6), 1409–1429. doi:10.1093/cje/beu025

Pagano, U., & Rossi, M. A. (2009). The crash of the knowledge economy. *Cambridge Journal of Economics*, *33*(4), 665–683. doi:10.1093/cje/bep033

Pavlínek, P. (2019). Restructuring and internationalization of the European automotive industry. *Journal of Economic Geography*, *1*, lby070. doi:10.1093/jeg/lby070

Peoples, J., & Sugden, R. (2000). Divide and rule by transnational corporations. In C. Pitelis & R. Sugden (Eds.), *The nature of the transnational firm* (pp. 174–194). London: Routledge.

Ponte, S., & Daviron, B. (2011). Creating and controlling symbolic value. In N. Bandelj & F. F. Wherry (Eds.), *The cultural wealth of nations* (p. 197). Stanford, CA: Stanford University Press.

Prasad, S., & Sounderpandian, J. (2003). Factors influencing global supply chain efficiency: Implications for information systems. *Supply Chain Management: An International Journal*, *8*(3), 241–250. doi:10.1108/13598540310484636

Rafiquzzaman, M. (2002). The impact of patent rights on international trade: Evidence from Canada. *Canadian Journal of Economics/Revue Canadienne dEconomique*, *35*(2), 307–330. doi:10.1111/1540-5982.00132

Ramioul, M., & Van Hootegem, G. (2015). Relocation, the restructuring of the labour process an job quality. In J. Drahoukopil (Ed.), *The outsourcing challenge: organizing workers across fragmented production networks* (pp. 91–115). Brussels: ETUI.

Ricardo, D. (1817). *On the Principles of Political Economy, and Taxation*, by J. Murray. Retrieved from http://books.google.fr/books?id=cUBKAAAAYAAJ

Riedel, N. (2018). Quantifying international tax avoidance: a review of the academic literature. *Review of Economics*, *69*(2), 169–181. doi:10.1515/roe-2018-0004

Rochet, J., & Tirole, J. (2006). Two-sided markets: A progress report. *The RAND Journal of Economics*, *37*(3), 645–667. doi:10.1111/j.1756-2171.2006.tb00036.x

Rodrik, D. (2018). What do trade agreements really do? *Journal of Economic Perspectives 32*(2), 73–90.

Saliola, F., & Zanfei, A. (2009). Multinational firms, global value chains and the organization of knowledge transfer. *Research Policy*, *38*(2), 369–381. doi:10.1016/j.respol.2008.11.003

Sanders, N. R. (2016). How to use big data to drive your supply chain. *California Management Review*, *58*(3), 26–48. doi:10.1525/cmr.2016.58.3.26

Satariano, A., & Burrows, P. (2011). Apple's supply-chain secret? Hoard lasers. *Bloomberg Businessweek*, *4*, 50–54.

Schmidt, E., & Cohen, J. (2014). *The new digital age: Reshaping the future of people, nations and business (1. publ. in paperback)*. London: Murray.

Sell, S. K. (2010). TRIPS was never enough: Vertical forum shifting, FTAS, ACTA, and TPP. *Journal of Intellectual Property Law*, *18*, 447.

Sell, S. K., & Prakash, A. (2004). Using ideas strategically: The contest between business and NGO networks in intellectual property rights. *International Studies Quarterly*, *48*(1), 143–175.

Shadlen, K. (2008). Globalisation, power and integration: The political economy of regional and bilateral trade agreements in the Americas. *The Journal of Development Studies*, *44*(1), 1–20. doi:10.1080/13562570701722089

Shapiro, N. (1988). Market structure and economic growth: Steindl's contribution. *Social Concept*, *4*, 72–83.

Shih, S. (1996). *Me-too is not my style: Challenge difficulties, break through bottlenecks, create values*. Taipei: The Acer Foundation.

Staricco, J. I., & Ponte, S. (2015). Quality regimes in agro-food industries: A regulation theory reading of fair trade wine in Argentina. *Journal of Rural Studies*, *38*, 65–76. doi:10.1016/j.jrurstud.2015.02.002

Stevens, G. C., Johnson, M. (2016). Integrating the supply chain … 25 years on. *International Journal of Physical Distribution & Logistics Management*, *46*(1), 19–42. doi:10.1108/IJPDLM-07-2015-0175

Sturgeon, T. J., & Van Biesebroeck, J. (2011). Global value chains in the automotive industry: An enhanced role for developing countries? *International Journal of Technological Learning, Innovation and Development*, *4*(1/2/3), 181–205. doi:10.1504/IJTLID.2011.041904

Sweet, C. M., & Eterovic Maggio, D. S. (2015). Do stronger intellectual property rights increase innovation? *World Development*, *66*, 665–677. doi:10.1016/j.worlddev.2014.08.025

Taglioni, D., & Winkler, D. (2016). *Making global value chains work for development*. Washington, DC: The World Bank.

Teece, D. J. (1986). Profiting from technological innovation: Implications for integration, collaboration, licensing and public policy. *Research Policy*, *15*(6), 285–305. doi:10.1016/0048-7333(86)90027-2

Timmer, M. P., Erumban, A. A., Los, B., Stehrer, R., & de Vries, G. J. (2014). Slicing up global value chains. *Journal of Economic Perspectives*, *28*(2), 99–118. doi:10.1257/jep.28.2.99

Ting, A. (2014). iTax-Apple's international tax structure and the double non-taxation issue. *British Tax Review 2014 No. 1*. Retrieved from SSRN: https://ssrn.com/abstract=2411297

Tokatli, N. (2007). Global sourcing: insights from the global clothing industry—the case of Zara, a fast fashion retailer. *Journal of Economic Geography*, *8*(1), 21–38. doi:10.1093/jeg/lbm035

Tørsløv, T. R., Wier, L. S., & Zucman, G. (2018). *The missing profits of nations*. Cambridge, MA: National Bureau of Economic Research.

UNICE (2000). *Intellectual property rights. Compendium of UNICE position papers*. Business Europe. Retrieved from https://www.businesseurope.eu/publications/intellectual-property-rights-compendium-unice-position-papers

USTR (2017). *2017 Special 301 report on intellectual property rights*. Washington, DC. Retrieved from https://ustr.gov/sites/default/files/301/2017%20Special%20301%20Report%20FINAL.PDF

Varian, H. R. (2010). Computer mediated transactions. *American Economic Review*, *100*(2), 1–10. doi:10.1257/aer.100.2.1 doi:10.1257/aer.100.2.1

Varian, H. R. (2014). Beyond big data. *Business Economics*, *49*(1), 27–31. doi:10.1057/be.2014.1

Von Hippel, E. (1978). A customer-active paradigm for industrial product idea generation. *Research Policy*, *7*(3), 240–266. doi:10.1016/0048-7333(78)90019-7

Wade, R. H. (2003). What strategies are viable for developing countries today? The World Trade Organization and the shrinking of "Development Space". *Review of International Political Economy*, *10*(4), 621–644. doi:10.1080/0969229031000160190 2

Wang, J. (2006). Economies of IT systems at Wal-Mart—An historical perspective. *Journal of Management Information and Decision Sciences*, *9*(1), 45–66.

Weng, Y., Yang, C.-H., & Huang, Y.-J. (2009). Intellectual property rights and US information goods exports: The role of imitation threat. *Journal of Cultural Economics*, *33*(2), 109–134. doi:10.1007/s10824-009-9095-1

Wilson, M. (2015, May 6). Wal-Mart focuses on speed, innovation with SAP's HANA technology. Retrieved March 15, 2018, from https://www.chainstoreage.com/article/wal-mart-focuses-speed-innovation-saps-hana-technology/

WIPO (2016). *World intellectual property indicators* (pp. 176). Geneva: WIPO.

WIPO (2017). *Intangible capital in global value chains (World Intellectual Property Report)*. Genève: Author.

Yang, G., & Maskus, K. E. (2001). Intellectual property rights, licensing, and innovation in an endogenous product-cycle model. *Journal of International Economics*, *53*(1), 169–187. doi:10.1016/S0022-1996(00)00062-3

Yang, Y. (2017). China pours millions into facial recognition start-up Face++. *FT.com*, November 1.

Yu, P. K. (2017). A half-century of scholarship on the Chinese intellectual property system. *American University Law Review*, *67*, 1045–1140.