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Defining and Measuring the Institutional Context of National Intellectual Property Systems in a post-TRIPS world

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Abstract

Indices that approximate for the quality and strength of intellectual property (IP) systems are commonly used as variables in empirical international management studies. However, while international IP systems have radically transformed after the implementation of the TRIPS agreement, these contextual changes have not been accounted for in existing international management research approaches. This study examines the institutional context of IP systems in the post TRIPS implementation years by conceptualizing how IP Law on the books (regulations) and IP Law in practice (enforcement) combine. This enables the identification of two new contextual categories of IP systems that have not been conceptually, theoretically, or empirically captured in existing international management research. A review of the existing literature on indices measuring different aspects of national IP systems provides insights into how to improve future theoretical and empirical international management work that aims to study the effects of the context of IP systems in the post TRIPS era.

"Few institutionalists are happy with the way we measure institutions, but many hold their noses and run the regressions anyway" (Shirley, 2013, p. 31)

1.   Introduction

The quote by Shirley (2013) in her commentary on the work of Voigt (2013) on how (not) to measure institutions, highlights the problems that researchers face when using indices that measure the quality or strength of institutions in empirical quantitative studies. Following the established approaches in institutional theory, researchers normally use such indices to proxy for the overall effect of an institution, even though these indices are often constructed to measure the quality of certain specific aspects of institutions (Shirley, 2013; Voigt, 2013). Such approaches do not allow studies to conceptually and empirically capture the actual institutional context and the potentially different effects of major characteristics of the institution in question. This approach therefore unintentionally undermines the validity of the findings of these studies. Voigt (2013) emphasizes the importance of measuring specific institutions (not institutions in general) and for indices measuring institutions to distinguish between how an institution is specified in the Law on the books (de jure) and how agents in administrative systems implement and enforce the Law in practice (de facto). In international management studies however, the measurement of political, legal, and especially Intellectual Property (IP) institutions, which are the focus of this study, are dominantly theorized to have a unified effect on the activity and behavior of firms. Most studies in the literature have consequently approximated institutions with single variables that are normally assumed to capture all aspects of an institution. This is the case even though some international management researchers have used more refined theorizations and incorporated empirically distinctive approaches for the measurement of other institutional/cultural factors, e.g. objective vs perceived measures of psychic and cultural distance (see: Hutzschenreuter et al., 2014; Håkanson & Ambos, 2010). These approaches have however not considered the recommendations of Voigt (2013) to consider the effect of objective and perceived quality

measures in the context of the effect of institutions in specific areas of economic transactions. Hence, there is a need to consider explicitly the institutional effects of Law on the books and Law in practice in the context of the type of economic transaction being examined.

In this paper we identify and review forty IP indices used in empirical studies to approximate for the effects of the quality of national IP systems.[1] We demonstrate why the transformed IP contextual landscape that emerged after the implementation of the Trade-Related Aspects of Intellectual Property Rights (TRIPS) agreement requires clearer and more focused theoretical and empirical approaches in the use of these indices to measure the effects of IP Law on the books and IP Law in practice.[2] As we illustrate in section two, we identify and highlight two new types of IP systems that emerged after the implementation of the TRIPS agreement (FT, 2015; USTR, 2015). The first new category relates to countries offering IP systems with high quality Law on the books but low quality Law in practice. The second includes countries which have poor quality Law on the books but high quality Law in practice. The existence and effects of these two new categories of the post-TRIPS international context of IP systems on international management have not been theoretically and empirically identified and tested in studies to date. This is mainly due to path dependency based on pre-TRIPS studies (researchers relying on the use of an IP index that previous international management authors in the literature also used to study the pre-TRIPS context) and the inadequate consideration of the distinct characteristics and exact qualities of the existing IP indices available. Therefore, existing studies in the international management literature use IP indices in a way that does not actually provide a relevant or appropriate

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[1] IP indices are widely used in the international management literature to study the effect of IP systems on for example: knowledge transfer and firm performance (Berry, 2015), knowledge generation within MNCs (Berry, 2014), governance of R&D alliances (Kwon, Haleblian & Hagedoorn, 2016), offshore R&D activity (Nandkumar & Srikanth, 2015), export product variety (Ivus, 2015), internal versus external development of technology (Anand, Mulotte & Ren, 2016) and the location decision of manufacturing MNEs (Bilir, 2014).
[2] The TRIPS agreement was signed by all members of the World Trade Organization and is effective since January 1st 1995 (Taubman et al., 2012).

proxy for studying the post-TRIPS context of international IP systems (Arora, 2009; Maskus, 2000). A large number of studies, for example, use the index of patent systems strength by Park (2008) to proxy for the overall effect of the quality of protection of Intellectual Property Rights (IPR). This index focuses however purely on the availability of patent Law on the books and does not account for the effectiveness of patent Law in practice in a country (Brander et al., 2017; Maskus, 2004).

This paper makes two contributions to the literature, which can help international management researchers consider the effects of the post-TRIPS landscape of IP systems and select the most appropriate indices to capture their effect. First, using the concepts of Law on the books and Law in practice, we identify and explain how two new contextual categories of IP systems evolved in the post-TRIPS landscape. This contribution enables researchers to consider these new contextual types of IP systems and tailor their theoretical frameworks and empirical approaches to explore how the two existing and the two newly identified categories of IP systems affect international management. Second, we review and analyze forty indices that measure the quality of different aspects of IP systems. We analyze the key characteristics of the IP indices and provide clear recommendations to researchers on how to select the most suitable indices to capture more accurately the exact categories of IP systems used in their theoretical models. This contribution can help researchers to avoid unintended empirical problems such as omitted variable bias when using IP indices that do not appropriately proxy for the actual post-TRIPS context of IP systems. An example of the usefulness of these two contributions is a researcher seeking to examine the major risks to the IPR of Multinational Enterprises (MNE) from the international transfer of knowledge. This requires assessment of the institutional distance in terms of the qualities of Law on the books and Law in practice in host countries. This needs: a) the development of an appropriate theoretical framework that accurately reflects the post-TRIPS institutional context of countries and b) the selection of

suitable indices that provide appropriate proxies for Law on the books and Law in practice in host countries. The contributions of this paper therefore help to improve understanding of the key factors that need to be considered when researchers theorize and empirically study the potential effects of different categories of IP systems on the IPR of MNEs. The paper also provides help in selecting appropriate indices to proxy for the quality of IP systems.

Section two of the paper discusses the contemporary context of IP systems and identifies four categories of IP systems that emerged after the implementation of TRIPS. Section three reviews the existing literature that developed indices measuring the quality of IP systems and provides recommendations on how to best utilize the existing indices in empirical studies. Finally, section four discusses the theoretical and empirical implications of this study and recommends future research directions.

2.   The evolution of the context of IP systems after the TRIPS agreement

The evolution of the quality of national IP systems over the last 20 years was strongly influenced by the World Trade Organization (WTO) and the TRIPS agreement reached during the 1986-1994 Uruguay round of negotiations. The aim of the TRIPS agreement was to introduce minimum standards of IP law and thereby reduce the obstacles to protecting IPR in cross-country economic transactions. The TRIPS agreement set out clear obligations on WTO members to provide clear and appropriate IP law. The TRIPS agreement did not however set obligations regarding the effectiveness with which IP law should be applied in practice.[3] Together with the international co-operation efforts of the World Intellectual Property Organization (WIPO), the TRIPS agreement requires and supports countries to

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[3] WTO member countries classified as developed countries were required to adopt all TRIPS legal provisions by the 1st of January 1996; developing and transition countries by the year 2000; and least developed countries have been granted an extension to comply with TRIPS by the 1st of July 2021 (WTO, 2013).

develop more balanced and effective IP systems. This has led to the strengthening of IP systems across most countries (Taubman, 2012).

The signing of the TRIPS agreement in 1995, and its implementation by all developed and most developing countries by the year 2000, significantly changed the characteristics of national IP systems (Taubman et al., 2012). Legal systems that impact cross-border transactions have two distinctive components: a) Law on the books and b) Law in practice (Halliday & Carruthers, 2007). The availability of IP law conferring property rights and formal legal process for enforcement as these appear in the statutes of a national jurisdiction is IP Law on the books, whereas the effectiveness with which third party governmental institutional actors in a country enforce allocated property rights is IP Law in practice. In most countries, TRIPS changed the context of these two institutional underpinnings of IP systems.

The breadth and scope of law on IP has expanded over the last two decades across most countries (Park, 2008) leading to a narrowing of differences in the qualities of national IP systems in terms of Law on the books. Significant variations in the Law in practice however still exist because of the way that IP laws are enforced by third party governmental institutional actors (Khoury et al., 2014). This is because the breadth and depth of law on the books in a country does not necessarily lead to the effective enforcement of the Law in practice (Keupp et al., 2012; Khoury et al., 2014; Yang & Sonmez, 2013). Countries that signed the TRIPS agreement agreed to introduce new IP related laws in order to provide a harmonized minimum level of formal legal protection for IPR. Expanding and strengthening Law on the books can be achieved by legislative reforms; however, the effective enforcement of the new Laws in practice is more difficult to achieve. Indeed, while changing formal institutional systems can normally be achieved relatively quickly, changing informal institutions is a slow process (Khoury et al., 2014; North, 1990, 2005). Informal institutions

are embedded in the norms of behavior and the social protocols used by governmental institutional actors that enforce IP laws. If these informal institutions (Law in practice) do not legitimize and support changes to formal institutions (Law on the books), problems with effectively protecting IPR can emerge. It is therefore possible that the formal and informal institutions comprising the IP system of a country can be incongruent. In some societies, informal institutions dominate the rules of the game, leading to outcomes from human transactions that are largely determined by the norms of behavior and social protocols used by economic actors (Helmke & Levitsky, 2004; Ostrom, 1990). In some countries the new IP laws introduced after TRIPS are therefore often not aligned with suitable norms of behavior and social protocols of institutional agents engaged in the enforcement of IPR (Dunning & Kim, 2007; Yang & Sonmez, 2013). In other words, the implementation of TRIPS resulted in minimum requirements for Law on the books, but did not guarantee appropriate Law in practice that ensures effective enforcement.

The effectiveness of the enforcement of Law in practice depends on the norms of behavior and social protocols used in public and private agencies including the judicial system, police, customs and excise agencies that are involved in the actual enforcement of IP (Keupp et al., 2010; Yang et al., 2008). The evolution of new norms of behavior by key actors is a slow process and may not be conducive to efficient economic transactions (North, 1990). In such cases, Law in practice can exert adverse influence on the capacity of a firm to enforce its IPR (Hillman & Keim, 1995; Yang & Sonmez, 2013). Many emerging economies such as China have recently expanded the availability and scope of Law on the books, but the enforcement of the Law in practice remains problematic because most governmental institutional actors: a) do not consider IP violations to be a priority problem, b) lack suitable underpinning by norms of behavior, and c) follow enforcement procedures which operate under social protocols that are closed or hard to access by foreign firms. These behavioral

factors increase the costs and risks associated with protecting IPR (Li & Zhang, 2007; OECD, 2009; USTR, 2015).

The importance of norms of behavior and social protocols used by governmental institutional actors related to enforcement is highlighted by Erick Robinson, chief patent counsel for Rouse, an international law firm specialising in IP. According to Mr Robinson (FT, 2015), "The Chinese government's new specialised IP courts now provide companies with an enforcement mechanism comparable to, if not better than, those in Europe and the US (…) but not all patent owners should rejoice (…) first, companies must have friends in China. In a country where everything is based on relationships, every company must have multiple levels of relationships with both government officials and influential Chinese industry leaders…". This quote illustrates the importance of how effective protection of IPR in some locations depends not only on clear and extensive Law on the books, but also on understanding norms of behaviour connected to Laws in practice. This requires an understanding of the norms of behaviour of agents involved in enforcement and being embedded in complex social protocols that influence how Law in practice works. Effective protection of IPR therefore requires Law on the books and Law in practice to work in a complementary way and be available to all IP right holders regardless of their country of origin. In this context, liability of foreignness connected to IPR arises from misunderstanding behavioural aspects of key agents that enforce the Law in practice (Khoury et al., 2014; Orr & Scott, 2008).

Given the importance of considering both Law on the books and Law in practice when assessing the effectiveness of the IP systems of countries, Figure 1 indicates four possible post-TRIPS categories of national IP systems: i) low qualities of Law on the books and Law in practice; ii) high qualities of Law on the books and Law in practice; iii) high quality Law on the books but low quality Law in practice; iv) low quality Law on the books

but high quality Law in practice. Before the implementation of TRIPS, the IP systems of countries were thought to fall into either category i) or ii). Some countries had clear assignment of Law on the books, which was assumed to be effectively enforced. Other countries had no, or limited, assignment of IP, which led to the assumption that the limited IPR were not effectively enforced. The focus was mainly on the extent and depth of Law on the books with little attention to issues related to the effectiveness of third party IP institutional actors who enforce the IPR in practice. This theoretical and empirical approach is the standard perspective in contemporary international management studies.

Two new categories of IP systems have however emerged after the implementation of TRIPS that have not been previously identified in the literature. The first new category includes countries that fully implemented TRIPS, but the effectiveness of enforcement by third party institutional actors is weak. After the implementation of TRIPS these IP systems moved from the bottom left quadrant (i) to the top left quadrant (iii) in Figure 1. The second new category includes countries where the third party institutional actors provide effective enforcement of IP rights, but these countries do not comply with the TRIPS IP Law on the books requirements or have not adopted other significant IP Law provisions and treaties such as the Patent Co-operation Treaty (PCT). These countries are found in the bottom right quadrant (iv).

-----------------------------------**Figure 1 goes about here**-----------------------------

2.1   Low IP Law on the books and Low IP Law in practice

In countries where Law on the books is unclear and lacks sufficient depth to provide clearly assigned IPR and where the quality of Law in practice is low (quadrant i), firms are likely to face significant infringement of their IP. Firms in such locations face high transaction costs and risk when seeking to identify what legal protection exists for their IPR and experience

difficulties in enforcing IP, since these can be ill defined in that market (Zhao, 2006). Suitable IP indices that indicate host countries with these characteristics can help to identify host locations where the transfer of IP rich assets poses high risk for both asserting IP and defending them by use of the legal systems in host locations.

2.2   High IP Law on the books and High IP Law in practice

In countries where the quality of Law on the books and the quality of Law in practice are high (quadrant ii), firms can anticipate a favorable climate for the protection of their IP where the infringement of IP will be effectively dealt with. IP indices that can identify host locations with such IP systems indicate where MNEs are likely to face low transaction costs and risks associated with the transfer of IP rich assets in the context of both establishing and protecting their IP (James et al., 2013; Yang & Sonmez, 2013).

2.3   High IP Law on the books but Low IP Law in practice

A new, previously unrecognized category of IP systems has emerged after the implementation of the TRIPS agreement. This category exists where Law on the books provides high quality legal protection of IPR, but the quality of Law in practice is low (quadrant iii). While firms can establish their IPR in these countries, the low quality of Law in practice means that they face high costs and risk when attempting to enforce their rights. Identification of such host locations provides guidance to where MNEs need to engage with and become familiar with the behavior of the various agents involved in the enforcement of IPR (Eden & Miller, 2004; Global Intellectual Property Center, 2009; Orr & Scott, 2008).

2.4   Low IP Law on the books but High IP Law in practice

The fourth category includes host locations that have low quality Law on the books, but provide effective enforcement of the Law in practice (quadrant iv). Such IP systems are not common as they, effectively, have IP systems which are strongly influenced by informal institutional arrangements, and have a low range and depth of Law on the books. There are examples of societies that have this type of characteristic (Helmke & Levitsky, 2004; Ostrom, 1990) and the economic areas covered by these informal institutions tend to be connected to two types of economic activities. First, such areas relate to low-level economic activities not characterised by the type of IP rich assets that MNEs often transfer across frontiers. Second, these countries may have high concentration of economic activities in a small number of industries. This can lead to underdeveloped IP legislation compared to other countries due the low quantity of Law on the books because of the limited range of industries that exists in such locations. Enforcement by agents involved with the Law in practice may however be of high quality.

2.5   Patent systems after the implementation of TRIPS in 2005

To further exemplify the development of the two new categories of IP systems after the implementation of TRIPS, in Figure 2 we plot 48 countries using the scores for the year 2005 of two indices that capture patent Law on the books (Park, 2008) and patent Law in practice (Papageorgiadis et al., 2014).[4] The mean of the Park (2008) index for the 48 countries in the year 2005 is 4.12 (out of 5) and the standard deviation is 0.48. We set the dividing line at 3.88 for Law on the books, which equals to half a standard deviation from the mean. The mean of the Papageorgiadis et al. (2014) index for the year 2005 is 6.41 (out of 10) and the standard deviation is 2.19. Following the same approach, we set the dividing line at 5.35.[5]

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[4] The characteristics of the two indices used to develop the plot are summarised in Table 1 and discussed in more detail in sections 3.3 and 3.4 of the paper.
[5] Deciding on the most suitable proxy from the variety of indices available to capture IP Law on the books and IP Law in practice and how to assign cut off points and place countries to IP system categories, will depend on

Figure 2 reveals that the 48 countries included in the plot are spread in the four categories, with the IP systems of eleven countries being positioned in the new post-TRIPS categories shown by quadrant (iii) and five countries positioned in the category shown by quadrant (iv).

------------------------------------**Figure 2 goes about here**-----------------------------

The characteristics of the patent systems of countries positioned in the new post-TRIPS' categories shown in quadrants (iii) and (iv) diverged from the traditional expectation that the quality of Law on the books and Law in practice would develop simultaneously in a non-diverging way. After the implementation of the TRIPS agreement in 2005, some countries that had offered weak Law on the books moved to quadrant (iii) as they introduced high quality patent laws but had low quality Law in practice. China, for example, increased the quality of patent laws. This is captured in the Park (2008) index which rose from 2.12 in 1995 to 4.08 in 2005. During this period, China joined almost all international IPR treaties aimed at strengthening patent Law protection, introduced a number of legislative changes to strengthen administrative and judicial procedures that cover such issues as preliminary injunctions, product patent protection, and became fully TRIPS compliant (Maskus, 2004; Yamane, 2011). Similarly, patent laws were strengthened in Argentina, raising from 2.73 in 1995 to 3.98 in 2005. In Turkey the Park index rose from 2.65 to 4.01. By 2005, both of these countries had incorporated new legislation that expanded the length of the patent term, imposed compulsory licensing restrictions, and in the case of Argentina introduced patent protection for pharmaceutical products (WTO, 2006). In terms of Law in practice however, China, Argentina and Turkey are listed in the US Trade Representative's (USTR) 301 reports

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the context of a future study. A study, for example, on the influence of IP systems in terms of high and low risk (for the combination of IP Law on the books and IP Law in practice) for the transfer of technology, may consider several dividing lines to assess the level of risk of a host country's IP system quality. The selection of the most appropriate index will depend on the context of a study such as the industries considered and a potential focus on a specific type of IP such as e.g. patents.

of 2004, 2005 and 2006, highlighting significant problems in the enforcement of IPR.[6]

Argentina and Turkey were placed in the priority watch list and China was placed in either

the priority watch list, or in the Section 306 list for monitoring.

In contrast, the patent systems of countries positioned in the new category shown in

quadrant (iv) have strengthened the quality of implementation of Law in practice, but they

have kept their patent legislative frameworks stable. The quality of patent Law in Practice in

these five countries received positive comments in USTR 301 reports. The 2005 USTR 301

report highlights the development of high quality enforcement: "Malaysia is steadily

improving its enforcement efforts, and Taiwan continues to make significant progress in

providing improved IPR enforcement" (USTR, 2005, p.5). Other 301 reports mentioned that:

"Governments, such as those of Hong Kong and Macau that implemented optical media

controls in previous years have clearly demonstrated their commitment to continue to enforce

these measures. Taiwan and Malaysia are steadily improving their enforcement as well"

(USTR, 2004, p.3).

However, while countries in quadrant (iv) offer TRIPS compliant levels of patent

laws (Jordan, Malaysia, Iceland, Taiwan), they have not expanded their patent related

legislative and administrative frameworks by e.g. adopting laws that would simplify patent

administration and enhance cooperation with foreign patent offices. Most of the countries in

this category were not members of the UPOV (International Union for the Protection of New

Varieties of Plants) treaty (Iceland, Malaysia and Taiwan). Hong-Kong, Jordan and Malaysia

have not agreed to the Budapest Treaty on the international recognition of the deposit of

microorganisms for the purposes of patent procedures and Jordan, Malaysia and Taiwan do

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[6]The "Special 301" report is a US "Congressionally-mandated annual review of the global state of intellectual property rights (IPR) protection and enforcement" prepared by the USTR (USTR, 2018). Countries included in Section 306 of USTR's 301 report, are monitored for their progress in terms of their compliance with bilateral IP agreements that are the basis for resolving an investigation under Section 301.

not take part in the Patent Co-operation Treaty (PCT) (WIPO, 2018a, 2018b).[7] Countries may choose not to adhere to these IP treaties and strengthen their IP legal systems in order to protect domestic interests.

For example, this kind of approach was evident in Malaysia in political discourses regarding the proposal for "Patents Amendment Act 2006". Mr Lim Kit Siang, the leader of the opposition party, highlighted that the TRIPS agreement gives "considerable room for different national patent laws to reflect a country's development level and priorities" (LimKitSiang.com, 2006, p.1) and argued that Malaysia should not sign the PCT agreement because it would make it easier for foreign patent owners to gain patent protection in the country. In 2005 Malaysia granted only 37 patents to residents and 2471 patents to non-residents (The Economic Planning Unit, 2006), and Lim Kit Siang contended that signing the PCT would lead to a significant increase in the number of foreign patent applications being granted (LimKitSiang.com, 2006). This, he maintained, would prevent Malaysian firms from moving up the value chain due to the need to pay royalties for accessing higher technological inputs. He particularly emphasized the potential negative impact on the domestic biotechnology industry (LimKitSiang.com, 2006). Lim Kit Siang (2006, p.7-8) suggested that "… to foster a biotechnology industry in Malaysia, Malaysia actually needs to grant as few patents as possible in Malaysia…given the low level of research and innovation at the moment, it is doubtful that Malaysians will break into the US patent market. But by making it easier to patent in Malaysia, the country's biological resources are in danger of being expropriated". This type of political resistance to sign the PCT and other treaties in Malaysia provides an example of why countries positioned in quadrant (iv) rejected or delayed strengthening the Law on the books connected to IPR in the years before and after TRIPS.

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[7] The Patent Cooperation Treaty "assists applicants in seeking patent protection internationally for their inventions, helps patent Offices with their patent granting decisions, and facilitates public access to a wealth of technical information relating to those inventions" (WIPO, 2018).

Although the five countries in quadrant (iv) provide high quality enforcement of patent Law in practice in 2005, this is connected to a lower range of patent rights compared to other countries and their legal administrative procedures are often not aligned with these of other countries. These countries therefore have low Law on the books compared to many other countries, but have high quality enforcement in terms of Law in practice.

The above discussion highlights that it is necessary for researchers to consider in their theorizing of the effects of IP systems the effect of the four different categories of IP systems in a post-TRIPS world. To operationalise such theorising requires the selection of appropriate IP indices that effectively proxy for the quality of Law on the books and Law in practice. The paper now turns to an assessment of the existing indices of IP systems to examine which indices can best be used as proxies that appropriately enable the identification and measurement of the different categories of IP systems.

3.   Review of Indices Measuring the Quality of IP Systems in the Literature

We followed the three stages of conducting a systematic literature review, as specified by Tranfield et al. (2003), to identify and review the existing literature on indices measuring the quality of IP systems: i) planning the review, ii) conducting the review and, iii) reporting and dissemination.

3.1   Planning the Review

Following Tranfield et al. (2003), a scoping study enabled: a) identification and mapping of the contemporary context of the elements of the quality of IP systems after the implementation of the TRIPS agreement, and b) briefly review the relevant empirical literature to determine the relevance and size of the literature review of indices that measure the quality of IP systems. The first aspect of the scoping study was presented in the previous

section of this paper and revealed the two new post-TRIPS categories of IP systems. The second aspect of the scoping study focused on identifying if the number of studies that developed measures for the approximation of the quality of IP systems is sufficient for a systematic review of the literature. This revealed that there are a significant number of studies seeking to provide indices that quantify the quality of IP systems that span the international management, international business, economics, law, and practitioner literatures. The diverse nature of the domain where indices measuring the quality of IP systems are published provided a way to gain the insights of academics from various disciplines as well as those of practitioners.

A review protocol to guide a systematic review informed by the scoping, identification, and mapping of the contemporary post-TRIPS context of IP systems, enabled a wider search of the literature than one focusing on one specific aspect of an IP system, such as on IP Law on the books only. This approach enabled the setting of the following research question: What are the major methods and approaches used for measuring the quality of international IP systems in the international management, international business, economics, and law in both academic, and practitioner literatures? The search for studies that provide IP indices involved those published between the years 1980-2015, and included studies independent of the length of the article and the context of publication (such as peer reviewed academic studies, book chapters, unpublished PhD studies, practitioner studies and reports). It is important to clarify that due to the inherent difficulties of developing IP indices that measure IP institutions, such as indices capturing IP norms and values, (Peng et al., 2017), many studies have used data from practitioner studies and reports. Thus, Berry (2015, 2017) and Zhao (2006) used the International Intellectual Property Alliance's (IIPA) recommendations for countries to be placed on the USTR's 301 Watch List (USTR, various

years). This review therefore included practitioner studies and reports that developed IP indices.

3.2   Conducting the Review

To identify the studies that developed IP indices we used the following keywords and search terms: "Intellectual property index", "Intellectual property score", "Intellectual property measure", "Intellectual property enforcement score", "Intellectual property protection score", "Intellectual property quality", "IP index", "IP score", "IP measure", "IP enforcement score", "IP protection score", "IP quality", "Patent system index", "Patent system score", "Patent system enforcement score", "Patent system protection score", "Patent system quality", "Copyright system index", "Copyright system score", "Copyright system enforcement score", "Copyright system protection score", "Copyright system quality", "Trademark system index", "Trademark system score", "Trademark system enforcement score", "Trademark system protection score". We developed the list of keywords and search terms following the journal keywords listed in key studies published in the literature (e.g. Park, 2008) as well as key phrases included in the introductory sections of each identified study. Searches were conducted using the databases "Web of Science", "EBSCOhost", and "Scopus", as well as the web search engine of scholarly literature "scholar.google.com" and the web search engines "www.google.com" and "www.duckduckgo.com" in order to identify IP indices published in practitioner oriented outlets.[8] Two researchers carried out the searches independently between June and July 2015.

The search identified 46 studies that relate to indices measuring IP quality published in the international management, international business, economics and law disciplines, as

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[8] The www.duckduckgo.com search engine administers web searches without tracking and without the influence of a user's past search record and geographic location, thereby showing all users the same results in the same ranking order and avoiding personalized results. In so doing, www.duckduckgo.com uses other web search engines such as "Yahoo!" and "Bing".

well as IP quality indices published by businesses and non-profit policy making

organizations. Six studies (I – VI) were eliminated from the inclusion in the review. (I) The

study by Zhao (2006) used ten secondary sources and calculated their average to categorise

the countries into a single dichotomous variable accounting for weak or strong IP strength.

Zhao (2006) however did not develop an IP index score. The approach used by Zhao (2006)

will be further discussed and expanded upon in the recommendation section. (II) Similarly,

the "international property rights index" published by the "Property Rights Alliance" includes

three IP related indices (Ginarte & Park, 1997; USTR, various years; WEF, various years)

together with 12 other variables to calculate a "property rights index" which is however not

an "intellectual property rights" index as it focuses on "property" in general and falls outside

of normal definitions of IP. The three IP related components of the "property rights index"

are separately included in this review. (III/IV) Other studies such as by Mahadevanvijaya and

Park (1999) (for the year 1995), and by Park and Wagh (2002) (for the year 2000) are

excluded since the updates to the Ginarte and Park (1997) index that they provided (for the

years 1995 and 2000 respectively), were also included in the latest updated scores of the

index by Park (2008). (V) Likewise, the moderate controls with the use of instrumental

variables applied on the Rapp and Rozek (1990) index by Maskus and Penubarti (1995) are

not discussed. (VI) Finally, the index by McCalman (2004) is not reported since the authors

only used the Ginarte and Park (1997) index in conjunction with the Corruption Perceptions

Index (CPI) index to develop index scores for forty countries, for the year 1997.

Table 1 lists the forty academic and practitioner indices published between the years

1980-2015 that attempt to quantify different aspects of the quality of IP systems. The two

different aspects of the quality of IP systems investigated in this study are Law on the books

and Law in practice and Table 1 reports the studies that are possible proxies of these two

aspects. In addition, Law in practice is further categorized into a) studies that focus on data

on perceptions of the effectiveness of patent systems and b) studies that centre on performance related data regarding the effectiveness of patent systems. Table 1 also provides information regarding the scope of IP considered (e.g. focus on patents only), the number of countries captured, and the time period covered by each of the studies.

----------------------------------Table 1 goes about here-----------------------------

3.3   Indices measuring IP Law on the books

The review found twenty-one indices with the potential for use as proxies for the measurement of the quality of Law on the books (see Table 1). Most of the measures focused on capturing the availability and scope of Law on the books provisions for different types of IP such as patents (e.g. Bosworth, 1980; Evenson, 1990; Ginarte & Park, 1997) copyright and trademarks (Reynolds, 2004), trade secrets (Lippoldt & Schultz, 2014), plant varieties (Campi & Nuvolari, 2015), and TRIPS (Hamdan-Livramento, 2009). In addition, some studies developed measures that capture the availability of Law on the books provisions related to specific industries such as the pharmaceutical industry (Liu & La Croix, 2015; Pugatch, 2006). Two studies focused specifically on measuring the availability of Law on the books provisions related to the administration process of patent applications as carried out by national patent offices (de Saint-Georges & van Pottelsberghe de la Potterie, 2012; Yang & Sonmez (2013).

The methodology followed to quantify and calculate the IP index scores is almost identical for all twenty-one studies, that is, by counting the availability (or not) of certain Law on the books provisions using dichotomous variables. Once a specific IP law is introduced in a country, it is documented in the book-law provisions and becomes available to the public, allowing researchers to collect longitudinal information about the availability (or not) of a particular law. Existing studies therefore measure the availability (1) or not (0)

of Law on the books provisions, the sum of which constitutes the overall score of each index. Given that data on Law on the books is extensively available in the legal literature, indices measuring IP Law on the books are able to cover extended time periods and develop scores for a large number of countries.

There is a possible internal validity problem with many of the existing studies because of conflating the availability/scope of laws with the measurement of the quality of law on the books. Current indices focus on the measurement of the extent of availability of IP law provisions in a given country. An inherent assumption in these approaches is that higher numbers of legal provisions related to the IP regulatory system of a country indicate a system with good quality Law on the books. The number of IP related legal provisions however does not necessarily reflect good quality Law on the books. First, using the example of software patentability that was incorporated in the latest update of the Park (2008) index, IP systems that do not provide patent rights to software inventions are not necessarily deficient or lower quality to the ones that do. This is because according to WIPO (2015) "In many countries, computer programs, whether in source or object code, are protected under copyright. The major advantage of copyright protection lies in its simplicity. Copyright protection does not depend on any formalities…", "…international copyright protection is automatic - it begins as soon as a work is created. Also, a copyright owner enjoys a relatively long period of protection, which lasts, in general, for the life of the author plus 50 or, in certain countries, 70 years after the author's death…". This suggests that while certain legal provisions (that comprise the indices in the literature) may not be present in a country, the legislative system of the country may in fact assign and protect IP rights with alternative legal provisions. Second, the availability of a high number of legal provisions in a country that are (potentially) unclearly specified, could lead to a dysfunctional IP law statute that IP owners may find difficult to navigate and operate in. In contrast, a country that has a low number of

IP laws which are clear and useful may be preferred by owners compared to the system of a country that incorporates a high number of Law on the book which are however of questionable usefulness. This is because the characteristics of relevant laws determine the quality of Law on the book in a country. Measuring the quality of Law on the books in terms of the characteristics such as clarity and ease of use of law would therefore provide a more accurate approximation of the quality of these laws. These problems can lead to attributing a high or low quality classification to the Law on the books without due reflection on whether the number and types of laws accurately capture the quality of the regulatory framework.

3.4   Indices measuring IP law in practice

We identify nineteen studies which developed indices that attempted to measure the quality of Law in practice in three ways – those that: i) utilized survey data to measure the perceptions of economic actors (involved in IP systems) regarding the effectiveness of Law in practice; ii) used reports that provide quantitative information about the IP enforcement effectiveness in a country, often including other more general secondary data as proxies of the quality of Law in practice, and iii) used a combination of the two approaches.

Ten studies used survey data to capture the perceptions of economic actors (often business practitioners) regarding the quality of Law in practice (BASCAP, 2007; EIU, 2015; IMD, various years; Lesser, 2001, 2011; Mansfield, 1994; Seyoum, 1996; Sherwood, 1997; TaylorWessing, various years; WEF, various years). Most of the studies collected survey data using a single item question to capture the respondents' perceptions using a cross-sectional (BASCAP, 2007; Mansfield, 1994; Seyoum, 1996; Sherwood, 1997) or annual longitudinal data collection approach (EIU, 2015; IMD, various years; WEF, various years). Three studies used alternative approaches by combining the data on perceptions with other proxies (Lesser, 2001, 2011; TaylorWessing, various years). Lesser (2001, 2011) used the corruption

perceptions index by Transparency International (various years) to proxy for the actors'

perceptions of Law in practice and combined it with data on the availability of a selected

number of available Laws on the books. In contrast, TaylorWessing (various years) develops

the scores of its index by combining multi-item survey data on perceptions regarding Law in

practice, with 74 instrumental variables relating to country related aspects such as the Visa

Restrictions Index by Henley & Partners, and data on GDP per capita employed by the World

Bank.[9] One problem with (mainly) cross-sectional studies in the literature is that they

received a low number of survey responses which limits the usability and meaningfulness of

the final index scores. This is the case for the study of BASCAP (2007) which published an

"IP strength" index using data originating from an IP focused questionnaire survey that

received only 48 responses from firms originating from 27 different industries in the year

2007.

Seven studies developed indices that measure the quality of Law in practice by

quantifying reports and other secondary data on IP enforcement effectiveness (Gillespie et al.,

2002; Global IP Centre, various years; Li & Yu, 2014; Ostergard, 2000; Pugatch, 2007;

Riker, 2014; Smarzynska-Javorcik, 2004). Most of the studies combined secondary datasets

that approximate for the effectiveness of IP enforcement with proxies for the quality of Law

on the books using established approaches such as the dichotomous variables (as discussed in

the previous section 3.3) or the Ginarte and Park (1997) index scores. For example,

Smarzynska-Javorcik (2004) used the Ginarte and Park (1997) index to proxy for the quality

of Law on the books and then implemented a quantified version of the qualitative

descriptions of the strength of IP systems provided by the International Intellectual Property

Alliance (IIPA) in their recommendations for countries to be placed on the USTR's 301

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[9] The number of secondary data incorporated in the TaylorWessing (various years) index has changed from 43 variables in 2008 to 74 in 2014, making direct data comparisons between the index scores of different years of the index inconsistent.

Watch List. A different approach is followed by Riker (2014) who proxied for the quality of Law in practice using data on US licensing transactions abroad. The index scores are calculated with the use of the coefficients from an OLS estimation that includes independent variables (which become components of the final index scores) such as, the kilometric distance between the US and a host country, economic development, and colonial ties.

Finally, two studies developed indices that use measures of both perceptions of economic actors regarding the effectiveness of Law in practice and reports that provide quantitative information about the IP enforcement effectiveness in a country (Papageorgiadis et al., 2014; Tobiason, 2004). Papageorgiadis et al. (2014) bring together a number of different proxies that were previously employed in the literature (such as the IP related survey data by the WEF and IMD, the secondary data by Business Software Alliance (BSA) and CPI and the approach followed to quantify the USTR 301 reports as implemented by Smarzynska-Javorcik, 2004) to develop a composite index that approximates for the quality of Law in practice for 48 countries.

The indices considered as proxies for Law in practice use a wide variety of means involving surveys of the perceptions about IP enforcement and quantification of secondary data on the effectiveness of enforcement, with two using a combination of these methods. There are possible validity issues with using such indices as proxies for Law in practice because of difficulties of adequately defining and measuring norms of behaviour and social protocols used by agents involved in enforcement. These problems include ensuring that the measures used for proxying norms and social protocols are closely related to agents that have important roles in enforcing IP (Peng et al., 2017). Furthermore, norms of behaviour and in particular social protocols connected to IP enforcement are likely to have somewhat diverse characteristics in different host locations. Studies to develop indices of Law in practice require additional work to identify measures of norms of behaviour and social protocols by

agents that are clearly applicable to IP enforcement and have validity across different countries. As in the case with indices for IP Law on the books (see section 3.3) careful selection of IP indices by consideration of their key characteristics in relation to the objectives of the research will help identifying the 'best' available indices.

3.5   Implications for designing research

Our review of the forty IP indices provides a number of implications relating to the selection of suitable IP indices that are good approximations of the quality of Law on the books and Law in practice to enable appropriate specifications for future empirical work in a post-TRIPS world. It is necessary to select indices that best capture the impact of IP systems on dependent variables according to the theoretical underpinning of studies that indicate where countries are situated in the four possible categories (identified in Section 2).

Current studies normally consider the role of IP systems as the primary independent variable of interest to test specific research questions and hypotheses, or as a control variable and therefore of secondary importance to the main focus of the paper. There are two main approaches when selecting indices to proxy for the quality of IP systems in empirical models. First, an IP index is used as a single variable to proxy for the quality of the IP system of a country. This approach implicitly assumes that both Law on the books and Law in practice are embedded in the selected index. This approach is followed by the majority of studies using IP indices in the literature and involves the use of a single variable most commonly, the index by Park (2008). Second, some studies follow the dichotomous classification of countries into weak/strong IP systems that was put forward by Zhao (2006). This approach uses the weighted average of a number of indices, blending data from different and unrelated time periods (e.g. the data for the year 1998 from the Rapp and Rozek index with the data for the year 2000 of the BSA) to create a binary variable that captures if a country has a strong or

weak IP system (Berry, 2015). The mixing of data from unrelated time periods limits the explanatory power of the binary classification since the time period covered and accuracy of contextual coverage are unclear. The classification developed by Zhao (2006) was however unchanged and used in the empirical models of other more contemporary studies to proxy for the effect of quality of IP systems.

While both approaches could appropriately capture the pre-TRIPS context of IP systems, there are some problems with these approaches. The identification of the four categories in Section 2 suggests that, the use of a single index or general binary categorization enables, at best, the capture of one aspect of the post-TRIPS context of IP systems, either the quality of Law on the books or the quality of Law in practice. The use of a single IP index in empirical investigations studying the post-TRIPS context of IP institutions therefore is appropriate only when the aim of a study has a clearly defined focus on measuring the effects of the quality of either the Law on the books or the Law in practice. Future studies seeking to consider both of these contingencies need to select indices that adequately capture both of these aspects of IP systems. Examination of the joint effect of Law on the books and Law in practice would require either an interaction between relevant IP indices, or the merging of two (or more) IP indices that are suitable to the context of a study, into a composite index that captures both aspects of the IP system.

Future research that aims to study the effect of IP systems as a primary independent variable of interest that has comprehensive coverage of all categories of the qualities of IP systems need to incorporate two IP variables in the empirical model. These should include one that proxies for the quality of Law on the books and one for the quality of Law in practice. A way of doing this would be to run an interaction model, where two IP index quality variables are interacted and the marginal effects of the moderating variable (e.g. proxy for the quality of IP Law in practice) on the other variable (Law on the books) is used

to explain the effects on the dependent variable. Incorporating the two variables in the specification captures the separate effects of Law on the books and Law in practice. This provides information on how each of these IP aspects affects international management outcomes. Investigation of the interaction effects between proxies for Law on the books and Law in practice enables identification of the effects of countries location in one of the four post-TRIPS categories of IP systems. This kind of operationalization would more accurately capture how institutions affect the IPR of MNEs and thereby on how this influences their strategies and operations. This type of approach would also respond to the calls for more accurate definition and measurement of institutions in the context of how and where agents engage in economic transactions (Shirley, 2013; Voigt, 2013).

Research aiming to approximate the effect of IP institutions as a control variable can follow two approaches. First, researchers can use one index that proxies only for one aspect of IP institutions e.g. Law in practice. In this case, the researchers would need to ensure that any discussion regarding the effect of IP systems would be specifically focused on the effect of the exact component measured and not refer to the general effect of the IP system. A study using for example the index by Park (2008) would need to explain that this index is focused on the quality of Law on the books and also provide the rationale for not controlling for the quality of Law in practice. Second, researchers can consider developing a new "universal" IP index variable that attempts to proxy for the overall general effect of the quality and strength of IP institutions. Developing a universal composite index would involve searching for the most appropriate indices that match with the time period and focus of their study (e.g. on a specific industry) and selecting indices that capture both the quality of Law on the books and Law in practice. Researchers would then need to combine the indices and develop one general IP index. This would require normalizing the data of the different indices considered for the universal composite index, using a standardization technique such as e.g. z-scores

(Papageorgiadis et al., 2014) and then decide on how to combine the data. Ostergard (2000, p.355) suggests to either consider a weighting scheme and multiply two such indices since "the multiplication…signifies that the law and the enforcement component are both necessary conditions" or add the two measures as "…the researcher may even find that the laws themselves have a deterrent effect and that the correct approach is to consider the scores additive". In the simple case of using only two indices to develop a composite universal index, such as the indices by Park (2008) and Papageorgiadis et al. (2014) used in Figure 2, the authors would need to normalize the data and then decide if one of the two indices would need to receive a higher weight compared to the other and multiply them or simply add them. The aggregation involved in such approaches may lead to a failure to capture adequately the underlying contextual institutional conditions (Shirley, 2013). The constraints presented by available data may however mean that the statistical analytical techniques that are required to be used in studies places a limit on the number of control variables. In such cases researchers should highlight possible limitations to their results.

4.   Conclusions and Implications for Future Research

This study presents how different contextual aspects of national IP systems have transformed after the implementation of the TRIPS agreement and identifies four distinct post-TRIPS categories of institutional configurations that underpin IP systems. Two of the four post-TRIPS categories of IP systems are new and their contextual implications have not been identified nor considered in existing research of the post-TRIPS period. The four categories are identified by considering the evolution and transformation of the two different components comprising a national IP system, namely the qualities of Law on the books and Law in practice. The new contextual dimension is identified in countries where the two aspects of IP systems are incongruent, such as when the quality of Law on the books is high,

but the quality of Law in practice is low. Such incongruent IP systems are identified in many emerging as well as in a few developed economies. This richer contextual understanding of IP systems permits the construction of research agendas around the influence of the different categories of IP systems on the strategy and management systems of foreign firms. This future stream of research has the potential to develop our understanding of how institutional quality and distance related to IP systems affects the direction and outcome of the internationalization processes. The analysis of IP systems using this type of contextual framework provides a means to improve the contextual setting of studies that consider the differences between the IP systems of countries and their effect on the IP decision making by MNEs (Peng et al., 2017). The first contribution of this paper therefore is the identification of the two contextual dimensions of IP systems after TRIPS which are missing from existing studies of IP systems.

The second contribution of this study originates from the review of the existing international management literature that developed indices focusing on the measurement of the institutional factors connected to IP systems. The review considers two groupings: a) indices that may be used to proxy the quality of Law on the books, and b) indices that may be used to proxy the quality of Law in practice. The review highlighted the advantages and disadvantages of existing indices and provides recommendations on how to use existing indices to capture more effectively the four categories of institutional context connected to IP systems in a post-TRIPS world. This helps future international management researchers to understand the strengths and weaknesses of existing indices that may be used to operationalize proxies for IP systems. Studies seeking to identify how the four categories of IP systems influence phenomena such as FDI flows, or the impact on cross-frontier technology outcomes, need to consider how to operationalize IP indices that capture the qualities of the two major Law components of IP systems. This requires either some kind of

interaction of indices, or the construction of a tailor made aggregate index that captures the combined effect of both Law categories. Such approaches can help to improve the rigour of empirical studies in international management by reducing problems such as omitted variable bias.

The results of this study also have important implications for policy makers and practitioners. Policy makers from national and international organizations can use this study to define the focus and select the most appropriate index to inform their studies on the effects of IP systems on e.g. FDI (see EPO, 2017), or benchmark the strength of their IP system (see Australian Government Productivity Commission, 2016). The UK Intellectual Property Office (IPO, 2017) for example uses the IP indices published by Taylor Wessing and the Global Intellectual Property Center to assess the quality of the UK's IP framework compared to other countries. Policy makers would benefit from using the findings of this study to develop a more thorough and objective benchmarking exercise that distinguishes between the Law on the books and Law in practice. This could be done by choosing more than one IP index to compare the quality of Law on the books and more than one index to compare the quality of Law in practice. This is important since although the UK patent system ranks number one in the index of Taylor Wessing (IPO, 2017) in terms of the quality of Law in practice, it ranked 15th in the index of patent systems strength of Papageorgiadis et al. (2014). Taking into consideration multiple indices that focus on specific aspects of the IP system can enable the identification of actionable policies to boost the accuracy, credibility and trustworthiness of assessments of IP systems.

Similarly, business practitioners from firms seeking to resister and exploit their IP rights internationally require the accurate assessment of the quality of the IP systems in their target countries. The IP councilors and managers of such firms can use the findings of this study to select the most appropriate IP indices to support their IP filing and investment

decisions. Managers can use the findings of the study to identify the most relevant index that could help them assess the quality of a patent system in terms of the qualities of Law on the books and Law in practice. Table 1 and the associated discussion in section 3 can be used to search the available IP indices that measure the qualities of Law on the books and Law in practice in terms of availability of clear well defined IPR and about the effectiveness of enforcement by agents in IP systems. This can help them inform their international patent filing strategy which relates to taking the decision to register or renew their patent rights in a country or portfolio of countries as well as help them decide if it would be efficient for their firm to engage in patent litigation in a specific country. These issues are important for assessing investments in foreign countries with regard to such things as entry mode, and the best organizational means to commercialize and appropriate the returns to IP assets in host countries (Ahammad et al., 2018).

Future studies using indices to approximate for the different aspects of institutions connected to IP systems need to ensure that they capture the qualities of Law on the books and Law in practice appropriately. Researchers should develop more comprehensive theoretical frameworks that delineate the effects of different contextual categories of IP systems, as well as clearly explain what is and what is not captured by the indices used to proxy for the quality of IP systems (OECD, 2008). The development of such appropriate frameworks before deciding on which index or indices to use as a proxy in studies can also help researchers to understand better what is effectively captured in the empirical estimations used in studies involving IP systems.

Research that aims to construct new indices that measure the quality of different aspects of IP systems should consider three issues. First, future studies need to develop a wider conceptual framework that clearly encapsulates the institutional underpinning of IP systems in a post-TRIPS world (OECD, 2008). Use of an appropriate conceptual framework

before deciding on the components of future indices can enable the clear positioning of the measures in the literature and help researchers to understand better what they are capturing in their empirical estimations. Second, future studies focusing on the measurement of the quality of Law on the books should consider if laws clearly define rights and provisions that enable MNEs to be able to confidently use and protect their IPR in host countries. To help develop further understanding on this, future studies could survey IP law professionals and in-house IP councilors to obtain views and perceptions on the quality of the regulative provisions and of the formal processes for enforcing these regulations. Third, future studies could aim to develop indices that are tailored to the measurement of the strength of IP systems for particular industries. This has already been done for Law on the books connected to the pharmaceutical industry (Liu & La Croix, 2015). This industry approach can be expanded to cover not only Law on the books, but also to indices focusing on Law in practice.

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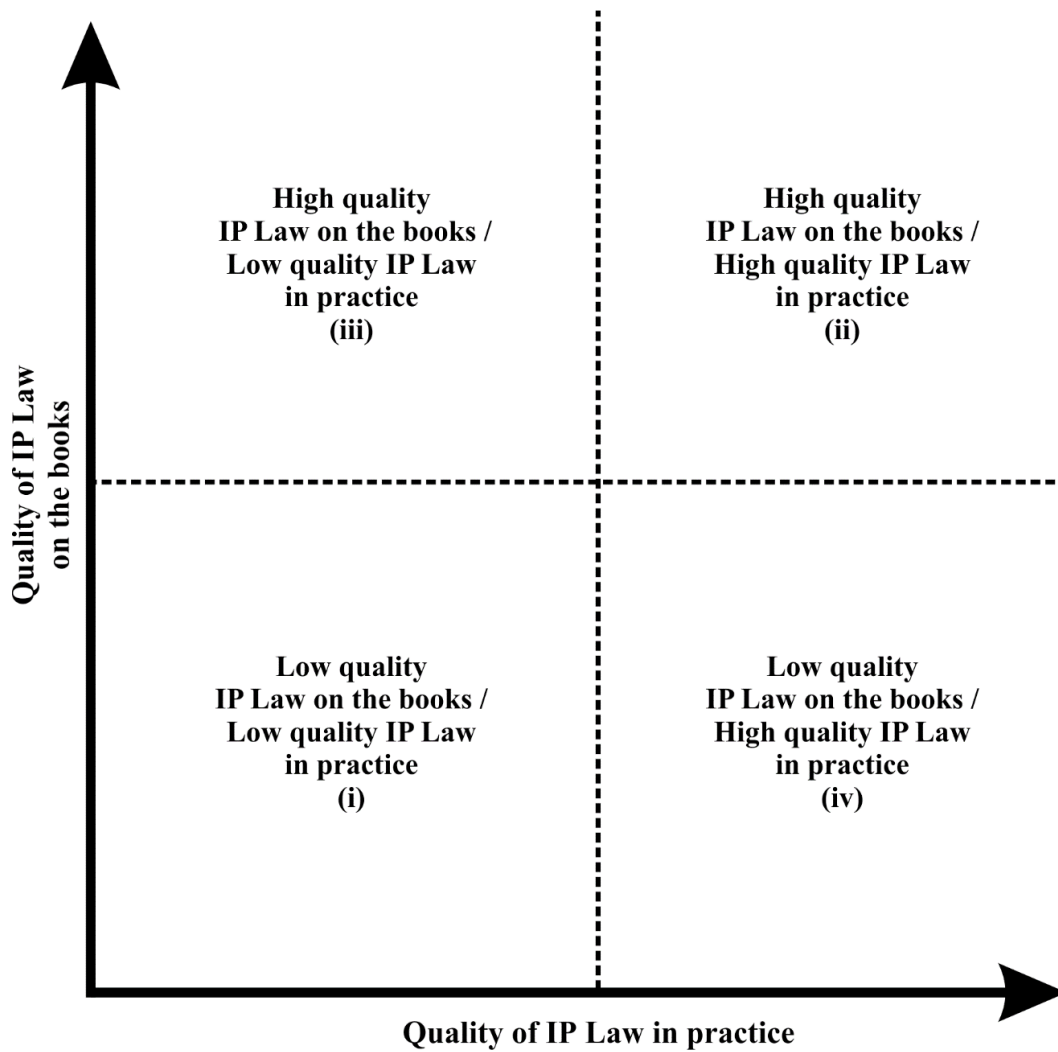
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Figure 1. The four post-TRIPS contextual categories of IP systems

High quality
IP Law on the books /
Low quality IP Law
in practice
(iii)

High quality
IP Law on the books /
High quality IP Law
in practice
(ii)

Low quality
IP Law on the books /
Low quality IP Law
in practice
(i)

Low quality
IP Law on the books /
High quality IP Law
in practice
(iv)

Quality of IP Law
on the books

Quality of IP Law in practice

Figure 2. Country plot of 48 patent systems in the post-TRIPS year 2005 using the annual

scores of two indices of patent Law on the books and patent Law in practice.
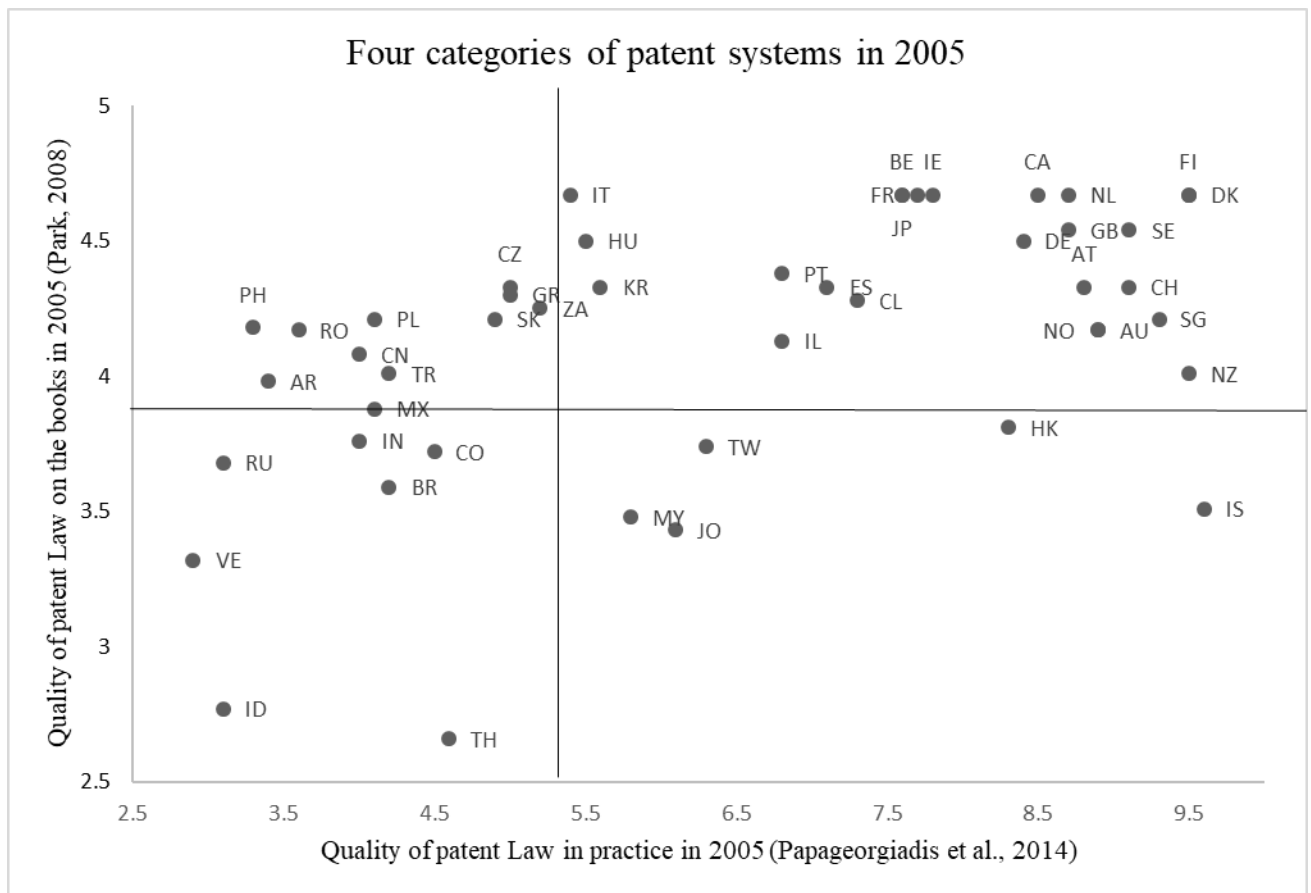
Table 1. Studies published in the 1980-2015 period that developed indices measuring the strength of different aspects of IP systems

	Author/s	Time period	Scope	Scale and Range of Index	Countries	Law in practice Perceptions of effectiveness	Law in practice Reports of effectiveness	Law on the books	Data
1	Andrés (2006)	1994, 1997 & 2000	C, S	0 (weak) to 2 (strong)	23	-	-	✓	National legislative texts
2	BASCAP (2007)	2007	IP	Favorable IP system: 0 (min) to 3.49 (strong) Unfavorable IP system: -3.49 (weak) to 0 (strong)	53	✓	-	-	Survey data on the favorableness of a country's IP environment
3	Bosworth (1980)	1974	P	Qualitative ranking	50	-	-	✓	National legislative texts
4	Burke (1996)	1984	IP	0 (not member) or 1 (member)	53	-	-	✓	National legislative texts
5	Campi & Nuvolari (2015)	1961-2011 Quinquennially	PL	0 (weak) to 5 (strong)	69	-	-	✓	National legislative texts
6	de Saint-Georges & van Pottelsberghe de la Potterie (2012)	2008	P	0 (weak) to 100 (strong)	32	-	-	✓	National legislative texts
7	Economist Intelligence Unit (EIU) (various years)	Monthly	IP	1 (weak) to 5 (strong)	150	✓	-	-	Survey of EIU's analysts on their perceptions of IP protection
8	Evenson (1990)	1990	P	Qualitative ranking	62	-	-	✓	National legislative texts
9	Ferrantino (1993)	1990	IP	0 (not member) or 1 (member)	45	-	-	✓	National legislative texts
10	Gadbaw & Richards (1988)	1987	P, C, TM, TS	Qualitative ranking	7	-	-	✓	National legislative texts

	Author/s	Time period	Scope	Scale and Range of Index	Countries	Law in practice		Law on the books	Data
						Perceptions of effectiveness	Reports of effectiveness		
11	Gillespie et al. (2002)	1980-1994	TM	Categories: a) low/ moderate/ high; b) slow/ moderate/ fast; c) neutral / pro-foreign	62	-	✓	✓	a) National legislative texts b) processing time of trademark applications by WIPO
12	Ginarte & Park (1997)	1960-1990 Quinquennially	P	0 (weak) to 5 (strong)	110	-	-	✓	National legislative texts
13	Global Intellectual Property Center (2012, 2014, 2016)	2012, 2014, 2016	IP, P, C, TM, TS	0 (weak) to 30 (strong)	30	-	✓	✓	a) National legislative texts; b) use of OECD's 2009 General Trade-Related Index of Counterfeiting of Economies (GTRIC-e) in 2014 -unclear for 2016; c) BSA. The methodology and number of variables used has changed over time (annual score comparisons cannot be made). The quantification of some variables based on qualitative data is unclear.
14	Hamdan-Livramento (2009)	1997-2007	TRIPS	0 (not compliant) to 8 (compliant)	53	-	-	✓	National legislative texts related to TRIPS compliance
15	IMD (various years)	1997-to date	IP	0 (weak) to 10 (strong)	55	✓	-	-	Survey of 4000+ business executives. Question on the perceived effectiveness of IP systems
16	Kondo (1995)	Average of 1979-1987	P	-4 (weak) to 4 (strong)	33	-	-	✓	National legislative texts
17	Lesser (2001)	1998	IP	0 (weak) to 12 (strong)	44	✓	-	✓	a) National legislative texts; b) CPI; c) presence of a webpage by a country's national IP office
18	Lesser (2011)	2009	P	0 (weak) to 12 (strong)	148	✓	-	✓	a) National legislative texts; b) CPI
19	Li & Yu (2014)	1985-2010	P	0 (weak) to 3 (strong)	1	-	✓	✓	a) National legislative texts; b) UN Human Development Indicators; c) IP case finalization rates; d) proportion of lawyers
20	Lippoldt & Schultz (2014)	1985-2010 Quinquennially	TS	0 (weak) to 1 (strong)	37	-	-	✓	National legislative texts
21	Liu & La Croix (2015)	1960-2005 Quinquennially	Pharma	0 (weak) to 5 (strong)	154	-	-	✓	National legislative texts

	Author/s	Time period	Scope	Scale and Range of Index	Countries	Law in practice		Law on the books	Data
						Perceptions of effectiveness	Reports of effectiveness		
22	Mansfield (1994)	1990	IP	0% (weak) to 100% strong)	16	✓	-	-	Survey of 100 major firms
23	Ostergard (2000)	1988, 1991 & 1994	P, C, TM	P: 0 (weak) to 5 (strong); C: 0 (weak) to 10 (strong); TM: 0 (weak) to 8 (strong); ENF: 0 (weak) to 4 (strong)	76	-	✓	✓	a) National legislative texts; b) assessment of enforcement effectiveness based on analysis of the US State Department annual publication Country Reports on Economic and Trade Practices
24	Papageorgiadis et al. (2014)	1998-2011	P	0 (weak) to 10 (strong)	48	✓	✓	-	Secondary data (WEF, IMD, USTR301, ICRG, CPI, BSA)
25	Park (2008)	1995, 2000, 2005 Quinquennially	P	0 (weak) to 5 (strong)	122	-	-	✓	National legislative texts
26	Park & Lippoldt (2008)	1990-2005 Quinquennially	P, C, TM	0 (weak) to 5 (strong)	120	-	-	✓	National legislative texts
27	Pugatch (2006)	2005	Pharma	0 (weak) to 5 (strong)	4	-	-	✓	National legislative texts
28	Pugatch (2007)	2005	IT	0 (weak) to 4 (strong)	9	-	✓	✓	a) National legislative texts; b) BSA piracy rates
29	Rapp & Rozek (1990)	1988	P	0 (weak) to 5 (strong - minimum standards)	159	-	-	✓	National legislative text comparison with guidelines proposed by US Chamber of Commerce IP Task Force.
30	Reynolds (2004)	1965-2002	C, TM	0 (weak) to 1 (strong)	145 (max)	-	-	✓	National legislative texts
31	Riker (2014)	2012	Ind, S, F, TM	0 (weak) to 3 (strong)	33	-	✓	-	US Licensing Royalty Receipts
32	Seyoum (1996)	Average 1975-1990	P, TM, C, T	P, C, TM: 0 (weak) to 21 (strong); TS: 0 (weak) to 9 (strong)	27	✓	-	-	Survey of US-educated IP experts and practitioners.

	Author/s	Time period	Scope	Scale and Range of Index	Countries	Law in practice		Law on the books	Data
						Perceptions of effectiveness	Reports of effectiveness		
33	Sherwood (1997)	1995	P,C,TM, TS	0 (weak) to 100 (strong)	18	✓	-	-	a) Interviews with legal professionals; b) author's own experience
34	Siebeck et al. (1990)	1988	P	Qualitative ranking	115	-	-	✓	National legislative texts
35	Smarzynska-Javorcik (2004)	1995	P	The Ginarte and Park score (0-5) + the IIPA score 1 (weak) to 3 (strong)	24	-	✓	✓	a) Ginarte & Park (1997) index; b) quantification of IP regime description offered by IIPA (301 Watch list)
36	TaylorWessing (various years)	2008, 2009, 2011, 2014	P, C, TM, D, DN	0 (weak) to 1000 (strong)	36 (max)	✓	-	-	a) Online IP related survey data; b) 74 instrumental variables (secondary data such as the Visa Restrictions Index by Henley & Partners, and data on GDP per capita)
37	Tobiason (2004)	1989, 1994, 1999	P	0 (weak) to 10 (strong)	50	✓	✓	✓	a) National legislative texts (treaty membership); b) presence of a webpage by a country's national IP office, c) Other secondary data (Index of Economic Freedom, IMD, USTR301, CPI, BSA, Pharmaceutical violations from PhRMA's annual report)
38	Van Kranenburg & Hogenbirk (2005)	1998	P, C	0 (weak) to 1 (strong)	44	-	-	✓	National legislative texts
39	WEF (Various years)	1996-to date	IP	1 (weak) to 7 (strong)	131	✓	-	-	Survey of 11000+ business executives. Question on the perceived effectiveness of a country's IP system
40	Yang & Sonmez (2013)	Unclear	P	0 (weak) to 1 (min standards)	88	-	-	✓	National legislative texts

Abbreviations: BSA= Software piracy rates by BSA (various years); **C**=Copyright; **CPI**= Corruption perceptions index by Transparency International (various years); **D**= Design rights; **DN**= Domain names; **F**= Film Industry; **Ind**= Industrial processes; **IP**= Intellectual Property; **IT**= Information Technology industry; **P**=Patents; **Pharma**= Pharmaceutical industry; **PL**= Plant varieties; **ICRG**= Data from the International Country Risk Guide published by the PRS Group (various years; **S**= Software industry; **T**=Trademarks; **TS**= Trade secret.