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Measuring the Implementation of Intellectual Property Rights in India

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Measuring the Implementation of Intellectual Property Rights in India

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Abstract

This paper develops a novel *de facto* intellectual property rights (IPRs) Implementation Index, which measures the strength of IPRs based on the actual implementation of IP rights in India, over the period 1970–2020. Our index improves upon existing measures, including those by Rapp and Rozek (1990), Sherwood (1997), Ostergard (2000), Ginarte and Park (1997, 2008), and the World Economic Forum. Unlike some earlier indices which omit the enforcement dimension, or which capture only *de jure* provisions on the statutes, the IPRs Implementation Index that we propose explicitly incorporates the practical enforcement of IPRs.

The index focuses on the actual implementation of legal provisions via judicial outcomes. Its construction is based on the analysis of 414 fully disposed IP infringement cases heard in Indian district and high courts, compiled from reliable judicial data sources, namely Indian Kanoon and E-Courts. Court behavior is evaluated against key provisions of the Indian Patents Act 1970 (2005), including preliminary injunctions, burden of proof reversal, case duration, and additional entitlements such as Anton Piller orders as well as cost awards. From these case-level indicators, three sub-indices are first developed for patents, copyrights, and trademarks, and then these are aggregated using alternative schemes such as equal weights, principal component analysis, and factor analysis. The final index ranges from 0 (weak implementation) to 1 (strong implementation). Using the aggregate index based on 'equal weights' for illustration, results show that India's IPRs implementation improved steadily over the study period, with the index rising from 0.06 in 1970 to 0.53 in 2020, indicating a clear transition from 'weak' to 'moderate' implementation. These trends reflect not only the legal IP reforms in India, but also reflect their execution in reality.

Analysis of sub-index dynamics shows that while all three components (i.e., patents implementation index, copyrights implementation index, and trademarks implementation

index) co-move strongly with the final IPR index (correlations > 0.80). However, their contribution to final index's variation is not uniform i.e., according to principal component analysis and factor analysis, weights of the sub-indices are near-balanced (30% to 38% approximately), with copyrights slightly stronger structurally, yet standardized OLS decomposition reveals a different pattern. Trademarks account for the largest unique share of variation (≈42%), followed closely by patents (≈39%), whereas copyrights contribute only ≈19%. This indicates that the overall index is jointly driven, but predominantly shaped by the influence of trademark and patent components.

Comparison with the Ginarte and Park (1997) patent rights index for India reveals notable divergence in both interpretation and measured strength. The GP index appears to understate India's IPR protection levels prior to 1999, while overstating them post-2000. Consequently, our IPRI index indicates relatively weaker post-2000 enforcement, even in the TRIPS era, than what is suggested by the GP index. Overall, the IPRI index presents a more calibrated and less biased representation of India's IPR enforcement trajectory.

JEL Code: O34, C43, K11

Keywords: Intellectual property rights, enforcement, *de facto* index

1. Introduction

This paper presents a novel index for the implementation aspect of intellectual property rights in India, for the period 1970 to 2020. Our index enables construction of the first *de facto* measure of the strength of intellectual property rights using objective criteria. It emphasizes moving beyond mere legal provisions or *de jure* measures to compute actual implementation or *de facto* measures. This distinction has often been made in the received literature, and researchers have attempted to proxy *de facto* measures using alternative strategies, but our study is probably the first to directly measure the implementation aspect. Smaller measurement error in estimating the strength of intellectual property protection would imply a mitigation of the attenuation bias when estimating the response of variables such as innovation, technology transfer, trade, and overall economic growth to intellectual property reform. This, in turn, is evidently crucial for effective public policy in these spheres.

Empirical studies have shown keen interest in analysing how the strengthening of the IPR regime across nations significantly influences various economic factors, such as domestic innovation (Kanwar and Evenson, 2003; Chen and Puttitanun, 2005; Kanwar and Sperlich,

2019), foreign direct investment (Javorcik, 2004; Maskus, 2000; Lai, 1998; Glass and Saggi, 2002; Kanwar and Sperlich, 2023), trade (Maskus and Penubarti, 1995; Rafiquzzaman, 2002; Ivus, 2010; Sheikh and Kanwar, 2022; Sheikh and Kanwar, 2024; Sheikh and Kanwar, 2024), licensing (Markusen, 1995; Yang and Maskus, 2001; Kanwar, 2012), and economic growth (Gould and Gruben, 1996; Gold et. al, 2019). These studies typically use quantitative measures to assess IP protection strength that emphasizes the need of a composite index which can capture key aspects of IP protection, including 'enforcement' to provide data-driven insights, and support evidence-based policymaking.

There exist a few indices which measure the strength of IP protection across countries including Rapp and Rozek (1990), Sherwood (1997), Ostergard (2000), Ginarte and Park (1997), and Papageorgiadis (2014), etc. These indices consist several issues related to measuring the strength of IP protection at various levels, which our study aims to address. First and foremost, previous studies lack to capture the aspect of implementation of IP laws in its true sense i.e., observing the actual courtroom behaviour for the provision of remedies in case of IP infringement. Rapp and Rozek (1990) index do not incorporate any 'enforcement component' which may overestimate the IP protection in some countries. Ostergard (2000) and Sherwood (1997)[1] support the idea of incorporating both the existence and implementation aspects of IPR laws. However, Ostergard (2000) used the reports from the US state department on economic and trade practices[2] to measure the enforcement of IPR laws which seems quite subjective[3]. Its enforcement component does not capture any prior judicial reviews, trial histories, or customs which does not consider how the actual laws have been applied and interpreted in real-world scenarios. Moreover, the scores for existence of laws and enforcement are multiplied to derive the IPR protection scores for each nation and each type of law which is problematic because if one component is 0 then, the entire score will be 0. The methodology of measuring IP strength is also not very clear and these indexes now have become obsolete[4]. Ginarte and Park (1997) were amongst the first to provide an objectively computed index of IPR. It incorporates the aspect of enforcement in their patent rights index but their measure is only *de jure* and not *de facto* which captures the presence or absence of legal remedies and

[1] Ostergard (2000) states the weaknesses of Sherwood (1997) and came up with an upgraded index.
[2] See the protection of intellectual property rights, under the general framework, *The report on the US State Department on economic and trade practices*, 1989, available at https://www.govinfo.gov/content/pkg/CPRT-107JPRT77259/pdf/CPRT-107JPRT77259.pdf
[3] The report comments on whether a country is on the priority watch list of the US Special 301 Report, has bad foreign relations, or is found discriminating against foreign nationals on issues related to IP, etc.
[4] Ostergard (2000) prepared a code sheet measuring the strength and execution of IPR laws. The contents of the code sheet are not very clear. Moreover, the author conducted the study only for three years i.e., 1988,1991,1994 which makes it obsolete and not helpful in capturing the post-TRIPS scenarios.

lacks to capture the implementation aspect of patent laws in the case of patent infringement. Papageorgiadis (2014) also emphasises the need for capturing implementation in its index. However, its index is also subjective and does not capture the actual implementation directly[5]. Ignoring the implementation aspect or using *de jure* measures of IPR protection instead of *de facto* measures can generate measurement error[6] which can produce 'biased' and 'inconsistent' estimates. This difference matters because a country having a complete patent law regime on the books and 0 enforcement is equivalent to having no patent laws at all (Becker, 1968; Mookherjee and Png, 1992). Our index corrects this issue by calculating the scores according to the provisions in case of IP infringement by going through actual lawsuits, details of which will be discussed later.

Second, most of the studies such as Rapp and Rozek (1990) and Ginarte and Park (1997) focus only on patent rights to measure the strength of the entire IP regime as patents are the most important IPR instruments among all. However, they overlook other instruments such as copyrights and trademarks which are also important. Our index utilizes three forms of IPR laws[7] (patents, copyrights, and trademarks) to verify the reliability and stability of the IPR protection scores over time.

Third, to combine different components of the final index, aggregation strategies used by most of the previous studies is based on simple equal weighting only. On the other hand, this study uses three different weighting strategies including equal weights, principal component analysis and factor analysis to derive varied weights for a robust final index.

Finally, none of the existing indices provide variations of IP protection across industries. Our index is the first that shows industry wise variations for India to cater industry-specific needs for IP protection which will be discussed later. The prime focus of this study is to quantitatively measure the *de facto* IPR protection for India.

1.1 Intellectual Property Rights in India: A Brief Discussion

India along with 117 other countries[8] signed the GATT Agreement at Marrakesh in Morocco on 15 April 1994 for the establishment of the World Trade Organization (WTO). With this,

[5] Papageorgiadis (2014) uses the Corruption Perceptions Index (CPI) and Special 301 Report to capture the implementation aspect. Where, CPI is based on interviews and surveys, risks bias, while the Special 301 Report, despite assessing IP enforcement, is US-centric and lacks transparency.
[6] The measurement error (e_1) can be positive or negative.
[7] Ostergard (2000) also utilizes these three forms of IPR laws.
[8] Later in 1999, WTO had 135 countries as its members. Currently, WTO has 164 member countries. See, *World Trade Organization (WTO) Countries 2023*. (n.d.). Retrieved 25 October 2023, from https://worldpopulationreview.com/country-rankings/wto-countries

India became obligated to implement TRIPS agreement as a member signatory. A Patent Bill, 1995 was introduced with the establishment of the 'mail-box provisions', under which pharmaceutical and agrochemical product patent applications must be accepted that were filed during the TRIPS transition period to review later for the grant. Moreover, Exclusive Marketing Rights (EMR)[9] must be granted to those patent applications under the mail-box which receives marketing approval before a decision on the patent grant for up to five years or until a decision on a product patent is granted or rejected, whichever occurs first (WTO, 1997). A Patent Bill, 1995 was introduced in March 1995 in the Lok Sabha (i.e., the lower house of Parliament) but defeated in the Rajya Sabha (i.e., the upper house of parliament). This leads to the Patent Ordinance, which also had a limited life under the constitution and lapsed later on. Due to this failure of not implementing the basic requirement of EMR and mail-box provision, USA filed a case against India (U.S. vs India, DS50, n.d.)[10] in the WTO dispute settlement body in 1997 for not following TRIPS regulations properly. This resulted into the Patent Amendment Act of 1999 which provides EMR to the product patent applicants. This is followed by the Patent Amendment Act of 2002 which introduced some notable changes such as increase in the term of patentability to 20 years. India also committed to two major international IP agreements, Paris Convention for the Protection of Industrial Property (1998), and Patent Cooperation Treaty (PCT)[11] (1998) which allows for patent protection in many countries by filing one international patent application. With the enactment of the Patent Amendment Act 2005, India became fully compliant with TRIPS.

India encountered the majority of the effects of the tightening of IPR laws (mainly patent laws) on its manufacturing sector, particularly within the food, drug, and pharmaceutical industries due to the high dependency of these sectors on patent protection. The Indian pharmaceutical sector was worth around $4.3 billion[12] in 2003-04. After the allowance of product patents[13], selling and manufacturing generic copies of drugs became illegal that reduced the revenue options for the Indian pharmaceutical industry and arose a negative sentiment in the Indian drug market (Grace, 2004). However, Indian firms changed their

[9] Exclusive Marketing Rights (EMRs) are privileges granted to the applicants of product patents that allow the applicants to sell or distribute the substance mentioned in their patent applications.
[10] See, DS50 (n.d.) at https://www.wto.org/english/tratop_e/dispu_e/cases_e/ds50_e.htm
[11] See Patent Amendment Act 2002, page 3, paragraph 6, available at the IP India website https://ipindia.gov.in/writereaddata/Portal/IPOAct/1_39_1_patent-amendment-act-2002.pdf
[12] The statistics is available on the Intercontinental Medical Statistics (IMS data) website, at https://www.iqvia.com/insights/the-iqvia-institute/available-iqvia-data/ims-health-market-research-and-reports-repository
[13] The first pharmaceutical product patent issued under India's new patents regime was granted in March 2006 to Hoffman-La Roche for its Hepatitis C therapy under the brand name Pegasys. See, Barnard, D. L. (2001).

strategy by increasing the investment in R&D, focusing more on product innovation, and shifting their focus to exporting to more profitable and regulated markets like the US and Western Europe (Grace, 2004). Figure 1 illustrates the R&D intensity[14] and average R&D expenditure of the Indian pharmaceutical industry from 2004 to 2023. It can be seen that overall, the average R&D expenditure of pharma gradually and significantly raised from INR77.86 million in 2004 to around INR 600 million in 2023 which is almost 8 times. It also shows that the R&D intensity of pharma has almost doubled from 6.5% in 2005 to 12.6% in 2017, after which it stabilizes. Figure 2 shows the trends of total patent applications and grants in India from 1995 to 2021 (WIPO, 2023)[15]. It shows a gradual and remarkable rise in applications from 8,538 in 2000 (right after the provision of EMR for product patents) to 61,573 in 2021, which is almost 7 times more. Whereas, total patent grants started to increase somewhere around 2004 onwards and moved parallel to the total patent applications, with two peaks in 2008 and 2020 with 16,061 and 30,721 patent grants, respectively. This suggests that the external push of having strong IPR laws helped India to take the ladder of innovation which in turn helped firms to generate more profits and growth.

2. Related Literature: Intellectual Property Rights Indices

Majorly there are three types of literature in the indexing of IP rights strength. Each type shows an improvement over the previous type and this shift makes the importance of measuring the implementation aspect more unambiguous in the calculating measures of the strength of intellectual property protection. First type of literature includes indices such as Rapp and Rozek (1990) which are deficient on the count of even in a *de jure* sense. While, there are second types such as Ginarte and Park (1997) which do try to account for enforcement measures but are deficient in a *de facto* sense.

There is a third type of literature that attempted to address the issue of incorporating the execution of IPR laws by employing some of the indirect methods. These studies include Becker (1968), Mookherjee and Png (1992), Kanwar (2012), Hu and Png (2013), etc. Hu and Png (2013) modified by taking the product of the Ginarte and Park index and Fraser's index[16]. They have taken this formula based on the argument of papers by Becker (1968), and Mookherjee and Png (1992). Kanwar (2012) on the other hand, used the area 2 subindex,

[14] R&D intensity is calculated as the ratio of total R&D expenditure to the last year's total sales ratio.
[15] Estimates of patent filings in India is obtained from the WIPO database (July 2023) at https://www.wipo.int/ipstats/en/
[16] The Frasers Institute's Economic Freedom of the world Index measures the degree of Economic freedom of countries.

developed by Gwartney, Lawson, and Norton (2008)[17] to modify the Ginarte and Park's index for their study. The author added area 2 subindex to GP index which is a better approach than Hu and Png (2013) because of its additive nature. Multiplication makes the entire score 0 even if only one of the components is 0. There exist some other important indices that measure the innovation capacities of countries such as the Global Competitiveness Index (also known as the World Economic Forum Index) and the Global Innovation Index which are also worth mentioning.

However, these studies still fall short of a direct approach that can capture the true essence of implementation. The latter involves the study of court outcomes in case of intellectual property disputes evaluating whether the laws are actually being enforced in trials by examining the courts, the process of litigation, and other relevant factors. Our study attempts to bridge this research gap in the literature. It is the first study which attempts to develop a *de facto* index capturing the dimension of implementation of the standard TRIPS recommended IP rights in the specific context of India.

3. A New Implementation Index

This study presents a novel *de facto* IPR Implementation (IPRI) Index reflecting variations in the execution of intellectual property right laws in India from 1970 to 2020[18] on a quinquennial frequency. The final IPRI index is a weighted average[19] of the three distinct sub-indices namely the Patent Implementation Index, Copyright Implementation Index, and Trademark Implementation Index representing the three most important instruments of intellectual property rights i.e., Patents, Copyrights, and Trademarks respectively.

To create the IPRI Index, a comprehensive database is compiled from IPR infringement lawsuits heard in Indian courts, including District and High Courts. The collected lawsuits are first categorized into patents, copyrights, and trademarks, and analyzed every five years from 1970 to 2020. This database encompasses various details for each collected lawsuit based on the legal provisions such as the grant and pace of preliminary injunction, burden of proof reversal, other reliefs granted, duration of the suit, origin of plaintiffs and defendants,

[17] Gwartney, Lawson, and Norton (2008) measure various facets of a nation's enforcement environment such as, the execution of legal contracts, the autonomy of the judiciary, court impartiality, etc.,

[18] The reason for choosing this timeline is because 1970 is the year when the major act in intellectual property rights i.e., the Patents Act of 1970 was enacted. This timeline also includes the year of TRIPS inclusion. Moreover, the data on the legal search engines for IP infringement cases is available from 1970 onwards. Details related to legal search engines are mentioned later in the paper.

[19] Weighting strategy is discussed in the later sections.

jurisdiction and related industry of the infringed product or service, settlement issues, and final verdicts which is scored accordingly.

The underlying data pertain mainly to the provision of remedies under the Indian intellectual property rights infringement laws. Let us first discuss the available remedies in case of patent rights, copyrights and trademark infringement.

3.1 Legal Remedies in Patent Rights Infringement Trials

According to section 108(1) of the Indian Patents Act 1970 (2005)[20], the major remedies[21] available against the infringement of patent rights are (i) Injunction[22], (ii) Provision of damages or accounts of profit, (iii) Anton Piller order i.e., search and seizure of infringed goods, and (iv) Cost entitlement. Let us discuss them one by one for better understanding.

3.1.1 Injunction

Injunction, in general is a preventive remedy that can be granted at any time by the court to stop the continuation of any wrongful course of action done by the infringing party to prevent any further injury to the plaintiff (i.e., the person who files the suit in court in the first place), and remains in force until further orders of the court or specified time (Fiss, 1978). This is a very basic but very effective remedy that is granted not only in the case of infringement of intellectual property but in many other scenarios as well. Such as, restraining a party from refiling the suit in territory having no jurisdiction to hearing the case *(Manohar Lal Chopra v. Rai Bahadur, 1961)*[23]; for restraining defendant from making misleading and disparaging advertisements that slandered the plaintiff's product *(Havells India Ltd. vs Eveready Industries India Ltd., 2015)*[24]; restraining defendant from using plaintiff's license without his permission *(A.P. State Electricity Board v. Mateti S.V.S.Ramachandra Rao, 2015)*[25]; restraining defendant when an injury to the plaintiff concerning the immovable property in dispute can be caused *(Mr. Manish Bhandari v. Mr. Harish, 2021)*[26]; and more.

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[20] The Patents Act (1970) amended after the Patent Amendment Act (2005), is written as Patents Act 1970 (2005).
[21] See, Section 108 (1) of Patents Act 1970, available at https://indiankanoon.org/doc/425768/
[22] See, "*Injunctions and its types*" at https://districts.ecourts.gov.in/sites/default/files/Subject%20-%20III.pdf
[23] *Manohar Lal Chopra vs Rai Bahadur (1961), 1962 AIR 527, 1962 SCR SUPL. (1) 450, AIR 1962 SUPREME COURT 527, 1963 ALL. L. J. 169, at* https://indiankanoon.org/doc/5192/
[24] *Havells India Ltd. vs Eveready Industries India Ltd., 17 Mar 2015,* https://indiankanoon.org/doc/91815858/
[25] *A.P. State Electricity Board vs Mateti S.V.S.Ramachandra Rao, 1 Jul 2015,* *https://indiankanoon.org/doc/97532154/*
[26] *Mr. Manish Bhandari vs Mr. Harish, 25 Feb 2021,* https://indiankanoon.org/doc/110025096/

Broadly, injunctions are of two types[27], one is 'preliminary injunction' which is also known as 'temporary' or 'interlocutory injunction', and the other one is 'permanent injunction' also known as 'perpetual injunction'. A preliminary injunction in general is a relief issued to the plaintiff to restrain the defendant(s) temporarily from using, selling, distributing, or manufacturing the infringed items till the pendency of the lawsuit (Shapiro, 1992). While, a permanent injunction can restrain the defendant permanently from using, selling, manufacturing, distributing, or exporting the infringed items after the final adjudication (Shapiro, 1992). Additionally, procedural law governing civil suits in India also allows courts to grant 'ex-parte injunctions', a temporary injunction that can be granted without giving notice to the defendant, in cases of urgency where delay in granting the injunction would result in irreparable harm to the plaintiff[28] (Verma, 2004).

Article 50 of the TRIPS agreement provides power to the Indian judicial system to grant a preliminary injunction in case of IPR infringement (Verma, 2004). It is a significant enforcement mechanism (Ginarte and Park, 1997) from both traditional as well as efficiency viewpoints (Brooks and Schwartz, 2005). The traditional viewpoint suggests that it can act as a 'barrier to infringement' till the pendency of the suit to maintains the 'status quo' between the parties. i.e., it binds both parties against altering the current situation of the ownership of the intellectual property till the lawsuit ends. On the other hand, the efficiency point of view states that it can promote efficient behavior from the defendant's end by working as a 'stick' and 'carrot' to bring efficiency to his actions. Stick is the punishment to infringement and damages that the defendant has to pay if he violates the court orders[29]. On the other hand, 'carrot' is the reimbursement of the compliance cost if the defendant prevails at the end of the lawsuit.

Studies such as Morrison (1990), Shapiro (1992), Lemley and Volokh (1998), Brooks and Schwartz (2005), and Newman (2014) state that there exists a four-step test factors to determine the grant of a preliminary injunction. First, prima facie establishment of infringement by the plaintiff which states that to get injunctive relief against the defendant, a plaintiff must prove the occurrence of the credible and sustainable infringement of his patented product/ process by showing some sort of evidence such as advertisement related to the sale of infringed item, etc. In *Gujarat Electricity Board, Gandhinagar v. Maheshkumar and Co. (1982)*, the Apex Court defines prima facie case as, "*Prima facie case means that the Court*

[27] See, Injunctions: Types & Process - Lawyer for Injunction - 9310411779 (centurylawfirm.in)
[28] See, Using Ex-Parte and Ad-Interim Injunctions to Enforce Trademark Rights in India (sc-ip.in)
[29] Violating court orders or Contempt of Court' is a willful disobedience of any judgment given by the court. See, Contempt of Court Act (1971), at https://indiankanoon.org/doc/1396751/

should be satisfied that there is a serious question to be tried at the hearing, and there is a probability of Plaintiff obtaining the relief after the trial on the basis of the material placed before the Court. A Prima facie case is a substantial question raised bona fide which needs investigation and a decision on merits. The Court, at the initial stage, cannot insist upon a full proof case warranting an eventual decree"[30]. Moreover, the plaintiff needs to prove his patent's validity, if challenged by the defendant[31]. Establishing the prima facie case reflects that the plaintiff is more likely to win at the end of the full trial (Brooks and Schwartz, 2005).

The next step is for the plaintiff to prove that s/he will have irreparable harm that can't be compensated through any monetary means if an injunction is not provided. For example, loss of brand value, reputation, plaintiff's intrinsic value, customer base, trust, etc. In *Garware-Wall Ropes Ltd. v. Mr. Anant Kanoi and Ors. (2015)*, the Gujarat High Court explained irreparable harm, "*Principle of irreparable injury means which of the parties is likely to suffer mischief of injury if the injunction is granted or refused, the irreparable injury should be one which cannot be repaired or cannot be compensated in terms of money*"[32]. For example, in *M/S Bikanervala v. Grand Bikaner (2010)*, plaintiff's goodwill was hampered by the defendant, which was considered a cause for irreparable harm by the Delhi district court[33].

Third, the balance of convenience should be in favor of the plaintiff which means that the harm to the plaintiff should be more in case an injunction is not provided as compared to the harm to the defendant otherwise. It reflects the inconvenience to the parties and an injunction needs to be provided to balance their conveniences (Brooks and Schwartz, 2005). For example, in the case of *Moonshine Tech. Pvt. Ltd. v. Tictok skill Games Pvt. Ltd. and Ors. (2022)*, the Delhi High Court declared the balance of convenience in favor of plaintiff because his trademark "Baazi" is infringed by the defendant along with other services in his online game "WinZoBaazi", which created confusion among public[34]. So, in case, if injunction was not granted, then plaintiff would be more harmed as compared to the defendant, if it was granted.

Last condition to check is whether the 'public interest' remains intact or not, in case an injunction is granted to the plaintiff. If the grant of an injunction causes inconvenience or loss

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[30] *Gujarat Electricity Board, Gandhinagar vs. Maheshkumar and Co., 25 Mar 1982, AIR1982GUJ289, (1982)2GLR479, AIR 1982 GUJARAT 289* https://indiankanoon.org/doc/1908062/

[31] If somebody has an old enough patent (for more than 6 years) and have a goodwill attached to it, then a judge can easily approve the validity of the patent. Otherwise, an expert is required (Shapiro, 1992).

[32] *Garware-Wall Ropes Ltd. v. Mr. Anant Kanoi and Ors., 20 Mar 2015*, https://indiankanoon.org/doc/41495724/

[33] *M/S Bikanervala vs. Grand Bikaner, June 4, 2010*, at https://indiankanoon.org/doc/15045132/

[34] *Moonshine Tech. Pvt. Ltd. v. Tictok skill Games Pvt. Ltd. and Ors.*, (*2022), 31 Jan 2022,* https://indiankanoon.org/doc/137837776/

to a large part of public, then it is preferred not to grant an injunction. In this situation, social welfare remains above the welfare of plaintiff and instead of injunction, a compensation can be provided (Shapiro, 1992). This test factor is usually observed in case of useful drugs or inventions that can affect a large part of population. For example, in *Novartis Arg. Ltd. v. Cipla Ltd., (2015),* Cipla was found producing the illegal generic "Indacaterol" of the patented drug "Onbrez" of Novartis to treat chronic obstructive pulmonary disease[35]. It was also found that the price of the generic was about one-fifth of the price of "Onbrez" and it also captured the demand of a large part of the Indian market which made the Delhi High Court to not provide an injunction in the interest of public[36].

One thing to note here is that public interest is rarely considered, when the parties' businesses are big enough to affect a huge chunk of the public. On the contrary, a prima facie condition must always be satisfied by the plaintiff to establish the case in court. So, the remaining factors, i.e., balance of convenience and irreparable harm, are the two major deciding factors to get an injunction in any IP infringement case (Brooks and Schwartz, 2005).

3.1.2 Damages and Accounts of Profits

Section 108(1) of the Indian Patents Act 1970 (2005) states the provision of 'damages' and 'accounts of profits' where any one of them can be claimed in case of infringement but not both. Damages are usually provided as a remedy to 'compensate' the IP holders for the loss caused from infringement. They are basically the difference between the expected profits that the IP owner would have earned in case of no infringement and the actual profits earned in case of infringement (Brennan and Hennessy, 2001). Its calculation includes factors such as loss of sales, loss of economies of scale, loss of income from licence, reputational loss, etc., (Brennan and Hennessy, 2001).

In *M/S Reino Industrial Organics Pvt. Ltd v. M/S Refnol Resins & Chemicals Ltd. (2015),* Delhi District court stated that the concept of damages is not limited to compensatory damages alone[37]. As litigation evolved from early 1900s, three kinds of damages came into picture including, nominal damages, exemplary or punitive damages and compensatory damages. Punitive damages serve as a deterrent, discouraging the offender and others from engaging in similar illegal activities. On the other hand, nominal damage is a small amount

[35] *Novartis Arg. Ltd. vs. Cipla Ltd., (2015), 9 Jan. 2015,* https://indiankanoon.org/doc/68879740/
[36] Cipla was restrained only till the time it got the compulsory license to sell the copies.
[37] *M/S Reino Industrial Organics Pvt. Ltd vs M/S Refnol Resins & Chemicals Ltd., 31 Jan 2015, https://indiankanoon.org/doc/4534721/*

given to the plaintiff to show that s/he was correct but incurred no considerable harm. Damages are generally compensatory in nature and need to be calculated precisely with the help of accountants, if needed (Brennan and Hennessy, 2001).

Accounts of profit is an alternative remedy to damages. There is a difference between both the two, damages are calculated based on the lost profits of the plaintiff while accounts of profit are calculated based on the profits earned by the infringer from infringement (Blair, 1997; Brennan and Hennessy, 2001).

3.1.3 'Anton Piller' Order

An Anton Piller order is a remedy which allows the plaintiff to search the premises of the defendant and seize any infringement evidence without prior notice to the defendant. These orders are relevant for preserving evidence of intellectual property infringement (Ng, 1997).[38] According to Section 108 of the Patents Act 1970 (2005), a court can order the seizure, forfeiture, or destruction of the infringing goods and related materials without any prior notice to the defendant and for this the court appoints a local commissioner.

3.1.4 Cost Entitlement

A court can return the cost of the court proceedings such as court fee, attorney's fee or fee paid to any local commissioner back to the plaintiff after the final adjudication (Pincus, 1991). This entitlement of cost helps to relieve the plaintiff from the burden of cost incurred in the court proceedings. However, this payment is generally very nominal or insufficient.

There is no specific provision of cost entitlement in the Indian Patents Act, 1970 but there are other acts such as Court-fees Act, 1870 which is a separate legal enactment governs and regulates the fees in legal matters including patent, copyrights and trademark infringement.

In addition to the above-mentioned reliefs, section 104A of the Indian Patents Act 1970 (2005) provides another important relief, namely 'burden of proof reversal', which was directed by Article 34 of TRIPS for helping the process-patent owners in case of infringement (Straus, 2000).

[38] The order was named after an English case Anton Piller KG v. Manufacturing Processes Limited (1975) (Sahai and Bora, 2008).

3.1.5 Burden of Proof Reversal

Generally, the initial burden of proving any infringement lies on the plaintiff[39], but a court can shift this burden from the plaintiff to the defendant, in case of process patent infringement (Chawla, 2015). It is because usually process patents are technical in nature and infringement is not easy to prove without the help of a field expert. Some examples of this field are the patenting of microorganisms, non-biological, and microbiological processes (Dhawan and Saxena, 2020).

This shifting of the burden acts as a strong 'enforcement mechanism' for patent rights protection, as it eases the procedure of litigation for the plaintiff when it includes difficulty to prove infringement in the first place (Ginarte and Park, 1997).

Section 104A of the Patents Act 1970 (2005), states the provision of the 'burden of proof reversal' under process patent infringement cases. However, in some of the product patent cases, under certain circumstances, the burden of proof can also be reversed. Such as, in the case of large-scale equipment, for example, engines, aircrafts, etc., where the allegedly infringed products are not easy to obtain from the market through the regular mode because of i) the high price of the large-scale product; ii) some of infringed product and its equipment might be custom-made, which makes it difficult to purchase directly from the market through regular channels, and iii) when the equipment is directly controlled by the accused infringer[40] (Schwartz and Seaman, 2012)[41]. It can also be granted in case the structure or appearance of the infringed product is different but its features are same as the original one. For example, an infringed motor may look different but its functions are the exact same.

3.2 Legal Remedies in Case of Copyright Infringement

In India, the repercussions of copyright infringement are quite stringent. The consequences of copyright infringement can be categorized into four main areas. The first area is civil damages. Section 55 of the Copyright Act 1957[42] states that the owner of the copyright can seek reliefs similar to patent infringement by way of injunctions, compensations, and accounts for profit rendition for any losses incurred as a result of the infringement. Second, the law states that the

[39] Some of the examples of the 'proof of infringement' that can act as evidence in the court are advertisements related to the infringed product, a website's detail where the product is flashed for sale in the market, or the product itself can act as evidence if bought directly from the market under the defendant's name, etc.
[40] See, "*Patent Infringement in India*" by Rana, 2012, on SS Rana & Co., at https://ssrana.in/articles/patent-enforcement-in-india/
[41] Also see, https://www.managingip.com/article/2a5bxi588dmdriyv8eq68/allocating-the-burden-of-proof
[42] See Copyright Act (1957), available at https://lddashboard.legislative.gov.in/actsofparliamentfromtheyear/copyright-act-1957

person who infringes the copyright can face criminal prosecution. Third, a monetary fine may be imposed to redress the copyright infringement. According to section 63 of the Copyright Act 1957, if any individual is found guilty of copyright infringement, he could be fined an amount not less than Rs. 50,000 and up to Rs. 200,000. Fourth, there is provision for imprisonment for violation of the copyright laws. Section 63 of the Copyright Act states that the guilty party can face a jail term of not less than 6 months and up to three years. For repeat offenders, the minimum sentence is one year of imprisonment. Section 63A states that these penalties can be increased if the infringement is repeated subsequently.

Apart from these civil and criminal remedies, there exist remedies for the seizure and destruction of the infringed items, as well as entitlement of the cost to the plaintiff. Section 64 of the Copyright Act, makes provision for Anton Piller orders, and Article 3 of section 55 provides the relief of cost entitlement.

3.3 Legal Remedies in Case of Trademark Infringement

Section 135 of the Trademark Act 1999[43] states the major remedies available against the infringement of trademarks in India. These are discretionary rights that include: (i) Injunctions, including preliminary injunctions to restrain the defendant from using the trademark till the disposal of the suit and disposing of any asset that can affect the plaintiff's ability to recover the damages; (ii) Damages or account of profit; (iii) Anton Piller orders i.e., search and seizure of the infringed goods; and (iv) Cost entitlement. The civil remedies provided in the case of copyright and trademark infringement cases are the same as the remedies provided in the case of patent infringement. However, the burden of proof reversal is not a provision in case of copyright and trademark infringement. Hence, it is not considered in the construction of the copyright and trademark implementation indexes.

There is also a provision of criminal remedies in case of copyright and trademark infringement. However, since sufficient data related to criminal remedies is not available, these are not considered in the construction of the copyright and trademark implementation indexes.

3.4 Factors underlying construction of sub-indices

Based on these legal remedies, the underlying factors that we propose for the construction of the three sub-indices i.e., Patent Rights, Copyrights and Trademark Implementation Indices are as follows:

[43] See Trademark Act (1999), available at https://ipindia.gov.in/writereaddata/Portal/ev/TM-ACT-1999.html

1) The provision of a preliminary injunction, which indicates whether the preliminary injunction is granted or not in a lawsuit;
2) The pace of delivering a preliminary injunction in patent infringement cases, indicates the time (in months/years) taken in the grant of preliminary injunction during a lawsuit;
3) Conversion of a preliminary injunction, states the rulings in which a preliminary injunction converted in the final adjudication of lawsuit. Since, preliminary injunction is an interim relief, at the end of the full trial the court may either give orders to convert it into a permanent injunction (with or without the provision of damages/ compensation), substitute it with a monetary compensation, or vacate it altogether.
4) Burden of proof reversal[44], which indicates whether the burden of proof is shifted onto the defendant or not;
5) Anton Piller orders, indicates whether the search and seize orders are granted in a lawsuit or not;
6) Cost entitlement, indicates whether the court fee, attorney fee or any other kind of fee is entitled back to the plaintiff or not; and
7) Duration of entire lawsuit, indicates the number of years a lawsuit took to get final judgement or final disposal from court.

For convenience, we have grouped all the like factors together under the broad categories as depicted in Figure 3. The four broad categories considered under the PRI Index are:

(i) Preliminary injunction - measured as the unweighted sum of the scores for provision of a preliminary injunction, pace of grant of a preliminary injunction, and conversion of a preliminary injunction into a permanent injunction, monetary compensation (or both) or vacation.
(ii) Burden of proof reversal - measured as the score relating to shifting the burden of proof from the plaintiff to the defendant;
(iii) Other entitlements - measured as the unweighted sum of the scores of the Anton Piller and cost entitlement factors, and;
(iv) Duration of the lawsuit - measured as the score pertaining to the length of an IP infringement lawsuit.

We also wanted to add the 'cost of litigation' as a fifth category for our proposed index, because it is indicative of the monetary hurdles faced by patent owners during various stages

[44] Since this remedy is available only under the case of patent infringement, we are only considering it under the construction of Patent Implementation Index exclusively.

of the trial. Thus, the higher the cost of litigation, the more difficult it is for patent owners to opt for litigation as a way of getting justice from the courts. This constitutes a hurdle in the implementation of the patent laws, and makes the enforcement mechanism relatively less relevant. Thus, a high cost of litigation effectively implies weaker protection than is available on paper. A high cost of litigation pushes parties to opt for alternative dispute resolution remedies such as out-of-court settlement or mediation (WIPO, 2010)[45], which may yield sub-optimal redressal from the plaintiff's viewpoint. However, since firms and individuals are not willing to reveal the 'cost' data (mostly lawyers' fees) publicly, we are unable to include it in our index.

'Contributory infringement' is another remedy which can be considered for constructing our index. As explained previously in the context of the Ginarte-Park index, it refers to the action taken by the court against any third-party infringement. It means actions that do not in themselves infringe patent rights but cause or otherwise result in infringement by others. Actions taken against third-party infringement can strengthen patent rights protection and can act as an enforcement mechanism (Ginarte and Park, 1997). However, given that, data on this aspect of the supposed infringement is not available in the law cases and thus, we are unable to include it in computing our index.

The scores of the selected categories (i.e., preliminary injunction, burden of proof reversal, duration of lawsuit and other entitlements) are based on the ranking of their subsequent underlying factors. Turn now to the scoring criteria for the construction of the Patent Rights Implementation Index (PRI Index).

3.5 Scoring Criteria of Categories for Patent Rights Implementation Index

3.5.1 Preliminary Injunction

We propose to compute the category of preliminary injunction as the unweighted sum of the three factors: (i) the provision of a preliminary injunction, (ii) the pace of getting a preliminary injunction, and (iii) the conversion of a preliminary injunction at the end of a suit. The first factor 'provision of a preliminary injunction' is a binary variable that equals 1 if the plaintiff gets a preliminary injunction anytime during a lawsuit, and equals 0 otherwise. Since 'ex parte' injunction (the grant of a preliminary injunction in favor of plaintiff without the presence of defendant) is also a temporary injunction, we have considered it too for the sake of uniformity and to give it the same importance as preliminary injunction. We have given a score of 1 in

[45] See WIPO Magazine (2010), available at untitled (wipo.int).

case any one of these injunctions are provided, and a score of 0 when neither is given. The second factor 'pace of getting a preliminary injunction' is a categorical variable that equals 1 if the preliminary injunction relief is obtained within a month, 2/3 if the relief is obtained between 1 and 6 months, 1/3 if it takes between 6 months and a year, and 0 if it takes more than a year[46]. The minimum and maximum time periods considered here are based on the fact that it approximately takes a period of 1 week to 1 year to grant a preliminary injunction, and there are a very few cases in which the duration went beyond a year. The third factor 'conversion of a preliminary injunction' is also a categorical variable. This factor equals to 0 if the preliminary injunction is vacated altogether, 1/3 if only compensation is provided, 2/3 if preliminary injunction is converted into a permanent injunction but without any compensation, and equals 1 if it is converted into a permanent injunction with compensation.

Since all the three underlying factors ranges from 0 to 1, the category 'preliminary injunction' ranges from 0 to 3, with larger values indicating larger 'payouts' to the plaintiff, which implies greater deterrence to patent rights infringement, and hence stronger protection of patent rights.

3.5.2 Burden of Proof Reversal

The category 'burden of proof reversal' consists the factor itself which is a binary variable. It takes value 1 for lawsuits where the burden of proof is shifted onto the defendant to prove the infringement initially, and equals 0 otherwise. Shifting the burden makes the court procedure easy for the plaintiff, helps to promote litigation in patent related issues involving technical processes which stimulate enforcement practices related to patent infringement.

3.5.3 Duration of the Lawsuit

This category indicates the *total* length of the patent infringement trial in the Indian courts, right from the date of filing till the final disposal. A greater length, ceteris paribus, is taken to mean a delay in justice, which implies inefficient enforcement of patent infringement cases, whereas a shorter duration is equated with better enforcement. We realize that this supposition is somewhat simplistic, because a longer duration for some cases may have to do with those lawsuits being more complicated rather than having been inefficiently enforced. However, it is

[46] The variable is negatively skewed, and the data is concentrated between 0.5 and 1, with very little to the left of 0, which means that the time taken to grant the preliminary injunction is beyond 1 year in very few cases.

not possible to differentiate between more and less difficult cases at present, and therefore we ignore this issue on pragmatic grounds. We estimate the duration score as:

$$Duration\ Score = 1 - \frac{Number\ of\ years\ spent\ in\ resolving\ the\ dispute}{20} \quad [1]$$

Thus, its value ranges from 0 to 1, where smaller values indicate weaker enforcement of patent rights and larger value indicate the converse. Hence, an increase (decrease) in the number of years spent in resolving the patent infringement dispute decreases (increases) the score value, implying less (more) efficient enforcement. The denominator (20 years) represents the standard term of patent protection under the TRIPS agreement. If the dispute settlement is delayed beyond 20 years, that amounts to justice denied and 'weak' enforcement of patent rights.

3.5.4 Other Entitlements

This category is the unweighted sum of the two factors: (i) Anton Piller orders, and (ii) cost entitlement. The Anton Piller factor equals 1 if the court orders search and seizure following the discovery infringement evidence, and 0 otherwise. Further, if the relief of 'cost entitlement' is granted by the court to reimburse the cost of the suit (court fee, attorney's fee, and any local commissioner's fee) to the plaintiff, at the end of the suit, then the factor equals 1, and 0 otherwise.

The overall score of the 'other entitlements' category is then computed as the unweighted sum of the 'Anton Piller' score, and the cost entitlement score. Hence, it ranges from 0 to 2, where 0 means no other entitlements were provided in a case, 1 means only one of the two reliefs was provided by the court, and 2 means that both reliefs were provided. Thus, larger values of this component imply stronger enforcement of patent rights.

3.6 Scoring of Categories for Copyright and Trademark Implementation Indices

The three broad categories that we have considered for copyright and trademark implementation indices are preliminary injunction, other entitlements, and the duration of lawsuit and their scoring criterion are same as we stated under the PRI Index above.

The category 'preliminary injunction' is an unweighted sum of three underlying factors/sub-categories i.e., grant of preliminary injunction, pace of granting a preliminary injunction, and conversion of a preliminary injunction. The score value of category preliminary injunction ranges from 0 to 3 as discussed in earlier sections. The category 'other entitlement' is an unweighted sum of two sub-categories i.e.; Anton Piller orders and cost entitlement and ranges from 0 to 2. Scores of the last category 'duration of lawsuit' is estimated using equation

(1). We use the same standard 20 years as the denominator to maintain uniformity in the three indices. Moreover, we cannot use the standard term of copyright and trademark protection because copyright's term of protection is 60 years (in India) plus the lifetime of the author, and trademark's term of protection is 10 years but can be renewed unlimited times (Saha and Bharti, 2006). These scoring criteria are summarized in Table 1. Having discussed the underlying components and their computation in detail, we now put them together to derive the Patent Rights implementation sub-index, the Copyrights implementation sub-index, and the Trademarks Implementation sub-index.

3.7 Constructing the Patent Rights Implementation Index

To compute the patent rights implementation index (PRI Index), we follow the steps below:

Step 1: We begin with the scores of the four underlying components, namely, preliminary injunction (PIS_i), burden of proof reversal ($BPRS_i$), duration of lawsuit (DL_i), and other entitlements (OI_i), for every infringement case i in our sample, where these cases are spread over the sample period 1970 to 2020. How these individual scores are computed has been explained in the sections above.

Step 2: Summing these scores, we obtain a single value for each patent infringement case, i.e. $X_i = PIS_i + BPRS_i + DL_i + OE_i$. Since the preliminary injunction score lies between 0 and 3, the burden of proof reversal score lies between 0 and 1, the duration of lawsuit score lies between 0 and 1, and the other entitlements score lies between 0 and 2, their sum X_i lies between 0 and 7 for each patent infringement case i.

Step 3: For each patent infringement case i, this sum (X_i) is normalised using the formula $X_i^N = \frac{X_i - Min(X_i)}{Max(X_i) - Min(X_i)}$, so that the normalised sum X_i^N (where superscript N indicates the normalised variable) lies between 0 and 1. For normalisation, we have used global minimum and global maximum.

Step 4: Since the infringement cases i are spread over the sample period 1970 to 2020, evidently so is the normalised sum X_i^N. The arithmetic mean of X_i^N over all i in a given year t,

yields the patent rights implementation index for year t, i.e., $PRII_t = \underset{i}{Mean}(X_i^N)$ for year t, where t = 1970, 1975, 1980, 1985, 1990, 1995, 2000, 2005, 2010, 2015, 2020.

Using these data, we can then evaluate the strength of patent rights protection. For instance, if $0 \leq PRII_t \leq 0.33$, we may consider this to represent a relatively weak patent rights implementation regime, if $0.33 \leq PRII_t \leq 0.67$, we may consider this to indicate a moderate patent rights implementation regime, and if $0.67 \leq PRII_t \leq 1$, we may consider this to signal a relatively strong patent rights implementation regime.

3.8 Constructing the Copyright and Trademark Implementation Indices

The construction of these indices is same as the PRI Index except for one underlying factor (i.e., the burden of proof reversal). Let us discuss the steps briefly.

Step 1: We begin with the scores of the three categories, namely, preliminary injunction (PIS_j), duration of lawsuit (DL_j), and other entitlements (OI_j), for every copyright infringement case j in our sample. Similarly, we collect the scores of these three categories PIS_k, DL_k, and OI_k for every trademark infringement case k in our sample, where these cases are spread over the sample period 1970 to 2020. These individual computed scores have already been explained in the sections above.

Step 2: Summing these scores, we obtain a single value for each copyright infringement case, i.e. $Y_j = PIS_j + DL_j + OE_j$ and for each trademark infringement case, i.e., $Z_k = PIS_k + DL_k + OE_k$. Since the preliminary injunction score lies between 0 and 3, the duration of lawsuit score lies between 0 and 1, and the other entitlements score lies between 0 and 2, their corresponding sums Y_j and Z_k lie between 0 and 6 for each copyright and trademark infringement case j and k respectively.

Step 3: For each copyright and trademark infringement case j and k, the sum values (Y_j and Z_k) are normalised using formulas $Y_j^N = \frac{Y_j - Min(Y_j)}{Max(Y_j) - Min(Y_j)}$ and $Z_k^N = \frac{Z_k - Min(Z_k)}{Max(Z_k) - Min(Z_k)}$, so that the normalised sum values (where superscript N indicates the normalised variable) lies between 0 and 1.

Step 4: Since the infringement cases j and k are also spread over the sample period 1970 to 2020, evidently so is their normalised sum values. The arithmetic means of Y_j^N and Z_k^N over all j and k, respectively, in a given year t, yields the copyright and trademark implementation indices for year t, i.e., $CRII_t = \underset{j}{Mean}(Y_j^N)$ and $TRII_t = \underset{k}{Mean}(Z_k^N)$ for year t, where t = 1970, 1975, 1980, 1985, 1990, 1995, 2000, 2005, 2010, 2015, 2020.

Using these data, we can evaluate the strength of copyright and trademark protection in the similar way as we did earlier for patent protection. For instance, if $0 \leq CRII_t\ (TRII_t) \leq 0.33$, we may consider this to represent a relatively weak copyright and trademark implementation regime, if $0.33 \leq CRII_t\ (TRII_t) \leq 0.67$, we may consider this to indicate a moderate copyright and trademark implementation regime, and if $0.67 \leq CRII_t\ (TRII_t) \leq 1$, we may consider this to signal a relatively strong copyright and trademark implementation regime. Let us move on to discuss our sample and its characteristics to understand the results related to indices.

4. Our Sample and its Characteristics

To create the relevant database, first, we extracted all the information relevant to the underlying categories as discussed, corresponding to each index, for every patent, copyright and trademark infringement case heard in the Indian courts. According to Patents Act (1970), suits related to the infringement of IPR cannot be filed in the courts below the level of district courts. Supreme Court is an appellate court in case of IP related matters where only appeals can be filed. Usually, High Courts are also appellate courts to matters filled in district courts but in IP related matter, High Courts also have "original" jurisdiction, meaning that original cases having a certain minimum monetary value that may vary state to state can be filed in the High Courts (Anand and Anand, 2024)[47]. That's why, we got IP infringement cases filed in mainly district and high courts.

The timeline of our indices is from 1970 to 2020, starting from the enactment of Patents Act 1970 to recent times, which is a long timeline covering all the major amendments and incorporation of TRIPS in the Indian IPR regime. However, the data is collected quinquennially (i.e., five-yearly) and not annually. It is because a five-year gap allows for the observation of meaningful trends and changes over time. It allows a manageable amount of data to evaluate

[47] See, Anand and Anand, 2024, at https://www.mondaq.com/india/intellectual-property/1531964/patent-litigation-comparative-guide

within the given time period. Moreover, this interval is long enough to capture the policy changes such as legal amendments and shifts related to IP protection.

For information extraction purposes, we primarily used the 'Indian Kanoon' website, with some material retrieved from the 'Supreme Court Cases' (SCC)[48] website. These are reliable and widely used Indian law search engines, that contain the judgments for cases filed in the Indian courts. To filter all the required law cases, we first searched for 'patent infringement cases' in the Indian Kanoon search engine, and then applied a filter to search for the required year. The search engine then provided all the judgments related to the patent infringement cases in the concerned year[49]. Similarly, copyright and trademark infringement cases were searched. For the sake of pragmatism, we collected data only for cases whose final judgment had been passed before September 2023.

Although the judgments consisted of all the major information that we required, some of the important information such as the date of filing the case, the date of final disposal of the case, and some other details were missing. To collect these details, we had to trace back all the law cases to 'E-Courts'[50] which is an Indian government website that contains information on all State High Courts and District Courts, along with the final judgments[51].

Each observation in our database is one law case, with information on each of the categories that we specified above. More precisely, this consists of information on whether a preliminary injunction was granted or not, how many days that took, whether the burden of proof was reversed, whether other relief was not, the duration of the entire lawsuit, the origin of plaintiffs and defendants, the jurisdiction of the case, the industry to which the case is related, the settlement related issues of the case, the final verdicts, and more.

4.1 Sample Characteristics and Descriptive Statistics

Our dataset comprises a total of 414 intellectual property infringement cases pertaining to patents, copyrights, and trademarks. Out of these 414 cases, 51 or 12.3% cases relate to patent, 97 or 23.4% cases relate to copyright and 266 or 64.3% cases relate to trademark infringement. Although, patent infringement cases are not large in numbers, these are the only available

[48] We used Supreme Court Cases (SCC) website for reading legal articles, Acts, and other for other terminology.
[49] The appeared cases are either the final judgments that were already disposed of in the concerned year, or interim orders that will be disposed of on some future dates. We collected data only for those cases whose final judgment came either on the concerned date or on any date before the current year i.e., before September, 2023.
[50] See E-Courts website, available at https://services.ecourts.gov.in/ecourtindia_v6/
[51] We did not search for the information we required on E-courts in the first place, because this search required either a unique case identity number, names of the parties, or the judges' or lawyers' name, and these were unknown to us in the first place.

infringement cases that were fully disposed of before our cut-off date of September 2023. Moreover, many cases do not reach the court due to the preference of out-of-court settlement by the parties, because of the high litigation cost, all of which result in the small sample size of patent cases.

Out of these available patent infringement cases, maximum number of cases pertain to the pharmaceutical industry, about 33%, followed by 16% cases from the chemical industry, and the remaining 51% cases belonging to several other industries. Table 2 shows the frequency distribution of patent, copyright, and trademark infringement cases categorized by industry. In this table, we have used the 3-digit level of classification of industries from the National Industrial Classification (NIC)[52], 2008 to form groups of small industries such as toothpaste, ties, etc., mentioned in the extracted infringement cases. It shows that around 49% of copyright infringement cases, which is quite a high percentage, relate to creative and entertainment industry including artistic works, followed by around 19% cases from the publishing industry i.e., books, periodic journals and newspapers and 15% cases relate to television and broadcasting industry such as electronic media, TV shows, etc. It illustrates that 50% of trademark infringement cases pertain to pharmaceutical, food, chemical, consumer electronics, apparels, and beverages having maximum cases relate to the infringement of brand names of pharmaceutical industries. Rest of the 39 industries such as tobacco, footwear, jewellery, bags, etc., shown in the table relate to the remaining 50% of the infringement cases in trademark. This shows that overall, pharmaceutical, chemical and food industries are more prone of patent as well as trademark infringement in India and owners of IP pertaining to these industries are more vulnerable to implementation of IP laws in courts and seek strong protection of IPR.

It is interesting to note that in our sample, the maximum number of IPR infringement cases file in Delhi High Court which comprises about 76%, 58%, and 51% of patent, trademark and copyright infringement cases, respectively. Delhi jurisdiction holds relevance in intellectual property infringement cases mainly because of two broad reasons. First reason is the 'recognition' of the Delhi High Court as one of the premier commercial courts (fast track courts to resolve commercial disputes including IP-related matters) in India and its contribution to the jurisprudence of patents and trademarks is significant (Anand and Anand, 2024). Second, is the establishment of Intellectual Property Division (IPD)[53] by the Delhi High Court, which exclusively deals with the IP related matters, specifically focuses to resolve disputes related to

[52] See, details of NIC, 2008 at https://www.ncs.gov.in/Documents/NIC_Sector.pdf
[53] IPD was established at the Delhi High Court on February 22, 2022. See, details at http://dhc.nic.in/writereaddata/upload/Notification/NotificationFile_WD6KNDKFB4G.PDF

patents, trademarks, copyrights and other intellectual property efficiently by providing specialized expertise. To access the court's expertise in case of IP disputes, several companies shift their registered offices to Delhi to come under the territorial jurisdiction of the Delhi High Court (Halliburton, 2017). Overall, the Delhi High Court plays a vital role in protecting and enforcing intellectual property rights. Let us discuss the summary statistics of sub-categories based on our sample data.

4.2 Descriptive Statistics of Sub-Categories

Based on the trend of preliminary injunction grants from 1970 to 2020 as shown in Table 3, we estimate the likelihood of getting a preliminary injunction based on proportions. Here, the likelihood of a preliminary injunction being granted is operationalized as the sample proportion of favorable rulings within the dataset. Given that the variable preliminary injunction is binary ($x \in \{0,1\}$), where 1 represents the granting of an injunction and 0 represents a denial, the arithmetic mean $\bar{x}$ is mathematically equivalent to the empirical probability of the event. Specifically, the estimate is derived as: $\hat{p} = \frac{1}{n}\sum_{i=1}^{n} x_i$. Where, n represents the total number of cases with observable outcomes. This approach assumes that missing observations are missing at random (MAR) and do not systematically differ from the recorded cases. By calculating the mean in this manner, the resulting value represents the frequentist probability[54] or 'likelihood' of a grant occurring within the studied jurisdiction.

Based on panel (b) of Table 3, it is likely to say that there is nearly 77% likelihood of getting a preliminary injunction when claimed, in case of IP infringement in India, which is quite good. On an average, this likelihood is maintained over time from 1975 to 2020. Panel (c) shows that on average, the pace of getting a preliminary injunction has increased over time such that the length of a preliminary injunction trial has been reduced from approximately 1 year to 1 month from 1975 to 2020. We find that the average value for the year 1975 is very close to 0 (i.e., 0.17) implying that the time taken to grant the preliminary relief was around 1 year[55] on an average which increased approximately to 0.9 (close to 1) in 2020, implying a reduction in time taken to grant the relief within a month of the commencement of the trial, which is very quick.

A closer look by segregating the grant of preliminary injunction relief based on intellectual property rights instruments (i.e., patents, copyrights, and trademarks) shows that

[54] The 'likelihood or probability' here does not mean legal likelihood or subjective belief; it means the observed frequency of grants in law cases.
[55] This is based on the scores corresponding to cut-offs that we have discussed in the section 3.5 of this paper.

the proportion of obtaining a preliminary injunction is highest in trademark infringement cases (i.e., 81%), followed by patent (78%) and copyright (66%) cases when claimed by plaintiffs. Relative to patent infringement cases, the likelihood of a preliminary injunction being granted in trademark cases is approximately 4% higher, while relative to copyright infringement cases it is approximately 23% higher, with both figures calculated as proportional differences with respect to the corresponding baseline probabilities or proportions[56]. Courts are usually more willing to grant injunctions in trademark cases (McLeod, 2006). This is because using someone else's established brand name or logo can direct customers to the infringed products more likely than in any other case and the risk of irreparable harm becomes more plausible in such cases. According to McLeod (2006), the goodwill or reputation attached with the brand name is quite difficult to calculate in monetary terms and that's why, once the trademark owner proves the prima facie case, it's easier for him to prove irreparable harm in court and get preliminary injunction. It is also found that in patent infringement cases, it takes a longer time for a plaintiff to get a preliminary injunction relative to copyright and trademark infringement cases. This is because in patent infringement cases proving infringement or establishing a prima facie case is more difficult than in other infringement cases due to the more technical nature of patents. Moreover, it takes more time to evaluate the plaintiff's irreparable harm and the condition of the balance of convenience because of the technicality involved in their calculation.

It is an interesting point to discover if there exists any discrimination in granting reliefs against foreign firms in Indian courts or not. We found that on average, foreign plaintiff firms are 12% more likely to get preliminary injunction than Indian plaintiff firms. The proportion of a foreign firm to get preliminary injunction is around 85% on average which shows that there is no discrimination against foreign firms in Indian courts when granting reliefs[57]. The average duration for obtaining a preliminary injunction is within a month which is almost similar for both domestic and foreign firms, indicating no discrimination based on origin. It is important to know that any discrimination in delaying or denying reliefs can harm India's reputation in resolving IP disputes globally. This might be an act of reputation-building strategy for India in the international market[58]. The average duration of getting a preliminary injunction

[56] Relative likelihood is calculated as $(p_t - p_j)/p_j$, where p_t denotes the grant rate in trademark cases and p_j the corresponding rate in patent or copyright cases.

[57] It is to be noted that the Indian plaintiff firms are higher in the absolute number to file cases in the Indian courts as compared to foreign firms and still the proportion of getting a preliminary injunction is higher for the latter.

[58] India also signed a clause of non-discrimination against foreign countries under the Paris Convention (1883).

is found approximately the same in both domestic and foreign firms which is a plausible explanation for stating no discrimination with firms of any origin.

Moving on to the final verdicts in case of IP disputes reveals that on average about 23% of plaintiffs receive both a permanent injunction and compensation at the end of the final trial, around 38% got only permanent injunction while around 37% plaintiffs' preliminary injunction is vacated (almost same as the number of permanent injunctions). Reasons for such huge revocation include failure to prove infringement, lack of jurisdiction, and faux cases because of which plaintiffs often settle out of court to avoid delays and other issues. In patent and copyright infringement cases, the rate of vacating the preliminary injunctions is alarming. In more than 46% of patent infringement cases, the preliminary injunction relief is vacated while in copyright cases, the rate of revocation is even higher, approximately 51%. It can be observed that in these cases, the rate of vacating the preliminary injunctions is even more than the grant of a permanent injunction at the end of full trials.

It is found that on average, an IP infringement trial in India takes around 5 years 2 months to dispose of completely, which comes from the fact that on average the score for the length of the full IP infringement trials in India is 0.74. By putting this value in equation (1), i.e., $0.74 = 1 - k/20$, we get $k = 5.2$, which is equivalent to 5 years and 2 months or 5 years approximately. We find that the minimum score for the length of the full trial is 0, implying that there exist cases that took more than 20 years to dispose of. However, the proportion of these cases is very meager (1.5%). However, in our view these results are overestimated for two main reasons. First, mediation: It is found that around 19% of IP infringement cases were compromised through the Centre of Mediation and Conciliation (see, Table 4), avoiding high costs and delays. Notably, 41% of patent infringement cases used mediation, indicating its effectiveness as an Alternative Dispute Resolution (ADR) method. So, it can be stated that 'mediation', as an ADR mechanism, can complement formal litigation by enabling earlier resolution of disputes and thereby reducing judicial caseloads. However, increased reliance on ADR should not be interpreted unambiguously as evidence of judicial efficiency. Rather, the growing preference for mediation and arbitration often reflects litigants' lack of trust in the formal litigation process, arising from systemic issues such as delays in case disposal and corruption, which signal inefficiencies in existing enforcement mechanisms (Ginarte and Park, 1997). At the same time, once adopted, ADR mechanisms can mitigate the consequences of these inefficiencies by diverting cases away from courts and easing the burden on judges. In this sense, ADR functions as a second-best institutional response that partially offsets weaknesses in formal enforcement. Accordingly, promoting ADR, particularly mediation and

arbitration can enhance overall judicial efficiency, provided that access barriers such as high arbitration costs are addressed to ensure broader participation[59]. Overall, ADR is a response to judicial inefficiency, but it can still function as a mechanism that improves system-level efficiency.

Second, non-appearance of defendants: In about 20% of cases, defendants stopped appearing, leading to early case disposal. Furthermore, in around 2% of cases, plaintiffs withdrew cases before the final verdict, and the cases were disposed of early. Although the withdrawal rate is not very significant (2.4%). No pattern is found for the length of the entire case over the period of time.

It is also interesting to know if there any mismatch exists in the court's judgment or not. A component of this mismatch shows the inefficiency of courts. It is found that in approximately 29% of IP infringement cases, a mismatch in the court's judgment is found. It is estimated by dividing the sum of the number of cases where, a preliminary injunction was granted initially but revoked in the final judgement (75 such cases exist) and the number of cases where, a preliminary injunction was not granted initially but later granted by any appellate court such as High Court (21 such cases exist) by the total number of cases where a preliminary injunction was claimed (326 cases). The first kind of mismatch as already stated can occur due to the non-ability to prove infringement by the prosecution, etc. However, studies like Ramakrishna (2017) states that this mismatch can also occurs due to court's inefficiency in adjudicating the prima facie establishment of infringement. The second kind of mismatch is more interesting (in 26% of cases), which occurs purely because of the negligence on the lower court's end and represents inefficiency.

Additionally, we found that in 74% of IP infringement cases, courts granted the order of Anton Piller (i.e., a search/ seize/ destroy order), in cases where it was claimed by the plaintiff. This is highly likely. However, in only 55% of cases, courts are entitled back the costs of the court proceedings including lawyer's and local commissioner's fees, which is just a nominal or token cost and do not represent the actual cost incurred by the plaintiff at all.

For the burden of proof reversal, the statistics show an abysmal record of approximately 0.02% indicating that this relief is available on the statutes but not granted commonly, may be because this provision is available in process patents cases only.

[59] However, in many cases, the cost of litigation exceeds that of arbitration. See What does it cost to defend your IP rights? (wipo.int).

Finally, let us move on to the resultant indices i.e., patent rights, copyright and trademark implementation indices that we have constructed using the steps discussed in previous sections. First, let us discuss the Patent Rights Implementation Index and its associated interpretations.

5. Patent Rights Implementation (PRI) Index

Figure 4 graphs the Patent Rights Implementation Index over our sample period 1970 to 2020. Although the index depicts some fluctuation over time, we find that it lies in the 'moderate zone' ranging between 0.33 and 0.67 for the bulk of the sample period, except for the years 1985 and 2010. The overall trend of the index, as emphasized by the dotted line in Figure 4, seems to be linear and increasing. This implies that over our sample period, the enforcement of patent rights in India has strengthened not just in a *de jure* sense, but in the *de facto* sense as well.

We estimated the linear growth rate of patent rights implementation per period over time as shown in Figure 5. It shows that there is no consistent growth pattern over time from 1970 to 1995 but after 1995, a consistent rate of improvement can be seen (although, negative till 2010) with positive growth rates in 2015 and 2020. This is because, before 1995, minimum standards did not exist in India due to which the estimated growth rates seem fluctuating. From 1995 to 2005, patent rights were in constant amendments to include new laws which causes to increase the growth of implementation of these laws later on 2005 onwards.

In particular, after 2010 the execution of laws improved, and the PRI index increased approximately by 98% and 20% from 2010 to 2015 and from 2015 to 2020, respectively (Figure 4). The analysis of our case data reveals that this was because of grant of more relief in this period and result is not affected by sample size because a sufficient number of patent infringement cases are collected from 2010 onwards (See, Panel (a) of Table 3). The average value of the index is calculated around 0.37, as discussed above, it indicates that the index on an average lies in the moderate zone of implementation. On an average, the data deviates around 0.16 units from the mean value. The minimum value is around 0.22 and maximum is 0.57, representing the maximum variation in the patent rights protection regime.

6. The Copyright Implementation Index

Figure 6 graphs the copyright implementation index. Overall, the index is increasing as estimated by the linear fitted dotted line shown in Figure 6, and majority of the data points lie in the moderate zone interval from 0.33 to 0.67 (except,1970 and 1985), indicating that the

implementation of copyright laws in India is neither too weak nor too strong. The increasing fitted line indicates that the copyright laws are also strengthened overtime in the *de facto* sense. Several fluctuations can be observed in the data till the year 2010, which could be because of the introduction of amendments in the copyright laws till 2012. However, the index increased consistently from 2010 to 2020 with an overall growth rate of 12% indicating an improvement of implementation in the last decade. On an average, the index values around 0.42 with a standard deviation of around 0.12. The minimum and maximum values are around 0.2 and 0.57, respectively showing a shift in the implementation of laws from weak to moderate zone.

7. The Trademark Implementation Index

The graph shown in Figure 7 represents the trademark implementation index based on our sample from period 1975 to 2020. The overall trend of the index is also linear and increasing, estimated by the dotted line as shown in Figure 7, indicating the strengthening of trademark laws protection in the *de facto* sense. All the values of the index lie in the moderate zone interval from 0.33 to 0.67 and interestingly, values for year 2005 and 2015 seem very close to the upper end of this cut-off, approaching strong level of enforcement. It can be seen from the figure, that before 1995, the index values shows a decrease in the implementation of trademark laws. However, the rate of this decline is non-increasing and the index caught pace after the year 1995 (may be because of the introduction of the TRIPS agreement). After 2005, the index seems fluctuating but not too much which might have occurred due to an important amendment in the trademark laws of 2010.

The average value of the index is around 0.41, with a stanadard deviation of 0.17, approximately. The minimum index value is around 0.34 and the maximum value is around 0.65, representing the maximum variation in the trademark protection regime in entire period from 1975 to 2020.

Let us now discuss the construction of the final *de facto* IPR implementation index in the next section.

8. Constructing the IPR Implementation Index

The IPR Implementation Index (IPRII) is computed as a weighted sum of the Patent Rights Implementation Index (PRII), the Copyrights Implementation Index (CRII), and the Trademark Implementation index (TRII), i.e.,

$$IPRII_t = w_P PRII_t + w_C CII_t + w_T TII_t \quad [2]$$

Where, w_P, $w_C, and\ w_T$ are the weights corresponding to the patent implementation index, copyright implementation index, and trademark implementation index, respectively. Since the range of each of the sub-indices lies between 0 and 1, the range of the IPR implementation index also lies between 0 and 1. For data aggregation, determination of weights is shown in the next sub-section.

8.1 Weights Determination

Weights corresponding to each of the three sub-indices are determined based on the three widely used schemes: (i) Equal weights, (ii) Principal Component Analysis and (iii) Factor Analysis. Let us discuss the weighting criteria under each scheme in detail.

8.1.1 Equal Weights

Equal weighting strategy is widely used and one of the simplest approaches to calculate the aggregate indices. Many indices such as Human Development Index (UNDP, 1990) are constructed using equal weights. Ginarte and Park (1997) also applied equal weights to each of their underlying categories to create patent right index (also known as GP Index). Applying equal weights is equivalent of taking simple average of all the underlying categories of the proposed index. Under this scheme, $w_P = w_C = w_T = 0.33$ and the IPR Implementation Index (IPRII) is:

$$IPRII_t = {(PRII_t + CII_t + TII_t)}/{3} \quad [3]$$

This approach is simple, effortless and assigns equal importance to each of the three patent, copyrights and trademark implementation sub-indices.

8.1.2 Weights Determination using Principal Components Analysis

PCA is generally used to reduce the dimensions of a dataset and it indicates which variable is more important among a list of variables (Pearson, 1901). We have three variables of interest that are patent rights, copyrights and trademark implementation indices. First, we check whether the data are normally distributed or not. Using Skewness/Kurtosis and Shapiro-Wilk tests, we found that all the three variables are normally distributed (panel (a) of Table 5). Next, we standardize all the variables of interest to remove any sensitivity in PCA results due to different units of variables (Bolch and Huang, 1974; Krishnan, 2010). Since, our indices are unitless and already normalized between 0 to 1, it is not as such required to standardizing the sub-indices in our case. However, for robustness, we have estimated principal components with

or without standardization and both ways give the same results. We inspected correlation among all the three indices as shown in panel (b) of Table 5 which indicates that there exists sufficient correlation to perform PCA. Next, we performed Kaiser-Meyer-Olkin (KMO) test as a measure of adequacy of data for PCA analysis as shown in panel (c) of Table 5. The cut-off value is strictly greater than 0.6 indicating that the data is adequate for the principal component analysis (Krishnan, 2010; Li. et. al., 2020). Additionally, Barlett's test is also performed to check the sphericity of data. Result shows that the p-value is 0.006 (< 0.05) which is rejected at 5% significance level implying that there exists enough intercorrelation among variables to perform any factor analysis.

Panel (d) of Table 5 shows the results of PCA. We have used the correlation matrix over the covariance matrix for the PCA calculation. It is because using correlation matrix with original variables is equivalent of using covariance matrix with the standardized variables (Krishnan, 2010). Moreover, our sub-indices are normally distributed and normalised. Hence, standardizing the variables and using covariance matrix is not useful. Result shows that the maximum variation of approximately 77% is explained by the first principal component (PC1) followed by 17% by the second (PC2), and 6% by the third (PC3). A widely used eigenvalue rule which is also known as Kaiser's criteria states that only components having eigenvalues greater than or equals to 1 should be considered for the index creation (Guttman, 1954; Kaiser, 1960). In our case, PC1 has eigenvalue 2.303, followed by 0.517 for PC2 and 0.179 for PC3, so that PC1 is enough to summarize the three indices. Using the PC1 scores, we compute: $PC_{1t}^{N} = \frac{PC_{1t} - Min(PC_{1t})}{Max(PC_{1t}) - Min(PC_{1t})}$, (where superscript N indicates the normalised variable). The resultant predicted PC1 scores vary over time and represents one of the versions of IPR implementation index using PCA.

Additionally, we have extracted the shares of PC1 loadings for each of three indices from panel (d) of Table 5 and applied the resultant shares of loadings as weights in equation (2) to get another version. The shares of loadings are calculated in the following way:

$$w_i = \frac{u_i}{\sum_{i=1}^{3} u_i} \qquad [4]$$

Here, u_i is the loading of the variable i corresponding to PC1 and w_i is the resultant weight of the variable i. Using this, we found $w_1 = w_P = 31.5\%$, $w_2 = w_C = 36\%$ and $w_3 = w_T = 32.5\%$ as the weights corresponding to patents, copyrights and trademark indices. These two versions of PCA-driven IPR Implementation indexes will help to robust the final findings.

8.1.3 Weights Determination Using Factor Analysis

Factor analysis[60] is almost similar to PCA in terms of dimensionality reduction by dropping the redundant variables. However, there exist some differences between these approaches. Factor analysis takes latent variables into account and assumes that the existence of common factors shows the variation in the data, while PCA assumes that the linear combination of all the underlying variables captures the maximum variations.

Factor analysis assumes that common factors are uncorrelated with each other (Spearman, 1904). We have already shown that all the three variables are normally distributed, and that the sample is adequate for factor analysis and the variables are sufficiently intercorrelated to find the common factors deriving variation in the data.

Table 6 shows the results for the factor analysis. Panel (a) shows that the maximum variation of approximately 97% is explained by factor 1, followed by factor 2 with 3% variation. These variations explained by factor 1 and factor 2 have been calculated by dividing their eigenvalues by the sum of the positive eigenvalues. A widely used eigenvalue rule known as Kaiser's criterion, states that only components having eigenvalues more than 1 should be considered for the index creation (Guttman, 1954; Kaiser, 1960). In our case, factor 1 has eigenvalue of 1.918, followed by factor 2 and factor 3 with eigenvalues of 0.054 and -0.172, respectively. Thus, factor 1 is enough to represent the IPR implementation index. Uniqueness shown in Panel (b) is the non-shared variance or the variance which is unique to the associated variable only. According to the factor analysis, higher uniqueness of the variable implies lower relevance of the variable (Mueller, 1978). Panel (c) shows the orthogonal rotation of the pattern matrix which shows the clearer picture of correlations between the variables and factors.

Having estimated factor 1 scores, we normalise them to lie between 0 and 1 by using the formula: $F_{1t}^{N} = \frac{F_{1t} - Min(F_{1t})}{Max(F_{1t}) - Min(F_{1t})}$, (where superscript N indicates the normalised variable). The resultant predicted factor1 scores vary over time and represents one of the versions of IPR implementation index using factor analysis. We have also extracted the shares of factor 1 loadings for each of the sub-indices from Panel (b) of Table 6 and applied the resultant shares of loadings as weights in equation (2) to compute an alternative estimate of the IPR implementation index. The shares of loadings are calculated as:

$$w_i = \frac{v_i}{\sum_{i=1}^{3} v_i} \qquad [5]$$

[60] Studies such as Jung and Lee (2011) and Papageorgiadis et. al., (2014) have used factor analysis.

where, v_i is the loading of variable i corresponding to factor1 and w_i is the resultant weight of variable i. Using this, we found $w_1 = w_P = 30\%$, $w_2 = w_c = 38\%$ and $w_3 = w_T = 32\%$ as the weights corresponding to the patents, copyrights and trademark sub-indices. We shall use these two alternative estimates of the IPR Implementation index to test the robustness of our results.

9. Trends of the Final Index Driven by Sub-Indices

As we can see from PCA and FA, the three sub-indices do not carry identical weights, but they are still quite close to each other, indicating that all three are almost equally important, with the copyright index reflecting slightly higher variation and relevance.

Now to add on to this and to determine whether the final IPRI index is equally driven by its three components, we compared correlation patterns of these sub-indices with the final IPRI index and also done comparisons using standardized regression-based variance decomposition. Pairwise correlations showed strong co-movement of the composite index with all sub-indices (> than 80%), most notably with copyrights (r = 0.92), followed by trademarks (r = 0.86) and patents (r = 0.84). However, when all components were evaluated jointly through standardized OLS regression, the contribution pattern shifted[61]. The decomposition indicates that trademarks (approx. 42%) and patents (approx. 39%) indices explain the majority of unique variation in the final index, whereas copyrights index contributes the least (≈19%), suggesting that its influence is largely shared with other components rather than distinct.

While correlation, PCA and FA suggest that copyrights contribute most to the shared structure of the index, standardized OLS variance decomposition shows that patent and trademark indices provide stronger unique explanatory power[62]. Hence, the final IPRI index is not driven by a single component, but results from a combination of shared variation (largely from copyrights) and unique incremental influence (particularly from patent and trademark).

[61] For the standardized OLS-based variance decomposition, all three sub-indices (patent, copyright, and trademark) were first transformed into z-scores, along with the final IPRI index. We then regressed the standardized final index on the standardized sub-indices. The resulting standardized coefficients were squared to capture the relative influence of each sub-index. These squared coefficients were summed, and each was divided by the total to obtain the proportional contribution of each component. The resulting shares represent the relative explanatory weight of each sub-index in driving variations in the overall index.

[62] This divergence is expected because correlation measures bivariate relationships, whereas decomposition captures marginal contribution after accounting for overlap among the sub-indices. The relatively lower contribution of copyright index in the decomposition indicates that much of its variance is shared with patent and trademark indices, rather than adding unique information.

This indicates that the overall index is jointly driven, but predominantly shaped by the independent influence of trademark and patent components.

Figure 8 shows the time-series plot which demonstrates that the final IPRI Index closely by tracking all three underlying components, confirming strong co-movement. However, visual fluctuations suggest that patent and trademark implementation indices exhibit more pronounced variation over time, while copyright index remains comparatively smoother and more aligned with the overall index. This graphical evidence is consistent with our findings.

Panel (a) of Table 7 summarizes and shows the trends of all the 5 versions of the IPR implementation index from 1970 to 2020. The 5 versions that are considered in this study are: (i) Equal-weight index, which is derived by taking simple average of all the three sub-indices (patent rights, copyright, and trademark implementation indices); (ii) Norm_PC1_Predicted_Index, which is derived by normalizing the predicted PC1 scores; (iii) PC1_Share_Load_Index, which is derived by summing the product of each sub-indices with their corresponding shares of loadings given by PC1; (iv) Norm_F1_Predicted_Index, which is derived by normalizing the predicted factor1 scores; and (v) F1_Share_Load_Index, which is derived by summing the product of each sub-indices with their corresponding shares of loadings given by factor1. All the versions of IPR implementation index represent the *de facto* measures of the strength of IPR in India not just the *de jure* measures. This practice is novel in its own. The trend shown by all the five versions of IPR Implementation Index (IPRII) is similar and the overall trend of IPRII is linear and increasing as shown by the dotted line in Figure 9.

It can be observed from Table 7 and Figure 9 that equally weighted index and indices based on PC1 shares and factor1 shares are almost similar and in fact overlapping each other with mean values of 0.39, 0.4 and 0.4 (approximately) respectively. Moreover, their standard deviations also equate at 0.13. On the other hand, index represented through the normalized PC1 and factor1 scores are scaled up version of the previous three with the mean values of around 0.70 and 0.66. The standard deviation of normalized PC1 and factor1 scores are around 0.28 and 0.29 respectively, which are quite similar.

Figure 9 shows that all the five versions of IPRI index are mostly fluctuating overtime from 1970 to 2010 with peaks in 1975, 1990 and 2005, 2015 and 2020. Peaks in years 1975, 1990 and 2005 are resultant of the variations in the implementation of IPR laws due to several important amendments or policy shifts in the patent, copyrights and trademark laws in India from 1970 to 2010. After 2010, the graphs seem increasing and stabilized thereafter. An increase of around 36% in the strength of IPR laws in terms of implementation can be seen from 2010 to 2020, through equally weighted index and indices based on PC1 shares and

factor1 shares. The index based on the normalized factor1 scores also shows a similar increase of around 37% from 2010 to 2020. On the other hand, the normalized PC1 scores shows even more increase of around 43% in the same interval.

Based on the values of the equally-weighted version of IPR Implementation Index ($IPRI_t$), we can categorize the implementation of intellectual property rights laws in India in zones (i.e., low, moderate and high) in the following way,

$$\begin{cases} 0 \leq IPRI_t \leq 0.33, & Weak\ IPRs\ in\ year\ t \\ 0.33 < IPRI_t \leq 0.67, & Moderate\ IPRs\ in\ year\ t \\ 0.67 < IPRI_t \leq 1, & Strong\ IPRs\ in\ year\ t \end{cases}$$

Based on this, it can be concluded that overall, the implementation of intellectual property rights in India is shifted from weak to moderate level from 1970 to 2020 which not only reflects the transition and adoption of strong IPR laws on the legal code but also shows their execution in reality.

The visual representation shown in Figure 9 represents that there is no difference in the rank ordering among the indexes due to a change in the weights on the underlying components. Panel (c) of Table 7 shows the index sensitivity to different weights, which determines whether the different weighting schemes produce substantial changes in the rank ordering of the data points. The Spearman rank correlation test is used here for the sensitivity check. Spearman's rho or Spearman's correlation coefficient tests whether the rank of the values in one sample is differentiated from that of the other sample. The range of Spearman's correlation coefficient lies between -1 to 1, where -1 means the ranks in samples are inverted and 1 means the ranks in samples are the same[63]. The first column of panel (c) of Table 7 shows that there is a high correlation between the rank ordering of the equally weighted index and all the other weighted versions. The correlation coefficients of other versions also show high correlation among themselves as shown in other columns. In other words, this reflects that the rank order is not changing with the change in the weights associated with each of the sub-indices. So, it remains to the researcher to choose the variation of his choice or use all of them to perform robustness checks.

10. Comparison with Ginarte and Park (1997) Index for India

To explore the shifts from *de jure* methods to *de facto* method of intellectual property rights indices, we are comparing the Ginarte and Park (1997) index which is based on *de jure*

[63] Ginarte and Park (1997) have also used spearman rank correlation to check the weight sensitivity of their index components.

measures with the new IPRI index. For simplicity, we use the equally weighted estimate of the IPRI index. The purpose of comparing the new *de facto* index with the GP index is to identify differences between actual IPR implementation and the legal provisions outlined by the GP index. Any noted differences will highlight the value of capturing the actual enforcement of IP laws over time. The comparison will be done only for India because our new index is available for India only, even though the GP index is available for numerous countries. There is a positive correlation of 61.2% between IPRI index and GP index states that there is a positive relationship between these two indices. The other versions of IPRI index also portray similar results with correlation of around 65% on average. However, the result just reflects a simple relationship and not causality. A paired two sample t-test for means shows that these two indexes are different at 1% significant level and not identical in terms of their ranges and values. The result is true for all the variants of IPRI index which confirms that the two indices are conceptually and statistically different as expected and validates the fact that the calculated IPRI index based on the actual execution of IP laws shows a different picture of the Indian IP regime than that of shown by the GP index which is based on the adoption of laws on the books.

A graphical distinction is also made as shown in Figure 10, which compares IPRI index with GP index over a period of 1970 to 2020. For comparison, we have taken the equally weighted IPRI index and GP index. Since, IPRI index ranges from 0 to 1, we have normalized the GP index also to the range of 0 to 1. The comparison clearly shows that the GP index has underreported the scores for India for the period before 1999 and overreported the scores for the period after 2000. This suggests that using the IPRI index post-2000 shows weaker IP law enforcement in India than the GP index indicates, even after adopting TRIPS. Thus, the IPRI index offers a more balanced and unbiased view.

11. Concluding Remarks

This study introduces a novel *de facto* Intellectual Property Rights Implementation Index (IPRI) to measure the actual enforcement strength of IPRs in India, using data from infringement cases adjudicated in Indian courts between 1970 and 2020. Employing three robust aggregation techniques, i.e., equal weights, principal component analysis, and factor analysis, the study constructs a comprehensive measure that captures the practical enforcement of IPRs beyond legislative provisions. The index reveals a clear transition in India's IPR protection framework, evolving from weak enforcement in the 1970s to a moderate level by

2020, reflecting the combined effects of stronger legislation and improved enforcement mechanisms.

This paper details the construction of the IPRI and its three constituent sub-indices, namely, the Patent Implementation Index, Copyright Implementation Index, and Trademark Implementation Index. Each representing the *de facto* strength of protection in their respective domains. These sub-indices comprise broad categories with underlying factors based on legal remedies under India's fully amended, TRIPS-compliant IPR regime. To assess how efficiently and promptly these remedies are delivered, variables such as the grant of preliminary injunctions and the speed of dispute resolution were incorporated, offering a holistic picture of enforcement performance. Descriptive statistics of these components are also presented for deeper understanding.

Each step in constructing the sub-indices is elaborated, and regimes are classified as weak (0–0.33), moderate (0.34–0.67), and strong (0.68–1) to interpret results effectively. The arithmetic mean of normalized category scores forms the basis of each index. Findings indicate a steady, linear rise in all three sub-indices over the study period, signifying progressive improvement in the implementation of patent, copyright, and trademark laws. On average, all three indices lie within the moderate enforcement range, trending toward stronger implementation in recent years. Notably, the Patent Implementation Index shows a remarkable 137% growth between 2010 and 2020, while the Copyright Implementation Index rises by 12% during the same period, underscoring a marked strengthening of IPR protection.

Finally, an examination of the internal composition of the IPRI index indicates that its overall movement is not uniformly driven by its constituent components. Although all three sub-indices exhibit strong co-movement with the final *de facto* index, reflecting a high degree of shared dynamics. While correlation, PCA and FA suggest that copyrights contribute most to the shared structure of the index, standardized regression-based variance decomposition reveals a more differentiated contribution pattern. It shows that patent and trademark indices provide stronger unique explanatory power. In particular, the trademark and patent components account for the largest shares of unique variation in the final index, whereas the contribution of copyrights is comparatively smaller and largely overlaps with that of the other components. Taken together, these results suggest that while copyrights play a central role in shaping the common structure of the index, the independent influence of trademarks and patents predominantly determines its marginal variation.

Importantly, the *de facto* index diverges significantly from the widely used Ginarte and Park (GP) Index, which underestimates India's IPR strength before 2000 and overestimates it

after 2000. These discrepancies highlight the limitations of traditional *de jure* measures and emphasize the necessity of enforcement-based indices to capture the real-world strength of IPR protection, especially in emerging economies like India.

In the future studies, we empirically examine the impact of IPR strengthening on India's economic growth using this new *de facto* index, analyzing how the inclusion of implementation dynamics alters the estimated effects across different IPR regimes. Moreover, how *de facto* IPR strengthening impact the industry-level outputs such as industry R&D, sales and profitability across different innovation levels.

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Table 1

Scoring Scheme of the Underlying Categories of the CRI and TRI Indices

Categories	Sub-categories/Underlying Factors	Sub-Factors	Scores
1) Preliminary Injunction	I) Grant of Preliminary Injunction	i) Granted	1
		ii) Not Granted	0
	II) The pace of Granting a Preliminary Injunction	i) Within 1 month	1
		ii) Between 1 month to 6 months	2/3
		iii) Between 6 months to 1 year	1/3
		iv) Anything above 1 year	0
	III) The Conversion of a Preliminary Injunction at the End	i) Both Permanent Injunction and Compensation	1
		ii) Permanent Injunction	2/3
		iii) Only Compensation	1/3
		iv) Vacated	0
2) Duration of Entire Suit	NA	k = Number of years spent in resolving the dispute	1-(k/20)
3) Other Entitlement	I) Anton Piller	i) Yes	1
		ii) No	0
	II) Cost Entitlement	i) Yes	1
		ii) No	0

Table2: Frequency Distribution of Patents, Copyrights and Trademarks Infringement Cases by Industry

Industry	Patents		Copyrights		Trademarks	
	Freq.	(%)	Freq.	(%)	Freq.	(%)
Air and spacecraft and related machinery	1	1.96				
Basic chemicals, fertilizer and nitrogen compounds	8	15.69			5	1.88
Basic iron and steel					1	0.38
Basic precious and other non-ferrous metals					1	0.38
Beverages					14	5.26
Computer programming, consultancy and related acti.					8	3.01
Construction of buildings					2	0.75
Consumer electronics	1	1.96			17	6.39
Creative, arts and entertainment activities			48	49.48	6	2.26
Dairy products					1	0.38
Data processing, hosting and related activities; web portals			1	1.03		
Domestic appliances	1	1.96			3	1.13
Electric motors, generators, transformers and electricity	4	7.84			2	0.75
Electric power generation, transmission and distribution	1	1.96				
Electronic components					1	0.38
Food products	1	1.96				
Footwear					3	1.13
Games and toys	2	3.92				
General-purpose machinery	1	1.96			10	3.76
Growing of non-perennial crops	2	3.92			3	1.13
Jewellery, bijouterie and related articles					1	0.38
Management consultancy activities					1	0.38
Measuring, testing, navigating and control equipment;					2	0.75
Medical and dental instruments and supplies					1	0.38
Motion picture, video and television programme active.			1	1.03		
Motor vehicles	2	3.92			10	3.76
Other chemical products					23	8.65
Other electrical equipment	1	1.96				
Other fabricated metal products; metalworking service					3	1.13
Other food products					25	9.39
Other manufacturing					4	1.5
Other personal service activities					1	0.38
Other social work activities without accommodation					2	0.75
Other textiles					1	0.38
Pharmaceuticals, medicinal chemical and botanical	17	33.33			38	14.29
Plastics products	1	1.96				
Printing and service activities related to printing			2	2.06	4	1.5
Products of wood, cork, straw and plaiting materials					7	2.63
Publishing of books, periodicals and other publishing activities			18	18.56	8	3
Real estate activities with own or leased property					11	4.14
Refined petroleum products	1	1.96			9	3.38
Rubber products					2	0.75
Short term accommodation activities					4	1.5
Software publishing			11	11.34		
Specialized design activities			1	1.03		
Special-purpose machinery	2	3.92			3	1.13
Spinning, weaving and finishing of textiles					1	0.38
Structural metal products, tanks, reservoirs and steam					1	0.38
Tanning and dressing of leather; manufacture of luggage, bags	1	1.96			2	0.75
Telecommunication	4	7.84				
Television programming and broadcasting activities			15	15.46	2	0.75
Tobacco products					3	1.13
Transport equipment					1	0.38
Travel agency and tour operator activities					1	0.38
Vegetable and animal oils and fats					2	0.75
Wearing apparel, except fur apparel					16	6.02
Total	51	100	97	100	266	100

Table 3: Preliminary Injunction Statistics in IP infringement Trials by Year													
	(a) Number of IP trials				(b) Preliminary Injunction (PI) Grants					(c) Duration of PI Grants			
Year	Patents	Copyrights	Trademarks	Total	No. of trials where PI claimed	Prop. of granting PI when claimed (Average)	Std. Dev.	Min	Max	Average Duration of granting PI from the date of filing the suit	Std. Dev.	Min	Max
1970	0	2	0	2	1	0	.	0	0	.	.	.	.
1975	1	1	2	4	4	1	0	1	1	.17	.34	0	.67
1980	1	3	3	7	6	.83	.41	0	1	.58	.42	0	1
1985	2	3	6	11	9	.78	.44	0	1	.56	.46	0	1
1990	1	3	1	5	5	1	0	1	1	.67	.34	.33	1
1995	3	9	9	21	21	.76	.44	0	1	.69	.43	0	1
2000	3	3	5	11	11	.82	.41	0	1	.37	.48	0	1
2005	1	12	40	53	44	.84	.37	0	1	.8	.33	0	1
2010	9	25	82	116	97	.71	.46	0	1	.82	.35	0	1
2015	16	23	108	147	115	.79	.41	0	1	.87	.29	0	1
2020	14	13	10	37	32	.69	.47	0	1	.88	.26	0	1
Overall	51	97	266	414	345	.77	.42	0	1	.79	.35	0	1

Table 4: Tabulation: Mediation/ Ex-parte/ Withdrawn						
Whether the case lawfully compromised/withdrawn from the court/ or defendant stop appearing at some point in time?	**Overall**			**Patents**	**Copyrights**	**Trademarks**
	Freq.	**Percentage**	**Cum.**	**(%)**	**(%)**	**(%)**
Arbitration Petition	1	0.24	0.24	1.96	.	.
Compromised	78	18.89	19.13	41.18	10.31	17.74
Defendants proceeded ex-parte	82	19.85	38.98	.	19.59	23.77
Withdrawn and settled outside	10	2.42	100.00	5.88	3.09	1.51
Information not given	21	5.08	44.07	.	8.25	4.91
None of the above	221	53.51	97.58	50.98	58.76	52.08
Total	414	100.00		100.00	100.00	100.00

Table 5: Tests for Principal Component Analysis (PCA)

Panel (a): Skewness/Kurtosis and Shapiro-Wilk W Tests for Normality

		Skewness/Kurtosis				Shapiro-Wilk W Test			
Vars	**N**	**P(Skew)**	**P(Kurt)**	**adj_chi2(2)**	**Prob>chi2**	**W**	**V**	**z**	**Prob>z**
PRI	11	0.307	0.482	1.780	0.410	0.957	0.700	-0.61	0.731
CRI	11	0.240	0.981	1.590	0.452	0.935	1.053	0.092	0.463
TRI	11	0.062	0.058	6.290	0.043	0.884	1.876	1.188	0.117

Panel (b): Matrix of Correlations

Variables	**(1)**	**(2)**	**(3)**
(1) PRI Index	1.000		
(2) CRI Index	0.708	1.000	
(3) TRI Index	0.484	0.753	1.000

Panel (c): Kaiser-Meyer-Olkin (KMO) Test of Sample Adequacy and Barlett's Test for Sphericity

KMO Test-Statistic	**Barlett's Test**		
0.617	Chi-Sq	Degree of Freedom	P-value
	12.612	3	0.006**

Note: *Here, ** indicates that the null hypothesis is rejected at 5% level of significance.*

Panel (d): Principal Components (Eigenvectors)

	PC1	**PC2**	**PC3**
Eigenvalue	2.303	0.517	0.179
Proportion	0.768	0.172	0.060
	PC1	**PC2**	**PC3**
PRI Index	0.546	0.744	0.385
CRI Index	0.621	-0.052	-0.782
TRI Index	0.562	-0.666	0.491

Panel (e): Component Rotation Matrix-Orthogonal Varimax

	PC1	**PC2**	**PC3**
PC1	0.546	0.562	0.621
PC2	0.744	-0.666	-0.052
PC3	0.385	0.491	-0.782

Table 6: Tests For Factor Analysis				
Panel (a): Factor Analysis/Correlation				
Factor	**Eigenvalue**	**Difference**	**Proportion**	**Cumulative**
Factor1	1.918	1.864	1.065	1.065
Factor2	0.054	0.226	0.030	1.095
Factor3	-0.172	.	-0.095	1.000

LR test: independent vs. saturated: chi2(3) = 14.16 Prob>chi2 = 0.0027** (Significant at 5% level)

Panel (b): Factor Loadings (Pattern Matrix) and Unique Variances			
Variable	**Factor1**	**Factor2**	**Uniqueness**
PRI Index	0.716	0.169	0.458
CRI Index	0.905	0.002	0.180
TRI Index	0.765	-0.160	0.390

Panel (c): Rotated Factor Loadings (Pattern Matrix) and Unique Variances			
Variable	**Factor1**	**Factor2**	**Uniqueness**
PRI Index	0.469	0.567	0.458
CRI Index	0.721	0.548	0.180
TRI Index	0.706	0.334	0.390

Panel (d): Factor Rotation Matrix		
	Factor1	**Factor2**
Factor1	0.797	0.604
Factor2	-0.604	0.797

Table 7: Index of IPR Implementation: 1970 to 2020

Panel (a): Different Weighting Strategies

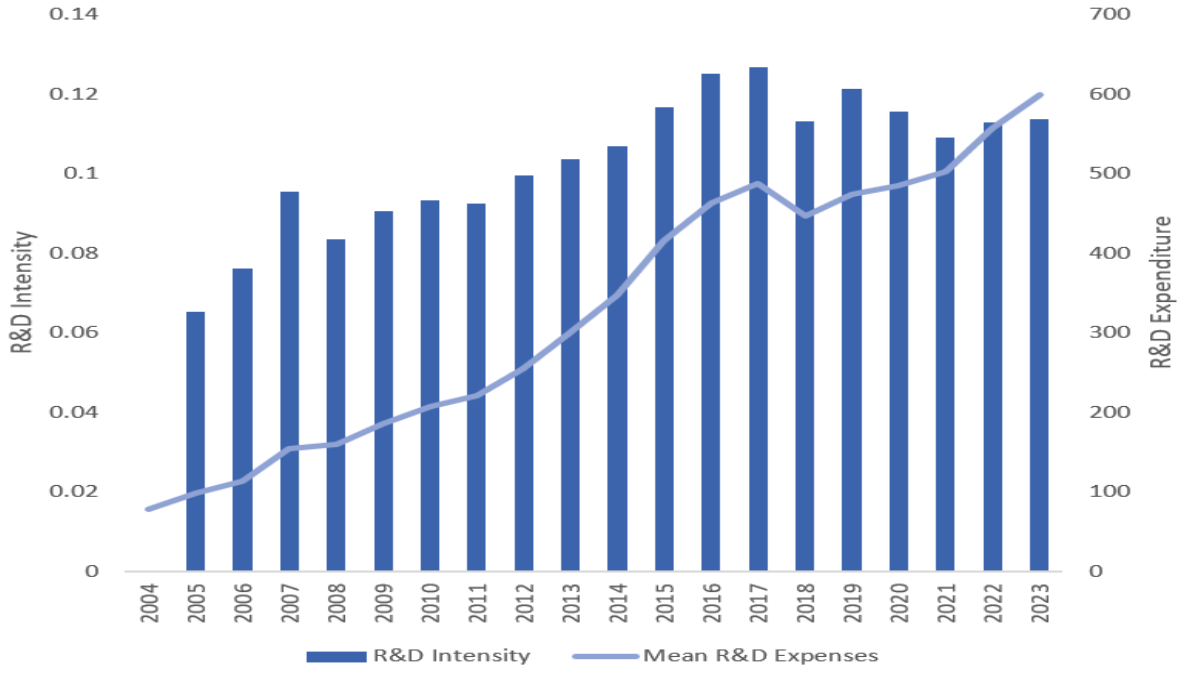
Year	Equal-Weight Index	Norm_PC1_Predicted_Index	PC1_Share_Load_Index	Norm_F1_Predicted_Index	F1_Share_Load_Index
1970	0.0647222	0	0.0697058	0	0.0735892
1975	0.4288095	0.7808041	0.4308964	0.7751884	0.4322536
1980	0.399709	0.7026699	0.399908	0.6534133	0.399572
1985	0.2771958	0.4239078	0.2776994	0.3444132	0.2780556
1990	0.4574074	0.8304898	0.4566144	0.7824802	0.4550806
1995	0.3877337	0.6731681	0.3877036	0.6150228	0.387217
2000	0.3905926	0.6518362	0.3889789	0.5350471	0.3877111
2005	0.480924	0.8980723	0.4846225	0.9181266	0.4878106
2010	0.3866213	0.7006826	0.3908703	0.7284495	0.3942812
2015	0.5302356	0.9889606	0.5308304	0.9604961	0.5310417
2020	0.5283741	1	0.5294147	1	0.5295517
Panel (b): Summary Statistics					
Mean	0.3938477	0.695508309	0.395204036	0.6647852	0.396014936
Standard Deviations	0.1309997	0.283785135	0.130130785	0.292934303	0.129355134
Minimum	0.0647222	0	0.0697058	0	0.0735892
Maximum	0.5302356	1	0.5308304	1	0.5310417

Panel (c): Sensitivity of the IPR Implementation Index: Spearman's Rank Correlation Test

Variables	(1)	(2)	(3)	(4)	(5)
(1) Equal Weight Index	1.000				
(2) Norm_PC1_Predicted_Index	0.955	1.000			
(3) PC1_Share_Load_Index	0.973	0.982	1.000		
(4) Norm_F1_Predicted_Index	0.927	0.991	0.973	1.000	
(5) F1_Share_Load_Index	0.973	0.982	1.000	0.973	1.000

Spearman rho = 0.973

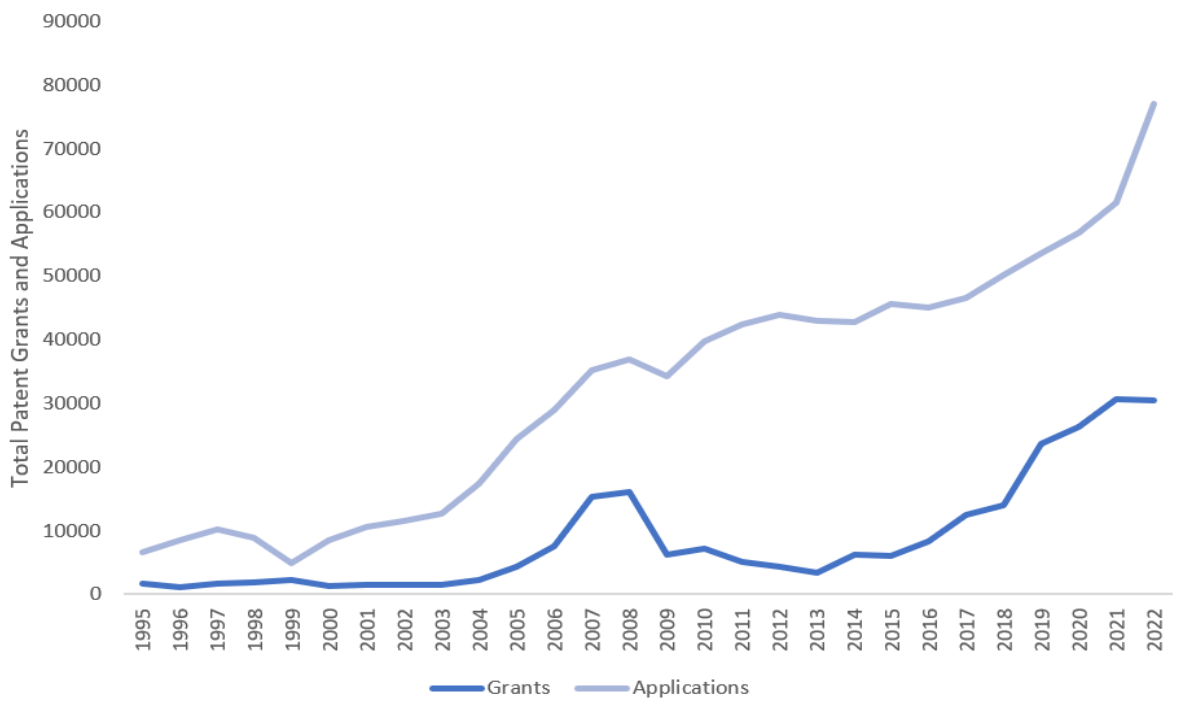
Figure 1: R&D Intensity and Expenditure of the Indian Drugs and Pharmaceutical Industry (in Million Rs.)



Note: To calculate R&D intensity, we have taken the ratio of yearly averages of R&D expenditure of all the Indian pharmaceutical firms[64] available at the Center for Monitoring Economy (CMIE) Prowess database to their yearly average of the total sales[65] value lagged for one period[66].

[64] There is a total of 948 pharmaceutical firms available at the CMIE website.
[65] This criteria of calculating the R&D intensity is used by many studies such as Cohen and Klepper (1992), Bouquet and Deutsche (2008), Padget and Galan (2010), and etc.
[66] The total sales variable is lagged one year because the budget for R&D is typically allocated several months before the funds are actually expended (Cohen and Klepper, 1992). That's why, the R&D expenditure of this year depends on the sales of the last year.

Figure 2: Total Patent Applications and Grants (1995 to 2022)



Note: Based on the estimates of the number of patent fillings and grants in India for years 1995 to 2021 obtained from the WIPO database (July 2023) at https://www.wipo.int/ipstats/en/

Figure 3: Categories and Underlying Factors/Sub-Categories of Patent Rights Implementation Index

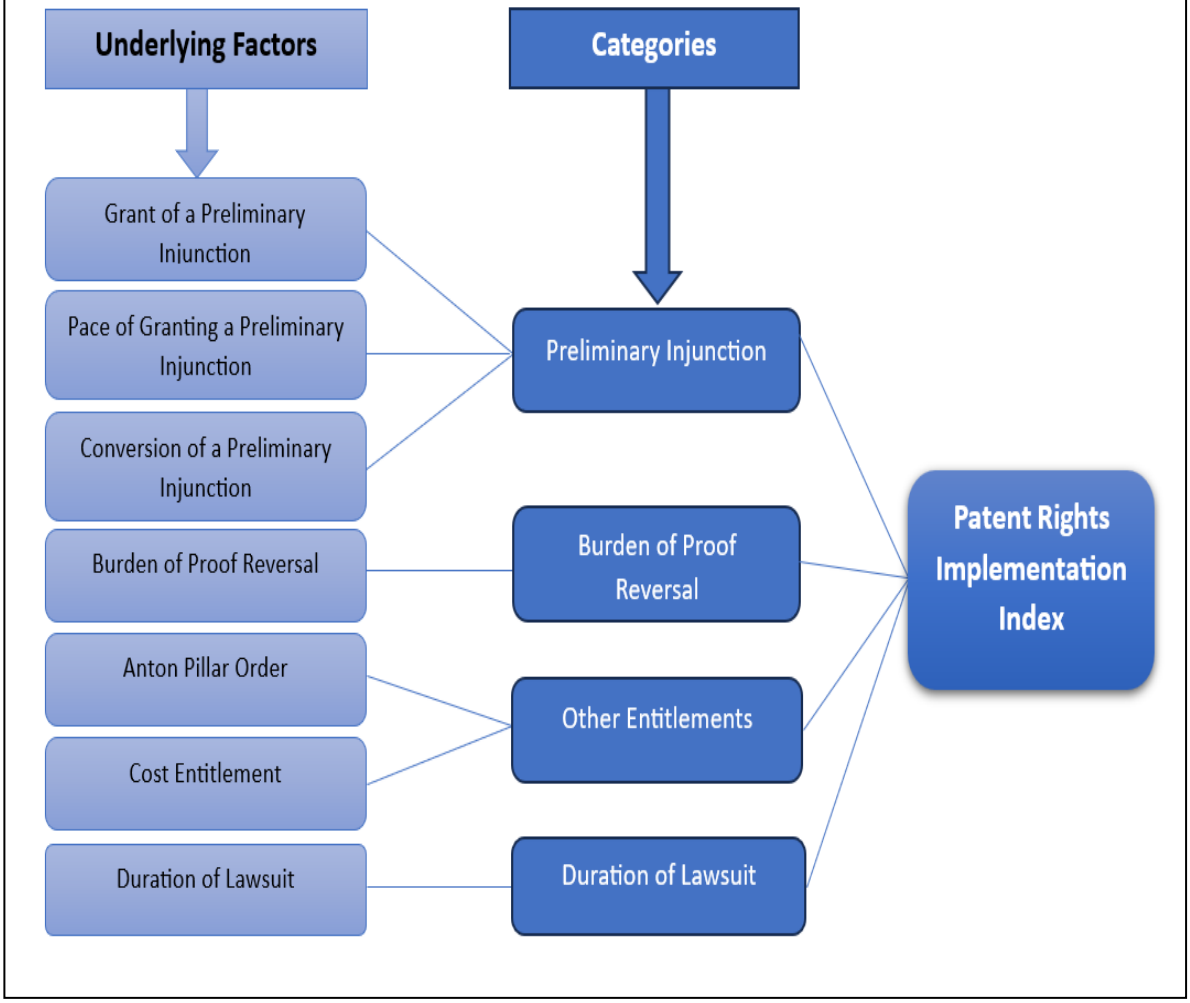


Figure 4
The Patent Rights Implementation Index

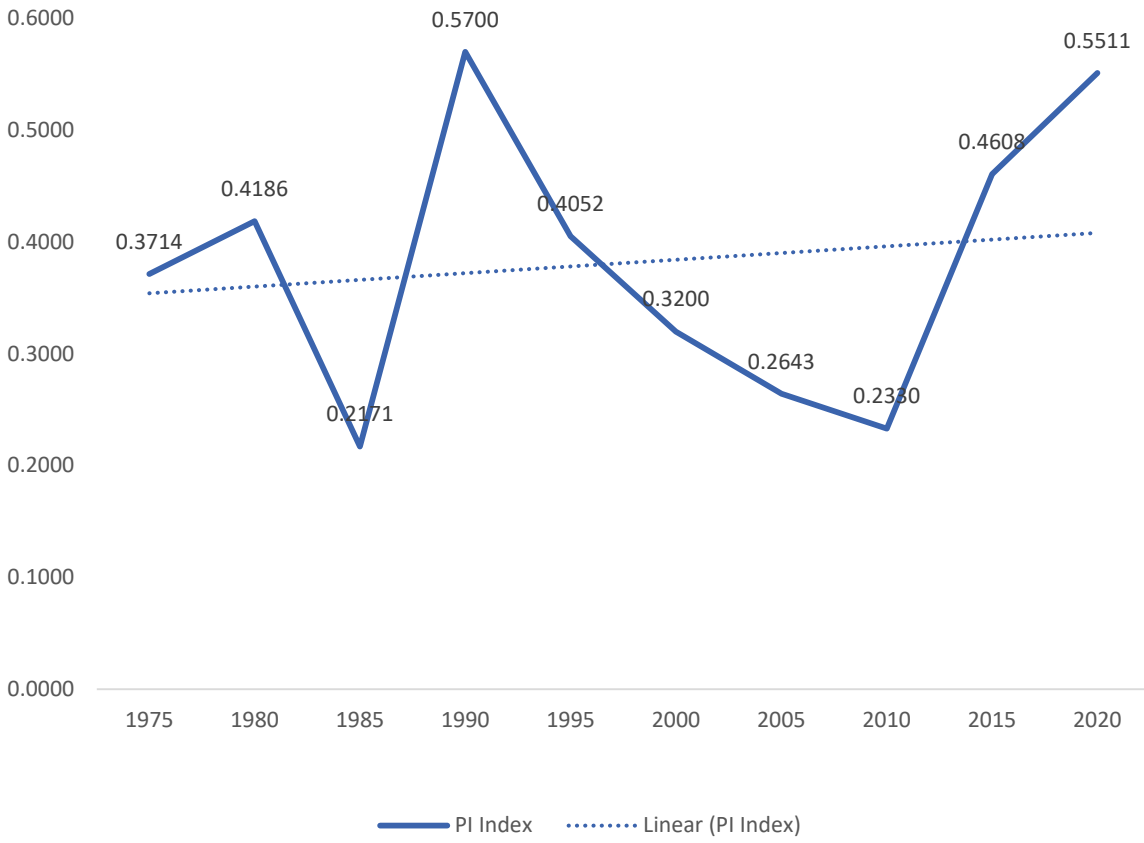


Figure 5
Patent Rights Implementation Index (Growth Rates)

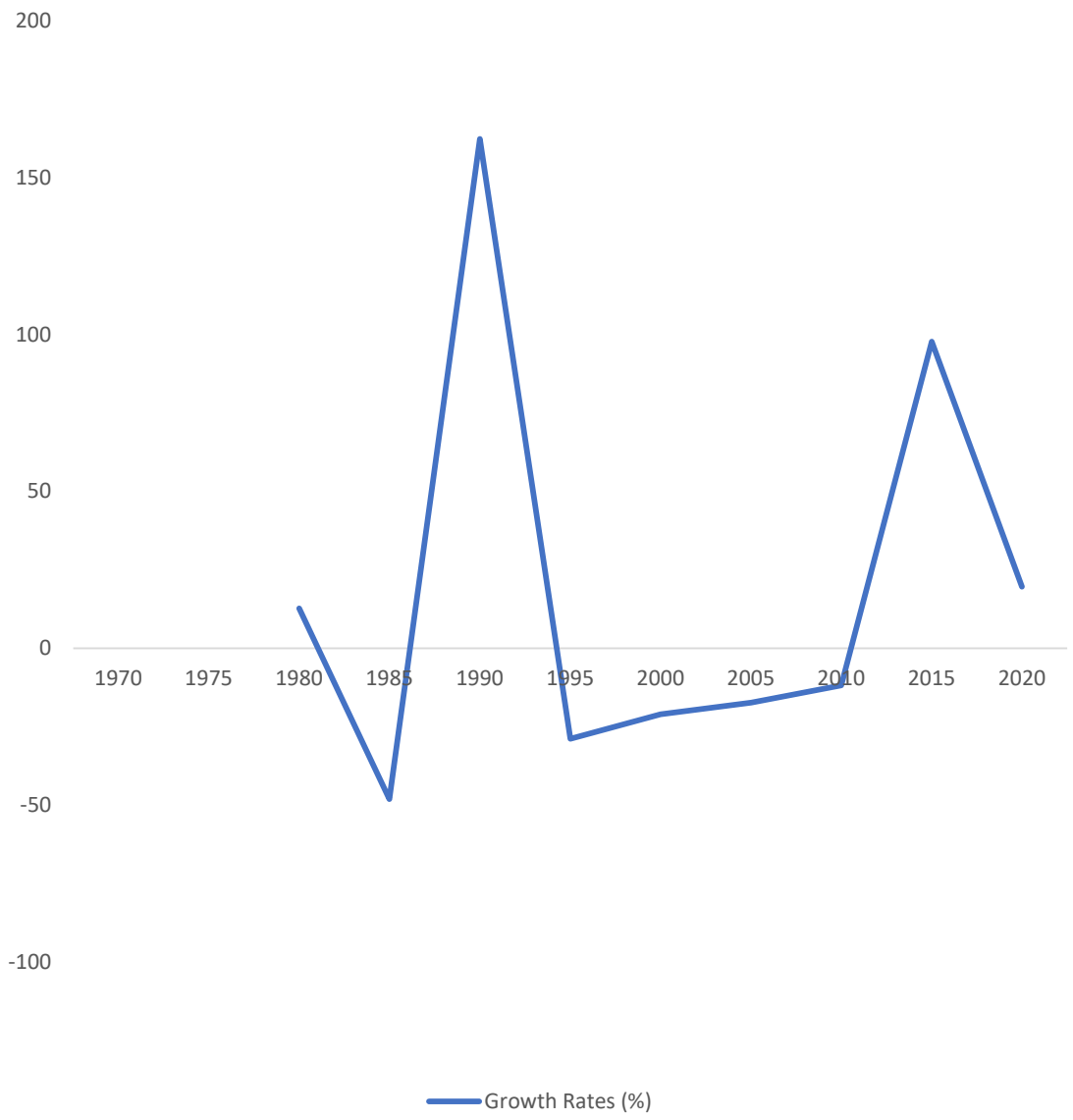


Figure 6

The Copyright Implementation Index

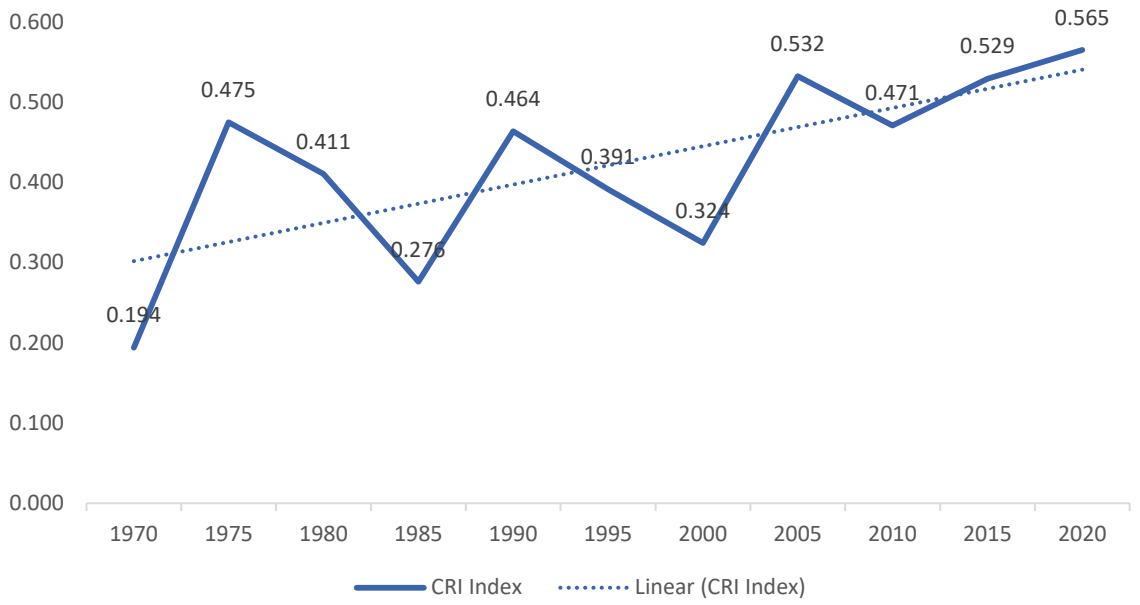


Figure 7

The Trademark Implementation Index

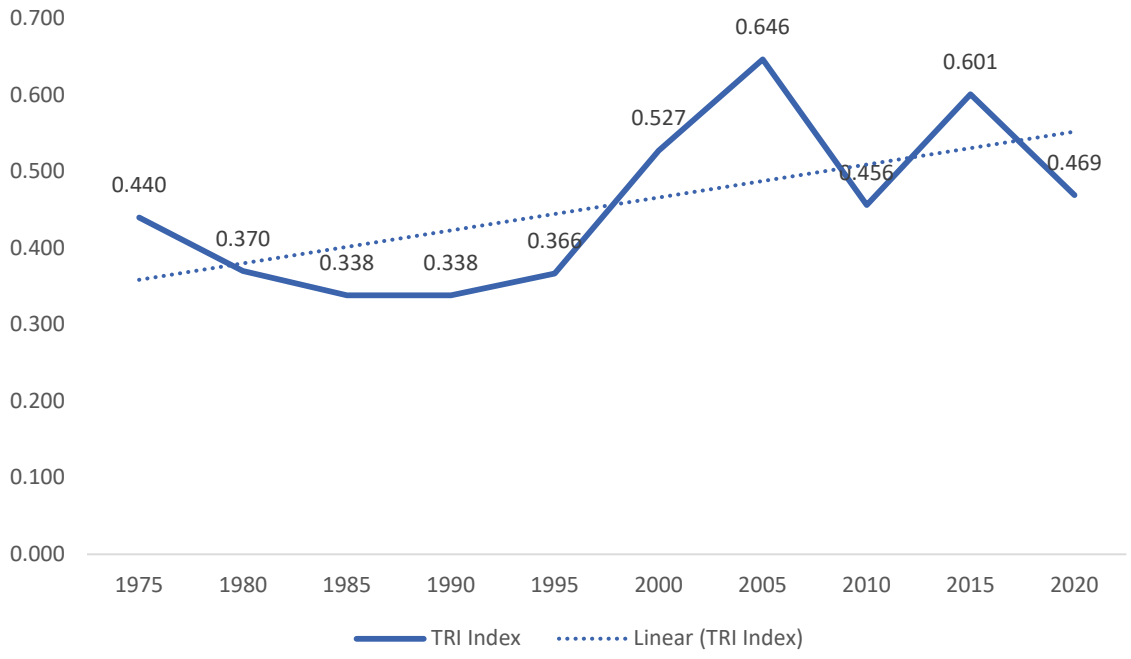


Figure 8

Trends of Final IPRI and All the Three Sub-Indices Over Time

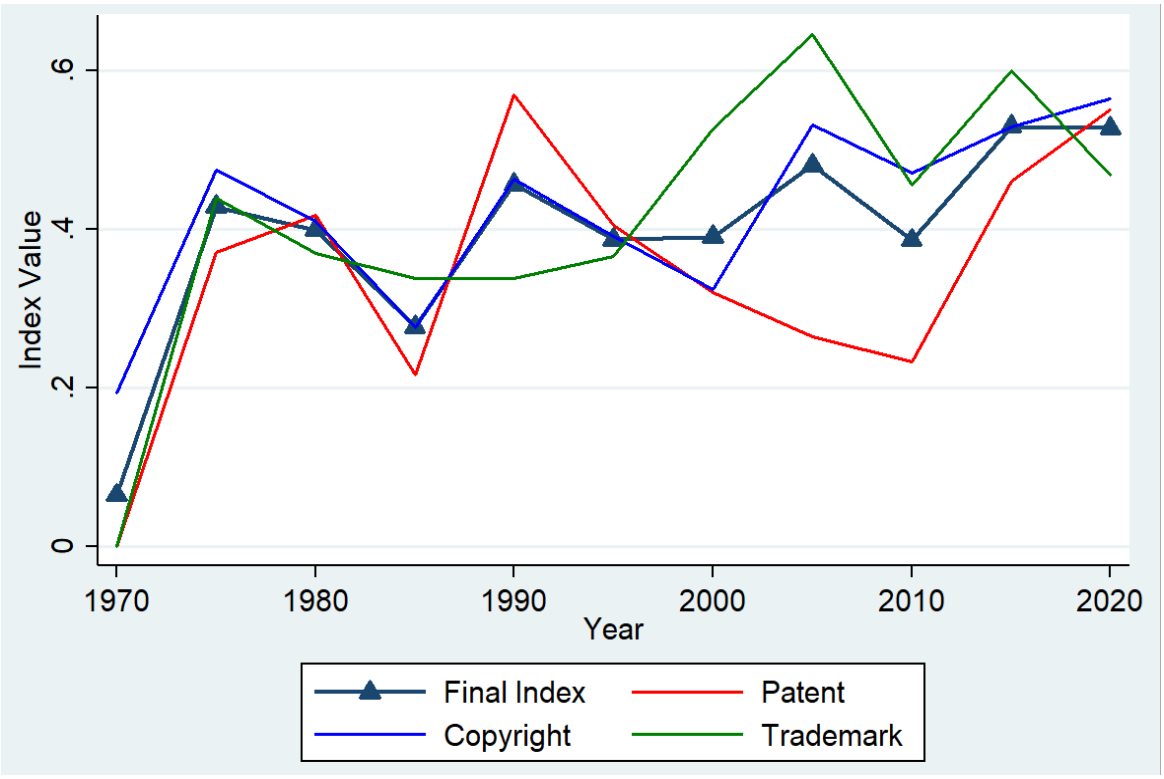


Figure 9

Different Versions of IPR Implementation Index: 1970-2020

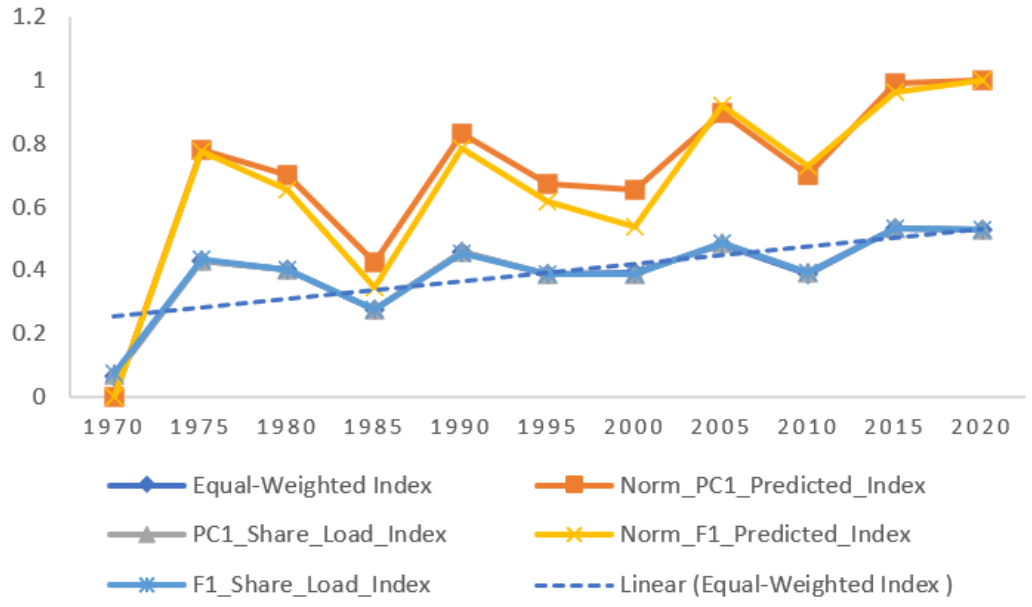


Figure 10

Comparision Between IPRI Index and GP Index