STANDARDS ESSENTIAL UTILITY MODELS[*]

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ABSTRACT

Approximately eighty countries including China, Germany, France and Brazil, recognize a form of intellectual property protection "below" the level of patents which is generally referred to as the "utility model" (UM). Unlike patents, UMs are generally not given a substantive examination by an administrative agency, have shorter terms than patents, and vary in their enforceability in litigation. Yet UMs are increasingly being declared as "essential" to industry standards (standards-essential utility models or SEUMs), licensed, together with patents, under FRAND and other licensing policies and even enforced in litigation. This paper, for the first time, analyzes the scope and extent of UM essentiality declarations and the litigation of SEUMs, both in isolation and compared to other UMs and standards essential patents (SEPs).

It finds that: (1) where available, UMs are viewed as being easier, cheaper and quicker to obtain than patents, though their assertion in litigation may be less robust, (2) though some jurisdictions limit the subject matter of UMs to simple mechanical devices, others permit UMs covering complex technologies involving software and methods, such that the specifications and claims of many UMs are outwardly indistinguishable from those of patents, (3), the principal jurisdictions in which UMs are issued include China (by a wide margin), Taiwan, Germany, Korea and Japan, all of which are key jurisdictions involved in ICT standardization, (4) some, but not all, SDOs expressly permit or require the disclosure and licensing of UMs that are potentially essential to their standards, while the requirements of SDO policies that do not expressly mention UMs are ambiguous, (5) nearly 1,000 SEUMs have been declared as essential to broadly-adopted industry standards at ETSI and other prominent SDOs, (6) firm strategies appear to differ dramatically in terms of SEUM declaration, ranging from intensive to virtually no SEUM activity, even among firms of similar size and market focus,

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and (7) though far less than other SEPs, SEUMs have been subject to litigation in China and Germany, and there appears to be no structural barrier to their litigation in other jurisdictions. These findings raise questions concerning the legal requirement to disclose and license SEUMs and the value of SEUMs for purposes of calculating FRAND royalty rates for individual firm portfolios and for determining top-down aggregated royalty rates for entire standards.

CONTENTS

INTRODUCTION 5
I. UTILITY MODEL SYSTEMS AROUND THE WORLD 6
A. Adoption of Utility Model Protection 6
B. Utility Models in International Agreements 8
C. Characteristics of Utility Model Protection 8
1. Eligible Subject Matter 9
2. Examination 9
3. Litigation 9
II. STANDARDS ESSENTIAL PATENTS AND UTILITY MODELS 10
A. FRAND Licensing Commitments – Background 10
B. Essentiality 10
C. Utility Models as Standards-Essential 11
III. DATA CONCERNING STANDARDS ESSENTIAL UTILITY MODELS 12
A. Empirical Literature Concerning Utility Models 12
B. Methodology 13
C. Findings – Utility Models 14
1. Utility Model Filings by Country 14
2. Utility Model Filers 17
D. Findings – Standards Essential Utility Models (SEUMs) 17
1. Technical Content of SEUMs 17
2. SEUM Declarations 18
3. Geographic Distribution of SEUMs 19
4. SEUM Declarants 21
5. Jurisdictional Choices by SEUM Declarants 23
6. SEUMs and SDOs 24
E. Litigation Data 25
1. Litigated Utility Models 25
2. Litigated SEPs 27
3. Litigated SEUMs 28
F. Summary of Findings 29
IV. Discussion 30
A. SDO Policies and UMs 30
B. SEUMs and FRAND Royalties 31

C. UM Harmonization 32
D. Areas for Further Research 33
CONCLUSION 33
DATA APPENDIX 35

INTRODUCTION

Unlike the United States, which has a single patent system for the protection of all innovations meeting a minimum threshold of inventivenss, approximately eighty countries worldwide, including major economies such as China, Japan, Korea and Germany,[1] offer a lesser form of innovation protection known variously as utility models, technical designs, petty patents, innovation patents, short-term patents, and the like.[2] For the sake of convenience, we refer to all such forms of sub-patent innovation protection as "utility models" or simply "UMs".

While national rules regarding the scope, availability and issuance of UMs vary from country to country,[3] most UM regimes offer protection for tangible products, with many, but not all, jurisdictions excluding processes, biological materials and computer software from the scope of protection.[4] The duration of UM protection ranges from five to fifteen years, with most countries offering ten years of protection.[5] In most countries, UM applications are not formally examined and must simply disclose the product in question.[6]

Given the lack of examination, obtaining UMs is generally viewed as faster and cheaper than obtaining patents.[7] This combination of speed and cost, in theory, makes UMs potentially attractive to small and medium enterprises (SMEs) that cannot afford to obtain full patent protection.[8] Similar considerations have also been raised as advantageous to innovators in low-income countries.[9] As one commentator observed of Germany's UM system, which dates to 1891, UMs were from the beginning intended to benefit small businesses and innovators who lacked the resources to seek full patent protection:

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[1] World Intell. Prop. Org., WIPO IP Statistics Data Center, https://www3.wipo.int/ipstats/index.htm?tab=utility (version updated Nov. 2021) (visited Jun. 28, 2022) [hereinafter WIPO IP Statistics].

[2] See Uma Suthersanen, *Utility Models: Do They Really Serve National Innovation Strategies?*, *in* THE INNOVATION SOCIETY AND INTELLECTUAL PROPERTY 2, 4 (Josef Drexl & Anselm Kamperman Sanders eds., 2019) (discussing nomenclature).

[3] See Daniel R. Cahoy & Lynda J. Oswald, *Is Legal Harmonization Always Better? The Counter-Case of Utility Models*, 58 AM. BUS. L.J. 525 (2021) (noting the lack of harmonization of utility model regimes around the world).

[4] See Dan Prud'homme, *Creating a "model" utility model patent system: A comparative analysis of the utility model patent systems in Europe and China*, IP KEY WORKING PAPER FOR CHINA'S STATE INTELLECTUAL PROPERTY OFFICE 23-28 (2014), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2541900.

[5] See John Richards, Utility Model Protection Throughout the World at Table 1 (2010), https://ipo.org/wp-content/uploads/2013/03/Utility_Model_protection.pdf.

[6] See Prud'homme (2014), *supra* note 4, at 58.

[7] Prud'homme (2014), *supra* note 4, at 17 Chart 2 (comparing official costs of utility models versus patents in China and various European countries) and 48-49.

[8] *See* Prud'homme (2014), *supra* note 4, at 10-11; Uma Suthersanen, Utility Models and Innovation in Developing Countries 7-8, UNCTAD-ICTSD Project on IPRs and Sustainable Development (2006).

[9] *See* Prud'homme (2014), *supra* note 4, at 10-11; Suthersanen (2006), *supra* note 8, at 7-8.

> A utility model patent is a 'little patent,' or the 'patent of the small business man.' Its value lies in the rapid protection of short-lived innovations. It is intended to promote the development or further development of articles of use, articles of mass consumption, for which it has always had special significance...[10]

Despite their long history and widespread adoption, UMs remain, as Professor Mark Janis observed more than two decades ago, "a backwater of intellectual property."[11] Compared to the large body of scholarly literature in other areas of intellectual property law, particularly that concerning patents, there is scant literature concerning UMs, and only a handful of empirical studies that focus on them.[12]

This paper, for the first time, assesses the declaration of UMs as essential to widely deployed technical interoperability standards and analyzes the impact of these declarations on the "FRAND" licensing commitments of their owners.[13]

The remainder of this paper proceeds as follows: Part I provides a brief overview of UM systems around the world. Part II summarizes SDO requirements regarding the disclosure and licensing of patents and UMs. Part III briefly summarizes the empirical literature concerning UMs, then presents the results of our study, comparing SEUM filing, declaration and litigation rates to those of UMs and SEPs more broadly. Part IV discusses the implications of these findings for SDOs, policy makers and private firms. We conclude with recommendations for further research.

I. UTILITY MODEL SYSTEMS AROUND THE WORLD

A. Adoption of Utility Model Protection

The concept of the utility model was first introduced in Great Britain via an 1843 Act that allowed applicants to register the shape and configuration of useful articles of manufacture -- a complement to an 1842 act protecting ornamental

[10] H. Naumann, *Utility Model Patent Protection*, 40 J. Pat. Off. Soc'y 800, 802-03 (1958).

[11] Mark D. Janis, *Second Tier Patent Protection*, 40 HARV. INTL. L.J. 151, 152 (1999). For recent collections of citations to the academic literature on utility models, see Cahoy & Oswald, *supra* note 3, at 528 n.10 and Suthersanen (2019), *supra* note 2, at 3 n.3

[12] The existing empirical literature on utility models is discussed in Part II.A, infra.

[13] FRAND designates a commitment to license patents essential to an industry standard on terms that are fair, reasonable and nondiscriminatory. See Part II.A, *infra*.

product designs.[14] Given a range of perceived conflicts with the patent system and little use by practitioners, the UK statute was formally revoked in 1919.[15]

Germany, in contrast, embraced the concept of UMs during the late nineteenth century as a necessary form of legal protection for "small inventions" – useful improvements of products such as clothing, hand tools and housewares.[16] UMs, in the German framework, fit somewhere between existing protections for fashion designs, which were purely aesthetic, and patents, which required a higher showing of novelty. In 1891, the German legislature enacted its first statute protecting the utility model or *Gebrauchsmuster*.[17]

Japan and Poland followed shortly after Germany in enacting UM protections during the early twentieth century,[18] with other jurisdictions across Europe, Asia and Latin America implementing UM systems throughout the century. Jurisdictions around the world continue to experiment with UM protection, and proposals for UM systems have been periodically made in the United States,[19] the European Union,[20] India[21] and other countries.

At the same time, some countries that once had UM systems have discontinued them due to perceived conflicts with the general patent system or their failure to achieve desired goals. Thus, the Netherlands, which adopted a "short term patent" system in 1995, eliminated that system in 2008.[22] Belgium abolished its "small patent" system in 2009.[23] And Australia, which adopted an "innovation patent" system akin to UMs in 2001, formally discontinued that system in 2021 after significant policy debate.[24]

And though major industrial jurisdictions including Germany, France, Italy, Japan and Korea still offer UM protection, UMs are utilized most heavily in China, where more than 97.5% of the approximately three million worldwide UM applications were filed in 2021.[25]

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[14] Lionely Bently & Brad Sherman, *The United Kingdom's Forgotten Utility Model: The Utility Designs Act 1843*, 1997 Intell. Prop. Q. 265, 268 (1997).

[15] Bently & Sherman, *supra* note 14, at 277.

[16] Naumann, *supra* note 10, at 801.

[17] Nauman, *supra* note 16, at 801. See also Kelsey Martin Mott, *The Concept of Small Patent in European Legal Systems and Equivalent Protection under United States Law*, 49 Va. L. Rev. 232, 234-46 (1963) (history of German utility model laws).

[18] *See* Mott, *supra* note 17, at 246 (citing LADAS, THE INTERNATIONAL PROTECTION OF INDUSTRIAL PROPERTY 458-63 (1930)).

[19] Janis, *supra* note x.

[20] [draft UM directive]

[21] See Raju Narayana Swamy, Utility Models as A Second –Tier Patent System: Is it worth implementing in India? Working Paper, May 12, 2022, https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4091118.

[22] See Prud'homme (2014), *supra* note 4, at 11.

[23] Id. at 11-12.

[24] [Rimmer]

[25] WIPO IP Statistics, *supra* note 2 (2,852,219 Chinese utility model applications versus worldwide total of 2,923,019 utility model applications).

B. Utility Models in International Agreements

UMs are expressly contemplated alongside patents by the Paris Convention for the Protection of Industrial Property, which added language concerning UMs in 1911.[26] Yet the Paris Convention does not explicitly delineate the scope of UM protection, which is left largely to the discretion of signatory states. The principal effect of the Paris Convention is simply to require that signatories grant national treatment to applicants for these rights, meaning that they may not discriminate between domestic and foreign applicants or among applicants from different countries.[27] The result of this lack of formal treaty guidance is a diverse set of UM rules that lack significant harmonization.[28]

Unlike the Paris Convention, the 1994 World Trade Organization (WTO) Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS Agreement) does not cover UMs.[29] According to one leading commentator, this omission was intentional.[30] But while UMs are not expressly authorized under the TRIPS Agreement, they are not prohibited by it either. Accordingly, as observed by Uma Suthersanen, WTO members "are free to formulate or reject UM protection as they see fit", provided, of course, that they comply with national treatment obligations under the Paris Convention, which are incorporated into TRIPS.[31]

C. Characteristics of Utility Model Protection

While UM protection varies from country to country, UMs share some key characteristics. This Section highlights some of the similarities and differences of UM protection in various jurisdictions.

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[26] Paris Convention for the Protection of Industrial Property, art. 1, ¶ 2, July 14, 1967, 21 U.S.T. 1583, 828 U.N.T.S. 305 ("The protection of industrial property has as its object patents, utility models, industrial designs, trademarks, service marks, trade names, indications of source or appellations of origin, and the repression of unfair competition.") See Cahoy & Oswald, *supra* note 3, at 534 n.34.

[27] See Henning Grosse Ruse-Khan, *The International Legal Framework For the Protection Of Utility Models: Paper prepared for the WIPO Regional Seminar on the Legislative, Economic and Policy Aspects of the Utility Model System, Kuala Lumpur (Malaysia), 3-4 September 2012*, (2012), https://www.wipo.int/edocs/mdocs/aspac/en/wipo_ip_kul_12/wipo_ip_kul_12_ref_t3c.pdf.

[28] See Cahoy & Oswald, *supra* note 3, at 527 ("there appears to be no harmonization effort for this right or even general concern about its seemingly random availability or lack of treaty coverage.")

[29] Agreement on Trade-Related Aspects of Intellectual Property Rights, Apr. 15, 1994, Marrakesh Agreement Establishing the World Trade Organization, Annex 1C, 1869 U.N.T.S. 299 [hereinafter TRIPS Agreement].

[30] DANIEL GERVAIS, THE TRIPS AGREEMENT: DRAFTING HISTORY AND ANALYSIS 337-38 (3rd ed. 2008) (TRIPS Agreement was intended to cover only standard patents and not utility models).

[31] Suthersanen (2019), *supra* note 2, at 6. Utility models have also been recognized in certain bilateral and multilateral trade and investment agreements. *See id*. at 6-7, Grosse Ruse-Khan, *supra* note 27, at x.

1. Eligible Subject Matter

It is a common perception that UM are intended to cover relatively simple product design features that do not rise to the level of inventiveness of patents. For example, the original German UM system was originally directed toward physical products (i.e., those that possessed "spatial form" (*Raumform*)).[32] Thus, as recently as 2021, UM in Germany were granted for inventions such as neck pillows (DE202021001064U1), Christmas tree stands (DE202021000981U1), drinking straws (DE202021103855U1) and a novel "mobile dog waste collection aid" (DE202021003254U1). However, the German spatial form requirement was eliminated in 1990.[33] Germany now permits UM protection for chemical and electrical, in addition to mechanical, designs, resulting in what Mark Janis refers to as "a scope of eligible subject matter essentially congruent to that of the regular patent regime."[34] Thus, recent German UM include a "communication control chip" (DE202021106098U1), a "circularly polarized cylindrical two-port MIMO dielectric resonator antenna device for 5G applications" (DE202021105303U1) and a "payment system with the option of transaction-specific rights control" (DE202021000532U1) – inventions that could easily be envisioned as the subjects of ordinary patent protection. This convergence of UM and patent coverage appears in many jurisdictions, such that many UM are today virtually indistinguishable from patents, at least at a textual level.

2. Examination

One the key differences between UM and patents is in their examination procedure. While patents are typically examined by a governmental office that has technical expertise and applies strict criteria for patentability to claimed inventions, UM are typically granted pursuant to a registration-only system, in which they are granted without substantive examination.[35] This difference often results in the issuance of UM in a manner that is more rapid and less expensive than that of patents.[36]

3. Litigation

The ability of holders to enforce UM varies around the world. In some jurisdictions such as Australia and Sweden, UM may not be enforced in litigation.[37] Rather, the holder must seek a substantive examination or convert them to patents before enforcement. In other jurisdictions, such as Germany, UM may be enforced directly once they are issued.[38]

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[32] *See* Janis, *supra* note x, at 164.
[33] *See* Janis, *supra* note x, at 164.
[34] *See* Janis, *supra* note x, at 164.
[35]
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In addition to enforcement, UMs can be subject to validity challenges either in administrative proceedings or court proceedings.[39]

II. STANDARDS ESSENTIAL PATENTS AND UTILITY MODELS

A. FRAND Licensing Commitments – Background

Technical interoperability standards such as Wi-Fi, 5G and Bluetooth are communication protocols that enable products made by different manufacturers to communicate with little user intervention. Today, most of these standards are developed by firms that collaborate within industry associations known as standards-development organizations (SDOs).[40] Given the technical nature of their contributions, firms that participate in SDOs can accumulate hundreds or thousands of patents covering key interoperability standards, particularly in the telecommunications and computing industries.[41] In order to address concerns about the leverage that holders of such patents could exert after a standard is widely adopted (so-called patent "hold-up"),[42] most SDOs have adopted policies requiring their participants to license patents that are "essential" to their standards (standards-essential patents or SEPs) to the manufacturers of standardized products on terms that are "fair, reasonable and non-discriminatory" (FRAND) and that are either royalty-free or that bear royalties that are themselves FRAND.[43] This obligation is intended to assure manufacturers that they will be able to incorporate widely-adopted standards into their products without the threat of being prohibited from selling standardized products by the holders of SEPs.

B. Essentiality

A SEP holder's obligation to grant licenses to manufacturers of standardized products generally applies only to patents that are "essential" to the implementation of the standard.[44] Holding a SEP is thus a double-edged sword. On one hand, the owner must forego to right to use the SEP to exclude others from the market for

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[40] *See generally* Justus Baron et al., *Making the Rules: The Governance of Standard Development Organizations and their Policies on Intellectual Property Rights*, *in* JRC SCIENCE FOR POLICY REPORT, EUR 29655 (Nikolaus Thumm ed., 2019).

[41] *See, e.g.*, Justus Baron & Tim Pohlmann, *Mapping Standards to Patents Using Declarations of Declared Standard-Essential Patents and Systems of Technological Classification*, 27 J. ECON. & MGMT. STRATEGY 504, 521, tbl. 7 (2018).

[42] *See generally* U.S. DEPT. JUSTICE & FEDERAL TRADE COMM'N, ANTITRUST ENFORCEMENT AND INTELLECTUAL PROPERTY RIGHTS: PROMOTING INNOVATION AND COMPETITION 42 (2007) ("Many SSOs have developed policies to mitigate hold up").

[43] *See* Mark A. Lemley, *Intellectual Property Rights and Standard-Setting Organizations*, 90 CAL. L. REV. 1989 (2002).

[44] Jorge L. Contreras, *Essentiality and Standards-Essential Patents* in CAMBRIDGE HANDBOOK OF TECHNICAL STANDARDIZATION LAW: COMPETITION, ANTITRUST, AND PATENTS 209, 209 (Jorge L. Contreras ed., 2017).

products incorporating the standard and license it to all manufacturers of standardized products.[45] In return, for standards giving rise to FRAND royalty obligations, the SEP holder is assured that all implementers of the standard will pay it a FRAND royalty.

Despite the importance of essentiality to the value of patents practiced by standardized products, the essentiality of a particular patent to a particular standard is usually determined unilaterally by the patent holder without external verification.[46] Not surprisingly, given the potential royalty revenue that may be earned from SEPs, the unilateral nature of essentiality declarations has led to significant over-declaration of SEPs in relation to many standards.[47] For example, in one frequently-cited series of studies, only 28%, 29% and 50% of patent families declared "essential" to the 2G, 3G and 4G wireless telecommunications standards, respectively, were assessed by an independent reviewer to be essential to the implementation of those standards.[48] For this reason, the essentiality of declared SEPs to particular standards is frequently challenged in litigation, with the result that some patents asserted against products implementing standards as to which they were declared essential are found by a court to be neither essential to the standard nor infringed by the product implementing the standard.[49]

C. Utility Models as Standards-Essential

In addition to patents, some SDO policies require or permit participants to disclose UMs as potentially essential to implement their standards. This requirement is made explicit, for example, in the *Guidelines for Implementation of the Common Patent Policy* of the International Telecommunications Union (ITU), International Organization for Standardization (ISO) and International Electrotechnical Committee (IEC), which defines a 'patent' as including "those claims contained in and identified by patents, utility models and other similar statutory rights based on inventions (including applications for any of these)".[50]

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[45] This obligation applies only to SEP holders that participated in the development of the relevant standard and are thus bound by the licensing policies of the relevant SDO. See Jorge L. Contreras, *When a Stranger Calls: Standards Outsiders and Unencumbered Patents*, 12 J. COMP. L. & ECON. 507 (2016) (discussing phenomenon of standards "outsiders" – SEP holders who are not bound by SDO policies).

[46] Contreras, *Essentiality*, *supra* note 44, at x.

[47] Rudi Bekkers et al., *Overcoming inefficiencies in patent licensing: A method to assess patent essentiality for technical standards*, RESEARCH POL. (2022); Contreras, *Essentiality*, *supra* note 44, at 224-25.

[48] Fairfield Resources International. 2008 Analysis of Patents Declared as Essential to GSM as of June 6, 2007 http://frlicense.com/GSM_FINAL.pdf; Fairfield Resources International. 2009. Review of Patents Declared as Essential to WCDMA Through December, 2008; Fairfield Resources International. 2010. *Review of Patents Declared as Essential to LTE and SAE (4G Wireless Standards) Through June 30, 2009*. http://www.frlicense.com/LTE%20Final%20Report.pdf.

[49] See Contreras, *Essentiality*, *supra* note 44, at x.

[50] Int'l Telecommunications Union, Int'l Org. for Standardization, Int'l Electrotechnical Comm., Guidelines for Implementation of the Common Patent Policy for ITU-T/ITU-R/ISO/IEC (2/11/2018) at 2, https://www.itu.int/dms_pub/itu-t/oth/04/04/T04040000010005PDFE.pdf.

Other prominent SDOs including the European Telecommunications Standards Institute (ETSI), the Internet Engineering Task Force (IETF) and the HDMI Forum, also expressly require the disclosure or licensing of UMs that are believed to be essential to a standard.[51]

While the policies of these SDOs expressly mention UMs, the policies of other SDOs, including ATSC[52] and JEDEC,[53] do not, and instead apply their disclosure and licensing requirements only to "patents". At these SDOs, it is not clear what effect the disclosure of a UM under the SDO's disclosure or licensing policies would have. The implications of this definitional gap are considered more fully in Section IV.B, below.

And while commentators have casually observed that UMs have infrequently been disclosed as essential to technical standards,[54] there has not, until this study, been an empirical assessment of the rate at which UMs are declared to be essential. With the caveat that, just as with patents, a declaration to an SDO that a UM is believed to be essential to the implementation of particular standard is not an assurance that the UM will ultimately be found to be essential, this paper refers to such declared UMs as "standards-essential utility models" (SEUMs).

III. DATA CONCERNING STANDARDS ESSENTIAL UTILITY MODELS

A. Empirical Literature Concerning Utility Models

Over the years, a small amount of empirical literature concerning utility models has emerged. Suthersanen (2006)[55] offers empirical data on UM filings in Germany, Japan, Korea, China, Malaysia and Taiwan, and Suthersanen, Dutfield and Chow (2008)[56] collect contributions including empirical data on UM filings in Singapore, Australia, Japan, Korea, China, various ASEAN nations and Mexico. Both of these

[51] *See* Rudi Bekkers & Andrew Updegrove, *IPR Policies and Practices of a Representative Group of Standards-Setting Organizations Worldwide* 54 (2013) (noting utility model requirements of major SDOs). *See also* GUIDE TO PATENT POLICIES OF STANDARDS DEVELOPMENT ORGANIZATIONS 4 (Jorge L. Contreras et al., eds., 2nd ed. 2022) (noting "catch all" term that includes utility models in SDO disclosure policies).

[52] Advanced Television Systems Committee, Inc., Patent Policy – Document B/04 at § 11.b (Dec. 13, 2007) ("'Essential Claim' means claims of all patents issued, and patent applications filed, under the laws of any country that are necessarily infringed by implementing the normative portion of a Specification Document").

[53] JEDEC, JEDEC Manual of Organization and Procedure § 8.2.1 (Dec. 2022) (defining "Patent" as "All classes or types of patents other than design patents (including, without limitation, originals, divisions, continuations, continuations-in-part, extensions or reissues), and applications for these classes or types of patents throughout the world.")

[54] *See, e.g*. Bekkers & Updegrove, *supra* note 51, at 54.

[55] Suthersanen (2006), *supra* note 8.

[56] INNOVATION WITHOUT PATENTS: HARNESSING THE CREATIVE SPIRIT IN A DIVERSE WORLD, (Uma Suthersanen, Graham Dutfield, & Kit Boey Chow eds., 2007).

foundational works seek to assess the effectiveness of UM systems as promoters of local innovation, particularly in emerging economies.

UM have also been the subject of a handful of more recent studies focusing on business strategy and innovation theory. Kim et al. (2011)[57] analyze Korean UM filings to assess their contribution to firm performance. Cao et al (2014)[58] compare firms' filing behavior for inventions protected in both the U.S. and China. Heikkilä and Lorenz (2018)[59] study the strategic utilization of UMs by German firms, while Heikkilä and Verba (2018)[60] explore the structures and characteristics of European patent families that include UMs. Cahoy and Oswald (2021) use U.S. patent priority data to assess the degree to which firms elect to pursue patent versus UM protection for similar innovations. Finally, Zhang (2022)[61] investigates the frequency with which UM are litigated in China and the characteristics that make both patents and UM more likely to be litigated.

While Section III.C of this paper presents additional empirical data regarding UM filings and litigation worldwide, the purpose of this paper is not to analyze UM systems generally. Rather, the empirical data on UM systems that are presented in Section III.C are intended to provide background for the more detailed discussion and analysis of SEUMs in Section III.D.

B. Methodology

This study utilized data on UM filings around the world provided by the World Intellectual Property Organization (WIPO)[62] as well as the IPLytics platform (now a part of Lexis-Nexis).[63] As an official United Nations organization, WIPO makes available filing data from the patent offices of its 193 member states.[64] The IPLytics database includes patent and UM filing data from 98 national and regional patent offices.[65] IPLytics also contains SEP declarations made at 35 different SDOs and 11 patent pools, including disambiguated information regarding SEP declarants, as

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[57] Yee Kyoung Kim et al., *Appropriate intellectual property protection and economic growth in countries at different levels of development*, 41 RESEARCH POL. 358 (2011).

[58] Siwei Cao, Zhen Lei & Brian Wright, *Speed vs. Length of Patent Protection Evidence from innovations patented in U.S and China*, (2014), https://are.berkeley.edu/sites/default/files/job-candidates/pdfs/SiweiCao_WP101214.pdf.

[59] Jussi Heikkilä & Annika Lorenz, *Exploring the relative importance of patents and utility models among German firms*, 27 ECONOMICS OF INNOVATION AND NEW TECHNOLOGY 80 (2018).

[60] Jussi Heikkilä & Michael Verba, *The role of utility models in patent filing strategies: evidence from European countries*, 116 SCIENTOMETRICS 689 (2018).

[61] Huiyan Zhang, *Characteristics of litigated patents in weak intellectual property rights regimes: Evidence from China*, (2022), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4196569.

[62] WIPO IP Statistics Data Centre, https://www3.wipo.int/ipstats/index.htm?tab=utility

[63] https://platform.iplytics.com

[64] WIPO, Member States, https://www.wipo.int/members/en/ (updated as of Feb. 2023 at time of search).

[65] IPLytics, IPlytics Platform Data Sources 5, https://platform.iplytics.com/pdf/IPlytics_DataSources_EN.pdf

well as information (sourced from Darts IP) concerning SEPs that have been litigated.[66] These databases were queried between March and May 2023.

C. Findings – Utility Models

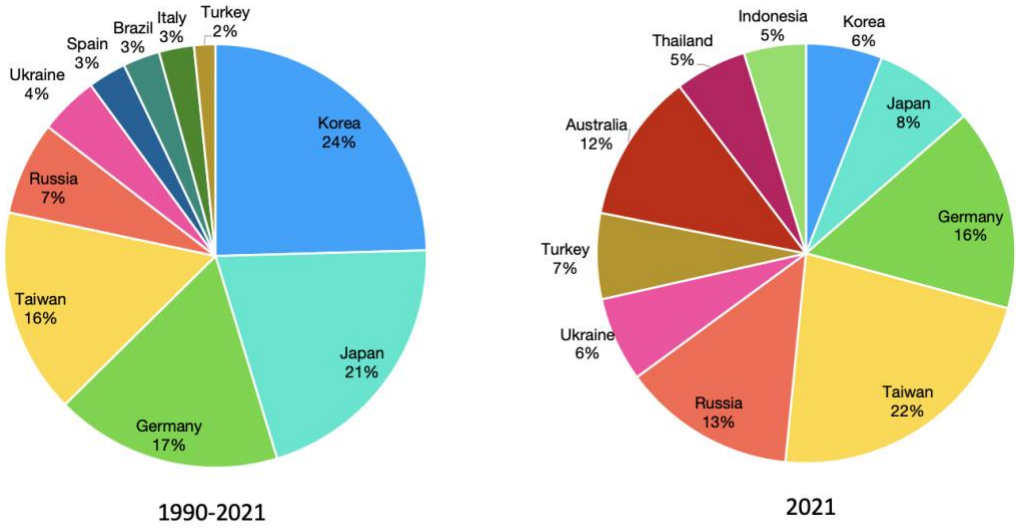
In this Section III.C, descriptive statistics are presented regarding all UM filings, applicants and litigation. Section III.D, below, then turns to SEUMs.

1. Utility Model Filings by Country

From 1990 to 2021, inclusive, approximately 23 million applications for UMs were filed across 194 jurisdictions, with approximately 17.7 million filed between 2012 and 2021, inclusive (see Supplemental Data Table 1). China is by far the jurisdiction in which the most UMs are filed. In 2021 alone, there were 2.8 million Chinese UM filings out of a global total of 2.9 million (97.6%), and from 1990 to 2021, collectively, there were 19.8 million Chinese UM filings out of a global total of 23.5 million (84.4%). The growth of Chinese UM filings is discussed in greater detail below.

Other than China, several jurisdictions including Germany, Korea, Japan, Taiwan and Russia have consistently had significant numbers of UM filings. *Figures 1 and 2* show the top 10 jurisdictions for UM filings in 2021, as well as cumulative UM filings for the period 1990 to 2021.

Figure 1
Top 10 Utility Model Filing Jurisdictions (excluding China), 1990-2021 and 2021

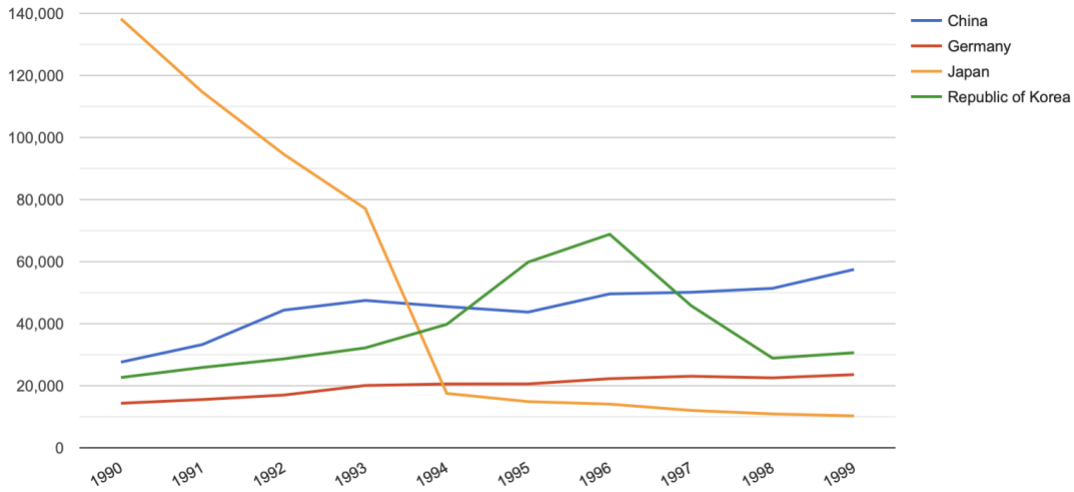


[66] IPLytics

Figure 1 highlights a number of notable shifts in UM filings over time. First, the enormous number of filings in China far outstrips those in any other country. Second, Korea and Japan, both early leaders in UM filings, have dropped in ranking, leaving Germany and Taiwan as the highest filing jurisdictions after China. Countries in Central Europe and Asia Minor including Russia, Ukraine, and Turkey, as well as smaller Asian countries such as Thailand, Indonesia, Philippines, Hong Kong have increased their rankings at the expense of European jurisdictions such as Spain, Italy, and Poland. Some of these trends are examined in greater detail below.

From a historical perspective, during the 1990s, four jurisdictions dominated the filing of UM applications: China, Germany, Japan and Korea, representing 1.5 million of 1.7 million total filings worldwide (89.5%) (*Fig. 2*). This period marks the beginning of China's rise to become the dominant jurisdiction for UM filings.

Figure 2
Utility Model Filings 1990-1999 in Top 4 Jurisdictions

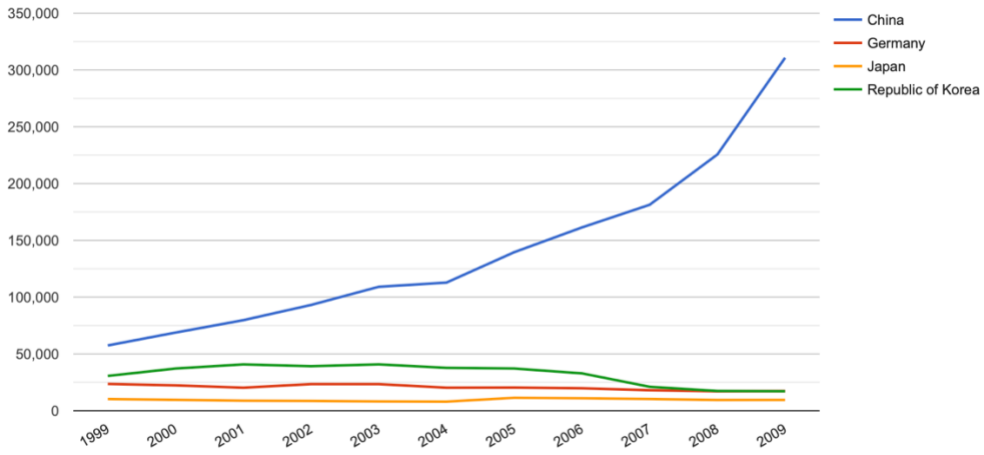


From 1990 to 1993, China, Germany and Korea had comparable levels of UM filings, with Japan leading by a significant margin. A statutory change in Japan in 1993 led to a sharp decrease in Japanese filings.[67] From 1995 to 1997 Korea was the filing leader, but was overtaken by China in 1997 with approximately 46,000 filings to China's 50,000.

Chinese filings began to increase rapidly in the early 2000s (*Fig. 3*), breaking the 100,000 mark in 2003 (representing 52% of all filings worldwide).

[67] [Suzuki]

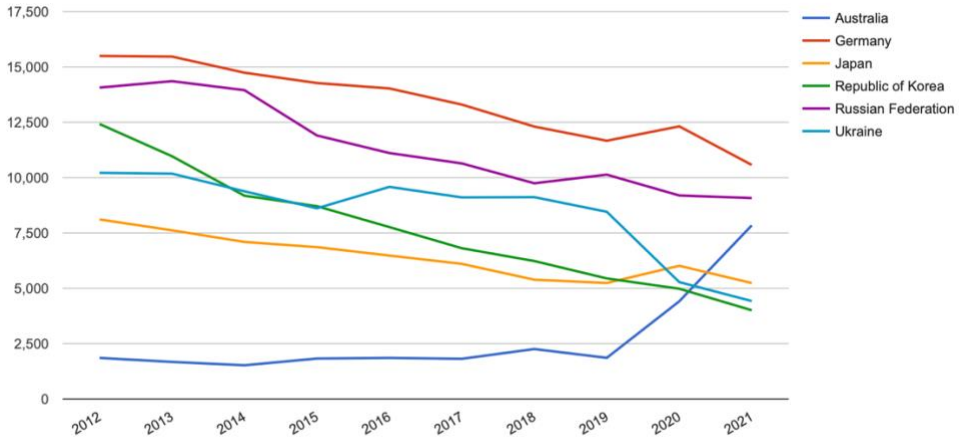
Figure 3
Utility Model Filings 1999-2009 in Top 4 Jurisdictions



In 2011, China's 585,000 UM filings represented 87.2% of the 671,000 filings worldwide and in 2021, China's 2.8 million filings represented 97.6% of the global total. The reasons for China's rapid embrace of UM filings has been discussed elsewhere in the literature and is beyond the scope of this article.[68]

As a result of China's massive surge of UM filings, analysis of activity in the rest of the world can only be understood if Chinese filings are omitted. Thus, from 2012-2021, approximately 424,000 filings in the top six jurisdictions other than China (Australia, Germany, Japan, Russia, Korea and Ukraine) accounted for 55% of non-China filings during that period. These filings reveal a few interesting trends.

Figure 4
Utility Model Filings, 2012-2021, Top 6 Jurisdictions (excluding China)



[68] See, e.g., Prud'homme (2014), *supra* note x.

As shown in *Figure 4*, with the exception of Australia, filings in each of these jurisdictions declined during the period from a total decline of 32% (Germany, with approximately 11,000 filings in 2021) to 68% (Korea, with approximately 4,000 filings in 2021). Australia is the exception, possibly because, as noted above, Australia abolished its innovation patent (UM) system in 2021 and beginning in 2019 filers sought to obtain as much protection as possible while it was still available.

2. Utility Model Filers

The UM systems of certain jurisdictions appear to be more attractive to foreign filers than others. For example, the vast majority of Japanese UM filers are firms headquartered in Japan. From 2000 to 2022, of the top 30 applicants for Japanese UMs, only two were non-Japanese (Foxconn (Taiwan)[69] and Applied Materials (US)). Filings in Japan are also exceptionally distributed, with the top 1000 filers representing only 8.4% of total applications during that period. A similar pattern appears to exist in China, where the vast majority of UM applicants appear to be local Chinese firms, though the very large number of Chinese UM filings make this observation difficult to verify empirically.

In Germany, on the other hand, 10 of the top 30 UM applicants are foreign-based, including the top filer, Ford Motor Co., whose 1959 applications are nearly double the number of applications by the second highest filer, Siemens (1028).[70] Other non-German applicants in the top 30 are based in the U.S., Hong Kong, Taiwan, Korea, Japan and Italy.[71] German UM applications are dispersed, with the top 1000 applicants representing approximately 73,000 of 313,000 applications from 2000 to 2022 (23%), but far less so than Japan.

D. Findings – Standards Essential Utility Models (SEUMs)

Section III.C, above considered UM filings of all kinds. This Section III.D focuses on SEUMs -- UMs that are declared by a party to be essential to an industry standard.

1. Technical Content of SEUMs

As discussed in Section II.C.1, UMs may cover anything from very simple mechanical designs to complex technological systems. In the case of SEUMs, the

[69] Foxconn is a Taiwan-based conglomerate that, for purposes of this article, is used as an umbrella designation for Hon Hai Precision Industry Co., Fushikang (Kunshan) Computer Connectors Co. and Sharp.

[70] Ford may have a particular business strategy favoring UMs. See Cahoy & Oswald, *supra* note 3, at 568.

[71] Cahoy and Oswald found that, as of 2017, firms based in the U.S., Japan, China, Germany, Korea, and Switzerland filed the greatest number of UM applications outside of their home jurisdictions. Cahoy & Oswald, *supra* note 3, at 556-57.

technical complexity of claimed inventions tends toward the more complex, given that most standardization activity in which patents and UM are filed occurs in the information and communications technology (ICT) sector in which products are largely electronic and software-based. As a result, the technical descriptions and claims contained in most SEUM documents are largely indistinguishable from those contained in patent documents.

2. SEUM Declarations

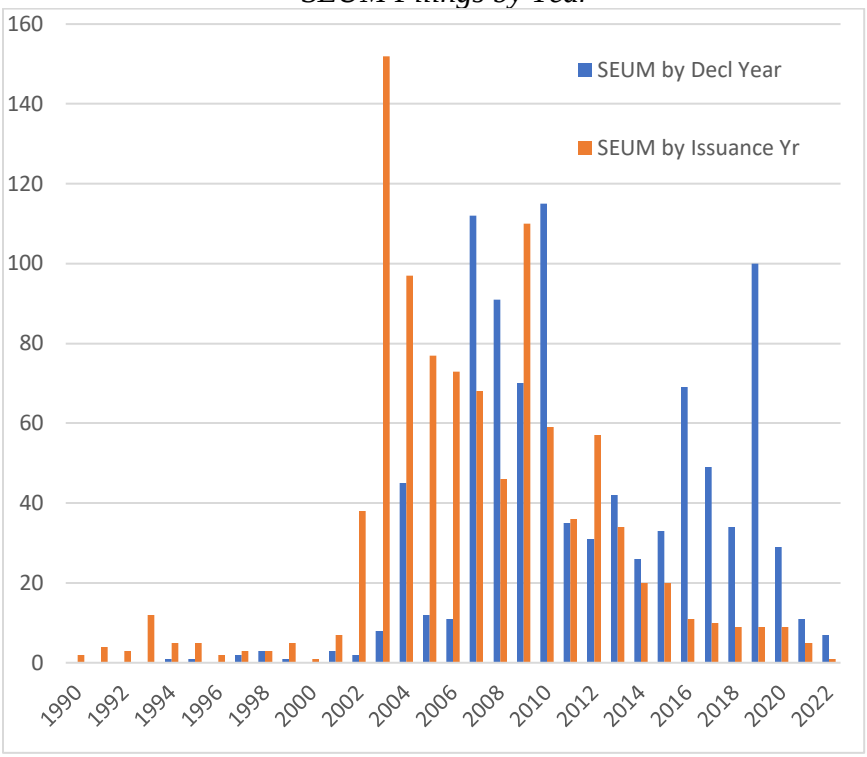
In considering SEUMs, it is important to recall that a single UM (like a single patent) may be declared as potentially essential to different standards and different versions of the same standard.[72] Thus, when considering standards-essential patents (SEPs), from 1990 to 2022, approximately 5.9 million individual SEP declarations have been made across all SDOs tracked by IPLytics, covering approximately 500,000 unique patents (counted by declaration year). The number of SEUMs is far lower. During the same period, approximately 7,700 SEUM declarations corresponding to 947 unique UMs were identified, representing approximately 0.2% of all SEP declarations.

Figure 5 shows total SEUMs by year of UM issuance and year of first declaration. Declarations can be made years after a patent is issued (e.g., in response to a "call for patents" made when a draft standard is submitted to the SDO for approval[73]), explaining why declarations appear to be weighted toward later years. Yet as shown in *Figure 4*, there does not appear to be a discernable trend in SEUM declarations over time, either increasing or decreasing).

[72] Moreover, as noted in Section x, some SDOs (such as IEEE, responsible for the pervasive Wi-Fi standards) do not require the declaration of specific SEPs or SEUMs, and permit participants to make "blanket" commitments to license all patents/UM that they hold on specified (i.e., FRAND or royalty-free) terms. These patents/UMs, while potentially numerous, are not included in these data.

[73] See GUIDE TO PATENT POLICIES, *supra* note 51 at x.

Figure 5
SEUM Filings by Year



3. *Geographic Distribution of SEUMs*

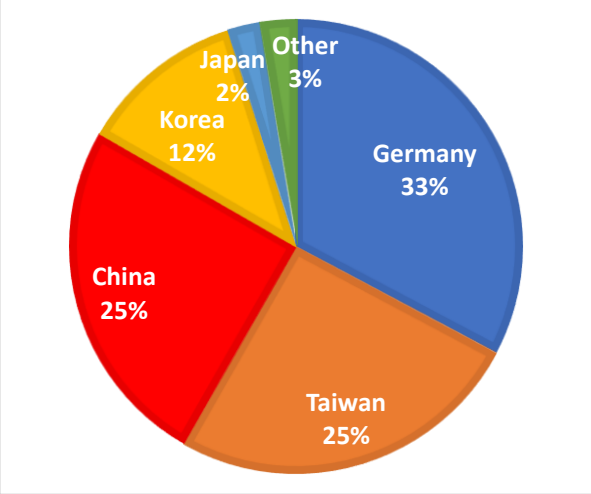
A total of 946 SEUMs were declared across a total of fourteen jurisdictions between 1990 and 2022.[74] Data regarding each jurisdiction in which SEUMs were declared during this period, compared to overall UM filings and SEP declarations in these jurisdictions, is contained in Supplemental Data Table 2.

Figure 6 illustrates the distribution of SEUMs among jurisdictions, which varies significantly both from that of all UMs generally and that of all SEP declarations. First, the number of SEUMs is considerably lower than the total number of declared SEPs in those jurisdictions.[75] SEUMs make up the highest portion of SEPs in Germany (4.26%) and Taiwan (2.05%). This percentage approaches zero in most other jurisdictions, with six or fewer SEUMs declared in all but the top five jurisdictions.

[74] Excludes five apparently spurious/erroneous UM declarations arising from what appear to be errors in declaration documents filed with the ATSC SDO.

[75] Note that total SEP figures include SEUMs.

Figure 6
Share of SEUM Declarations by Jurisdiction, 1990-2022



Perhaps the most notable divergence among filing rates of SEUMs, SEPs and UMs within a jurisdiction can be seen in China, which has by far the greatest number of UMs worldwide (97.6%). While patents issued by China have been declared as SEPs more than patents issued by any other country in this study,[76] the total number of Chinese SEPs exceeds that of Japan and Korea by only a factor of two. Of Chinese SEPs, only 237 are SEUMs (0.32%), placing China behind both Germany and Taiwan in terms of SEUM declarations and behind Germany, Taiwan, Ukraine and France in terms of the percentage of UMs that are declared as SEUMs. Moreover, given China's huge number of UMs (nearly 20 million), the percentage declared as SEUMs is vanishingly small. These results reinforce the notion that the Chinese UM system is largely oriented toward local manufacturing of simple products and not toward the type of sophisticated international technology development that occurs within SDOs. Nevertheless, Chinese UMs are still declared as SEUMs more than UMs from any countries other than Germany and Taiwan. Thus, even though representing a small percentage of China's overall UM volume, the number of Chinese SEUMs is significant.

France, a large European jurisdiction, has comparatively few SEPs (459), four of which are SEUMs. France's low number of SEPs is particularly curious, given that the leading SDO in terms of SEP declarations (ETSI) is based in France. While Ukraine has similar number of SEPs (697), six of which are declared as SEUMs, it has a far larger number of UMs (about 148,000, ranked 7th in the world). Despite their overall low numbers of SEPs and SEUMs, Ukraine and France rank third and fourth globally in terms of the percentage of declared SEPs that are UMs, suggesting UM systems that resemble patent systems in terms of the degree of technical complexity that may be protected (though this is

[76] Data from countries, such as the U.S., that lack UM systems is not included. From 1990 to 2022, 102,663 U.S. patents were declared as SEPs.

Denmark and Hungary exhibit similar characteristics, inasmuch as they have moderate numbers of UMs (over 8,000 each, similar to France), but higher numbers of declared SEPs (over 2,000 each). Each of Denmark and Hungary have a handful of SEUMs.

In contrast, Spain, a European jurisdiction of similar size to France, has more than 20 times the number of declared SEPs as France.[77] Even so, Spain had only three SEUMs. A similar pattern is observed in Brazil, a jurisdiction with a relatively high number of SEP declarations (11,283), but only one SEUM. Both Spain and Brazil also have large numbers of UMs, ranking 8th and 9th worldwide. Yet the percentage of these UMs that are declared as SEUMs is negligible. These results suggest that while the patent systems in Spain and Brazil are amenable to protecting complex ICT inventions (hence the high number of SEPs), their UM systems are oriented toward less technical inventions, resulting in few SEUMs.

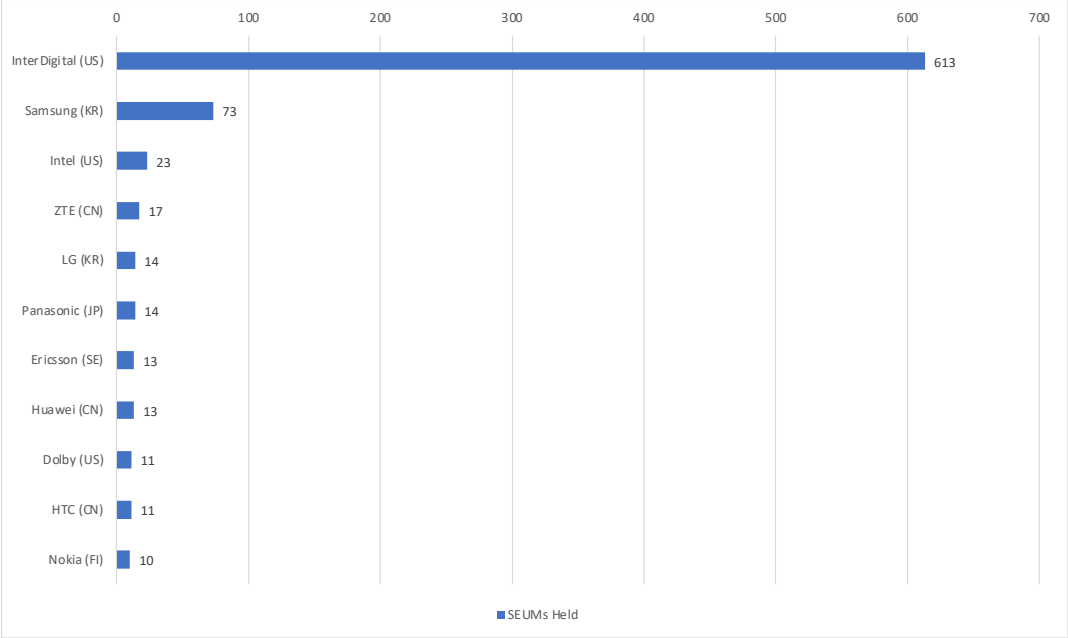
This hypothesis may also explain the lack of SEUMs in other jurisdictions with large numbers of UMs, such as Russia, which ranks 6th overall in terms of UM filings, with nearly 680,000 UMs issued between 1990 and 2021, but no declared SEUMs. Other jurisdictions with high levels of UM filings but no SEUMs include Turkey, Thailand, Indonesia, Italy, Philippines, Poland, Mexico and Hong Kong.

4. SEUM Declarants

Unlike ordinary UMs, which have applicants from a broad cross-section of industries and geographies, the majority of SEUM declarations have been made by a single firm: US-based Interdigital, which holds 613 of a total 985 declared SEUMs (61%). *Figure 7* shows the number of declared SEUMs held by declarants of ten or more SEUM from 1990 to 2022 (with full data in Supplemental Data Table 3).

[77] Speculation regarding the causes for different levels of SEP declaration among jurisdictions is beyond the scope of this paper, which focuses on SEUMs.

Figure 7
Top SEUM Declarants, 1990-2022



As shown in *Figure 7*, InterDigital based in the U.S. is by far the most prolific declarant of SEUMs. In addition to InterDigital, the top eleven SEUM holders include two other US firms, Intel and Dolby Laboratories, despite the fact that the US does not itself have a UM system. This observation suggests that firms such as these operate strategically across borders, irrespective of the rights offered by their home jurisdictions. The other top SEUM holders originate from Korea (Samsung and LG), China (ZTE, Huawei), Taiwan (HTC), Japan (Panasonic), Sweden (Ericsson) and Finland (Nokia). Each of these jurisdictions has a UM system.

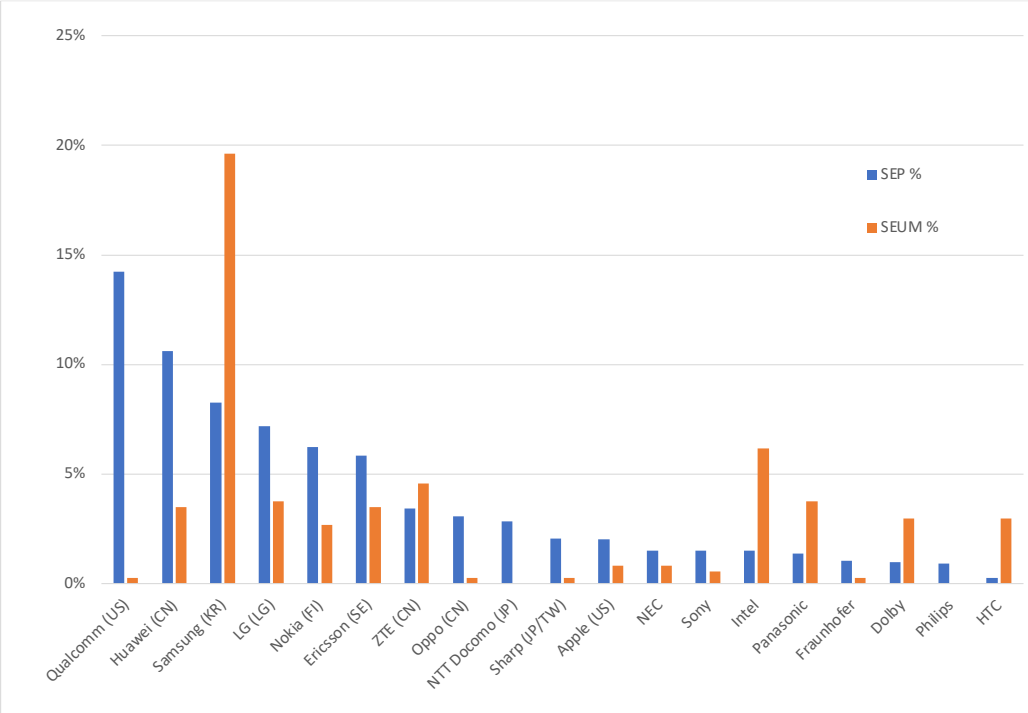
Below the top eleven firms, 123 additional firms from a range of countries held between one and seven SEUMs each, with a total of 173 SEUMs among them. This "long tail" suggests that, other than InterDigital and, possibly, some of the other top SEUM holders, firms involved in standardization have not developed a concerted strategy of filing UMs or declaring SEUMs at SDOs, resulting in SEUM declarations that are for the most part sporadic and nonpurposive.

While the absolute number of SEUM declarations made by individual firms may allow conclusions to be drawn about firm strategy, additional insight can be gained by comparing SEUM declarations with SEP declarations made by these firms. Accordingly, *Figure 8*, below, compares the SEUM declarations made by the top SEUM declarants (excluding, for purposes of presentation, InterDigital[78]) with SEP declarations by those firms and other "top" SEP declarants, in each case

[78] InterDigital is excluded from Figure 7 to avoid its graphical "swamping out" the distinctions among other SEUM declarants.

based on the percentage that such firms' declarations represent of all SEUM and SEP declarations.

Figure 8
Comparison of SEP and SEUM Declaration Shares by Top SEUM Declarants (excluding InterDigital), 1990-2022



Interestingly, there appears to be little correspondence between the percentage of SEP and SEUM declarations made by any given firm. Most striking is InterDigital (omitted from *Figure 8* to delineate the shares of other firms more clearly), which declared 613 of 985 SEUMs (62%) but only 21,404 of 502,717 SEPs (4.3%). As shown in *Figure 8*, Samsung, Intel, Panasonic, Dolby and HTC follow a similar pattern, accounting for a much larger share of SEUM than SEP declarations. In contrast, firms such as Qualcomm, Huawei, LG, Nokia, Ericsson, Oppo, NTT Docomo, Sharp and Apple were responsible for a much larger share of SEP than SEUM declarations.

5. Jurisdictional Choices by SEUM Declarants

The jurisdictions in which SEUMs are issued does not correspond to the national origin of their declarants, nor follow any discernable pattern at all. *Table 1* below shows the countries in which declared SEUMs have been issued for the top five SEUM holders.

Table 1
Jurisdictions of SEUMs Held by Top Holders, 1990-2022

	InterDigital	Samsung	Intel	ZTE	LG	TOTAL
Taiwan	228					228
China	201		9			210
Germany	105	66	13	9	9	202
Korea	79	6			5	90
Japan		1				1
France			1			1
Denmark				5		5
Hungary				2		2
Finland				1		1
TOTAL	613	73	23	17	14	740

Perhaps the only general conclusion that can be drawn from *Table 1* is that large SEUM declarants obtain SEUMs in Germany. Despite China's significant share of all global UMs, only InterDigital and, to a lesser degree, Intel, have declared SEUM's issued by China.

Curiously, ZTE, a large Chinese handset manufacturer, has declared no SEUMs issued in China, but is the declarant of the only SEUMs issued by three smaller European jurisdictions (Denmark, Hungary and Finland). While Finland, the headquarters of Nokia, can potentially be explained for this reason, there is no obvious explanation for ZTE's interest in Denmark or Hungary, and, again, this declaration pattern must be attributable to ZTE's unique business objectives and strategies.

In short, these statistics reveal a highly idiosyncratic pattern of SEUM declaration across firms, which is likely driven by individual firm strategies.[79]

6. SEUMs and SDOs

SEUMs have been declared across a variety of SDOs. *Table 2* shows the SDOs at which SEUMs have been declared from 1999 to 2022 across the top five UM filing jurisdictions.

Table 2
SDOs in which SEUMs are Declared, 1999-2022

SDO	China	Germany	Japan	Korea	Taiwan
ANSI	1				1
ARIB		1	2	1	

[79] Such idiosyncratic UM strategies were also observed by Cahoy and Oswald with respect to the automotive industry and its pursuit of UM. See Cahoy & Oswald, *supra* note 3, at 568.

SDO	China	Germany	Japan	Korea	Taiwan
ATSC	7	22	4	7	7
Blu-Ray		1			
ETSI	220	281	13	111	226
IEC	1				
IEEE		1			
IETF			1	1	1
ISO		3			
ITU-T	1	9	1	1	2
JEDEC	7	6	1	2	4
OMA		1			
SMPTE				1	
WPC		1			

Not surprisingly, the "G" series of wireless telecommunications standards developed under the aegis of ETSI, which are documented as having the largest number of SEP declarations,[80] also have the most SEUMs declared against them. Yet several other SDOs also have declared SEUMs. ATSC, ITU-T and JEDEC include declared SEUMs from each of the top 5 SEUM jurisdictions, while nine other SDOs have a handful of SEUM declarations.

Moreover, individual firms choose which SDOs to participate in based on their own product offerings and research programs. Thus, firms primarily engaged in wireless telecommunications and heavily involved in standardization at ETSI would not necessarily participate in JEDEC, which focuses on semiconductor memory devices.

E. Litigation Data

Patents and UMs give their owners significant leverage in negotiation and transaction, in part, because these legal instruments can be enforced at law. This Section provides descriptive statistics concerning litigation of UM, SEPs and SEUMs.

1. Litigated Utility Models

From 2000 to 2022, approximately 30,000 UMs were the subject of litigation, including administrative challenges (e.g., patent office opposition) and court proceedings. These figures do not include UMs that were subject to arbitration proceedings.

As shown in *Table 3*, litigated UMs can be found across a wide range of jurisdictions, from large, developed economies to small and developing ones.

[80] See Baron & Pohlmann, *supra* note x, at x.

Table 3
Jurisdictions where Utility Models were Litigated, 2000-2022

Jurisdiction	Litigated UMs		Jurisdiction	Litigated UMs
China	21,018		Peru	22
Germany	2,589		Chile	21
Japan	1,377		Austria	14
Russia	1,292		Bulgaria	14
Taiwan	1,213		Colombia	13
Korea	911		Hungary	11
Brazil	512		Australia	6
Turkey	341		France	6
Czech Rep.	257		Philippines	4
Spain	249		Costa Rica	4
Italy	101		Estonia	4
Poland	97		Argentina	3
Finland	79		Romania	2
Denmark	36		Greece	1
Slovakia	36		Moldova	1
Ukraine	25		Portugal	1

Consistent with its position as the leading jurisdiction in terms of overall UM filings, China is also the site of the greatest number of UMs subject to litigation (69.5%). This being said, this share is significantly lower than China's share of overall UM filings during this period (95.6%). As such, China appears to have a somewhat lower rate of litigation than other jurisdictions.

Other jurisdictions in which large numbers of UMs are filed (i.e., Germany, Japan, Russia, Korea) also lead the rankings for litigated UMs. Nevertheless, there is a "long tail" of jurisdictions in which UMs are litigated but relatively few UMs have been issued. For example, Finland, with 79 litigated UMs, ranks 13th in terms of litigated UMs, but only 23rd in terms of overall UM filing during the period. Moreover, some jurisdictions that rank fairly high in terms of UM issuance (e.g., Australia, France, Philippines) have very little UM litigation, and Thailand, Mexico and Hong Kong, which ranked 11th, 17th, 19th, respectively, in terms of UM issuances during the period, had no reported UM litigation during the period.

A wide range of parties have been involved in UM litigation, with no individual party holding more than 0.2% of total UMs subject to litigation (either as the plaintiff or defendant). Of the twenty firms holding the largest number of UMs subject to litigation from 2000 to 2022 (ranging from 22 to 63 UMs), three were Taiwanese and seventeen were Chinese. Even among the top 50 holders of litigated UMs, the large majority were Chinese (including Segway, the former US manufacturer of personal mobility devices, now a Chinese-held firm), together with a handful of Taiwanese and Japanese firms.

2. Litigated SEPs

Between 2000 and 2022, approximately 5,835 SEPs around the world were the subject of litigation, the large majority of which were issued in the United States (4,129, 71%). Excluding the U.S. and other jurisdictions without UM systems (EPO, UK, Canada and Israel), 840 SEPs were litigated in the countries shown in *Table 4*, which is presented for comparison to findings regarding SEUM litigation below.

Table 4
UM Jurisdictions with SEPs Subject to Litigation, 2000-2022

UM Jurisdiction	Litigated SEPs
China	559
Japan	121
Germany	59
Spain	36
Brazil	16
Australia	9
Taiwan	8
Korea	7
Chile	6
Sweden	4
Finland	3
Colombia	3
France	2
Others	1 each

Table 5 shows the firms holding the largest number of litigated SEPs around the world and how many SEPs held by each of these firms has been subject to litigation.

Table 5
Litigated SEPs, 2000-2022, Top 20 Firms

Firm	Rank	Country of Origin	Litigated SEPs
Qualcomm	1	United States	459
Nokia	2	Finland	443
Huawei	3	China	421
LG	4	Korea	400
Ericsson	5	Sweden	391
Samsung	6	Korea	363
InterDigital	7	United States	278
Apple	8	United States	139

Firm	Rank	Country of Origin	Litigated SEPs
Philips	9	Netherlands	130
Sharp (Foxconn)	10	Japan/Taiwan	103
ZTE	11	China	93
ETRI	12	Korea	85
Google	13	United States	82
Blackberry	14	Canada	73
NTT Docomo	15	Japan	73
Oppo	16	China	72
Dolby	17	United States	69
NEC	18	Japan	65
Panasonic	19	Japan	61
Sony	20	Japan	57

Given that the large majority of SEP litigation worldwide involves SEPs issued in the US, it is not surprising that several of the leading participants in SEP litigation (5 of the top 20 firms) are based in the U.S. However, given the global nature of many markets dominated by standardized products, there is often little correlation between the nationality of a firm and the jurisdiction(s) in which it enforces SEPs.

3. Litigated SEUMs

Unlike UMs and SEPs more generally, only 13 SEUMs were litigated around the world between 2000 and 2022: six in China and seven in Germany (*Table 6*).

Table 6
Litigated SEUMs, 2000-2022

Jurisdiction	Owner	First Declared	SDO	Standard	Title
Germany	Samsung	2003	ETSI	2G 3G 4G 5G	Device for channel coding and multiplexing in a CDMA communication system in a CDMA communication system
Germany	Samsung	2003	ETSI	3G 4G 5G	Uplink transmitting device for mobile communication system, has rate matcher that bypasses information symbols and processes parts of first and second parity symbols according to given rate matching rule
China	InterDigital	2008	ETSI	3G	User equipment for high-speed shared control channels
Germany	Netlist	2010	JEDEC	3DS LRDIMM	System that uses distributed bytewise buffers on a memory module
China	InterDigital	2011	ETSI	3G	User equipment of media access control multitasking/de-multitasking and base station
China	Foxconn	2011	JEDEC	SO-006 SODIMM	Opposite-linked connection assembly
Germany	ZTE	2011	ETSI	5G	Apparatus for generating and breaking down signaling of uninterrupted means
China	Foxconn	2013	JEDEC	SO-018	Card rim connector

Jurisdiction	Owner	First Declared	SDO	Standard	Title
Germany	Samsung	2015	ETSI	3G 4G 5G	Device for performing a handover in a mobile communication system
China	InterDigital	2016	ETSI	3G 4G 5G	Radio communication system for providing channel distribution information for supporting UL and DL channel
Germany	Nokia	2016	ETSI	4G	Randomization of block-spread signals
China	InterDigital	2020	ETSI	2G 3G 4G	High speed down-stream chain circuit public channel subscriber equipment able to support mixed automatic repeated request
Germany	IP Bridge	2020	ETSI	4G	Terminal device

Despite the low number of litigated SEUMs, *Table 6* makes possible a few interesting observations. First, as noted above, SEUMs are technical in nature, often indistinguishable in their specifications and claims from patents. This being said, at least two of the three SEUMs declared with respect to JEDEC standards appear to relate more to physical connections among electronic components than the internal functionality of those components (a more typical approach for UM). The SEUMs declared with respect to ETSI standards, however, appear highly technical in nature.

Second, some firms appear to have embraced the strategic use of SEUMs in their standardization strategies. InterDigital, in particular, holds 4 of 13 litigated SEUMs (31%). As noted above, InterDigital is, by far, the holder of more SEUMs than any other firm in the world. Thus, just as Ford Motor Co. in the automotive sector has been observed by Cahoy and Oswald to have adopted a business strategy involving the acquisition (and possibly assertion) of UMs,[81] InterDigital appears to have adopted such an approach in the ICT sector, particularly around standards developed under the aegis of ETSI. Samsung, the second highest holder of SEUMs, appears to have adopted a similar strategy.

But the enforcement of SEUMs is not limited to large SEUM holders. As shown in *Table 6*, small entities that are not among the top SEP or SEUM holders have also asserted SEUMs. Given that UMs are easier and cheaper to obtain than patents, SEUMs may be attractive to smaller entities as enforcement devices.

F. Summary of Findings

The principal findings of this study can be summarized as follows:

1. Where available, UMs are viewed as being easier, cheaper and quicker to obtain than patents, though their assertion in litigation may be less robust.

[81] Cahoy & Oswald, *supra* note 3, at 568.

2. Though some jurisdictions limit the subject matter of UMs to simple mechanical devices, others permit UMs covering complex technologies involving software and methods, such that the specifications and claims of many UMs are outwardly indistinguishable from those of patents.

3. Principal jurisdictions in which UMs are issued include China (by a wide margin), Taiwan, Germany, Korea and Japan, all of which are key jurisdictions involved in ICT standardization.

4. Some, but not all, expressly SDOs permit or require the disclosure and licensing of UMs that are potentially essential to their standards. The requirements of SDO policies that do not expressly mention UMs are ambiguous.

5. Nearly 1,000 UMs (SEUMs) have been declared as essential to broadly adopted industry standards at ETSI and other prominent SDOs in the ICT sector.

6. Firm strategies appear to differ dramatically in terms of SEUM declaration, ranging from intensive to virtually no SEUM activity, even among firms of similar size and market focus.

7. Though far less than other SEPs, SEUMs have been subject to litigation multiple times in China and Germany, and there appears to be no structural barrier to their litigation in other jurisdictions.

IV. DISCUSSION

The findings of this study raise a number of implications for governmental policy, SDO operations and firm strategy, and also suggest numerous avenues for additional research.

A. SDO Policies and UMs

As noted in Section II.C, while some SDOs, such as ETSI and IETF, expressly permit or require the disclosure and licensing of SEUMs to implementers of their standards, other SDOs do not expressly include UMs within the scope of their patent disclosure and licensing commitments. Yet, as shown in *Table 2*, firms have clearly disclosed SEUMs to SDOs, such JEDEC and ATSC, that fail to include UMs within their definitions of "patents".[82]

[82] See notes 52-53, *supra*, and accompanying text.

At these SDOs, it is not clear what the effect would be of the disclosure of a UM under the SDO's disclosure or licensing policy. Would a UM declared as essential to a standard be treated in the same manner as a patent declared under that policy and thus be subject to the SDO's FRAND licensing requirements? Or would the UM disclosure be disregarded as noncompliant with a policy that only permitted the disclosure of patents, and thus lack any legal effect?

The converse question also arises: if an SDO policy does not explicitly require the disclosure of UMs, then what obligation, if any, does the holder of an SEUM have to disclose and/or license that UM to implementers of the standard? If UMs are not subject to an SDO's FRAND licensing requirements, then is an SEUM holder free to charge supra-FRAND royalties for its SEUMs, or to refuse to license them at all? Or would the nondisclosure or concealment of a UM implicitly violate the spirit of the SDO policy or even applicable law?[83]

It is likely that the answers to these questions would depend on the specific understandings and intentions of the SDO members who drafted and approved the relevant policy,[84] and would thus be highly fact-specific (and vulnerable to differing recollections). In order to avoid these interpretive uncertainties, SDOs that have not expressly addressed the treatment of UMs under their disclosure and licensing policies would do well to consider doing so.

B. SEUMs and FRAND Royalties

Even assuming that SEUMs are deemed to constitute SEPs under an SDO's disclosure and licensing policies, SEUMs raise distinct but related questions regarding the calculation of FRAND royalties. First, given that UMs are generally not given substantive examination by relevant patent offices, their terms are shorter than those of patents and in many countries they lack direct enforceability, an argument could be made that UMs are, on average, less "valuable" than patents. As such, an argument could be made that the "fair and reasonable" royalty payable with respect to an SEUM should be less than the "fair and reasonable" royalty payable with respect to an SEP. By extension, the value of (and the FRAND royalty payable with respect to) a portfolio that includes SEUMs should be less than the value of a similarly sized portfolio that includes only SEPs. If SEUMs are not

[83] See Renata B. Hesse & Frances Marshall, *U.S. Antitrust Aspects of FRAND Disputes*, *in* CAMBRIDGE HANDBOOK OF TECHNICAL STANDARDIZATION LAW: COMPETITION, ANTITRUST, AND PATENTS (Jorge L. Contreras, ed., 2017) (describing legal enforcement actions against firms that withheld information about SEPs from SDO and other participants).

[84] See, e.g., Rambus, Inc. v. Infineon Techs. AG, 318 F.3d 1081, 1098 (Fed. Cir. 2003) (finding that while a literal reading of JEDEC's policy imposed no duty of disclosure on JEDEC members, SDO participants shared a common understanding that they should disclose patents necessary to practice JEDEC standards); Qualcomm Inc. v. Broadcom Corp., 548 F.3d 1004 (Fed. Cir. 2008) (finding similar duty to disclose patents based on informal norms and expectations of SDO participants). See also Jorge L. Contreras, *From Private Ordering to Public Law: The Legal Framework Governing Standards-Essential Patents*, 30 HARV. J. L. & TECH. 211, 219-20 (2017) (discussing cases).

distinguished from SEPs when portfolios are valued, then incentives will exist for opportunistic firms to "stuff" their portfolios with cheap and easy-to-obtain SEUMs of questionable validity and essentiality in order to increase the size (and putative value) of those portfolios.

The issue of SEUM valuation has implications not only for transactions between individual holders of SEUMs and potential infringers, but for *all* holders of SEPs (and SEUMs) that are declared to be essential with respect to a particular standard. For example, when SEPs and SEUMs are placed into a pool for collective licensing to implementers of a standard, the royalty received from implementers is often distributed among pool members in proportion to the number of patents that they have licensed to the pool. The share of such royalties allocable to SEUMs, however, should arguably be lower than the share allocable to SEPs.

The same issue arises in connection with the "top-down" calculation of FRAND royalties payable with respect to a standard. Top-down royalty calculation methodologies seek to determine the overall value of a standard to a product, to use that value to assess an aggregate royalty for SEPs covering the standard, and then allocate a portion of the aggregate royalty to each holder of SEPs based on the number (and possibly the value) of its SEPs.[85] Top-down FRAND royalty calculations, which have already been utilized in judicial decisions in the U.S., UK and Japan, may take on even greater prominence under a recent European Union proposal to implement this methodology in official calculations of aggregate SEP royalties.[86]

If SEUMs are valued lower than other SEPs, then in such top-down royalty determinations, the presence of SEUMs should be a factor used in determining both the overall level of royalties payable with respect to a standard, as well as the share of such aggregate royalty that is allocated to different holders of SEPs and SEUMs.

C. UM Harmonization

Traditionally, UMs have existed largely as devices of national law with little harmonization among jurisdictions, even within closely-knit regions such as the European Union. Yet the entry of UMs into the field of technical standardization, an inherently multinational arena, begs the question whether UM systems should be harmonized to a greater degree. That is, if UMs can effectively be utilized to expand individual firm portfolios of patents subject to FRAND licensing, then jurisdictions that make it easier to obtain UMs are likely to attract more UM filers, and perhaps to draw applicants away from their own, or other, patent systems (e.g., if a UM can be obtained for one fourth the cost of a patent, in one fourth the time,

[85] See Jorge L. Contreras, *Aggregated Royalties for Top-Down FRAND Determinations: Revisiting 'Joint Negotiation,'* 62 ANTITRUST BULL. 690, 692-96 (2017) (discussing top-down methodology and its usage in the courts).

[86] See Eur. Comm'n, Proposal for a Regulation of the European Parliament and of the Council on standard essential patents and amending Regulation (EU)2017/1001 (Apr. 27, 2023).

but yield a similar value, then UMs could quickly become preferred instruments in some markets. What's more, fast and cheap UMs could result in a "race to the bottom" among jurisdictions seeking to capitalize on the "numbers game" among SEP holders. These considerations should encourage policy makers to consider more closely aligning UM systems across borders.

D. Areas for Further Research

This study is the first empirical assessment of SEUM declaration and litigation. Not surprisingly, there is much more to be studied with respect to UMs and the standardization ecosystem. One area for further research is the assessment of the "quality" of UMs that are declared as SEUMs, both in comparison to other UMs and to SEPs. The question of patent quality has attracted significant attention from scholars as well as governmental authorities in recent years, and numerous metrics for the measurement of patent quality have been developed (e.g., citation analysis). However, we are unaware of any significant study of UM quality or analysis whether the same metrics applied to patents can be applied to UMs. Further research of these questions would help to establish the value of SEUMs that form a part of SEP portfolios and to establish FRAND royalty rates both for individual SEUMs, portfolios including both SEUMs and SEPs, and for top-down FRAND royalty determinations for entire standards.

It would also be useful to gain a better understanding of the business strategies that have led some firms to declare SEUMs in large quantities, while others have largely ignored them. A greater appreciation for firm strategy in relation to UMs could help policy makers to tailor their UM systems to the needs of the private sector.

Further research into SEUM assertion and litigation is also warranted. The litigation data that we reviewed could be supplemented with more detailed information regarding case outcomes, timing and tactics. Greater visibility into these issues could help policy makers to assess whether UMs are being (or could be) abused as litigation devices, and whether procedural safeguards should be put in place to avoid such abuse in the future.

CONCLUSION

UMs, once a "back water" of intellectual property scholarship, may be more relevant to technology-intensive standards than previously thought. This study demonstrates that UMs are being declared essential to industry standards in significant numbers, at least by some firms. Given the relative ease, speed and cost-effectiveness of obtaining UMs, it is possible that this trend will continue. Policy makers and SDOs should thus consider clarifying, and more intensely harmonizing, their rules concerning UMs and SEUMs. Firms and courts should likewise consider the value of SEUMs when calculating FRAND royalties for portfolios and overall standards.

DATA APPENDIX

Supplemental Data Table 1[87]
Top 20 Utility Model Applicants, 2021 and Cumulative 1990-2021

Country	2021 rank	2021 UM	1990-2021 rank	1990-2021 UM (n=23,515,896)
China[88]	1	2,852,219	1	19,839,834
Taiwan	2	15,162	5	515,008
Germany	3	10,576	4	569,205
Russia	4	9,079	6	234,215
Australia	5	7,844	12	42,943
Japan	6	5,238	3	679,994
Ukraine	7	4,425	7	147,980
Turkey	8	4,490	11	53,555
Korea[89]	9	4,009	2	806,739
Thailand	10	3,762	13	42,039
Indonesia	11	3,249	18	15,844
Spain	12	3,091	8	96,124
Brazil	13	2,578	9	92,245
Italy	14	2,019	10	88,093
Philippines	15	1,799	17	22,316
Czech Republic	16	1,104	15	39,134
Poland	17	779	14	40,415
Mexico	18	706	19	15,556
France	19	673	24	8,910
Hong Kong	20	552	23	9,032

[87] All data sourced from WIPO, other than data for Taiwan, which is sourced from IPLytics.

[88] References to "China" refer to the Peoples Republic of China, excluding the special administrative areas Hong Kong and Macau and Taiwan (Republic of China).

[89] References to "Korea" refer to the Republic of Korea

Supplemental Data Table 2
SEUM Declarations – All Jurisdictions, 1990-2022

Country	SEUMs (n=946)	SEUM Rank	Total UMs	UM Rank	Total Declared SEPs	Declared UM as % of SEPs
Germany	310	1	569,205	4	7,280	4.26%
Taiwan	241	2	515,008	5	11,754	2.05%
China	237	3	19,839,834	1	74,190	0.32%
Korea	112	4	806,739	2	36,648	0.31%
Japan	22	5	679,994	3	39,027	0.05%
Ukraine	6	6	147,980	7	697	0.86%
Denmark	5	7	8,869	25	2,750	0.18%
France	4	8	8,910	24	459	0.87%
Spain	3	9	96,124	8	9,646	0.03%
Hungary	2	10	8,605	26	2,009	0.10%
Brazil	1	11	92,245	9	11,283	--
Argentina	1	11	6,455	28	1,565	0.10%
Finland	1	11	14,933	20	1,038	0.10%
Czech Rep.	1	11	39,134	15	54	1.85%

Supplemental Data Table 3
Top SEUM and SEP Declarants, 1990-2022

	SEPs (n=502717)	SEP %	SEUM (n=985)	SEUM%	SEUM -IDC % (n=372)
Qualcomm (US)	71634	14.2%	1	0.1%	0.3%
Huawei (CN)	53329	10.6%	13	1.3%	3.5%
Samsung (KR)	41522	8.3%	73	7.4%	19.6%
LG (LG)	36070	7.2%	14	1.4%	3.8%
Nokia (FI)	31287	6.2%	10	1.0%	2.7%
Ericsson (SE)	29322	5.8%	13	1.3%	3.5%
ZTE (CN)	17290	3.4%	17	1.7%	4.6%
Oppo (CN)	15480	3.1%	1	0.1%	0.3%
NTT Docomo (JP)	14231	2.8%	0	0.0%	0.0%
Sharp (JP/TW)	10396	2.1%	1	0.1%	0.3%
Apple (US)	10091	2.0%	3	0.3%	0.8%
NEC	7566	1.5%	3	0.3%	0.8%
Sony	7557	1.5%	2	0.2%	0.5%
Intel	7485	1.5%	23	2.3%	6.2%
Panasonic	6828	1.4%	14	1.4%	3.8%
Fraunhofer	5245	1.0%	1	0.1%	0.3%
Dolby	4857	1.0%	11	1.1%	3.0%
Philips	4505	0.9%	0	0.0%	0.0%
HTC	1358	0.3%	11	1.1%	3.0%
InterDigital	21404	4.3%	613	62.2%	n/a