WOULD UTILITY MODELS IMPROVE AMERICAN INNOVATION?

EVIDENCE FROM BRAZIL, GERMANY, AND THE UNITED STATES

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INTRODUCTION: THE UTILITY MODEL CONCEPT AND THE EFFECTS OF PATENT LAW ON INNOVATION

> *The Congress shall have Power . . . to promote the Progress of Science and useful Arts, by securing for limited Times to Authors and Inventors the exclusive Right to their respective Writings and Discoveries . . .* [1]

At the time of the founding of the American Republic, the importance of intellectual property protection was already recognized to the extent that the construction and maintenance of a legal regime for copyrights and patents is one of the constitutionally enumerated powers of the United States Congress. The 1st Congress passed the first American patent law barely more than a year after the establishment of the federal government,[2] and since then more than eight million United States patents have been issued.[3] The patent regime has been a crucial component of American federal law throughout the nation's history.

The reasons for this are, primarily, economic. "Patent law is the classic example of an intellectual property regime modeled on [a] utilitarian framework."[4] The theory underlying the existence of patents is that a legal, time-limited monopoly on the practice of an invention enables the inventor to recoup the value of the time, effort, and resources put into realizing the invention, and to reap the benefits of commercialization, before the invention enters the public domain, where its value accrues to the population generally.[5] Therefore, goes the pro-patent argument: inventors will be incented to invest labor and capital in their ideas, thereby accelerating the technological and economic progress of the nation as a whole.[6] In the United States, where economic liberalism has always been the norm, leveraging the economic incentives of individual inventors and entrepreneurs in this way has been, and remains, a fixture of the legal and political landscape.

Over the past several decades, however, a growing number of commentators have questioned whether the existence of patents is, in

1. U.S. CONST. art. I, § 8.
2. Patent Act of 1790, Ch. 7, 1 Stat. 109-112.
3. *Millions of Patents*, U.S. PAT. & TRADEMARK OFF. (Dec. 27, 2011, 12:58 PM) http://www.uspto.gov/news/Millions_of_Patents.jsp.
4. ROBERT P. MERGES, PETER S. MENELL & MARK A. LEMLEY, INTELLECTUAL PROPERTY IN THE NEW TECHNOLOGICAL AGE 29 (6th ed. 2012).
5. CRAIG ALLEN NARD, THE LAW OF PATENTS 31-33 (2d ed. 2011).
6. *Id.*

fact, beneficial. As early as 1958, the Austrian-American economist Fritz Machlup opined that "[i]f [the United States] did not have a patent system, it would be irresponsible, on the basis of our present knowledge of its economic consequences, to recommend instituting one. But since we have had a patent system for a long time, it would be irresponsible, on the basis of our present knowledge, to recommend abolishing it."[7] "[A]s many as 80 percent of software engineers say the patent system actually hinders innovation" in that sector,[8] and the Federal Reserve Bank of St. Louis argued in a 2012 working paper that "weak patent systems may mildly increase innovation with limited side-effects, [but] strong patent systems retard innovation with many negative side-effects."[9] That paper's recommendation was blunt: "[T]he best solution is to abolish patents entirely."[10]

A complete and thorough analysis of whether the existence of patents is beneficial would go well beyond the scope and competence of a single essay. A more tractable, and perhaps more fruitful, course of action is to assume the existence of a patent system and seek ways to optimize the system's effects on innovation, drawing on lessons from other nations. One of the clearest areas in which the American patent law regime is sub-optimal is in the length of time required to obtain a patent—as of December 2012, the U.S. Patent and Trademark Office had a backlog of more than 600,000 pending patent applications and an average time from application to first office action of 18.4 months.[11] Reducing this backlog should be a major goal of any patent reform, as "delay is . . . the greatest problem with the [American] patent system."[12]

One potential patent reform that could improve the effectiveness of the American patent regime is the introduction of the utility model. A utility model is "an exclusive right granted for an invention, which allows the right holder to prevent others from commercially using the protected invention . . . for a limited period of time . . . [and] is similar to

7. S. SUBCOMM. ON PATENTS, TRADEMARKS, AND COPYRIGHTS OF THE S. COMM. ON THE JUDICIARY, 85TH CONG, AN ECONOMIC REVIEW OF THE PATENT SYSTEM 80 (1958) (written by Fritz Machlup), *reprinted in* Nard, *supra* note 5, at 33.

8. *When Patents Attack*, NAT'L PUB. RADIO (July 22, 2011), http://www.npr.org/templates/transcript/transcript.php?storyId=138576167.

9. Michele Boldrin & David K. Levine, *The Case Against Patents* (Fed. Reserve Bank of St. Louis Working Paper 2012-035A, Sept. 2012), *available at* http://research.stlouisfed.org/wp/2012/2012-035.pdf.

10. *See id.*

11. *See Data Visualization Center Patents Dashboard*, U.S. PATENT & TRADEMARK OFFICE (USPTO), http://www.uspto.gov/dashboards/patents/main.dashxml (last visited Jan. Sept. 28, 2013).

12. *See Inside Views: Interview with Chief Judge Paul R. Michel on US Patent Reform*, INTELLECTUAL PROPERTY WATCH (July 14, 2011), http://www.ip-watch.org/2011/07/14/interview-with-chief-judge-paul-r-michel-on-us-patent-reform/.

a patent."[13] Never a part of the American patent law, utility models can be obtained in at least 55 countries.[14] Although such intellectual property rights schemes vary by country, utility models generally differ from patents in that they have less stringent acquisition requirements and shorter terms of protection, and confer a less extensive set of rights.[15] Perhaps most intriguingly, utility models are much cheaper and quicker to acquire than patents, with an average pendency of just six months.[16] Utility models can therefore be thought of, in many ways, as weak patents (which the Federal Reserve Bank of St. Louis observed can increase innovation) that are immune from the delays that plague the arduous United States Patent and Trademark Office (the "USPTO") prosecution process, making them a worthy target of interest for those concerned with reforming the American patent regime.

This paper will examine two utility model systems (the Brazilian and German systems, which differ from each other significantly) and compare innovative outcomes in those systems with outcomes in the United States. Part I of the paper lays out the analytical framework and methodology for assessing and comparing innovative outcomes. Part II carries out the analysis with respect to Brazil, Germany, and the United States. Finally, Part III presents a substantive, targeted policy recommendation for improving the innovation effects of the American patent regime.

I. THE ANALYTICAL FRAMEWORK: THE GLOBAL INNOVATION INDEX AS AN INDICATOR OF INNOVATIVE QUALITY

> *There's no question that measuring anything is tricky, and measuring "innovation" is even trickier.*[17]

One of the most methodologically rigorous attempts to measure innovation in countries around the world is the Global Innovation Index (the "GII"), published annually by the international business school, INSEAD, and the World Intellectual Property Organization ("WIPO"),[18] which has been used, audited, and refined by the European Commission's

13. *Protecting Innovations by Utility Models*, WORLD INTELL. PROP. ORG. (WIPO), http://www.wipo.int/sme/en/ip_business/utility_models/utility_models.htm (last visited Jan. 8, 2013).

14. *Where Can Utility Models Be Acquired?*, WIPO, http://www.wipo.int/sme/en/ip_business/utility_models/where.htm (last visited Jan. 8, 2013).

15. *Protecting Innovations by Utility Models*, *supra* note 13.

16. *Id.*

17. Robert B. Tucker, DRIVING GROWTH THROUGH INNOVATION 55 (2009).

18. *See generally* THE GLOBAL INNOVATION INDEX 2012 (Soumitra Dutta ed. 2012) [hereinafter "GII"] *available at* http://www.globalinnovationindex.org/userfiles/file/GII-2012-Report.pdf.

Joint Research Centre.[19] The GII is an invaluable research tool, not only because it is exhaustive (the 141 countries analyzed "represent 94.9% of the world's population and 99.4% of the world's GDP"[20]) and includes indicators that "go beyond . . . traditional measures of innovation,"[21] but because INSEAD and WIPO publish all of the raw data used to compile the GII freely on the Internet,[22] making it easy to examine the relationships between individual innovative inputs and outputs with greater specificity.

Another advantage of the GII is that it measures inputs to innovation as well as outputs, and it divides an out-of-100 output score by an out-of-100 input score to obtain a ratio indicating each country's innovative "efficiency."[23] Because the quantity and quality of innovative inputs correlates with the level of economic development in a country,[24] merely assessing innovative outcomes fails to capture how effectively and efficiently a country uses its innovative resources. As the goal of this paper is to assess the impact of utility models on innovation while controlling for as many other factors as possible, it is this Innovation Efficiency Index (the "IEI") which this paper uses as the dependent variable.

Full descriptions of the variables that make up the GII, as well as their relative weights, are presented in Appendices A (for input variables) and B (for output variables), but the workings of the GII and the IEI warrant some brief description here. There are five pillars of innovative inputs (institutions, human capital and research, infrastructure, market sophistication, and business sophistication) and two pillars of innovative outputs (knowledge and technology, and creative). Each of the pillars is further divided into three sub-pillars, each of which is comprised of three to six individual indicators. Examples of input indicators include press freedom (part of the "institutions" pillar) and net inflows of foreign direct investment (part of the "business sophistication" pillar); examples of output indicators include the number of patent applications at the national patent office and exports of computer and communications services (both part of the "knowledge and technology" pillar). The Innovation Input and Output Sub-Indices are weighted averages of their respective constituent indicators; the ratio of

19. *Global Innovation Index 2012 measures capabilities of 141 Countries*, EUROPEAN COMM'N JOINT RSCH. CENTRE (July 5, 2012), http://ec.europa.eu/dgs/jrc/index.cfm?id=1410&obj_id=15060&dt_code=NWS&lang=en.

20. GII, *supra* note 18, at 6.

21. *Id.* at 4.

22. *Global Innovation Index 2013*, INSEAD (2013), http://globalinnovationindex.org/content.aspx?page=data-analysis.

23. GII, *supra* note 18, at 22.

24. *Id.* at 76-77.

the latter Sub-Index to the former is the IEI.

Finally, the distinction between "technological" innovation and "creative" or "non-technological" innovation is useful for the analysis. The former consists of patent applications, scientific journal articles, computer software, etc. (the "knowledge and technology" pillar of the Innovation Output Sub-Index); the latter consists of trademark registrations, new business creation, recreation and culture, etc. (the "creative" pillar of the Innovation Output Sub-Index). Although this paper is directed toward the effects of patent law on innovation generally, such effects will be more direct, and more clearly identified, with regard to technological innovation.

II. ANALYSIS:THREE CASE STUDIES IN UTILITY MODEL REGIMES

> *[T]he very first official thing I did, in my administration—and it was on the very first day of it, too—was to start a patent office; for I knew that a country without a patent office and good patent laws was just a crab, and couldn't travel any way but sideways or backwards.*[25]

Not all utility model systems are created equal; from country to country, utility models vary in terms of length (from as short as six years in France[26] to as long as fifteen years in Brazil[27]), eligible subject matter (all patentable inventions are eligible in France,[28] while Asian countries generally allow utility models to be granted only for "[d]evices concerning a shape, structure or combination of these in an article"[29]), administrative procedures, and other areas. It is for this reason that, instead of "Are utility models good for innovation?", a more productive question to ask is "What *kind* of utility models are good for innovation?"

For purposes of comparison to the American patent regime, then, the utility model systems to be examined should differ in their details to allow for a more targeted policy recommendation. It is for that reason that this paper focuses most specifically on the Brazilian and German utility model regimes, which differ from one another in a number of

25. MARK TWAIN, A CONNECTICUT YANKEE IN KING ARTHUR'S COURT 64 (1889).

26. "Les titres de propriété industrielle protégeant les inventions sont: . . . [l]es certificats d'utilité, délivrés pour une durée de six ans à compter du jour du dépôt de la demande." ["The industrial property titles protecting inventions [include]: . . . utility certificates, issued for a period of six years from the date of filing."] CODE DE LA PROPRIÉTÉ INTELLECTUELLE art. 611-2 (May 3, 2012), *available at* http://www.wipo.int/wipolex/en/text.jsp?file_id=273944.

27. "[A] utility model patent [shall remain in force] for a period of 15 (fifteen) years from the date of filing." Law No. 9,279 of May 14, 1996 [hereinafter "Brazilian Law No. 9,279] art. 40, *available at* http://www.wipo.int/wipolex/en/text.jsp?file_id=125397.

28. CODE DE LA PROPRIÉTÉ INTELLECTUELLE, *supra* note 26, at art. 611-10.

29. *Comparison of Utility Model Systems by Nation*, JAPAN PATENT OFF., http://www.jpo.go.jp/shiryou_e/toushin_e/shingikai_e/pdf/en_utility/material3.pdf (last visited Jan. 11, 2013).

respects. Brazil's utility model system is unusual in that it requires substantive examination of utility model applications;[30] although the threshold of patentability for utility models is lower than for full-term patents, examination takes place in the context of the same basic requirements of novelty, inventive step, and industrial application.[31] Germany's system requires no such substantive examination.[32] In Brazil, any patentable subject matter may be eligible for protection as a utility model;[33] Germany's system excludes methods and processes from utility model eligibility.[34] Utility model protection lasts fifteen years in Brazil, as compared to ten years in Germany.[35]

Perhaps most important, however, are the ways in which the utility model systems complement, differ from, and interact with their full-term patent system counterparts, and it is here where the Brazilian and German systems evince fundamental differences not just in their technical details or administrative procedures, but in the philosophies and justifications that underlie and inform them. The German system is what might be termed a "coexisting" system—that is, patents and utility models are not alternatives to one another, but mutually reinforcing concepts, both of which can be directed to similar sets of ideas.[36] Utility

30. Brazilian Law No. 9,279, *supra* note 27, at art. 33.

31. "Uma invenção é patenteável quando atende simultaneamente aos três requisitos básicos: novidade, atividade inventiva e aplicação industrial . . . Um modelo de utilidade é patenteável quando o objeto de uso prático (ou parte deste) atende aos requisitos de novidade na nova forma ou disposição, aplicação industrial e envolve um ato inventivo, que resulte em melhoria funcional no seu uso ou na sua fabricação." ["An invention is patentable if it meets the three basic requirements: novelty, inventive step and industrial application . . . A utility model is patentable when the object of practical use (or part thereof) meets the requirements of novelty in the new form or arrangement, industrial application and involves an inventive step, which results in functional improvement in its use or in its manufacture."] *Guia de Depósitos de Patentes* [*Guide to Patent Applications*], INSTITUTO NACIONAL DA PROPRIEDADE INDUSTRIAL [BRAZILIAN NATIONAL INDUSTRIAL PROPERTY INSTITUTE] 11, http://www.inpi.gov.br/images/stories/downloads/patentes/pdf/Guia_de_Deposito_de_Patentes.pdf (last visited Jan. 11, 2013) [hereinafter "Brazilian Patent Guide"].

32. "Eine Prüfung des Gegenstands der Anmeldung auf Neuheit, erfinderischen Schritt und gewerbliche Anwendbarkeit findet nicht statt." ["Examination of the subject matter of the [utility model] application does not take place with regard to novelty, inventive step, and industrial application."] Gebrauchsmustergesetz [GebrMG] [Utility Model Law], as amended July 31, 2009, at § 8(1), http://www.wipo.int/wipolex/en/text.jsp?file_id=229677 (last visited Sept. 27, 2013) (Ger.).

33. Brazilian Patent Guide, *supra* note 31, at 16, 20.

34. "Als Gebrauchsmuster warden nicht geschützt: . . . Verfahren." ["Not protectable as utility models are: . . . methods."] GebrMG, *supra* note 32, at § 2.

35. "Die Schutzdauer eines eingetragenen Gebrauchsmusters beginnt mit dem Anmeldetag und endet zehn Jahre nach Ablauf des Monats, in den der Anmeldetag fällt." ["The term of protection of a registered utility model begins with the filing date and ends ten years after the end of the month in which the date of filing falls."] GebrMG, *supra* note 32, at § 23(1).

36. *See id.* at §§ 1, 2 (identifying the types of subject matter suitable and unsuitable for utility model protection); *cf.* German Patent Law, §§ 1, 3, *available at* http://www.wipo.int/wipolex/en/text.jsp?file_id=238776 (defining the scope of patent

models can claim priority on the basis of earlier-filed patent applications (as long as the claim is made within two months of the completion of the patent prosecution process)[37] and vice versa (as long as the claim is made within a year of the utility model's filing date)[38]—indeed, a utility model and, subsequently, a patent can be obtained for the same subject matter.[39] Brazil's utility model regime, by contrast, could be considered a "competitive" system, wherein patents and utility models are mutually exclusive options to accomplish similar, but not identical, ends; applications for utility models are handled by the same procedures as applications for patents,[40] and with the exceptions of the term of protection[41] and the thresholds of patentability necessary to obtain rights,[42] there is little to separate the two concepts. Unlike in Germany, utility models and patents may not be obtained for the same subject matter in Brazil, no matter the order in which they are sought or any claims to priority.

And so the question arises again, but with a slightly different meaning: "What *kind* of utility model is good for innovation?" Which of the two competing theories of what a utility model is, or should be, leads to better innovative outcomes? Is the ease of obtaining a German utility model (no substantive examination, no preclusion of later patentability) worth the weaker set of rights obtained thereby (no processes or methods, a term half as long as that of a patent[43])? Is it preferable to undergo a longer, more consequential prosecution (some degree of substantive examination, a forced choice between utility models and patents) to secure stronger rights (fifteen years of protection, all patentable subject matter eligible), as under the Brazilian regime? Are both systems beneficial? Or does American patent law, with its total absence of the utility model concept, have it right to begin with?

A. The "Strong" Utility Model Regime: Brazil

Among upper-middle-income countries, Brazil ranks eighth on the IEI with a score of 0.82 (0.08 better than the United States).[44] Detailed data on Brazilian innovation can be found in Appendix C.

protection in similar terms).

37. GebrMG, *supra* note 32, at § 5(1).

38. German Patent Law, *supra* note 36, at § 40(1).

39. *Id.* at § 40(5).

40. *See generally* Brazilian Law No. 9,279, *supra* note 27, at art. 30-37.

41. "An invention patent shall remain in force for a period of 20 (twenty) years, and a utility model patent for a period of 15 (fifteen) years from the date of filing." *Id.* at art. 40.

42. Brazilian Patent Guide, *supra* note 31, at 11.

43. "The duration of a patent shall be 20 years, beginning on the day following the filing of the application for the invention." German Patent Law, *supra* note 36, at § 16(1).

44. GII, *supra* note 18, at 23, 26.

As a nation with a developing economy, Brazil is a fertile proving ground for utility models as a concept because of the positive effect utility models have been shown to have on innovation in such countries. A 2011 investigation by researchers at the Korea Institute of Intellectual Property, Seoul National University, American University, and the Republic of Korea Naval Academy in the journal *Research Policy* found that in general, utility models are "conducive to innovation and growth, controlling for other factors" in developing countries.[45] In the Brazilian case particularly, the World Bank has recognized that "utility models helped domestic producers gain a significant share of the farm machinery market by encouraging adaptation of foreign technologies to local conditions."[46] Brazil is a poster child for the notion that utility models can serve as "a stepping stone for developing more patentable inventions later on."[47]

The design of Brazil's utility model system, especially its similarities to the regime for full patents, is particularly interesting in light of Brazil's current economic position. Although Brazil is still characterized as a developing country,[48] its rapid economic growth over the past decade[49] has put it on the threshold of becoming characterized as a developed country.[50] Thus, Brazilian intellectual property law must navigate the tricky boundary between two worlds: the developing world, where utility models "allow[] . . . economies to build up their indigenous innovative capacities,"[51] and the developed world, where "[full] patent protection contributes to innovation and economic growth."[52] It is perhaps not surprising then to find a "strong" utility model system in a country like Brazil, as such a system can be seen as an attempt to synthesize the advantages of utility models that enable the buildup of innovative infrastructure—lower thresholds for protection and a simpler prosecution process—with the advantages of patents that drive major

45. Yee Kyoung Kim, Keun Lee, Walter G. Park & Kineung Choo, *Appropriate Intellectual Property Protection and Economic Growth in Countries at Different Levels of Development*, 41 RES. POL'Y 358, 358 (2012).

46. WORLD BANK, GLOBAL ECONOMIC PROSPECTS AND THE DEVELOPING COUNTRIES 134 (2002), *available at* http://siteresources.worldbank.org/INTGEP/Resources/335315-1257200370513/gep2002complete.pdf.

47. Kim et al., *supra* note 45, at 358.

48. INTERNATIONAL MONETARY FUND, WORLD ECONOMIC OUTLOOK: GROWTH RESUMING, DANGERS REMAIN 182 (Apr. 2012), *available at* http://www.imf.org/external/pubs/ft/weo/2012/01/pdf/text.pdf.

49. Over the course of eight years, Brazil's per capita GDP (in current U.S. dollars) more than quadrupled, from $3,042 in 2003 to $12,576 in 2011. *GDP Per Capita*, WORLD BANK, http://data.worldbank.org/indicator/NY.GDP.PCAP.CD/countries (last visited Sept. 28, 2013).

50. The GII, for instance, classifies Brazil as an "upper-middle-income" country, one rung below the "high-income" classification. GII, *supra* note 18, at 26.

51. Kim et al., *supra* note 45, at 359.

52. *Id.*

breakthroughs in the developed world—stronger protections and longer terms of exclusive use.

A question then arises, however: for how much longer will Brazil need a utility model system? With Brazil headed toward characterization as a developed country within the next few decades and its utility model system already bearing strong resemblances to the patent regime, utility models may be reaching the ends of their useful lives in Brazil. Indeed, the Brazilian patent office, the Instituto Nacional da Propriedade Industrial (the National Institute of Industrial Property, the "INPI"), is already bedeviled by one of the hallmarks of patent systems in the developed world . . . delay. While the USPTO's average pendency in December 2012 was a substantial 39 months,[53] the INPI's mark in February of the same year was an astounding eight to nine years.[54]

This should give advocates of the introduction of the utility model in the United States some pause, as it may demonstrate that the utility model is not the right tool for solving the major problem the United States patent system faces; if the goal of a new reform is to reduce patent pendency, adopting a strategy that is utilized by a patent regime with an average pendency over twice as long as that of the United States does not, on its face, seem a particularly prudent course of action. One can argue that the length of pendency in Brazil is due to factors that have little or no relevance to the American system, such as a deficiency in resources as compared to the USPTO. The USPTO had 6,652 examiners on staff at the end of 2011[55] and received 503,582 patent applications in that year;[56] in 2010 the INPI employed 273 patent examiners[57] and received 22,686 patent applications and 1,988 utility model applications.[58] The INPI thus received 90.4 applications requiring examination per examiner, compared to 75.7 for the USPTO. Although this may explain some difference in efficiency between the two countries, it does not appear to be so significant as to account for such a wide gap in pendencies, especially considering the relative rates at which both offices have lately been expanding their corps of examiners[59] and

53. USPTO Data Visualization Center Patents Dashboard, *supra* note 11.

54. Letter from National Foreign Trade Council to U.S. Trade Representative Ronald Kirk (Feb. 10, 2012), *available at* http://www.nftc.org/default/Publications/Trade_Policy/Special301_Comments%202-10-12.pdf.

55. USPTO Data Visualization Center Patents Dashboard, *supra* note 11.

56. WIPO, WORLD INTELLECTUAL PROPERTY INDICATORS 49 *(*2012), http://www.wipo.int/export/sites/www/freepublications/en/intproperty/941/wipo_pub_941_2012.pdf.

57. INPI, BALANCE AND PERSPECTIVES: INPI IN TRANSFORMATION, 20, *available at* http://www.inpi.gov.br/images/stories/downloads/pdf/INPI_Relatorio_Comunicacao_ingles.pdf.

58. WIPO, *supra* note 56, at 49, 91.

59. INPI's 2010 staff of 273 examiners was a 22.4% increase over the previous year's

the fact that utility model applications do not undergo examinations as rigorous as those to which patent applications are subjected. Moreover, the INPI itself has identified that one of its major problems, irrespective of operational capacity, was that it was "little articulated with . . . industry and with the national innovation system;" INPI was "not perceived by many as relevant for its potential uses . . . [and was] culturally distant from the means of innovation."[60] This perceived irrelevance and "cultural distance" has been identified as a growing problem in the American system as well.[61] Brazil's experience, therefore, demonstrates that the existence of a strong utility model system is not a magic bullet for reducing pendency for full patent applications.

B. The "Weak" Utility Model Regime: Germany

Among high-income countries, Germany ranks fifth on the IEI with a score of 0.91 (0.17 better than the United States).[62] Detailed data on German innovation can be found in Appendix D.

The primary success of the German utility model (*Gebrauchsmuster*) has been as a placeholder—a measure used to quickly establish rights when the rights-holder eventually intends to obtain a full patent.[63] This is usually accomplished by "branching off" a utility model application from a preexisting patent application, which allows the rights-holder to maintain the priority date of the patent application and obtain rights while the patent application is still pending[64] (due to the lack of substantive examination of the utility model application). Unlike in several other countries with utility model systems,[65] a patent application is not deemed abandoned in the German system if a utility model application claiming the same subject matter and the same priority date is subsequently filed.[66] The most common reason for employing such a tactic is that holding a utility model can be advantageous in litigation if the patent applicant suspects infringement,[67] and intellectual property lawyers doing business in Germany often tout

223. INPI, *supra* note 57, at 20. In September 2012, the USPTO had a staff of 7,837 examiners, a 17.2% increase from the 6,685 of a year earlier. USPTO Data Visualization Center Patents Dashboard, *supra* note 11.

60. INPI, *supra* note 57, at 14.

61. *See When Patents Attack*, *supra* note 8.

62. GII, *supra* note 18, at 23.

63. *See* Hans-Peter Brack, *Utility Models and their Comparison with Patents and Implications for the US Intellectual Property Law System*, 2009 B.C. INTELL. PROP. & TECH. 102701, 7 (2010).

64. *Id.*

65. For instance, the patent offices of Japan, South Korea, and China all prohibit duplicate registrations. *See Comparison of Utility Model Systems by Nation*, *supra* note 29.

66. German Patent Law, *supra* note 36, at § 40(5).

67. Brack, *supra* note 63, at 6.

this to their clients as one of the major benefits of seeking a utility model.[68]

Despite their potential advantages in litigation, however, utility models' popularity in Germany is declining markedly; the number of German utility model applications declined 5.8%, and the number of German utility models granted declined 8.1% in 2011, as compared to the previous year.[69] "[L]arger firms such as those in the German chemical industry have taken the position that utility models are 'unsafe,' and oppose them . . . . [Such firms] do not wish to consume their resources defending themselves against an unexamined right [because] monitoring and litigation [of competitors' utility models] is quite costly for the firms."[70] By the same token, as Germany is a fully-developed nation with a well-established scientific infrastructure, many of the entities with the resources to realize new technological achievements may be willing to accept the expenditure of the additional time and money required to obtain the stronger rights that accompany a full patent, rather than risk their developments with the cheap but weak protections of the utility model; the utility model law (*Gebrauchsmustergesetz*) allows a wide range of parties to bring a claim for cancellation of a utility model,[71] and the burden lies with the holder of the utility model to prove validity.[72]

This reluctance to seek utility models for inventions and improvements is not confined to the German system; in 2011, applications for utility models decreased as compared to the previous year by substantial margins in South Korea, Japan, and Austria; decreased slightly in Spain; and were essentially flat in Italy and Hong Kong,[73] while patent applications increased markedly in each of these jurisdictions.[74] National patent offices in the developed world seem to be

68. *See, e.g.*, Steven C. Carlson, Frank Peterreins, Alexander Harguth, Adam R. Steinert, & Jan-Malte Schley, *German Utility Models: A Useful and Affordable Tool for Global IP Solutions*, http://www.fr.com/files/Uploads/Documents/Utility%20Models%20Article.pdf (last visited Jan. 14, 2013) (an advertisement to clients by the prestigious intellectual property firm Fish & Richardson promoting German utility models as a part of international IP litigation strategy); BARDEHLE PAGENBERG, UTILITY MODEL PROTECTION IN GERMANY 14 (2013), *available at* http://www.bardehle.com/fileadmin/contentdocuments/broschures/Utility_Model_Protection_EN.pdf (a similar publication by the firm Bardehle Pagenberg).

69. WORLD INTELLECTUAL PROPERTY INDICATORS, *supra* note 56, at 94. It should be noted that the trend in Germany is contrary to the worldwide trend of a 35.0% increase in applications and a 16.3% increase in grants, *id.* at 90, 94, but that trend is due almost entirely to a 42.9% increase in applications and an 18.5% increase in grants in China, which processes roughly 37 times as many utility model applications as any other single patent office. *Id.*

70. Brack, *supra* note 63, at p. 11.

71. GebrMG, *supra* note 32, at § 15(1).

72. *Id.* at § 17(1).

73. WORLD INTELLECTUAL PROPERTY INDICATORS, *supra* note 56, at 91.

74. *Id.* at 49.

getting the message; Germany is now one of the few remaining developed countries that offer utility model protection,[75] as those ranks have dwindled within just the last few years.[76] As firms increasingly move away from utility models and governments across the developed world drop their utility model systems (or consider doing so), Germany's system looks increasingly anachronistic, as does its weak utility model regime.

C. The No-Utility-Model Regime: The United States

Among high-income countries, the United States ranks 26th on the IEI with a score of 0.74.[77] Detailed data on American innovation can be found in Appendix E.

As noted in the Introduction to this paper, the American patent system is beset by a range of infirmities that pose a serious threat to innovation in the United States. Foremost among these is the sheer length of time necessary to prosecute a patent application through the USPTO, but several others loom. One such issue, which has received substantial press but is still largely misunderstood by the general public, is a sharp increase in patent trolling.[78] These two problems, in combination with others, have led innovators in several fields, most notably software, to begin eschewing the notion of patents completely.[79] On first impressions, utility models could arguably address these two major thorns in the side of the American innovator—utility models are quicker and easier to obtain than patents, and they are, under the "weak" utility model system that prevails in the developed world, less valuable to patent trolls because they are much more susceptible to cancellation than patents.[80]

The idea that the United States might benefit from the implementation of a utility model system, though not without its merits and its proponents,[81] suffers from several flaws. As an initial matter, despite much hand-wringing in the press (not all of it unfounded),

75. Kim et al., *supra* note 45, at 360.

76. The Netherlands, for instance, abolished its six-year utility model on 5 June 2008. NL Patent Office, *Patent Act 1995*, http://en.octrooicentrum.nl/patent-trademark-or-design/patents/patent-act-1995.html (last visited Jan. 14, 2013). Belgium did the same on 8 January 2009. *Belgian Patents*, FPS ECONOMY OF BELGIUM, http://economie.fgov.be/en/entreprises/Intellectual_property/Patents/Belgian_patents (last visited Jan. 14, 2013).

77. GII, *supra* note 18, at 23.

78. Patent assertion entities brought 61% of all patent lawsuits in the United States in the first eleven months of 2012, compared with 45% in 2011 and 23% in 2007. Sarah McBride, *Patent Troll Cases Now Make up Majority of All Patent Litigation, Study Says*, REUTERS (Dec. 10, 2012, 4:19 PM), http://www.reuters.com/article/2012/12/10/us-patents-usa-lawsuits-idUSBRE8B913I20121210.

79. *When Patents Attack*, *supra* note 8.

80. *See, e.g.*, GebrMG, *supra* note 32, at §§ 15(1), 17(1).

81. *See, e.g.*, Brack, *supra* note 63, at p. 11.

American *technological* innovation is not, in fact, in a state of all-out crisis. Although the United States ranks squarely in the middle of the pack in the IEI,[82] this is largely driven by weakness in what might be termed "creative" or "non-technological" innovation; America ranks 75th (out of 87 countries with data) in national office trademark registrations[83] and 41st (out of 62 countries with data) in Madrid Agreement trademark registrations.[84] If the IEI were recalculated using only the "knowledge and technology" pillar of the innovation output score, the United States would rank 31st overall[85]—not an excellent showing, but a substantially better one.

Furthermore, the performance of the American patent system has recently showed signs of improvement, at least in terms of patent pendency, without the implementation of utility models. The USPTO's time to first office action, though still much too high at 20 months, has fallen by eight months since August 2011, and the backlog of 608,000 applications is the smallest in well over two years.[86] The USPTO's own Quality Composite Score, which combines seven individual metrics to obtain a picture of how the USPTO is performing as a whole, stood at 72.4 in the fourth quarter of 2012, more than forty points higher (on a 0-to-100 scale) than just a year earlier.[87] These improvements may be expected to continue as the Office opens new branch offices in Dallas, Denver, Detroit, and Silicon Valley over the next two years.[88] As the USPTO begins to set its house in order after many years of subpar performance, the necessity of further reform may be questioned.

Additionally, to the extent that reform of the American patent system is needed, Congress has already attempted to address that need with the Leahy-Smith America Invents Act (the "AIA"), which was signed into law in September 2011 and will be fully in force by September 2015 (with most provisions becoming effective in March 2013).[89] The most significant change to American patent law contained in the AIA, and the one likely to have the biggest impact on the workings of the USPTO, was the switch from a first-to-invent system—the last

82. Of 141 countries examined, the United States' IEI score placed 70th, and in the bottom half (26th out of 44) of high-income countries. GII, *supra* note 18, at 23.

83. *Id.* at 396.

84. *Id.* at 397.

85. Author's own calculations. Based on data from *Global Innovation Index 2013*, *supra* note 22.

86. USPTO Data Visualization Center Patents Dashboard, *supra* note 11.

87. *Id.*

88. Allison Sherry, *Denver to Get U.S. Patent Office, A $440 Million Economic Boost*, THE DENVER POST (July 1, 2012), *available at* http://www.denverpost.com/politics/ci_20981965/denver-get-u-s-patent-office.

89. *See generally* UNITED STATES PATENT & TRADEMARK OFFICE, AMERICA INVENTS ACT: EFFECTIVE DATES (Oct. 5, 2011), *available at* http://www.uspto.gov/aia_implementation/aia-effective-dates.pdf.

such system in the world[90]—to a first-to-file system.[91] Proponents of the AIA argue that this change will improve the USPTO's efficiency by eliminating the need for examiners to closely scrutinize extrinsic evidence of an invention's date of "reduction to practice" and the need for interference, a costly and time-consuming procedure used to settle conflicting claims for priority between inventors under the first-to-invent system.[92] Under the AIA, an inventor may still claim that an earlier-filing inventor "derived" the invention from him or her and seek to have the earlier-filed application invalidated.[93]

Critics of the AIA contend that the newly created procedure of the derivation proceeding, by which the USPTO will examine claims of derived invention, will, in practice, be at least as administratively burdensome as the old interferences, vitiating any putative gains in patent system efficiency.[94] It is, of course, too early to tell which of these conflicting points of view is more accurate, but one cause for concern about the AIA's supposed efficiency gains, at least in the short-run, is that, for the next several years, the USPTO will have to conduct both interferences and derivation proceedings because applications filed on or after March 16, 2013 will be subject to derivation proceedings, while the backlog of hundreds of thousands of pending applications filed before that date will still be subject to interferences as they work their way toward issue.[95]

Even if utility models have a positive effect on innovation generally, they may not be appropriate for the American case. Economic research on the subject of utility models suggests that "[w]here th[e] capacity [to conduct innovative research] exists . . . a system that provides incentives to conduct minor, incremental inventions [*i.e.* a utility model system] is more conducive to growth."[96] In contrast, utility model protection weakly affects innovation and growth in developed countries.[97] This is consistent with the trend among developed countries away from utility models, even as the annual quantity of patent applications increases despite continued backlogs in most of the world's

90. Suzanne Konrad, *The United States First-to-Invent System: Economic Justifications for Maintaining the Status Quo*, 82 CHI.-KENT L. REV. 1629, 1629 (2007) (citing MARTIN J. ADELMAN ET AL., CASES AND MATERIALS ON PATENT LAW 160 (2d ed. 2003).

91. AMERICA INVENTS ACT: EFFECTIVE DATES, *supra* note 89, at 6.

92. George Rondeau, "*America Invents Act" Patent Law Overhaul: The Benefits and the Drawbacks*, LEXOLOGY.COM (Nov. 17, 2011), http://www.lexology.com/library/detail.aspx?g=5f772592-7ac2-41bc-becb-d3ff5c8ed192.

93. Changes to Implement Derivation Proceedings, 77 Fed. Reg. 56,068, 56,069 (Sept. 11, 2012) (to be codified at 37 C.F.R. pt. 42).

94. Charles L. Gholz, *Would Derivation Proceedings Be the Same as Derivation Interferences?*, 2 MEDICAL INNOVATION AND BUSINESS 39 (Summer 2010).

95. AMERICA INVENTS ACT: EFFECTIVE DATES, *supra* note 89, at 6.

96. Kim et al., *supra* note 45, at 358.

97. *Id.* at 359.

major patent offices. Even if decision-makers in the United States were to conclude that establishing some type of utility model protection would be beneficial for American innovation, implementing the utility model system would require changes to many aspects of American law;[98] whether American business—and, perhaps more significantly, the American Congress—would have the political and economic stomach to get such changes right is an open question.

III. CONCLUSION: RECOMMENDATIONS FOR THE FUTURE OF AMERICAN PATENT LAW

> *Be not the first by whom the new are try'd,*
> *Nor yet the last to lay the old aside.*[99]

The Brazilian and German experiences with their respective utility model systems give conflicting evidence as to the usefulness and propriety of the utility model concept, both in those countries and in regard to any prospective future reforms for the United States.

Brazil has, in the recent past, greatly benefited from its strong utility model system; in the late '90s and the early years of the 21st century, that system helped small, local businesses and was a significant catalyst in the economic miracle that has put Brazil on the cusp of transition to a high-income standard of living. Now that Brazil is prepared to make that leap from developing country to developed country, however, the continued viability and necessity of its utility model system is on shaky ground, both philosophically and practically.[100] Brazil also now faces a threat to innovation with which developed nations are well-acquainted and to which the utility model alternative has provided little relief: seemingly interminable patent pendency. If utility models have not immunized South America's largest and most important intellectual property system from such a malady, it is doubtful that they would do so in the United States, where they would likely play an even less prominent role.

Germany, in many ways, is now the standard-bearer for the utility model concept generally—the German Patent and Trademark Office (*Deutsches Patent- und Markenamt*) now receives more utility model

98. Brack, *supra* note 63, at 11.

99. ALEXANDER POPE, AN ESSAY ON CRITICISM, pt. 2, lines 336-37 (1709).

100. At present, Brazilian patent and utility model application data for 2011 are not available; in 2010, the number of utility model applications to INPI fell by 36.3% as compared to the previous year, while the number of patent applications rose 88.1%. WORLD INTELLECTUAL PROPERTY INDICATORS, *supra* note 56, at 49, 91. This could indicate that innovators, when faced with the choice between patents and utility models, are consciously shifting away from utility models in favor of patents, as the conventional model of IP rights suggests is appropriate for a country in Brazil's economic position.

applications than any of its peer offices in the developed world and, outside of China, Germany is perhaps the most prominent country that still offers utility model protection—but there, too, the concept's successes are counterbalanced by drawbacks. There is little doubt that Germany's weak utility model system provides firms with great flexibility and gives both plaintiffs and defendants in litigation (and potential litigation) greater clarity when making decisions about intellectual property strategy; it is perhaps for this reason that Germany has not fallen victim to America's rampant patent trolling epidemic. As a rich country, however, it has the capacity to go beyond the incremental improvements so typical of utility models and pursue game-changing technologies that are more properly protected by patents; it is unclear whether the utility model is still needed in Germany, and, if trends in other developed countries are any indication, the existence of the *Gebrauchsmuster* is on the wrong side of history.

What, then, can be said about the propriety of bringing utility models to the United States, where they have never before been implemented? There is no doubt that the American patent system has room to improve, but with the first performance data from 2012 giving encouraging signs and a significant expansion in USPTO capacity on the horizon, such improvement looks firmly within America's grasp without the need for utility models. As the German case and the recent history of utility models in the developed world evinces, for rich countries the utility model is quickly becoming an add-on, an afterthought whose time as an important piece of the intellectual property rights puzzle has passed.

Congress, to its credit, recognized that reform was needed, but its attempt at such reform was belated[101] and imperfect and has been subjected to sharp criticism.[102] The AIA's shortcomings in addressing some of the fundamental problems with the American patent system,

101. Apart from the creation of the United States Court of Appeals for the Federal Circuit in 1982, the AIA was the first significant modification to American patent law since 1952, despite many instances of clamoring for change (Fritz Machlup's 1958 testimony to Congress being an example). David Goldman, *Patent Reform Is Finally on Its Way*, CNN MONEY (June 24, 2011, 11:05 AM), http://money.cnn.com/2011/06/24/technology/patent_reform_bill/index.htm. Indeed, Congress and the Patent Act have often lagged behind the times throughout the nation's history; between the passage of the initial Patent Act in 1790 and the 1952 Patent Act, Congress meaningfully revised the American patent system only three times, in 1793, 1836, and 1870. Nard, *supra* note 5, at 19-22.

102. *See, e.g.*, Timothy B. Lee, *Mostly Pointless Patent Reform Bill Goes to Obama for Signature*, ARS TECHNICA (Sept. 8, 2011, 3:48 PM), http://arstechnica.com/tech-policy/2011/09/mostly-pointless-patent-reform-bill-goes-to-obama-for-signature/; Rob Wheeler & James Allworth, *U.S. Patent Overhaul Won't Help Innovators*, HARVARD BUSINESS REVIEW BLOG NETWORK (Sept. 15, 2011, 9:38 AM), http://blogs.hbr.org/cs/2011/09/the_america_invents_act_rearra.html.

such as the proliferation of business and software patents[103] (the latter of which have been a primary culprit in the growth of patent trolls[104]), have been a source of substantial misgivings about the continued viability of the American patent system.[105] While the additional resources that have been made available to the USPTO will, at least in the eyes of optimists and some reformers, cut down patent pendency,[106] problems remain, and Congress' political will to tackle such a challenging issue so soon after its latest attempt at reform is doubtful.[107]

So what *can* be done? Addressing the problem of software patents would certainly be a good start. The receptiveness of the USPTO and the Federal Circuit to software patents might have made sense in the earlier years of computing, but many in the industry now claim that such patents are counterproductive because they hinder research and development,[108] allow for the patenting of trivial or obvious improvements,[109] and are philosophically incompatible with the growing open source software movement.[110] While software patents do bring some benefits as well,[111] given the role they play in America's patent trolling epidemic, cabining or eliminating them is worth considering. Amending American patent law to exclude software from patentability would probably be the most ironclad (although potentially problematic) means of accomplishing that, but in the absence of congressional action, the Federal Circuit should seriously reevaluate its line of software patent cases to give the USPTO

103. Lee, *supra* note 102.

104. "You can't separate the problem with the patent troll from the problem with software patents. . . . There are hundreds of thousands of software patents floating around that are really broad, that are really vague . . . and a lot of them are bought up by patent trolls." Zach Weissmueller, *How Patent Trolls Kill Innovation*, REASON.COM (Feb. 20, 2013), http://reason.com/reasontv/2013/02/20/too-many-patents-how-patent-trolls-kill (internal quotation marks omitted).

105. *See, e.g.*, Boldrin & Levine, *supra* note 9.

106. Author's interview with John Posthumus (Oct. 11, 2012).

107. The AIA was the result of six years of political process, and was only passed after multiple previous attempts at reform failed because "private sector stakeholders remained in deadlocked disagreement on key provisions." Joseph M. Potenza, *The America Invents Act: One Year Later*, ABA-IPL LANDSLIDE (last visited Sep. 27, 2013), *available at* http://www.americanbar.org/publications/landslide/2012_13/january_february/the_america_invents_act_one_year_later.html.

108. ADAM B. JAFFE & JOSHUA LERNER, INNOVATION AND ITS DISCONTENTS 18 (3d ed. 2007).

109. JAMES BESSEN & MICHAEL J. MEURER, PATENT FAILURE: HOW JUDGES, LAWYERS, AND BUREAUCRATS PUT LAWYERS AT RISK 216 (2008).

110. *See, e.g.*, Richard Stallman, *Let's Limit the Effect of Software Patents, Since We Can't Eliminate Them*, WIRED (Nov. 1, 2012, 6:30 AM), http://www.wired.com/opinion/2012/11/richard-stallman-software-patents/.

111. For instance, a software patent can help a small company grow its valuation and expand its business. World Intellectual Property Organization, *Ways in Which Patents Can Help Your E-Commerce Business*, http://www.wipo.int/sme/en/e_commerce/pat_help.htm (last visited Sep. 27, 2013).

clearer guidance. The Federal Circuit's decision in *In re Bilski*,[112] in which it abandoned the "useful, concrete and tangible result" test for patentability of *State St. Bank and Trust Co. v. Signature Financial Group, Inc.*,[113] was a significant first step in this direction. Simply providing a weaker form of patent-like protection on software is another idea, but it is worth noting that neither Brazil[114] nor Germany[115] allow for utility model protection on computer programs.

Perhaps, at some point in America's past, before the United States became the economic hegemon it is today, it would have been advisable to institute a utility model regime, but the time to implement that regime is not now. To paraphrase Fritz Machlup, the Austrian-American economist who testified before Congress about the economic impacts of the patent system over fifty years ago: as to a utility model system, it would be irresponsible, on the basis of our present knowledge of its economic consequences, to recommend instituting one.[116]

112. 545 F.3d 943 (Fed. Cir. 2008), *aff'd sub nom. Bilski v. Kappos*, 130 S.Ct. 3218 (2010).

113. 149 F.3d 1368, 1373 (Fed. Cir. 1998).

114. UK Intellectual Property Office, INTELLECTUAL PROPERTY RIGHTS PRIMER FOR BRAZIL 30 (2008), *available at* http://www.ipo.gov.uk/ipr-guide-brazil.pdf (noting that software is protected by a special, longer-term form of copyright in Brazil).

115. "The following items, for example, do not qualify for utility model protection: . . . programs for computers." Deutsches Patent- und Markenamt [German Patent and Trademark Office], *Utility Model Protection*, http://www.dpma.de/english/utility_models/utility_model_protection/index.html (last updated Feb. 9, 2013).

116. Brack, *supra* note 63, at 11 (positing that the introduction of utility models to the landscape of United States intellectual property law, in the absence of significant "legal system reforms and . . . development of new business methods," would not bring "significant benefits").

APPENDIX A:
GLOBAL INNOVATION INDEX INPUT VARIABLES, WITH RELATIVE WEIGHTS IN GII[117]

Variable	Description or source	Relative weight in GII
Political stability and absence of violence/terrorism	World Bank index	0.022
Government effectiveness	World Bank index	0.022
Press freedom	Reporters Without Borders index	0.022
Regulatory quality	World Bank index	0.022
Rule of law	World Bank index	0.022
Cost of redundancy dismissal	Sum of notice period and severance pay for redundancy dismissal (in salary weeks, averages for workers with one, five, and ten years of tenure, with a minimum threshold of eight weeks)	0.022
Ease of starting a business	World Bank percent rank index	0.022
Ease of resolving insolvency	World Bank percent rank index	0.022
Ease of paying taxes	World Bank percent rank index	0.022
Expenditure on education	As a percentage of GNI	0.013
Public expenditure on education per pupil	All levels, as a percentage of GDP per capita	0.013
School life expectancy	Total number of years of schooling	0.013

117. The information in Appendices A and B is derived from the Sources and Definitions and Technical Notes of the 2012 Global Innovation Index. *See generally* GII, *supra* note 18, at 409-32.

	that a child can expect to receive in the future	
Assessment in reading, mathematics, and science	Programme for International Student Assessment average scores	0.013
Pupil-teacher ratio, secondary		0.013
Tertiary enrollment	As a percentage of the age group that corresponds to the tertiary level of education	0.017
Graduates in science and engineering	As a percentage of total tertiary graduates	0.017
Tertiary inbound mobility	The number of students from abroad studying in the country, as a percentage of the total tertiary enrollment in the country	0.017
Gross tertiary outbound enrollment	Mobile students coming from a country/region as a percentage of the population of tertiary student age in their home country	0.017
Researchers	Per million population	0.022
Gross expenditure on R&D (GERD)	As a percentage of GDP	0.022
Quality of scientific research institutions	World Economic Forum Executive Opinion Survey index	0.022
Information and communication	International Telecommunication	0.017

technologies (ICT) access	Union (ITU) index	
ICT use	ITU index	0.017
Government's online service	United Nations Public Administration Network (UNPAN) index	0.017
Online e-participation	UNPAN index	0.017
Electricity output	kWh per capita	0.017
Electricity consumption	kWh per capita	0.017
Trade- and transport-related infrastructure	World Bank/Turku School of Economics Logistics Performance Index	0.017
Gross capital formation	As a percentage of GDP	0.017
GDP per unit of energy use	At parity, per kilogram of oil equivalent	0.022
Environmental performance	Yale University/Columbia University index	0.022
ISO 14001 environmental certificates	Per billion dollars GDP at parity	0.022
Ease of getting credit	World Bank percent rank index	0.022
Domestic credit to private sector	As a percentage of GDP	0.022
Microfinance institutions' gross loan portfolio	As a percentage of GDP	0.022
Ease of protecting investors	World Bank percent rank index	0.017
Market capitalization	As a percentage of GDP	0.017
Total value of stocks traded	As a percentage of GDP	0017
Venture capital deals	Per trillion dollars GDP at parity	0.017

Applied tariff rate, weighted mean		0.013
Market access for non-agricultural exports	Five major export markets' weighted actual applied tariff rate	0.013
Imports of goods and services	As a percentage of GDP	0.013
Exports of goods and services	As a percentage of GDP	0.013
Intensity of local competition	World Economic Forum Executive Opinion Survey index	0.013
Employment in knowledge-intensive industries	As a percentage of workforce	0.011
Firms offering formal training	As a percentage of firms	0.011
GERD performed by business enterprise	As a percentage of total GERD	0.011
GERD financed by business enterprise	As a percentage of total GERD	0.011
GMAT mean score	Weighted by total number of test takers	0.011
GMAT test takers	Per million population 20-34 years old	0.011
University/industry research collaboration	World Economic Forum Executive Opinion Survey index	0.013
State of cluster development	World Economic Forum Executive Opinion Survey index	0.013
GERD financed by abroad	As a percentage of total GERD	0.013
Joint venture/strategic alliance deals	Per trillion dollars GDP at parity	0.013
Share of patents		0.013

with foreign inventor		
Royalty and license fees payments	Per thousand dollars GDP	0.017
High-tech imports	As a percentage of total net imports	0.017
Computer and communications service imports	As a percentage of commercial service imports	0.017
Foreign direct investment net inflows	As a percentage of GDP	0.017

APPENDIX B:
GLOBAL INNOVATION INDEX OUTPUT VARIABLES, WITH RELATIVE WEIGHTS IN GII

Variable	Description or source	Relative weight in GII
National office patent applications	Per billion dollars GDP at parity	0.042
Patent Cooperation Treaty applications	Per billion dollars GDP at parity	0.042
National office utility model applications	Per billion dollars GDP at parity	0.042
Scientific and technical journal articles	Per billion dollars GDP at parity	0.042
Growth rate of GDP per person engaged	Annual, in constant dollars at parity	0.042
New business density	New business registrations per thousand population 15-64 years old	0.042
Total computer software spending	As a percentage of GDP	0.042
ISO 9001 quality certificates	Per billion dollars GDP at parity	0.042
Royalty and license fees receipts	Per thousand dollars GDP	0.042
High-tech exports	As a percentage of total net exports	0.042
Computer and communications service exports	As a percentage of commercial service exports	0.042
Foreign direct investment net outflows	As a percentage of GDP	0.042
National office trademark registrations	Per billion dollars GDP at parity	0.042
Madrid Agreement trademark registrations	Per billion dollars GDP at parity	0.042

ICT and business model creation	World Economic Forum Executive Opinion Survey index	0.042
ICT and organizational models creation	World Economic Forum Executive Opinion Survey index	0.042
Recreation and culture consumption	As a percentage of total individual consumption	0.033
National feature films produced	Per million population 15-69 years old	0.033
Daily newspapers circulation	Per thousand population 15-69 years old	0.033
Creative goods exports	As a percentage of total exports	0.033
Creative services exports	As a percentage of total services exports	0.033
Generic top-level domains	Per thousand population 15-69 years old	0.042
Country-code top-level domains	Per thousand population 15-69 years old	0.042
Wikipedia monthly edits	Per population 15-69 years old	0.042
Video uploads on YouTube	Per population 15-69 years old	0.042

APPENDIX C:
GLOBAL INNOVATION INDEX DATA FOR BRAZIL[118]

Key indicators

Population (millions)	194.9
GDP per capita, PPP$	11,845.8
GDP (US$ billions)	2,517.9

		Score (0–100) or value (hard data)	Rank	
Global Innovation Index 2012 (out of 141)		**36.6**	**58**	
Innovation Output Sub-Index		33.0	52	
Innovation Input Sub-Index		40.2	69	
Innovation Efficiency Index		0.8	39	
Global Innovation Index 2011 (out of 125)			47	
GII 2012 rank among GII 2011 economies (125)			56	
1	**Institutions**	**50.4**	**84**	
1.1	*Political environment*	*59.6*	*62*	
1.1.1	Political stability*	66.5	63	
1.1.2	Government effectiveness*	42.8	65	
1.1.3	Press freedom*	69.4	78	
1.2	*Regulatory environment*	*71.0*	*48*	
1.2.1	Regulatory quality*	56.5	67	
1.2.2	Rule of law*	47.8	58	
1.2.3	Cost of redundancy dismissal, salary weeks	13.2	58	
1.3	*Business environment*	*20.6*	*127*	○
1.3.1	Ease of starting a business*	28.0	101	
1.3.2	Ease of resolving insolvency*	15.1	119	○
1.3.3	Ease of paying taxes*	18.7	113	○
2	**Human capital & research**	**31.5**	**83**	
2.1	*Education*	*49.6*	*73*	
2.1.1	Current expenditure on education, % GNI	4.8	43	
2.1.2	Public expenditure/pupil, % GDP/cap.	19.1	67	
2.1.3	School life expectancy, years	14.0	49	
2.1.4	PISA scales in reading, maths, & science	401.0	56	○
2.1.5	Pupil-teacher ratio, secondary	17.1	83	
2.2	*Tertiary education*	*16.4*	*115*	○
2.2.1	Tertiary enrolment, % gross	36.1	65	
2.2.2	Graduates in science & engineering, %	12.2	91	○
2.2.3	Tertiary inbound mobility, %	0.0	90	○
2.2.4	Gross tertiary outbound enrolment, %	0.2	129	○
2.3	*Research & development (R&D)*	*28.4*	*47*	
2.3.1	Researchers, headcounts/mn pop.	1,100.1	52	
2.3.2	Gross expenditure on R&D, % GDP	1.1	34	
2.3.3	Quality of scientific research institutions†	52.3	40	
3	**Infrastructure**	**39.1**	**49**	
3.1	*Information & communication technologies (ICT)*	*46.1*	*47*	
3.1.1	ICT access*	46.2	62	
3.1.2	ICT use*	21.1	61	
3.1.3	Government's online service*	67.3	32	
3.1.4	E-participation*	50.0	31	●
3.2	*General infrastructure*	*34.4*	*81*	
3.2.1	Electricity output, kWh/cap.	2,436.1	68	
3.2.2	Electricity consumption, kWh/cap.	2,200.6	66	
3.2.3	Quality of trade & transport infrastructure*	52.5	36	
3.2.4	Gross capital formation, % GDP	19.2	100	
3.3	*Ecological sustainability*	*36.6*	*54*	
3.3.1	GDP/unit of energy use, 2000 PPP$/kg oil eq.	6.9	39	
3.3.2	Environmental performance*	60.9	29	●
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	1.3	55	
4	**Market sophistication**	**35.6**	**82**	
4.1	*Credit*	*15.3*	*108*	
4.1.1	Ease of getting credit*	27.0	88	
4.1.2	Domestic credit to private sector, % GDP	57.0	55	
4.1.3	Microfinance gross loans, % GDP	0.1	72	○
4.2	*Investment*	*35.4*	*42*	
4.2.1	Ease of protecting investors*	46.7	60	
4.2.2	Market capitalization, % GDP	74.0	32	
4.2.3	Total value of stocks traded, % GDP	43.2	24	●
4.2.4	Venture capital deals/tr PPP$ GDP	10.0	47	
4.3	*Trade & competition*	*56.1*	*108*	
4.3.1	Applied tariff rate, weighted mean, %	7.6	106	
4.3.2	Non-agricultural mkt access weighted tariff, %	0.5	55	
4.3.3	Imports of goods & services, % GDP	12.1	141	○
4.3.4	Exports of goods & services, % GDP	11.2	139	○
4.3.5	Intensity of local competition†	69.3	46	
5	**Business sophistication**	**44.4**	**42**	
5.1	*Knowledge workers*	*52.6*	*48*	
5.1.1	Knowledge-intensive employment, %	19.3	72	
5.1.2	Firms offering formal training, % firms	52.9	22	●
5.1.3	R&D performed by business, %	40.2	44	
5.1.4	R&D financed by business, %	43.9	35	
5.1.5	GMAT mean score	563.8	24	●
5.1.6	GMAT test takers/mn pop. 20–34	33.5	98	
5.2	*Innovation linkages*	*38.0*	*57*	
5.2.1	University/industry research collaboration†	53.4	36	
5.2.2	State of cluster development†	52.1	30	●
5.2.3	R&D financed by abroad, %	n/a	n/a	
5.2.4	JV–strategic alliance deals/tr PPP$ GDP	16.7	70	
5.2.5	PCT patent filings with foreign inventor, %	10.1	93	○
5.3	*Knowledge absorption*	*42.6*	*38*	
5.3.1	Royalty & license fees payments/th GDP	1.4	60	
5.3.2	High-tech imports less re-imports, %	14.3	23	●
5.3.3	Computer & comm. service imports, %	49.4	17	●
5.3.4	FDI net inflows, % GDP	2.3	72	
6	**Knowledge & technology outputs**	**30.5**	**55**	
6.1	*Knowledge creation*	*22.7*	*67*	
6.1.1	Domestic resident patent ap/bn PPP$ GDP	1.2	64	
6.1.2	PCT resident patent ap/bn PPP$ GDP	0.2	55	
6.1.3	Domestic res utility model ap/bn PPP$ GDP	0.9	35	
6.1.4	Scientific & technical articles/bn PPP$ GDP	6.1	50	
6.2	*Knowledge impact*	*34.9*	*63*	
6.2.1	Growth rate of PPP$ GDP/worker, %	4.1	31	
6.2.2	New businesses/th pop. 15–64	2.4	41	
6.2.3	Computer software spending, % GDP	0.1	53	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	9.0	50	
6.3	*Knowledge diffusion*	*34.1*	*44*	
6.3.1	Royalty & license fees receipts/th GDP	0.2	60	
6.3.2	High-tech exports less re-exports, %	3.6	49	
6.3.3	Computer & comm. service exports, %	57.0	16	●
6.3.4	FDI net outflows, % GDP	0.6	51	
7	**Creative outputs**	**35.4**	**54**	
7.1	*Creative intangibles*	*41.2*	*67*	
7.1.1	Domestic res trademark reg/bn PPP$ GDP	21.9	61	
7.1.2	Madrid resident trademark reg/bn PPP$ GDP	n/a	n/a	
7.1.3	ICT & business model creation†	62.7	33	
7.1.4	ICT & organizational model creation†	50.4	62	
7.2	*Creative goods & services*	*29.7*	*47*	
7.2.1	Recreation & culture consumption, %	5.1	52	
7.2.2	National feature films/mn pop. 15–69	0.6	76	
7.2.3	Paid-for dailies, circulation/th pop. 15–69	60.9	79	
7.2.4	Creative goods exports, %	0.5	88	
7.2.5	Creative services exports, %	20.5	4	●
7.3	*Online creativity*	*29.7*	*49*	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	6.6	53	
7.3.2	Country-code TLDs/th pop. 15–69	42.7	43	
7.3.3	Wikipedia monthly edits/mn pop. 15–69	1,048.8	60	
7.3.4	Video uploads on YouTube/pop. 15–69	64.3	41	

118. *Id.* at 195.

APPENDIX D:
GLOBAL INNOVATION INDEX DATA FOR GERMANY[119]

Germany

Key indicators

Population (millions)	81.4
GDP per capita, PPP$	37,935.5
GDP (US$ billions)	3,628.6

		Score (0–100) or value (hard data)	Rank	
Global Innovation Index 2012 (out of 141)		**56.2**	**15**	
Innovation Output Sub-Index		53.7	7	●
Innovation Input Sub-Index		58.8	23	
Innovation Efficiency Index		0.9	11	
Global Innovation Index 2011 (out of 125)			12	
GII 2012 rank among GII 2011 economies (125)			15	
1	**Institutions**	**76.7**	**26**	
1.1	*Political environment*	*87.3*	*13*	
1.1.1	Political stability*	84.9	27	
1.1.2	Government effectiveness*	81.8	17	
1.1.3	Press freedom*	95.3	15	
1.2	*Regulatory environment*	*82.2*	*33*	
1.2.1	Regulatory quality*	91.7	14	
1.2.2	Rule of law*	90.9	16	
1.2.3	Cost of redundancy dismissal, salary weeks	21.6	94	○
1.3	*Business environment*	*60.4*	*42*	
1.3.1	Ease of starting a business*	48.9	71	○
1.3.2	Ease of resolving insolvency*	78.4	31	
1.3.3	Ease of paying taxes*	53.9	65	
2	**Human capital & research**	**55.4**	**16**	
2.1	*Education*	*63.6*	*23*	
2.1.1	Current expenditure on education, % GNI	4.3	61	
2.1.2	Public expenditure/pupil, % GDP/cap	n/a	n/a	
2.1.3	School life expectancy, years	n/a	n/a	
2.1.4	PISA scales in reading, maths, & science	510.2	13	
2.1.5	Pupil-teacher ratio, secondary	13.2	57	
2.2	*Tertiary education*	*41.8*	*45*	
2.2.1	Tertiary enrolment, % gross	n/a	n/a	
2.2.2	Graduates in science & engineering, %	24.6	28	
2.2.3	Tertiary inbound mobility, %	n/a	n/a	
2.2.4	Gross tertiary outbound enrolment, %	1.8	50	
2.3	*Research & development (R&D)*	*60.7*	*11*	
2.3.1	Researchers, headcounts/mn pop.	5,305.4	12	
2.3.2	Gross expenditure on R&D, % GDP	2.8	8	●
2.3.3	Quality of scientific research institutions†	76.6	10	
3	**Infrastructure**	**55.1**	**16**	
3.1	*Information & communication technologies (ICT)*	*73.1*	*14*	
3.1.1	ICT access*	84.1	6	●
3.1.2	ICT use*	56.9	20	
3.1.3	Government's online service*	75.2	24	
3.1.4	E-participation*	76.3	8	●
3.2	*General infrastructure*	*51.5*	*22*	
3.2.1	Electricity output, kWh/cap	7,525.1	27	
3.2.2	Electricity consumption, kWh/cap	7,107.8	23	
3.2.3	Quality of trade & transport infrastructure*	83.5	1	●
3.2.4	Gross capital formation, % GDP	17.3	116	○
3.3	*Ecological sustainability*	*40.8*	*39*	
3.3.1	GDP/unit of energy use, 2000 PPP$/kg oil eq.	7.0	37	
3.3.2	Environmental performance*	66.9	11	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	2.0	44	
4	**Market sophistication**	**54.9**	**24**	
4.1	*Credit*	*56.9*	*21*	
4.1.1	Ease of getting credit*	77.4	21	
4.1.2	Domestic credit to private sector, % GDP	107.8	27	
4.1.3	Microfinance gross loans, % GDP	n/a	n/a	
4.2	*Investment*	*39.1*	*32*	
4.2.1	Ease of protecting investors*	35.9	76	○
4.2.2	Market capitalization, % GDP	43.2	49	
4.2.3	Total value of stocks traded, % GDP	42.5	26	
4.2.4	Venture capital deals/tr PPP$ GDP	90.6	15	
4.3	*Trade & competition*	*68.9*	*34*	
4.3.1	Applied tariff rate, weighted mean, %	1.6	11	
4.3.2	Non-agricultural mkt access weighted tariff, %	2.0	92	○
4.3.3	Imports of goods & services, % GDP	41.4	69	○
4.3.4	Exports of goods & services, % GDP	46.8	49	
4.3.5	Intensity of local competition†	79.9	8	●
5	**Business sophistication**	**51.7**	**24**	
5.1	*Knowledge workers*	*69.8*	*25*	
5.1.1	Knowledge-intensive employment, %	41.9	14	
5.1.2	Firms offering formal training, % firms	35.4	51	
5.1.3	R&D performed by business, %	68.2	13	
5.1.4	R&D financed by business, %	67.3	9	
5.1.5	GMAT mean score	565.5	23	
5.1.6	GMAT test takers/mn pop. 20–34	260.4	24	
5.2	*Innovation linkages*	*39.2*	*55*	
5.2.1	University/industry research collaboration†	69.3	12	
5.2.2	State of cluster development†	62.0	13	
5.2.3	R&D financed by abroad, %	4.0	67	○
5.2.4	JV–strategic alliance deals/tr PPP$ GDP	21.3	64	
5.2.5	PCT patent filings with foreign inventor, %	24.5	74	○
5.3	*Knowledge absorption*	*46.1*	*26*	
5.3.1	Royalty & license fees payments/th GDP	4.0	25	
5.3.2	High-tech imports less re-imports, %	15.1	19	
5.3.3	Computer & comm. service imports, %	43.6	29	
5.3.4	FDI net inflows, % GDP	1.4	96	○
6	**Knowledge & technology outputs**	**54.9**	**12**	
6.1	*Knowledge creation*	*71.1*	*7*	●
6.1.1	Domestic resident patent ap/bn PPP$ GDP	25.3	5	●
6.1.2	PCT resident patent ap/bn PPP$ GDP	6.0	8	●
6.1.3	Domestic res utility model ap/bn PPP$ GDP	4.7	11	
6.1.4	Scientific & technical articles/bn PPP$ GDP	16.0	19	
6.2	*Knowledge impact*	*42.0*	*40*	
6.2.1	Growth rate of PPP$ GDP/worker, %	3.1	49	
6.2.2	New businesses/th pop. 15–64	1.2	57	○
6.2.3	Computer software spending, % GDP	0.7	15	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	17.2	29	
6.3	*Knowledge diffusion*	*51.5*	*18*	
6.3.1	Royalty & license fees receipts/th GDP	4.4	14	
6.3.2	High-tech exports less re-exports, %	13.7	24	
6.3.3	Computer & comm. service exports, %	54.2	20	
6.3.4	FDI net outflows, % GDP	3.3	17	
7	**Creative outputs**	**52.6**	**10**	●
7.1	*Creative intangibles*	*46.2*	*40*	
7.1.1	Domestic res trademark reg/bn PPP$ GDP	69.4	22	
7.1.2	Madrid resident trademark reg/bn PPP$ GDP	1.5	14	
7.1.3	ICT & business model creation†	65.3	24	
7.1.4	ICT & organizational model creation†	54.1	44	
7.2	*Creative goods & services*	*45.8*	*11*	
7.2.1	Recreation & culture consumption, %	9.5	15	
7.2.2	National feature films/mn pop. 15–69	2.7	40	
7.2.3	Paid-for dailies, circulation/th pop. 15–69	333.6	10	●
7.2.4	Creative goods exports, %	2.2	38	
7.2.5	Creative services exports, %	13.8	9	
7.3	*Online creativity*	*72.2*	*9*	●
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	98.9	7	●
7.3.2	Country-code TLDs/th pop. 15–69	77.5	5	●
7.3.3	Wikipedia monthly edits/mn pop. 15–69	8,223.0	14	
7.3.4	Video uploads on YouTube/pop. 15–69	70.5	24	

119. *Id.* at 224.

APPENDIX E:
GLOBAL INNOVATION INDEX DATA FOR THE UNITED STATES[120]

United States of America

Key indicators

Population (millions)	312.9
GDP per capita, PPP$	48,147.2
GDP (US$ billions)	15,064.8

		Score (0–100) or value (hard data)	Rank	
Global Innovation Index 2012 (out of 141)		**57.7**	**10**	
Innovation Output Sub-Index		49.1	16	
Innovation Input Sub-Index		66.3	9	
Innovation Efficiency Index		0.7	70	
Global Innovation Index 2011 (out of 125)			7	
GII 2012 rank among GII 2011 economies (125)			10	
1	**Institutions**	**85.1**	**17**	
1.1	*Political environment*	*78.5*	*29*	
1.1.1	Political stability*	72.8	52	
1.1.2	Government effectiveness*	78.8	19	
1.1.3	Press freedom*	83.8	41	
1.2	*Regulatory environment*	*94.4*	*13*	
1.2.1	Regulatory quality*	87.7	20	
1.2.2	Rule of law*	89.8	17	
1.2.3	Cost of redundancy dismissal, salary weeks	8.0	1	●
1.3	*Business environment*	*82.5*	*13*	
1.3.1	Ease of starting a business*	92.8	11	
1.3.2	Ease of resolving insolvency*	91.3	13	
1.3.3	Ease of paying taxes*	63.3	52	
2	**Human capital & research**	**53.4**	**22**	
2.1	*Education*	*61.3*	*31*	
2.1.1	Current expenditure on education, % GNI	4.8	46	
2.1.2	Public expenditure/pupil, % GDP/cap	22.0	46	
2.1.3	School life expectancy, years	16.8	10	
2.1.4	PISA scales in reading, maths, & science	496.4	23	
2.1.5	Pupil-teacher ratio, secondary	13.8	61	
2.2	*Tertiary education*	*38.8*	*54*	
2.2.1	Tertiary enrolment, % gross	94.8	2	●
2.2.2	Graduates in science & engineering, %	15.5	74	○
2.2.3	Tertiary inbound mobility, %	3.4	42	
2.2.4	Gross tertiary outbound enrolment, %	0.2	119	○
2.3	*Research & development (R&D)*	*60.1*	*12*	
2.3.1	Researchers, headcounts/mn pop.	4,663.3	18	
2.3.2	Gross expenditure on R&D, % GDP	2.8	9	
2.3.3	Quality of scientific research institutions†	80.4	7	
3	**Infrastructure**	**56.1**	**14**	
3.1	*Information & communication technologies (ICT)*	*80.9*	*5*	●
3.1.1	ICT access*	72.4	22	
3.1.2	ICT use*	58.9	17	
3.1.3	Government's online service*	100.0	1	●
3.1.4	E-participation*	92.1	5	●
3.2	*General infrastructure*	*58.5*	*12*	
3.2.1	Electricity output, kWh/cap	13,990.7	9	
3.2.2	Electricity consumption, kWh/cap	13,268.1	11	
3.2.3	Quality of trade & transport infrastructure*	78.8	7	
3.2.4	Gross capital formation, % GDP	15.1	129	○
3.3	*Ecological sustainability*	*29.0*	*73*	
3.3.1	GDP/unit of energy use, 2000 PPP$/kg oil eq	5.2	71	
3.3.2	Environmental performance*	56.6	48	
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	0.3	93	○
4	**Market sophistication**	**76.8**	**2**	●
4.1	*Credit*	*83.8*	*2*	●
4.1.1	Ease of getting credit*	97.1	4	
4.1.2	Domestic credit to private sector, % GDP	202.2	6	●
4.1.3	Microfinance gross loans, % GDP	n/a	n/a	
4.2	*Investment*	*83.0*	*2*	●
4.2.1	Ease of protecting investors*	94.2	5	
4.2.2	Market capitalization, % GDP	117.5	13	
4.2.3	Total value of stocks traded, % GDP	208.8	1	●
4.2.4	Venture capital deals/tr PPP$ GDP	243.3	5	●
4.3	*Trade & competition*	*63.7*	*69*	
4.3.1	Applied tariff rate, weighted mean, %	1.8	41	
4.3.2	Non-agricultural mkt access weighted tariff, %	1.1	76	
4.3.3	Imports of goods & services, % GDP	16.2	139	○
4.3.4	Exports of goods & services, % GDP	12.6	135	○
4.3.5	Intensity of local competition†	76.8	17	
5	**Business sophistication**	**59.9**	**9**	
5.1	*Knowledge workers*	*79.3*	*6*	●
5.1.1	Knowledge-intensive employment, %	36.3	28	
5.1.2	Firms offering formal training, % firms	n/a	n/a	
5.1.3	R&D performed by business, %	72.6	8	
5.1.4	R&D financed by business, %	67.3	10	
5.1.5	GMAT mean score	529.4	53	
5.1.6	GMAT test takers/mn pop. 20–34	1,832.0	1	●
5.2	*Innovation linkages*	*58.5*	*8*	
5.2.1	University/industry research collaboration†	78.5	3	●
5.2.2	State of cluster development†	63.2	9	
5.2.3	R&D financed by abroad, %	n/a	n/a	
5.2.4	JV–strategic alliance deals/tr PPP$ GDP	46.1	29	
5.2.5	PCT patent filings with foreign inventor, %	42.3	56	
5.3	*Knowledge absorption*	*41.7*	*46*	
5.3.1	Royalty & license fees payments/th GDP	2.3	40	
5.3.2	High-tech imports less re-imports, %	17.3	15	
5.3.3	Computer & comm. service imports, %	34.7	57	
5.3.4	FDI net inflows, % GDP	1.6	89	○
6	**Knowledge & technology outputs**	**56.1**	**11**	
6.1	*Knowledge creation*	*66.8*	*9*	
6.1.1	Domestic resident patent ap/bn PPP$ GDP	16.7	8	
6.1.2	PCT resident patent ap/bn PPP$ GDP	3.2	14	
6.1.3	Domestic res utility model ap/bn PPP$ GDP	n/a	n/a	
6.1.4	Scientific & technical articles/bn PPP$ GDP	15.0	27	
6.2	*Knowledge impact*	*45.0*	*31*	
6.2.1	Growth rate of PPP$ GDP/worker, %	3.5	42	
6.2.2	New businesses/th pop. 15–64	n/a	n/a	
6.2.3	Computer software spending, % GDP	0.9	7	
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	1.8	96	○
6.3	*Knowledge diffusion*	*56.3*	*13*	
6.3.1	Royalty & license fees receipts/th GDP	7.3	9	
6.3.2	High-tech exports less re-exports, %	14.8	20	
6.3.3	Computer & comm. service exports, %	45.4	30	
6.3.4	FDI net outflows, % GDP	2.4	22	
7	**Creative outputs**	**42.2**	**33**	
7.1	*Creative intangibles*	*37.0*	*84*	
7.1.1	Domestic res trademark reg/bn PPP$ GDP	11.2	75	○
7.1.2	Madrid resident trademark reg/bn PPP$ GDP	0.3	41	○
7.1.3	ICT & business model creation†	77.0	2	●
7.1.4	ICT & organizational model creation†	60.1	25	
7.2	*Creative goods & services*	*37.2*	*27*	
7.2.1	Recreation & culture consumption, %	9.3	18	
7.2.2	National feature films/mn pop. 15–69	3.5	34	
7.2.3	Paid-for dailies, circulation/th pop. 15–69	212.4	22	
7.2.4	Creative goods exports, %	2.5	34	
7.2.5	Creative services exports, %	5.4	36	
7.3	*Online creativity*	*57.6*	*20*	
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	91.2	8	
7.3.2	Country-code TLDs/th pop. 15–69	30.4	54	
7.3.3	Wikipedia monthly edits/mn pop. 15–69	5,004.9	30	
7.3.4	Video uploads on YouTube/pop. 15–69	83.2	2	●

120. *Id.* at 311.