

Institution: University of Liverpool		
Unit of Assessment: UoA 17 Business and Management Studies		
Title of case study: Patent Enforcement Index: Changing Patent Filing Practice and Policy Globally		
Period when the underpinning research was undertaken: September 2014 – to present		
Details of staff conducting the underpinning research from the submitting unit:		
Name(s): Professor Nikolaos Papageorgiadis	Role(s) (e.g. job title): Chair in International Business	Period(s) employed by submitting HEI: 01/09/2014 to present
Period when the claimed impact occurred: June 2015 - to present		
Is this case study continued from a case study submitted in 2014? No		
1. Summary of the impact (indicative maximum 100 words)		
<p>Research by Professor Papageorgiadis developed an index of patent enforcement strength leading to its adoption by intellectual property practitioners and policy-makers. The Patent Enforcement Index (PEI) captures patent enforcement strength volatility and differences across 51 countries, providing enhanced understanding of how national patent enforcement systems operate and leading to patent enforcement becoming a major factor in decisions relating to the filing of patents and the development of national patent systems. Testifying to the impact of the research, PEI is now used by: i) in-house patent managers from 26 multinational companies (12 industries) to inform and change their patent filing decision making; ii) 16 external patent attorneys to educate global clients about patent enforcement risk and promote patent filing in specific countries; and iii) policymakers from 5 countries to evaluate their countries' patent enforcement performance and develop evidence informed policies. The significance and global reach of the research impact stretches across corporate patent management practices and policymaking in 19 countries across 4 continents.</p>		
2. Underpinning research (indicative maximum 500 words)		
<p>Professor Papageorgiadis' research on measuring the Strength of Patent Enforcement (SPE) and its impact on international business strategy has addressed misplaced theoretical assumptions that when a country adopts patent laws then these are immediately and uniformly enforced by its agencies, courts, police and customs organizations. Professor Papageorgiadis' initial research index focused on the years 1998-2011 and captured only some of the factors relevant to patent enforcement. His subsequent research at Liverpool addressed gaps in understanding and a revised Patent Enforcement Index (PEI) for the years 1998-2017 identified previously uncaptured patent enforcement strength volatility and differences across 51 countries (3.1).</p> <p>The PEI illustrates unexpected SPE volatility and major differences across 51 countries. PEI's new evidence and accompanying dataset challenge established assumptions about the functioning of national patent systems and opened new avenues for theoretical and empirical studies with implications for international business strategy. These improvements are encapsulated in Publication output 3.1 which articulates the research and the PEI, measuring SPE in 51 countries for the years 1998-2017. Publication outputs 3.2-3.6 applied PEI and each addressed a gap in understanding the impact of cross-country SPE differences on international business strategy. The studies contributed to a more nuanced understanding of the contemporary context of international patent systems and the direct impact of SPE on innovation, Foreign Direct Investment (FDI) and country entry mode choice.</p>		

From this body of research there are two main insights underpinning the impact of this research.

Patent enforcement strength levels differ between countries (3.1). To measure national SPE levels, Professor Papageorgiadis' framework defines and maps the transactions costs that patent owners face when enforcing patents. He calculates PEI scores for 51 countries by applying the SPE framework using newly available firm and country level patent litigation and enforcement data. PEI reveals that national SPE varies significantly between countries and showcases previously uncaptured volatility in SPE within and between countries. PEI provides objective and measurable data evidencing the exact differences in SPE across countries and over time. Contrary to anecdotal evidence and established assumptions, PEI indicates that: a) companies need to customize their patent filing strategies in different countries so that they can mitigate risk and control uncertainty from variations in SPE; and b) policymakers need to consider their countries' SPE performance distinctly from other aspects of the patent system and develop SPE specific policymaking actions.

Global patent enforcement variability influences international business strategy

Professor Papageorgiadis' publications changed understanding regarding the impact of SPE on international business strategies (3.2-3.6). The studies found that SPE levels have: i) a U-shaped effect on innovation activity; ii) a positive effect on attracting Chinese and US FDI, iii) a varied effect on the entry mode choice of firms from BRICS countries (Brazil, Russia, India, China, South Africa) into Europe, and iv) a positive effect on economic growth. This research insight indicates that: companies need to customize their patent protection strategies to fit the level of risk from intellectual property theft in each country, and that policymakers improving SPE can help their country attract FDI.

The publications and accompanying index data were made freely available in the Journal of World Business's website with gold open access status. The pre-publication version of the index and PEI related infographics were also made available for download from the PEI dedicated webpages of the University of Liverpool under a Creative Commons Attribution 4.0 international license that allows users to freely copy, redistribute, adapt, remix, transform, and build upon the material for any purpose, even commercially. This accessibility has been critical to its adoption by parties to patent management and policy making at firm, industry and national levels.

3. References to the research (indicative maximum of six references)

- 3.1 Papageorgiadis, N. & Sofka, W. (2020). Patent enforcement across 51 countries - patent enforcement index 1998-2017. *Journal of World Business*, 55(4), 92-101. <https://doi.org/10.1016/j.jwb.2020.101092> .
- 3.2 Papageorgiadis, N., & Sharma, A. (2016). Intellectual property rights and innovation: A panel analysis. *Economics Letters*, 141, 70-72. Available from institution on request.
- 3.3 Papageorgiadis, N., Xu, Y., & Alexiou, C. (2019). The effect of European intellectual property institutions on Chinese outward foreign direct investment. *Management and Organization Review*, 15(1), 81-110. [doi:10.1017/mor.2018.38](https://doi.org/10.1017/mor.2018.38).
- 3.4 Papageorgiadis, N., McDonald, F., Wang, C., & Konara, P. (2020). The characteristics of intellectual property rights regimes: How formal and informal institutions affect outward FDI location. *International Business Review*, 29(1), 101-120. Available from institution on request.
- 3.5 Ahammad, M. F., Konwar, Z., Papageorgiadis, N., Wang, C., & Inbar, J. (2018). R&D capabilities, intellectual property strength and choice of equity ownership in cross-border acquisitions: evidence from BRICS acquirers in Europe. *R&D Management*, 48(2), 177-194. Available from institution on request.
- 3.6 Alexiou, C., Nellis, J., & Papageorgiadis, N. (2016). The effect of patent enforcement strength and FDI on economic growth. *Multinational Business Review*, 24(4), 334-353. Available from institution on request.

4. Details of the impact (indicative maximum 750 words)**Pathway to PEI Impact**

Resulting from research by Professor Papageorgiadis, PEI is now a tool used by in-house company patent managers, external patent attorney professionals and national patent policy makers in 19 countries to objectively and reliably assess national patent enforcement strength and inform decision and policy making.

The progress from research to widespread adoption of PEI has followed dissemination of the research and engagement activity with potential beneficiaries during 2014-2020 via several pathways:

- a) Keynote speeches and presentations at 11 patent practitioner and policymaking conferences directly engaging with 2500+ potential beneficiaries, such as his delivery of a keynote speech at the European Patent Office.
- b) 100+ posts with commentaries and infographics on Twitter and LinkedIn, directly engaging with beneficiaries internationally.
- c) A dedicated University of Liverpool webpage (www.liverpool.ac.uk/patent-systems) showcasing PEI, research insights and non-technical articles published in international media, are testament to the impact of PEI.

4.1 Corporate patent strategy and decision-making

Evidence from 26 multinational companies from 13 countries and 12 industries, ranging from manufacturing, to medical, to financial services (5.1), illustrate how the availability and access to PEI under gold open access and Creative Commons Attribution 4.0 international license changed the behaviour of in-house patent managers when making decisions about their international patent portfolio strategy. Managers screen countries to make decisions about registering every one of their granted patents. Pruning a global patent portfolio is an important economic decision that saves and redistributes economic resources and optimizes commercial risk exposure.

Exemplifying this breadth and depth of research impact, the Director of IP of a Swedish firm in the forest and gardening industry states he uses PEI to “*better prioritize selection of protection jurisdictions*” and “*...updated our foreign filing with this data, to help us spend money where it matters and where we get value for it (i.e. worth filing a patent)*” (5.2). Similarly, the IP Manager of an Israeli biotechnology firm explained how he used PEI to change their process and patent registration behaviour by deciding to cease their patenting activities in two countries (Turkey and Romania)(5.3).

Furthermore, the IP manager of a UK energy company acknowledges that the PEI informs their decision-making, and their company may, for example, “*reconsider filing in South Korea*” due to its unexpectedly low SPE strength (5.4). The IP Councillor of a US manufacturer used PEI to identify low scoring countries (5.5): “*...the research helps me specifically regarding countries with lower strength of IP protection...I would budget less resources to register IP in these countries, and...be more cautious of the risk of IP theft...*”. The Patent director of a Belgian pharmaceutical company with 2000+ patents also finds that PEI (5.6): “*...helps in the decision-making process to enforce a patent against an alleged infringer in a particular country*”.

4.2 Commercial and educational practices of external patent attorneys

Patent attorneys practising in professional service firms also use PEI, to educate and advise clients, commonly SMEs with small patent portfolios, about registering (or not) patents in specific countries. 16 external patent attorneys from 10 countries adopted PEI as best practice in understanding global patent enforcement and changed their commercial promotion and educational practices when advising their clients.

For example, a Dutch external patent attorney company who integrated PEI in their customer guides, advising their clients about anticipating *“the resources that may be required in each country if a patent is enforced”* (5.7, p.8). The patent attorney explains: *“...I have updated it [the guide]... using various resources, including your [PEI index]. It [PEI] nicely complements the rest of the information about costs”*. An Australian patent attorney firm used PEI in commercial presentations to educate and convince foreign companies to patent in Australia: *“Since Australia falls into the top category [of PEI] this was a good reason to file in Australia...it is good for us if we can promote Australia as a place to do business and your chart assists us with that”* (5.8).

4.3 Understanding and practice of patent policymakers and policy analysts

Patent policymakers and analysts use PEI to evaluate the performance of their national patent system, design policies to improve it and promote its attributes to foreign investors. Policy makers from five countries used PEI and its methodology to evaluate and analyze their countries' enforcement effectiveness. A Senior Advisor from a U.S. Government Commission that experimentally uses *“...the index in our statutory reports and non-statutory research projects...”* highlights: *“we have a growing research interest in better understanding and quantifying the importance of the enforcement of intellectual property laws. This research provides a robust and transparent method for doing so for patent enforcement. It represents a major step forward in the literature”* (5.9).

Similarly, the Australian Productivity Commission incorporated PEI in their practice (5.10, pp.100 & 211), to evaluate the *“enforcement practices and the administrative functioning of national patent systems as perceived by managers”*. PEI is the only index used in the report to measure patent enforcement. The Commission found that: *“by international standards, Australia has adopted strong IP settings...beyond the point where it promotes significant increases in technology transfer”* and recommends *“...protection above minimum international standards does not benefit our exporters without reciprocal protection in our trading partners”* (5.10, p.99).

5. Sources to corroborate the impact (indicative maximum of 10 references)

- 5.1 Four tables that list the job title, industry and country of 47 practitioners and policymakers who confirmed that they use PEI.
- 5.2 Written feedback from Director of IP of Swedish company that is a Global Industry Leader and uses PEI to update and better prioritize their international patent portfolio strategy (confidential).
- 5.3 Written feedback from IP Manager of an Israeli biopharmaceutical company who used PEI to change their patent registration processes and behaviour (confidential).
- 5.4 Written feedback from IP Counsel of UK energy company who consulted PEI and reconsiders filling their patents in South Korea (confidential).
- 5.5 Written feedback from IP Manager of a US 3D production system manufacturer who uses PEI to identify and budget less resources to register IP in low scoring countries (confidential).
- 5.6 Written feedback from Patent Director of Belgian pharmaceutical company who uses PEI to inform their decision-making process related to launching patent enforcement actions in particular countries (confidential).
- 5.7 Dutch patent attorney advisory firm incorporating the research in their international patent filing strategy guide used to advise firms (confidential).
- 5.8 Email communications with Australian patent attorneys who use PEI in promotional presentations to educate and convince foreign companies to patent in Australia (confidential).

5.9 Written feedback from the Senior Advisor from a U.S. Government Commission who acknowledges the use and usefulness of PEI's methodology for their research and their experimentation with incorporating it in their statutory reports and non-statutory research projects (confidential).

5.10 The full report by the Australian Productivity Committee. PEI is used to evaluate the enforcement practices and the administrative functioning of national patent systems, informing the findings and recommendations of the Committee's enquiry report to the Australian Government. See pages 100 and 211 of the report for reference to the Index.