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TITLE: A DEVELOPMENTAL APPROACH TO THE PATENT-COMPETITION INTERFACE

Abstract

This thesis proposes an approach to the patent-competition interface for developing countries. It puts forward a theoretical framework for the patent-competition interface for developing countries after canvassing relevant policy considerations. It examines the many reasons why patent protection is often not essential for generating innovation incentives in developing countries. These include the tendency of the patent system to overcompensate innovators, the availability of other appropriation mechanisms for innovators to monetize their innovations, and the lack of appropriate technological capacity in many developing countries to take advantage of the incentives generated by the patent system. It also argues that developing countries with a small population need not pay heed to the impact of their patent system on the incentives of foreign innovators. It then proposes a classification of developing countries into production countries, technology adaptation countries, and proto-innovation countries and argues that dynamic efficiency considerations take on different meanings for developing countries depending on their technological capacities. For the vast majority of developing countries bereft of meaningful innovation capacity, foreign technology transfer is the main vehicle for technological progress. The chief dynamic policy consideration for these countries is hence incentives for technology transfer instead of innovation incentives. There are three main means of voluntary technology transfer, importation of technological goods, foreign direct investment, and licensing. Competition law regulation of patent exploitation practices interacts with these three means of technology transfer in different ways and an appropriate approach to the patent-competition interface for these countries needs to take these into account. Distilling all these considerations, the thesis proposes an industry-specific approach to the patent-competition interface that is adjusted based on the country's technological

capacity. This approach is then applied to two patent exploitation practices, unilateral refusal to license and patent tying for illustration.

Table of Abbreviations

BRICS	Brazil, Russia, India, China, and South Africa
CJEU	Court of Justice of the European Union
FDI	Foreign Direct Investment
FRAND	Fair, Reasonable And Non-Discriminatory (royalty)
ISOs	Independent Service Organizations
LDCs	Least Developed Countries
LEC	Local Exchange Carrier
OSS	Operations Support Systems
PHOSITA	Person Having Ordinary Skill In The Art
R&D	Research and Development
SEP	Standard-Essential Patent
TPDC	Technology Proficient Developing Countries
TRIPS Agreement	Agreement on Trade-Related Aspects of Intellectual Property Rights
USPTO	United States Patent and Trademark Office
UNEs	Unbundled Network Elements
WIPO	World Intellectual Property Organization

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I. INTRODUCTION

This thesis proposes a developmental approach to the patent-competition interface. Such an approach takes into account the circumstances of developing countries that may require them to adopt an approach disparate from that of the industrialized economies. The patent-competition interface is one of the most complex areas of competition law. This complexity largely stems from the fact that the interface requires resolution of a conflict between patent policy and competition policy, arguments about the complementarity of their policy goals notwithstanding. Competition policy strives for lower prices and higher quality for consumers by prohibiting anticompetitive practices and mergers. Competition law also targets abuse of market power, with the precise amount necessary to trigger intervention differing across jurisdictions.

The patent system aims to spur R&D activities and innovation by providing a financial reward to innovators. This reward is created by giving the patentee a period of exclusivity during which she has the right to exclude others from implementing and commercializing the patented technology. Patent exclusivity does not necessarily create monopoly power or even market power. But in order for the patentee to recoup her R&D costs, the exclusivity must at least allow her to charge supra-competitive prices for her patented product. Therein ostensibly lies the conflict between patent policy and competition policy. The conflict is in fact more nuanced than this as competition law is also concerned with dynamic efficiency. Consumer welfare is enhanced by the emergence of innovation and new products. Therefore, the tension between the two policies is less acute than it may first seem and the concern of competition law for dynamic efficiency provides a possible middle ground for reconciling these two policies.

The patent-competition interface is saddled with added complexity in the context of developing countries. There are two reasons for this. First, while consumers in industrialized economies may be better positioned to bear higher prices in the name of spurring innovation, consumers in developing countries, many of whom are mired in abject poverty, can ill-afford any supra-competitive price increases. This means that while industrialized economies can afford greater leeway for patent policy and err on the side of favoring innovation when approaching the patent-competition interface, developing countries need to be much more vigilant about protecting consumer welfare and ensuring that whatever consumer welfare that is sacrificed is strictly necessary to secure additional innovation. As it turns out, there are some reasons to question whether patent protection is strictly necessary to generate innovation, including the tendency of the patent system to overcompensate innovators and the availability of other appropriation mechanisms for innovators to monetize their innovation.

Second, innovation takes on a different meaning in the context of developing countries. Not every developing country is capable of generating cutting edge innovation along the global technological frontier. In fact, very few of them are. Developing countries can be roughly classified into three categories based on their technological capacity: production countries, technological adaptation countries, and proto-innovation countries. The production countries are only capable of production and implementation of basic technology. The technology adaptation countries are in a position to adapt and implement sophisticated imported technology or perhaps to imitate or reverse engineer such technology. Proto-innovation countries, of which there are only a few, possess the capacity to produce cutting edge innovation in at least some industries. For the vast majority of developing countries bereft of genuine innovation capacity, the main vehicle for technological progress is technology transfer from foreign

innovators. Patentable innovation is mostly beyond their reach. Therefore, the patent policy imperative of incentivizing innovation by generating patentee reward becomes a less crucial policy consideration. Under the rubric of dynamic efficiency, these countries should focus on the incentives of foreign technology owners to transfer technology instead of innovation incentives.

Technology transfer can be voluntary and involuntary. The latter consists of outright copying and reverse engineering. There are three main means of voluntary technology transfer: importation of technological goods, foreign direct investment ('FDI'), and technology licensing. Unlike innovation incentives, with which competition regulation of patent exploitation practices shares a monotonic relationship, the relationship between the three modes of voluntary technology transfer and competition regulation of patent exploitation practices is varied and nuanced. In particular, different types of patent exploitation practices have disparate impact on incentives to transfer technology. To simplify slightly, a more permissive approach to patent exploitation practices that enhance the robustness of patent protection tends to increase technology transfer and steer modes of transfer toward FDI and licensing, which tends to redound greater technological benefits for developing countries.

The thesis thus proposes a framework for approaching the patent-competition interface that takes into account the technological capacity of individual countries. This framework acknowledges that innovation and technological upgrade is critical to the attainment of stable economic growth for developing countries. These countries hence need to encourage innovation and pursue opportunities for technological upgrade while keeping consumer welfare loss in check. But innovation needs to be understood differently in the context of developing countries depending on the native technological capacity. While a handful of developing countries are capable of

generating cutting-edge innovation, a vast majority of them are not. The policy balance underlying the patent-competition interface needs to be struck differently for the various developing countries depending on their technological capacity.

For production countries without meaningful innovation capacity, the primary focus when approaching the patent-competition interface is to protect consumer welfare. The lack of innovation capacity means that patent policy matters little for these countries. For the technology adaptation countries, the main focus under dynamic efficiency is the incentives of foreign technology owners to transfer their technology. Patent exploitation practices that implicate robustness of patent protection, such as unilateral refusal to license, and licensing restrictions, which may skew licensors' attitude toward licensing, take on heightened importance in these countries. An industry-specific approach to the patent-competition interface is called for in proto-innovation countries as their technological capacity varies across industries. For industries in which the country at issue possesses innovation capacity, the patent-competition interface will require a balancing of the interests of three constituencies, the consumers, the imitators, and the innovators.

The remainder of the thesis applies this framework to two types of patent exploitation practices, unilateral refusal to license and patent tying, as illustration. These two practices are chosen for two reasons. First, regulation of unilateral refusal to license and patent tying is applicable to all developing countries as both practices can be found in countries with varying levels of technological capacity. Second, unilateral refusal to license poses the most acute conflict between patent policy and competition policy. A finding of violation could result in compulsory licensing, which overrides patent protection. What follows is an exhaustive survey of the various theoretical and

doctrinal approaches to the two practices and a detailed framework for how developing countries should approach them.

There are eight chapters in this thesis. Following this introductory chapter, chapter II examines the extent to which developing countries should attach weight to innovation incentives under the patent-competition interface and concludes that little weight should be accorded for innovation incentive considerations. Chapter III surveys the different modes of technology transfer and assesses how they relate to and are affected by competition regulation of patent exploitation practices. Chapter IV integrates all the insights put forward in the previous two chapters and proposes a country-specific, industry-specific approach to the patent-competition interface for developing countries.

The thesis then moves on to application where the proposed framework is applied to two patent exploitation practices, unilateral refusal to license and patent tying. Chapter V delves into the various theoretical issues raised by competition regulation of unilateral refusal to license and compulsory licensing. In particular, it challenges the conventional wisdom that compulsory licensing undermines innovation incentives. Chapter VI canvasses the case law in the U.S. and the EU on unilateral refusal to license and discusses the doctrinal issues raised by these cases. It concludes by proposing a framework for analyzing unilateral refusal to license for developing countries that takes into account their existing technological capacity and the need to preserve incentives for technology transfer. Chapter VII shifts the attention to patent tying and proposes how developing countries should approach patent tying issues. It rejects the argument that patent tying is justified because it generates more innovation incentives. Chapter VIII concludes the thesis.

II. INNOVATION INCENTIVES IN DEVELOPING COUNTRIES

A. Introduction

This thesis attempts to propose how developing countries should approach the patent-competition interface in light of their developmental considerations. Before one can do that, one must first gain an understanding of the various policy arguments underlying the interface in the developed country context and how these arguments may play out differently in developing countries, and even among different groups of developing countries. What this and the next chapter seek to do is to determine how developing countries may need to approach the patent-competition interface differently from developed countries in order to promote technological upgrade without unduly sacrificing consumer welfare. In fact, a differentiated approach may be called for even among developing countries in light of their varied technological capacities.

The weight that innovation incentives should carry in the patent-competition interface should vary according to the country's technological capacity. In a country devoid of innovation capacity, innovation incentives matter little and competition policy should be given greater emphasis. In such a country, technological progress is mostly achieved through technology transfer. Dynamic efficiency is no longer concerned about innovation incentives but about incentives to transfer technology. How the stringency of the patent-competition rules may influence the incentives of foreign technology owners to transfer technology becomes a matter of serious concern. Under the guidance of relevant economic literature, this and the next chapter will explore the relationship between the patent-competition rules on the one hand and innovation incentives and the incentives to transfer technology respectively

on the other hand, and propose a general developmental approach to the patent-competition interface.

B. The Patent-Competition Interface: An Overview

The interface with intellectual property is one of the most complex areas within competition law. One reason for the complexity is that it juxtaposes two areas of law which share potentially conflicting objectives and incongruent views on how to achieve those objectives. Of the three main branches of intellectual property, patent law, which aims to encourage innovation and dissemination of technical knowledge and scientific advances through the grant of exclusivity, potentially shares the most acute conflict with competition law. The patent system is premised on the bargain that in exchange for the creation and disclosure of a genuinely novel and useful innovation, the owner of the technology will be awarded a period of exclusivity, during which she will be the only one permitted to practice and exploit the technology. Although this exclusivity does not always translate into substantial market power, it is intended to give the patent owner a modicum of market power to raise prices above marginal costs. Supra-competitive pricing is the very essence of the patent system. Without this ability to charge prices above marginal costs, the patent owner would fail to recoup her investments. Recoupment of R&D investments, which is the fundamental objective of the patent system, requires the ability to charge supra-competitive prices. The strength of this market power varies. When coupled with the right market conditions, a patent can confer substantial market power upon the patent owner. This will be the case when there are no reasonable substitutes for the patented product. For example, when a drug is the only known way to treat a disease or condition and the active pharmaceutical

ingredient is subject to patent protection, the patented drug will enjoy substantial market power.

It used to be assumed that the patent system conferred a monopoly upon the patent owner.[1] That view has been abandoned and it is now widely recognized that a patent only grants exclusivity, which may or may not morph into substantial market power. Patents are understood to confer a legal but not an economic monopoly. Nonetheless, it remains true that the operation of the patent system is premised on supra-competitive pricing, which must be paid by consumers. By preventing rivals from replicating and exploiting the patented technology, the patent system preempts competition, at least through reverse engineering or outright copying. Competition is of course the very process that competition law aims to protect. Competition law safeguards the competitive process and protects consumer welfare by prohibiting anticompetitive practices and mergers. Consumer welfare is advanced when the quality-adjusted prices of goods fall. In a nutshell, competition law favors more intense competition and lower prices.

While the two instruments may be viewed as complimentary in their ultimate policy objective, the conflict between these two areas of law is thus plain to see. Competition law encourages competition and strives for lower prices and higher quality. Patent law rewards innovators by preempting competition and allowing them to charge supra-competitive prices. In economic jargon, competition law promotes static efficiency, which can be further separated into allocative efficiency and productive efficiency, while patent law prioritizes dynamic efficiency. Competition law, however, is also concerned with dynamic efficiency to the extent that it enhances

[1] John C Stedman, 'Patents and Antitrust--The Impact of Varying Legal Doctrines' (1973) 1973 Utah Law Review 588, 590.

consumer welfare. Allocative efficiency is attained when resources are allocated to uses that place the highest value on them. Productive efficiency requires more efficient use of resources to satisfy needs of individuals in society. Dynamic efficiency focuses on innovation and is improved when the rate of innovation increases. Under patent law, static efficiency is sacrificed to foster dynamic efficiency. Louis Kaplow has thus described the conflict underlying the patent-competition interface as 'even more deep-seated than is generally perceived.'[2] In *International Wood Processors v. Power Dry, Inc.*, the United States Court of Appeal for the Fourth Circuit expresses a similar view that 'there may be conflict between the patent laws on the one hand, which encourage monopoly power by granting patent holders the right to exclude and be free from competition, and the antitrust laws, on the other hand, which generally proscribe monopoly and encourage competition.'[3]

Not everyone shares the same pessimistic view about the relationship between these two areas of law. Herbert Hovenkamp argues that the conflict between patent and competition laws 'is readily exaggerated'[4]. The source of the apparent conflict between these two areas of law is the 'deep uncertainty about the optimal amount and scope of IP protection.'[5] The implication of this argument is that if the patent system provided the optimal amount of innovation incentives to potential innovators, there would be no need for competition law to intervene. Competition policy considerations should only be accorded weight in patent-competition cases when the patent system has provided excessive innovation incentives.

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[2] Louis Kaplow, 'The Patent-Antitrust Intersection: A Reappraisal' [1984] Harvard Law Review 1817–18.
[3] 792 F2d 416, 426 (4th Cir 1986).
[4] Herbert Hovenkamp, 'United States Antitrust Policy in an Age of Ip Expansion' (Social Science Research Network 2004) SSRN Scholarly Paper ID 634224 2 <https://papers.ssrn.com/abstract=634224> accessed 31 March 2019.
[5] ibid.

Mark Lemley, a prominent intellectual property law scholar in the U.S., endorses the view that the patent system does not always provide optimal incentives. He observes that

> there is good evidence that IP rights do not always promote innovation. Sometimes they interfere with innovation, particularly if the rights are too strong or last too long, so that generation after generation of potential improvers must get permission from one (or, worse, many) existing stakeholders before innovating in a field.[6]

Competition law can thus be used as a counterweight to patent law. Lemley argues that the extent of competition law intervention into patent exploitation practices should vary in accordance with the strength of patent rights. Competition law enforcement should be strong when patent rights are strong and should be rolled back when patents rights weaken.[7] Policymakers should aim to achieve a delicate balance between the two. Excessively strong patent rights impede innovation, unnecessarily retards competition, and reduces social welfare.[8] Over-emphasis on competition risks the loss of innovation in the name of static efficiency.[9] Competition may backfire as a tool to spur innovation.[10]

Lemley's argument implies that patent law and competition law seek to achieve the same policy objectives.[11] Dynamic efficiency is indisputably the primary preoccupation of the patent system, which imposes a trade-off of short-term static efficiency loss for longer-term dynamic efficiency gains. It is, however, incorrect to say that competition law is only concerned with static efficiency. Lemley argues that this view is at least 'oversimplified'.[12] Competition law strives for improvement in consumer

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[6] Mark A Lemley, 'Industry-Specific Antitrust Policy for Innovation' (Social Science Research Network 2010) SSRN Scholarly Paper ID 1670197 3 <https://papers.ssrn.com/abstract=1670197> accessed 29 March 2019.
[7] Mark Lemley, 'A New Balance Between IP and Antitrust' (2007) 13 Southwestern Journal of Law and Trade in the Americas 237, 254.
[8] ibid.
[9] ibid.
[10] ibid.
[11] ibid 247.
[12] Lemley, 'Industry-Specific Antitrust Policy for Innovation' (n 6) 2.

welfare. Economists have long argued that over the long term, dynamic efficiency is a much more important source of improvement for consumer welfare and economic progress than static efficiency.[13] In the long run, consumers derive much more benefit from the emergence of new products and new technologies than the production of existing products at lower costs. Therefore, competition law values both static efficiency and dynamic efficiency to the extent that they enhance consumer welfare.[14] While the trade-off between static efficiency and dynamic efficiency underlying the patent system has been largely determined by the legislature, competition law allows the recalibration of this trade-off on a case-by-case basis after taking into account market conditions and other pertinent factors.

This view is echoed by Suzanne Scotchmer, who has asserted that the conflict between patent and competition laws 'is more a short-run tension than a long run tension, since in the long run intellectual property law leads to innovation, which improves the welfare of consumers. Since consumer welfare is the concern of competition law, there is no fundamental inconsistency.'[15] Robert Pitofsky has similarly emphasized the common policy objectives of patent and competition laws, asserting that

> both antitrust, by protecting competition, and intellectual property, by rewarding innovation, create incentives to introduce new products. In addition, antitrust for the most part has no quarrel with the argument that market power is more acceptable if it is reasonably necessary to achieve efficiencies, including efficiencies connected with innovation. When modest anticompetitive effects of a transaction are significantly outweighed by the positive consumer welfare consequences of innovation, antitrust has historically struck the balance in favor of innovation.[16]

[13] Donald Turner, 'Basic Principles in Formulating Antitrust and Misuse Constraints on the Exploitation of Intellectual Property Rights' [1984] Antitrust Law Journal 485, 485.
[14] ibid.
[15] Suzanne Scotchmer, *Innovation and Incentives* (MIT Press 2004) 161.
[16] Robert Pitofsky, 'Challenges of the New Economy: Issues at the Intersection of Antitrust and Intellectual Property' 68 Antitrust Law Journal 913, 917.

Competition law thus serves as a counter-balance to patent law in pursuit of the common policy objective of improving consumer welfare through encouraging innovation. Competition law can be viewed as a tool to recalibrate the innovation incentives generated by the patent system. This recalibration is necessary because the patent system may sometimes provide excessive protection and unduly suppress competition. The conceptualization of competition law as a counter-balance to patent law implicitly acknowledges that the two areas of law deploy conflicting tools in pursuit of their common policy objective. Patent law creates market power through exclusivity, whereas competition law promotes competition, which keeps market power in check, by prohibiting anticompetitive practices. As the United States Court of Appeal for the Second Circuit observed in *SCM Corp. v. Xerox Corp.*,

> The conflict between the antitrust and patent laws arises in the methods they embrace that were designed to achieve reciprocal goals. While the antitrust laws proscribe unreasonable restraints of competition, the patent laws reward the inventor with a temporary monopoly that insulates him from competitive exploitation of his patented art.[17]

A further source of uncertainty for the patent-competition interface is the lack of consensus on the relationship between competition and innovation. In the trade-off between static efficiency and dynamic efficiency, it is clear that increased competition or weaker patent protection lowers prices and raises static efficiency. In contrast, there is much less clarity on how dynamic efficiency is promoted. Even though patent and competition laws are said to pursue the common policy objective of advancing consumer welfare by promoting innovation, the two areas of law share different visions of how this can be achieved and what kind of market structure is most conducive to innovation. Patent law implicitly subscribes to the view that monopoly

[17] 645 F2d 1195, 1203 (2d Cir 1981).

supports greater innovation while competition law, unsurprisingly, places its faith in competition.

This harkens back to the long-running debate between adherents of Joseph Schumpeter and Kenneth Arrow on whether competition or monopoly induces more innovation. Schumpeter famously argues that monopoly is more conducive to innovation because R&D is costly and monopoly profits are necessary in order to fund the research needed to generate innovation.[18] He further observes that markets progress through innovation, whereby firms compete for the market through innovation, displacing an old monopoly with a new one.[19] Kenneth Arrow and others have disputed these claims, arguing that innovation is more abundant in a competitive market.[20] According to Arrow, a monopolist suffers from a major disincentive to innovate because a new product introduced by a monopolist will simply displace its own existing product. Therefore, innovation is a double-edged sword for a monopolist. Meanwhile, a monopolist's competitors do not suffer the same disincentive because they do not bear the costs of the lost revenue from the displaced product. Innovation will merely allow these competitors to capture the market from the monopolist. Arrow calls this 'the replacement effect'. This debate has spawned a large body of theoretical and empirical literature aiming to settle the debate.[21] A definitive resolution remains elusive.

[18] Joseph A Schumpeter, *Capitalism, Socialism, and Democracy* (Third Edition, Harper Perennial Modern Classics 2008) 87–120.
[19] ibid.
[20] Kenneth Arrow, 'Economic Welfare and the Allocation of Resources for Invention' (National Bureau of Economic Research, Inc 1962) NBER Chapters 619–20 <https://econpapers.repec.org/bookchap/nbrnberch/2144.htm> accessed 31 March 2019.
[21] Richard J Gilbert and Steven C Sunshine, 'The Use of Innovation Markets: A Reply to Hay, Rapp, and Hoerner' (1995) 64 Antitrust Law Journal 75.

While the academic debate rages on, policymakers and enforcers nonetheless must take an explicit or implicit view of the matter. Given the fundamental belief in competition law that competition is inherently beneficial to society and propels economic progress, it should come as no surprise that competition law generally subscribes to the Arrowian view. For example, in the U.S. Department of Justice-Federal Trade Commission 1995 Guidelines for the Licensing of Intellectual Property, the two agencies identified as a potential harm of cross-licensing arrangements and patent pools the possibility of a reduction in innovation competition.[22] This theory of harm is premised on 'the economic hypothesis that competition leads to more R&D than cooperation.'[23] In his advocacy for robust competition law enforcement to foster innovation, Jonathan Baker posits that firms innovate in an attempt to escape product market competition.[24] F.M. Scherer argues that with respect to abuse of dominance cases in the high-technology sectors, the presumption should be 'in favor of keeping structural and behavioral barriers to innovative new entry as low as possible.'[25] In the eyes of competition law enforcers and commentators alike, competition promotes innovation.

In contrast, by relying on the supra-competitive pricing permitted by patent exclusivity to spur innovation, patent law clearly holds the Schumpeterian view and presumes that market power is conducive to innovation. Therefore, while there seems to be common ground between patent and competition laws regarding their

[22] U.S. Department of Justice and Federal Trade Commission, 'Antitrust Guidelines for the Licensing of Intellectual Property' 30.
[23] Scotchmer, *Innovation and Incentives* (n 15) 172.
[24] Jonathan Baker, 'Beyond Schumpeter vs. Arrow: How Antitrust Fosters Innovation' 74 Antitrust Law Journal 575, 579.
[25] FM Scherer, 'Technological Innovation and Monopolization' (2005) No. 05-07 64 <https://www.antitrustinstitute.org/work-product/aai-working-paper-no-05-07-technological-innovation-and-monopolization/> accessed 31 March 2019.

policy objectives, the two areas of law rely on different tools to achieve their objectives and hold different views on the relationship between competition and innovation. While it may be an overstatement to say that there is a fundamental conflict between patent and competition laws, it is not entirely accurate to say that the conflict is readily exaggerated. In positing competition law as a counter-balance to patent law, Lemley and others implicitly accept that these two areas of law operate through conflicting means.

It remains to be determined how the balance between the two bodies of law should be struck. Almost twenty years ago, Pitofsky cautions against tilting the balance in competition law too far towards the preservation of innovative incentives generated by the patent system. He argues that

> An approach that grants broad exceptions to antitrust principles in favor of intellectual property holders distorts the balance too far in the direction of incentives to innovate by sacrificing too much in the way of competition and opportunities for follow-on innovation.'[26]

Lemley characterizes the prevailing approach to the patent-competition interface in the U.S. as one which 'treats IP rights as having primacy within their established boundaries, and relegates antitrust to the role of policing departures from those boundaries.'[27] He argues for a more nuanced industry-specific approach to the patent-competition interface, asserting that both areas of law play an equally important role in encouraging innovation and promoting dynamic efficiency and should be treated as equals.[28] The nature of the industry and the invention in question determines which tool should be used.[29]

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[26] Robert Pitofsky, 'Antitrust and Intellectual Property: Unresolved Issues at the Heart of the New Economy' (2001) 16 Berkeley Technology Law Journal 535, 545.
[27] Lemley, 'A New Balance Between IP and Antitrust' (n 7) 255.
[28] ibid 256.
[29] ibid.

C. Dynamic Efficiency Considerations in Context

1. Overview

Within the patent-competition interface, one may ascribe to competition law the role of an ex post adjustment mechanism for the fundamental trade-off underlying the patent system between static efficiency loss and dynamic efficiency gains. The patent system has struck a general trade-off between these two through setting the length of the patent term and delineating the scope of patent rights. The need for an adjustment mechanism is perhaps unsurprising because the patent system largely operates through rules of general application that do not make fine adjustments in accordance with the product or market at issue. Although some commentators have argued that the patent system, at least as it exists in the U.S., does tailor its rules to different industries[30], rules in the patent system by and large apply across the board. The length of the patent term is the same regardless of the product at issue. The scope of patent rights also does not vary by industry or product. Moreover, the trade-off in the patent system is made ex ante before the innovator has made the R&D investment. Competition law by nature operates on an ex post basis and makes case-by-case adjustments. It allows for much more finely-tuned adjustments of the trade-off between static efficiency and dynamic efficiency.

The patent system presupposes a causal relationship between the patentee reward generated by supra-competitive pricing and innovation incentives. While this relationship is highly intuitive, it has not gone unchallenged. It is important to examine the relationship between the patent system and the reward it offers on the one hand and innovation incentives the system purportedly generates on the other hand. While the ensuing discussion may be so misconstrued, it is important to clarify

[30] Dan L Burk and Mark A Lemley, 'Policy Levers in Patent Law' (2003) 89 Virginia Law Review 1575.

that the purpose of this inquiry is not to undermine or question the fundamental rationale of the patent system. It is fully recognized that competition law must respect the fundamental trade-off underlying the patent system and should only seek to make adjustments on the margin. The purpose of this inquiry is merely to assess the efficacy of the patent system in spurring innovation. If the effectiveness is found to be low, or the relationship between patentee reward and increased innovation seems uncertain, one needs to be more cautious about sacrificing consumer welfare to reward potential innovators. The ensuing inquiry will demonstrate why the patent system is a fairly suboptimal mechanism for generating innovation incentives and attracting innovations. This is particularly pertinent in the context of developing countries, especially the least developed ones, given that their consumers can ill-afford the supra-competitive prices charged by patent owners.

The fundamental argument of this thesis is that the relative weight to be attached to static and dynamic efficiencies varies across countries and depends on a number of factors. Readiness to accept static efficiency loss must reflect the state of the general consumers in the country. The poorer they are, the less they can afford supra-competitive prices. While poor consumers are not confined to developing countries, it remains true that the general body of consumers in developing countries, especially the least developed ones, is much poorer than those in developed economies. There is hence a more pressing need to protect consumers in developing countries from supra-competitive pricing. If the incentive effects of the patent system are uncertain, the potential costs of shifting the balance toward static efficiency will be lower.

The relative importance of dynamic efficiency considerations depends on the country's distance from the global technological frontier and the amount of innovative capacity in existence in the country. The closer a country is to the global

technological frontier, the less able it is to grow simply by copying other countries' technologies. Such a country must rely on its own innovative effort to grow. Innovation hence plays a more important role in its growth than in the growth of technological laggards. This country may justifiably decide that it would err on the side of innovation incentives despite the uncertain efficacy of the patent system in encouraging innovation. For technological laggards, which include almost all developing countries, growth is much less likely to come from genuine innovation in the global sense, which can be called frontier innovation, because they are much less capable of generating such innovation. For these countries, growth is often achieved through the acquisition and adaptation of foreign technologies, which shares a more complicated relationship with patent protection. Dynamic efficiency considerations and innovation incentives may carry less weight. These countries should be mindful of the doubtful effectiveness of the patent system in spurring innovation, which may counsel in favor of competition policy in the patent-competition interface.

Distance from the global technological frontier is also related to the amount of innovative capacity. The simple point is that the innovation incentives generated by the patent system will have much more meaningful impact in a country amply populated by potential innovators. In a country bereft of individuals or firms that can produce frontier innovation, reward provided by the patent system is unlikely to generate much innovation and will be largely unclaimed. There is unlikely to be much dynamic efficiency gains regardless of the static efficiency loss incurred by the country. The patentee reward in such a developing country will mostly only accrue to foreign innovators. In a country where patent protection is unlikely to attract much domestic innovation, policymakers may hesitate to err on the side of patent policy.

A note of clarification is in order. Most of the ensuing discussion and economic studies cited are concerned with the impact of increased patent protection on innovation incentives. These studies attempt to determine whether developing countries will enjoy greater innovation by raising the level of patent protection. The apparent discrepancy between the focus of these studies and that of this thesis, however, does not detract from their applicability to the patent-competition interface. This is because both the patent system and the patent-competition rules bear the same relationship with innovation incentives. Both act on the patentee reward by adjusting the scope of patent rights. The patent system adjusts the size of the patentee reward by lengthening or shortening the patent term and varying the scope of protection. The patent-competition rules do the same by shifting the boundary of permissible patent exploitation practices. A patentee will reap greater financial benefits from her innovation if competition law gives her greater scope to exploit her patents by allowing her to impose more restrictions on the sale of her product or the licensing of her technology. As far as patentee reward is concerned, raising the level of patent protection is equivalent to relaxing the patent-competition rules on patent exploitation. If the ensuing discussion shows that increasing the patentee reward by raising patent protection does not generate greater amount of innovation for one reason or another, the same would be true for increasing patentee reward by relaxing the patent-competition rules.

2. The Imprecise Nature of the Patent System as an Innovation Incentive Mechanism

There are a number of reasons to be cautious about giving too much deference to patent policy in the patent-competition interface. One of them is that the

patent system has an arguable tendency to overcompensate innovators and a minor reduction in patentee reward should not result in significant reduction in innovation incentives. As Hovenkamp observes, the confused state of both the law on and the theoretical discussion of the patent-competition interface is largely due to the uncertainty regarding the optimal amount of patent protection.[31] Patent protection comprises two dimensions: patent length and the scope of patent rights.[32] Variation along either dimension changes the size of the patentee reward, which presumably alters innovation incentives.[33] Competition regulation of patent rights affects the scope of such rights, which is the channel through which competition law influences innovation incentives.

The uncertainty regarding the scope of patent rights stems from the fact that there is a mismatch between what patentee reward currently offers to innovators and what it ought to cover. In order to generate the socially optimal amount of innovation incentives, what the patent system should seek to do is to compensate innovators for their risk-adjusted costs of innovation.[34] When deciding whether to undertake R&D for innovation, a potential innovator undertakes a profitability analysis. An innovator will undertake R&D so long as she expects to make enough from the innovation to cover the actual and opportunity costs of R&D. This would be the cost-benefit analysis undertaken by individual innovators. A systemic perspective would also require patentee reward to take into account the fact that not every R&D project

[31] Hovenkamp, 'United States Antitrust Policy in an Age of Ip Expansion' (n 4) 2.
[32] Robert Merges and Richard Nelson, 'On the Complex Economics of Patent Scope' [1990] Columbia Law Review 839, 839–40. Kaplow (n 2) 1823. Scotchmer, *Innovation and Incentives* (n 15) 98.
[33] Kaplow (n 2) 1823.
[34] Richard Gilbert and Carl Shapiro, 'Optimal Patent Length and Breadth' (1990) 21 RAND Journal of Economics 106, 107.

succeeds. Many of them in fact fail.[35] Therefore, the patent system must cover the risk-adjusted costs, and not just the actual R&D costs, of innovation.[36]

The mismatch lies in the fact that the patent system currently makes no attempt to match the patentee reward with costs of innovation, risk-adjusted or otherwise. This is largely because of the prohibitive information costs involved in obtaining information about R&D costs ex ante.[37] Instead of innovation costs, patentee reward seems to be calibrated to match the value of innovation.[38] The patent system is currently set up to allow the innovator to capture the value of her innovation, even though this may vastly exceed the innovation costs. Innovators can thus be overcompensated, sometimes grossly so. Recall that patentee reward is derived from a loss of consumer welfare.[39] If the patent system grossly overcompensates innovators, it means that a slightly reduction in patentee reward is unlikely to result in a significant loss in innovation. This gives competition law enforcers considerable leeway to shift the balance underlying the patent-competition interface toward competition policy without sacrificing innovation incentives.

There are four relevant parameters in the determination of optimal patent protection: (1) social benefits, (2) private benefits, (3) social costs, and (4) private costs.[40] Social benefits consist of private benefits and external benefits, which are benefits not captured by the innovator. Social costs consist of private costs and external costs, which are costs borne by society as a whole. Private costs and benefits

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[35] Adam B Jaffe and Josh Lerner, *Innovation and Its Discontents: How Our Broken Patent System Is Endangering Innovation and Progress, and What to Do About It* (Princeton University Press 2004) 41–42.
[36] ibid 41.
[37] Nancy Gallini and Suzanne Scotchmer, 'Intellectual Property: When Is It the Best Incentive System?', *Innovation Policy and the Economy* (MIT Press 2002) 55. Jaffe and Lerner (n 35) 38.
[38] Scotchmer, *Innovation and Incentives* (n 15) 97.
[39] Kaplow (n 2) 1823–25. Jaffe and Lerner (n 35) 37–41.
[40] Kaplow (n 2) 1823–25.

are what will guide the innovator's R&D investment decision. If private benefits exceed private costs, the investment will be undertaken. A positive outcome in this private cost and benefit analysis, however, does not necessarily mean that the innovation is beneficial to society. An innovation is only socially beneficial if its social benefits exceed its social costs, meaning that society is overall better off with the innovation.[41] A further clarification is that the benefits and costs of patent protection may differ from those of innovation. There are instances where it will be useful to highlight their differences.

The external benefits of innovation include the direct and indirect benefits of the innovation to society that are not captured by the innovator. To the extent that patent protection is responsible for attracting the innovation, the external benefits of innovation may coincide with the external benefits of patent protection. To the extent that innovation is spurred by other financial incentives, however, the social benefits of innovation exceed the social benefits of patent protection.[42] For the present purpose, it is assumed that the social benefits of innovation are the same as the social benefits of patent protection. Making such an assumption does not detract from the main argument of this section and simplifies the discussion. The benefits of cumulative innovation and technological spillovers are the same regardless of whether the innovation is motivated by patent protection or other appropriation mechanisms. It will be noted subsequently, however, that the benefits of innovation do often diverge from those of patent protection.

Direct benefits refer to the immediate impact of an innovation on social welfare. For a process innovation such as a cost-reducing technology, its direct social

[41] Gilbert and Shapiro (n 34) 107.
[42] Alvin Klevorick and others, 'Appropriating the Returns from Industrial Research and Development' 1987 Brookings Papers on Economic Activity.

benefits are the costs society saves in the production of an existing product.[43] For a product innovation in the form of a new product, the direct social benefit is the difference in consumers' willingness to pay for the improved product as compared to the original product, or the additional consumer surplus created by the new product.[44] Indirect social benefits generally refer to the beneficial impact of an innovation on the innovative activities taking place in the rest of the industry and economy in general. These can be in the form of the opportunities for cumulative innovation and the spillovers created by the initial innovation. Lemley asserts that 'improvements may in many cases dwarf the original work in terms of their practical significance'.[45] Other commentators have similarly emphasized the importance of cumulative innovation.[46]

Meanwhile, William Baumol has written extensively on the importance of spillovers from innovation. He estimates that innovators are able to capture only 20% of the value created by their innovations; the remaining 80% of the value is spread across society.[47] He boldly asserts that without these spillovers, a majority of the industrialized world would be condemned to a pre-Industrial Revolution standard of living.[48] Jeffrey Bernstein finds that the social value of innovation is at least twice as high as the private value of innovation in the industries he studied.[49] Timothy

[43] Suzanne Scotchmer, 'Standing on the Shoulders of Giants: Cumulative Research and the Patent Law' (1991) 5 Journal of Economic Perspectives 29, 31.
[44] ibid.
[45] Mark A Lemley, 'Economics of Improvement in Intellectual Property Law' (1996) 75 Texas Law Review 989, 997.
[46] Scotchmer, 'Standing on the Shoulders of Giants' (n 43). Merges and Nelson (n 32) 843–44, 870. John H Barton, 'Patents and Antitrust: A Rethinking in Light of Patent Breadth and Sequential Innovation' (1997) 65 Antitrust Law Journal 449, 453.
[47] William Baumol, *The Free-Market Innovation Machine: Analyzing the Growth Miracle of Capitalism* (Princeton University Press 2004) 121, 134–35.
[48] ibid 125.
[49] Jeffrey Bernstein, 'The Structure of Canadian Inter-Industry R&D Spillovers, and the Rates of Return to R&D' (1989) 37 Journal of Industrial Economics 315, 315–28.

Bresnahan concludes that the social benefits of mainframe computers vastly exceed their private benefits.[50]

An innovation may be spurred by patent protection or other financial incentives. To the extent that patent protection is responsible for the innovation, the private benefits of innovation and the private benefits of patent protection coincide. However, if there are other means for the innovators to recoup her investments and monetize her innovation, the private benefits of innovation could far outweigh the private benefits of patent protection. The private benefits of patent protection are the profits for the innovator made possible by the patent system. They are measured against the hypothetical financial reward accrued to the patentee absent patent protection.[51] In other words, the private benefits of patent protection are the additional value patent protection redounds to the innovator. Private benefits of innovation consist of all the revenue earned by the innovator from the exploitation of its innovation, including sale of the final product incorporating the patented technology, licensing of the technology, or even the sale of it in the form of an assignment.[52] The ways in which an innovator can reap financial benefits from her innovation are known as appropriation mechanisms.[53] Patent protection is only one of them. There are many other mechanisms which will be further discussed below. The various financial rewards provided by the different appropriation mechanism together constitute the private benefits of innovation.

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[50] Timothy Bresnahan, 'Measuring the Spillovers from Technical Advance: Mainframe Computers in Financial Services' (1986) 76 The American Economic Review 742, 753.
[51] Erich Kaufer, *The Economics of the Patent System* (Harwood Academic Publishers 1989) 42–43.
[52] James Bessen and Michael Meurer, *Patent Failure: How Judges, Bureaucrats, and Lawyers Put Innovators at Risk* (Princeton University Press 2009) 97.
[53] Alexandra Zaby, *The Decision to Patent* (Springer 2010) 30 <https://www.springer.com/us/book/9783790826111> accessed 4 April 2019.

The abundance of appropriation mechanisms means that the private benefits of innovation are likely to far exceed the private benefits of patenting. This has been confirmed by a number of empirical studies.[54] Scotchmer concludes that the average R&D costs are much greater than the average value of patents.[55] Zvi Griliches and co-authors find that the aggregate private value of patents amounts to roughly only 10% to 15% of the total national expenditures of R&D.[56] James Bessen and Michael Meurer put the figure even lower at 3%.[57] While different studies arrive at varying estimates, they all reach the same conclusion that R&D costs dwarf the private benefits of patent protection. Assuming that R&D is generally profitable, this means that the private benefits of innovation must vastly exceed R&D costs. Even with the more conservative estimates by Griliches and co-authors, the private benefits of innovation exceed the private benefits of patenting by seven- to ten-folds. This suggests that patent protection is not a very important appropriation mechanism for innovators. All this has led William Landes and Richard Posner to conclude that 'incremental increases in patent protection are unlikely to influence inventive activity significantly and incremental reductions might actually enhance economic welfare.'[58] One way to reduce patent protection incrementally is through the use of competition law.

The costs of innovation and patent protection are different and need to be clearly distinguished. There are direct and indirect external costs of patent protection. The direct external costs are the costs that arise from the administration of a patent

[54] Zvi Griliches, Ariel Pakes and Bronwyn H Hall, 'The Value of Patents as Indicators of Inventive Activity' (National Bureau of Economic Research 1986) Working Paper 2083 120 <http://www.nber.org/papers/w2083> accessed 4 April 2019.
[55] Scotchmer, *Innovation and Incentives* (n 15) 275.
[56] Griliches, Pakes and Hall (n 54) 120.
[57] Bessen and Meurer (n 52) 113.
[58] William Landes and Richard Posner, *The Economic Structure of Intellectual Property Law* (Harvard University Press 2003) 327.

system.[59] These include the operating costs for the patent registration office and the legal costs incurred by parties in patent litigation.[60] These costs are no doubt substantial. They are, however, mostly relevant on the systemic level and are unlikely to play an important role in determining the optimal patent protection in individual cases. The indirect external costs of patent protection include the deadweight loss inflicted by the supra-competitive pricing that is made possible by patent protection[61] and the social wastes that arise from the patent race where the loser's R&D investment will come to nought once she loses the race to obtain patent protection.[62] The costs from patent races are not inevitable and could be easily avoided if patent law permits an independent invention defense similar to copyright law.[63]

The indirect external costs of innovation include the costs of creative destruction. These costs are less well-documented but are nonetheless worth mentioning. They refer to the costs imposed by a new innovation on the producers of an existing product.[64] To the extent that the new innovation renders existing products in the market obsolete, the machineries that these firms have installed and the plants that these firms have constructed to produce their now-obsolete products may become redundant.[65] The investments made to produce these existing products will lose their productive value. Innovators do not take into account these costs borne by their rivals

[59] 'Patent Costs and Impact on Innovation' (European Commission 2014) 17.
[60] ibid 8.
[61] Scotchmer, *Innovation and Incentives* (n 15) 99.
[62] Partha Dasgupta and Joseph Stiglitz, 'Industrial Structure and the Nature of Innovative Activity' (1980) 90 Economic Journal 266. Jennifer F Reinganum, 'A Dynamic Game of R and D: Patent Protection and Competitive Behavior' (1982) 50 Econometrica 671. Pankaj Tandon, 'Rivalry and the Excessive Allocation of Resources to Research' (1983) 14 Bell Journal of Economics 152.
[63] Samson Vermont, 'Independent Invention as a Defense to Patent Infringement' (2006) 105 Michigan Law Review 475.
[64] Kristiina Huttunen, Jarle Møen and Kjell G Salvanes, 'How Destructive Is Creative Destruction? The Costs of Worker Displacement' 3–4. Baumol (n 47) 137.
[65] Baumol (n 47) 136–37.

when deciding whether to pursue an innovation.[66] From a social perspective, however, these losses could be substantial and may outweigh the benefits of the innovation.[67]

The private costs of innovation and patent protection are again different. The private costs of innovation refer to the direct R&D costs and opportunity costs of innovation. Direct R&D costs are the investments made by the innovator into the R&D that ultimately creates the innovation. Opportunity costs refer to the financial reward the innovator may receive from the best alternative use of her funds. As opposed to R&D, she may decide to boost her production capacity by building a new factory or acquiring more machinery. She may decide to attempt to increase sales by engaging in more marketing or promotion. Or she may seek to improve her firm's operational efficiency by investing in a new IT system. She will choose whichever that gives her the highest rate of return. Her return from the second most profitable alternative would be the opportunity costs of the chosen option.

The private costs of patenting refer to the costs incurred by the innovator to obtain patent protection for her innovation.[68] The two terms, however, seem to be used interchangeably by economists and lawyers alike to refer to R&D costs. When commentators speak of patenting costs, what they have in mind often seem to be R&D costs, perhaps together with patenting costs.[69] For most innovations that are not discovered by accident but require significant and continuous inventive effort, R&D

[66] ibid 137.
[67] Bessen and Meurer (n 52) 98.
[68] 'Patent Costs and Impact on Innovation' (n 59) 17.
[69] Scotchmer, *Innovation and Incentives* (n 15) 273. Mark Schankerman, 'How Valuable Is Patent Protection? Estimates by Technology Field' (1998) 29 RAND Journal of Economics 77, 94.

costs are likely to far exceed patenting costs.[70] Therefore, for most purposes, it is the private costs of innovation that will be the focus of discussion.

An innovation would be beneficial to society if its total social benefits outweigh its total social costs. An innovation would be worth having if it redounded net social benefit to society. A credible argument can be made that the costs of creative destruction should be ignored. Creative destruction is the necessary consequence of every innovation and the price society pays for technological progress.[71] Technological advancement would be needlessly retarded if society were to decide against an innovation due to the costs of creative destruction. An important implication of the social cost and benefit analysis for innovation is that it is possible for society to be saddled with excessive innovation.[72] While this may come as a surprise to some, it is merely the natural consequence of the fact that society has limited resources and it cannot invest all its resources into innovation. At some point, society would obtain greater benefits if it invested its resources elsewhere, such as infrastructure, public health or education.

A potential misallocation of resources to innovative activities may arise because while an innovation affects the entire society, the decision to invest in an innovation is made by an innovator in light of her private costs and benefits. An innovator will pursue an innovation if she derives net private benefit from it. An investment in an innovation will be made if the financial reward received by the innovator from the various appropriation mechanisms exceeds the risk-adjusted private costs of innovation, which include both direct R&D costs and the opportunity

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[70] Jean O Lanjouw and Mark Schankerman, 'Patent Quality and Research Productivity' (2004) 114 Economic Journal 441. Bronwyn H Hall, Adam B Jaffe and Manuel Trajtenberg, 'Market Value and Patent Citations' (2005) 36 RAND Journal of Economics 16. 'Patent Costs and Impact on Innovation' (n 59) 19.
[71] Schumpeter (n 18) 87–120.
[72] Scotchmer, *Innovation and Incentives* (n 15) 98.

cost. If the innovation gives her a financial reward that exceeds her returns in her next best investment option plus her R&D costs, she will choose to innovate.

The ideal incentive mechanism for innovation would be one under which all innovations that create net social benefits were pursued, which in turn would require that the private benefits of innovation for an innovator cover her risk-adjusted private costs of innovation. The task of the patent system would then be to ensure that patentee reward supplements whatever shortfalls may exist between the financial reward from other appropriation mechanisms and the innovator's risk-adjusted private costs of innovation. While determining this shortfall may present serious practical complications, the basic principle remains that the patent system seeks to ensure that socially beneficial innovations provide their innovators with net private benefits and are hence created.

The patent system would ideally calibrate the patentee reward such that the total private benefits of innovation just cover the risk-adjusted private costs of innovation.[73] Anything beyond that would constitute a windfall for the innovator and would be socially wasteful.[74] If it was possible for the government to estimate accurately the private costs and the probability of success of innovation, the patent system would be redundant.[75] The patent system is only a second-best option for incentivizing innovation.[76] The information requirements imposed by an ideal reward system mean that the patent system makes no attempt to calibrate the patentee reward such that the private benefits of innovation just cover the private costs of innovation.

[73] Landes and Posner (n 58) 300.
[74] ibid.
[75] Gallini and Scotchmer (n 37) 55.
[76] Ian Ayres and Paul Klemperer, 'Limiting Patentees' Market Power Without Reducing Innovation Incentives: The Perverse Benefits of Uncertainty and Non-Injunctive Remedies' (1999) 97 Michigan Law Review 985, 1008.

Instead, what the patent system seems to do is to allow the innovator to capture much, if not all, of the value of her innovation, which is presumably determined by its social benefits. For example, under U.S. patent law, the pioneer invention doctrine holds that groundbreaking innovations that open up a new field of research or commercial development, which create greater social value, are entitled to broader protection than less significant innovations.[77] As Scotchmer notes, '[g]iven that the length and breadth of patent protection cannot depend on the expected costs of an R&D project, the only way to ensure that firms undertake every research project that is efficient is to let the firms collect as revenue all the social value they create.'[78] Using the social value of an innovation as the benchmark is in fact our third-best option for incentivizing innovation.

The patent system in fact does not even live up to this third-best option. It does not try to match the scope of patent protection with the social value of an innovation. If it did, one would expect the patent term or the scope of patent rights to be adjusted accordingly, which would in turn require the patent system to determine the social value of an innovation. This would entail measurements of its spillover effects and an estimation of the possibility of cumulative innovation, among other things. The patent system makes no attempt to do anything of this sort. The complete absence of any effort by the patent system to ascertain the social value of an innovation and calibrate patentee reward against this value means that patentee reward may even exceed its social value. The scope of a patentee's rights under patent law may allow the her to capture value from spillovers and cumulative innovation beyond that which were

[77] Burk and Lemley (n 30) 1656. Brian J Love, 'Interring the Pioneer Invention Doctrine' (2011) 90 North Carolina Law Review 379, 382.
[78] Scotchmer, 'Standing on the Shoulders of Giants' (n 43) 31.

made possible by her innovation. This would amount to gross overcompensation of innovators and is unjustifiable from a social welfare perspective.

Recall that the first-best innovation reward mechanism should only compensate innovators for their risk-adjusted private costs of innovation. Setting patentee reward against the social value of an innovation already has a tendency to overcompensate innovators. There is in fact the possibility of double overcompensation under the current patent system when the patentee reward exceeds the social value of an innovation. It is of course possible that patentee reward may fall short of this value. There is no *a priori* reason to assume that the patent system will exhibit a systemic bias one way or the other. Such under-compensation would only affect innovation output if the social value and private costs of an innovation are very close in magnitude. In such case it is possible that allowing a patentee to capture the full social value of her innovation would cause the innovation to be produced but under-compensation would result in a loss of the innovation. However, such an innovation is unlikely to be socially beneficial once one takes into account its external costs.[79] The loss of such innovations should not be a matter of grave concern to society.

The foregoing discussion is not meant to pose a challenge to the patent system. While there could be a serious theoretical mismatch between what should be and what is actually offered by the patent system as a reward to secure socially beneficial innovations, there are very strong practical reasons to believe that attempts to correct this mismatch will be futile. The information requirements to correct this mismatch would be overwhelming. As a matter of patent system design, there is little that can be done about overcompensation of innovators. Yet this tendency to

[79] FM Scherer, 'The Economics of the Patent System', *Industrial Market Structure and Economic Performance* (Rand McNally 1980) 448.

overcompensate should not be simply ignored as far as the patent-competition interface is concerned. Given that patentee reward is generated from supra-competitive pricing, the fact that patentee reward tends to exceed what is necessary to secure socially beneficial innovations means that consumer welfare is needlessly sacrificed to generate excessive innovation incentives. There would be room for patent rights to be pared back to lower patentee reward without risking substantial loss of socially beneficial innovations. Static efficiency considerations could be emphasized at the expense of dynamic efficiency without much loss in innovation incentives. One way to achieve this would be through the patent-competition rules, which, by regulating how a patentee may exploit her rights and license her technology, alters the scope of patent rights.

While it may be tempting to argue that many of these issues arise from within the patent system and should be addressed through reforms within the system, as some commentators have argued, there are a few reasons why such reforms are unlikely to be adequate for our purpose. First, there does not seem to be momentum internationally for major reforms of the patent system that will address the concerns raised here. If anything, changes in the global intellectual property system seems to be in the direction of ratcheting up of rights instead of a recalibration of the level of protection. Even if global reform efforts were to materialize, they are likely to be dominated by the industrialized economies such as the U.S. and the EU, whose interests are in elevating protection. Developing countries are unlikely to achieve what they want from such global efforts. Second, the overcompensating tendencies of the patent system and other problems that were highlighted earlier are so fundamental to the patent system that it is unlikely that they can be addressed adequately through any reasonable foreseeable reform efforts. Third, the case-by-case nature of competition law adjudication means that it is a superior policy tool to generally applicable patent rules

for making fine adjustments to the balance between static and dynamic efficiencies in individual cases. Even after successful efforts to reform the patent system to address the aforementioned issues, there is always going to be a role for competition law to play in recalibrating the policy balance underlying the patent-competition interface, just as Lemley has convincingly argued.

3. The Availability of Other Forms of Appropriation Mechanism to Recoup R&D Investments

A further reason to believe that dynamic efficiency considerations can be de-emphasized without much concomitant loss of innovation incentives is that economists have noted that there are many mechanisms through which an innovator can appropriate the value of her innovation. Patent protection is only one of them. An innovator may choose to keep her innovation secret and rely on trade secrecy to maintain her competitive advantage. This would be particularly effective if the technology cannot be easily reverse engineered, as in the case of a process innovation. Competitors are unlikely to be able to decipher a cost-cutting technology simply from the appearance of the final product. For such an innovation, trade secrecy may more than suffice as an appropriation mechanism. The innovator need not incur the costs to secure a patent.

Apart from trade secrecy, an innovator may resort to what are known as first-mover advantages. The first firm to commercialize a new technology may enjoy a period of lead time over rivals simply due to the time it takes for rivals to replicate the technology. The amount of time that rivals need to replicate the innovator's technology through imitation is called the imitation lag.[80] The longer is this imitation lag, the more

[80] Sidney Winter, 'Appropriating the Gains from Innovation', in George Day and Paul Schoemaker (eds), *Wharton on Managing Emerging Technologies* (Wiley 2000) 250–51.

time the innovator will have to charge supra-competitive prices to recoup her R&D investments before a new entrant emerges. The imitation lag could be so long that the innovator recoups her private costs of innovation without resorting to patent protection. This is likely to be the case for innovations that are not particularly costly to create. Edwin Mansfield establishes the time-consuming and resource-intensive nature of imitation through a number of empirical studies.[81] He finds that imitation costs are usually about 65% of the innovation costs and that it usually takes 70% of the time spent on the original innovation to imitate it. If it took the original innovator five years to create the innovation, it would take the imitating firm three and a half years to reproduce it. In fact, Mansfield finds that in one-seventh of the cases surveyed in his study, imitation costs are no smaller than innovation costs. Imitation is not as costless or instantaneous as it is often assumed to be. The significant imitation lag that exists in most cases would give the innovator considerable time to recoup her initial investments.

This first-mover advantage can be enhanced through product differentiation strategies. Marketing and promotion would help the innovator to develop brand loyalty among consumers, which would allow her to hold on to part of her supra-competitive profit even after market entry by competitors. Aside from reinforcing the first-mover advantage, sales and marketing efforts separately constitute a distinct appropriation mechanism.[82] Such efforts would help the innovator to recoup her R&D costs regardless of the magnitude of the first-mover advantage. While brand loyalty can be developed among consumers through marketing and promotion, learning

[81] Edwin Mansfield, Mark Schwartz and Samuel Wagner, 'Imitation Costs and Patents: An Empirical Study' (1981) 91 The Economic Journal 907. Edwin Mansfield, 'Patents and Innovation: An Empirical Study' (1986) 32 Management Science 173.
[82] Klevorick and others (n 42) 795.

curve advantages allow the innovator to stay ahead of imitating rivals in the production process and maintain an edge in technical skills and know-how.[83] These are advantages that accrue to an innovator by virtue of being the pioneer for the product.

A number of economic studies have found that the degree of reliance on patent protection as an appropriation mechanism varies by the type of innovation and industry at issue. Process innovation is known to be much less reliant on patent protection than product innovation. This is mainly because while it is possible to reverse engineer a product innovation from the physical product, it is very difficult to do the same with process innovation. This may explain the result from one of the most exhaustive studies on appropriation mechanisms for innovators, the so-called Yale survey, in which Richard Levin and co-authors find that patents are the least effective appropriation mechanism for process innovation.[84] Patent protection is rated behind lead time, learning-curve advantages, and trade secrecy as an appropriation mechanism for process innovations.[85] Patent protection is rated ahead of trade secrecy, but rated substantially behind lead time, learning-curve advantages, and sales and marketing as an appropriation mechanism for product innovations.[86] 80% of the sampled businesses give sales and service effort a 5.0 out of a 7-point scale in effectiveness as an appropriation mechanism.[87] Only 20% of the sampled businesses give patents the same rating.[88] These results have been corroborated in a subsequent study, known as the

[83] ibid.
[84] ibid 794–95.
[85] ibid.
[86] ibid 795.
[87] ibid 796.
[88] ibid.

Carnegie Mellon survey, in which Wesley Cohen and co-authors update the results of the Yale survey and reach largely similar results.[89]

Apart from the type of innovation, studies have also shown that the degree of reliance on patent protection as an appropriation mechanism varies by the industry. The Yale survey classifies the one hundred manufacturing industries surveyed in their study into three clusters.[90] The first cluster, consisting of food products and metal products among others, seems to rely exclusively on sales and marketing as an appropriation mechanism.[91] The second cluster deploys a wider range of appropriation mechanisms, including first-mover advantages, learning curve advantages, and secrecy.[92] The third cluster, which mainly consists of pharmaceuticals and chemicals, is the only group that utilizes patent protection extensively.[93] These results are consistent with Mansfield's findings, which show that the pharmaceuticals and chemicals industries rely much more on patent protection as an appropriation mechanism than other industries.[94]

There are reasons why patent protection is more important to the pharmaceuticals and chemicals industries. Both industries are marked by low appropriability, meaning that appropriation of investment returns is difficult absent government intervention. This is because technology in both industries tends to be relatively codifiable and requires relatively little tacit knowledge to implement, hence rendering it susceptible to imitation. This means that both imitation costs and imitation

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[89] Wesley M Cohen, Richard Nelson and John P Walsh, 'Protecting Their Intellectual Assets: Appropriability Conditions and Why U.S. Manufacturing Firms Patent (or Not)' (National Bureau of Economic Research, Inc 2000) NBER Working Paper 7552 <https://econpapers.repec.org/paper/nbrnberwo/7552.htm> accessed 5 April 2019.
[90] Klevorick and others (n 42) 801.
[91] ibid.
[92] ibid 801.
[93] ibid 801–02.
[94] Mansfield (n 81) 174.

lag are low. However, imitation in both industries is highly profitable. The amount of R&D investment in both industries tends to be very high and the profit potential for products in both industries, especially pharmaceuticals, tends to be significant. Demand for medications tends to be inelastic and market structure for the industry highly concentrated.[95] High profit potential and low appropriability together lead to a high level of dependence on patent protection. Industries that do not share these characteristics are unlikely to rely on patent protection to the same extent.

To sum up, the foregoing discussion establishes that the patent system has a tendency to overcompensate innovators by failing to match patentee reward with the private costs or even the social value of innovation. This suggests that less deference can be shown to dynamic efficiency considerations within the patent-competition interface. Minor adjustments to the scope of patent rights can be made without significant impact on innovation incentives. This would be especially the case if the particular type of innovation at issue does not heavily rely on patents as an appropriation mechanism. Economic studies have demonstrated that different industries exhibit varying degrees of reliance on the patent system as an appropriation mechanism. While those studies, with the exception of the Carnegie-Mellon survey, were conducted in the 1980s and the results may be slightly outdated, their fundamental insight remains relevant. There are industry-specific variations in the degree of reliance on the patent system. This suggests that developing countries may need to develop an industry-specific approach to the patent-competition interface to take these variations into account.

[95] FM Scherer, 'A Note on Global Welfare in Pharmaceutical Patenting' (2004) 27 World Economy 1127, 1135.

4. The Mismatch between Innovation Incentives Generated by the Patent System and the Technological Capacity of Developing Countries

(i) Technological Capacity of Developing Countries

The last reason to be leery of attaching too much weight to dynamic efficiency considerations in the patent-competition interface in developing countries is that a developing country may simply not be in a position to take advantage of the innovation incentives generated by its patent system. This is despite the industry being one that relies on patent protection as an appropriation mechanism. It may risk stating the obvious to point out that innovation incentives would only spur innovation if there were potential innovators in the country to take advantage of those incentives.

Countries can be roughly classified into three categories as far as their technological capacity is concerned. The first group consists of countries with the capacity to engage in not much beyond basic production and perhaps implementation of rudimentary technology. These countries do not innovate or adapt foreign technology. Jeffrey Sachs has called these countries 'the marginalized', which include the Andean part of South America, almost all of sub-Saharan Africa, and large parts of Central and South Asia.[96] These countries are said to possess a basic production capacity. The second group consists of countries with the capacity to absorb foreign technology either through voluntary technology transfer or imitation, but not the capacity to innovate and produce its own new technology. Sachs calls these the technological diffusers, and includes in this group China, India, a large part of Latin America, and parts of Eastern Europe and the former Soviet Union.[97] These countries are said to possess an imitation or technology absorption capacity. The third group consists of countries with the

[96] Jeffrey Sachs, 'The Global Innovation Divide' in Adam Jaffe, Josh Lerner and Scott Stern (eds), *Innovation Policy and the Economy*, vol 3 (National Bureau of Economic Research 2003) 133.
[97] ibid.

capacity to innovate along the global technological frontier. They are the innovators that enjoy endogenous growth, 'in which innovative activity takes place on a significant scale, and patented products and technologies are produced and sold domestically and on world markets.'[98] These countries are said to possess an innovation capacity.

Table 1. Table Showing Classification of Developing Countries by Technological Capacity

Group	The Marginalized	The Technological Diffusers	The Innovators
Type of capacity	Production	Imitation/Technology absorption	Innovation
Countries	South America (Andean part), Sub-Saharan Africa, and large parts of Central and South Asia	China, India, a large part of Latin America, and parts of Eastern Europe and the former Soviet Union	North America, most of western and northern Europe, Japan

Countries with an innovation capacity clearly would respond to the innovation incentives created by their own patent system. Dynamic efficiency considerations matter in these countries. Countries with only a production capacity are incapable of genuine innovation and are so far from acquiring an innovation capacity that dynamic efficiency considerations can be largely discounted. Countries with an imitation or technology absorption capacity rely on technology importation for technological progress and will want to facilitate technology transfer as much as possible.

The fact that the importance of dynamic efficiency considerations varies in accordance with the country's technological capacity is encapsulated in a U-shape relationship between per capita income and patent protection. Technological capacity is presumed to correlate positively with per capita income, which is by and large true.

[98] ibid 132–33.

Prior to the TRIPS Agreement (Agreement on Trade-Related Aspects of Intellectual Property Rights), which mandates a minimum level of patent protection among all signatory countries, economists consistently find that the amount of patent protection offered in a country follows a U-shape relationship with its level of development as measured by per capita income. Keith Maskus and co-authors describe this relationship as follows:

> The poorest countries allocate virtually no resources to invention and innovation and have little intellectual property to protect. As incomes and technical capabilities grow to moderate levels, some inventive capacity emerges, particularly of the adaptive kind, but competition remains based on imitation, and the majority of economic and political interests prefer weak protection. As an economy develops, additional inventive capacity and demands for high-quality products emerge, and more firms lobby for effective protection, a process that is abetted by foreign firms interested in servicing growing markets. Finally, protection shifts up sharply at the highest level of income.[99]

The relatively high levels of patent protection at the lowest levels of income are attributed to past colonial influences. Many poor developing countries inherited intellectual property laws which maintained a fairly high level of protection from their European colonial masters.[100] With no domestic imitators to clamor for laxer intellectual property laws to facilitate imitation, these poorest countries have persisted with the legacy level of protection. As domestic producers begin to acquire technological capacity and seek to replicate foreign technologies, they push for lower levels of protection. The level of protection is shown to reach its nadir at USD2,000 per capita at 1985 prices and to remain at that level until income rises to USD8,000 per capita at 1985 prices, when domestic producers begin to acquire innovation capacity

[99] Keith Maskus and others, 'Intellectual Property Rights and Economic Development in China', *Intellectual Property and Development* (Oxford University Press 2005) 298.
[100] Commission on Intellectual Property Rights, 'Integrating Intellectual Property Rights and Development Policy' (2002) 22 <www.iprcommission.org/papers/pdfs/final_report/CIPRfullfinal.pdf> accessed 5 April 2019.

and lobby for stricter patent protection.[101] These results corroborate the notion that dynamic efficiency considerations tend to grow in importance as income rises and the country industrializes. However, with the advent of the TRIPS Agreement, developing countries have ratcheted up their level of patent protection across the board[102] and such a U-shape relationship is no longer observed[103].

History is replete with examples of countries which lowered their level of patent protection to facilitate domestic technology acquisition. Until the 1980s, when the country emerged as a technological powerhouse, the patent system in Japan was designed to facilitate technology transfer.[104] It was only reformed to focus on protecting innovation once Japan had emerged as a major innovator.[105] In fact, foreigners were not allowed to obtain a patent in Japan until 1899.[106] Switzerland adopted a similar strategy and did not introduce a patent system until its domestic watchmakers had established themselves as technological leaders and were threatened by imitators.[107] The domestic chemical and textile industries, however, remained reliant on foreign technology and opposed the introduction of a patent system.[108] As a compromise, the Swiss patent system initially only protected mechanical inventions, which would benefit the watchmaking industry, but not chemical inventions, which would have stopped the domestic chemical manufacturers from adopting foreign technology.[109] Switzerland did

[101] ibid.
[102] Walter Park and Douglas Lippoldt, 'International Licensing and the Strengthening of Intellectual Property Rights in Developing Countries During the 1990s' (2005) 40 OECD Economic Studies 7, 10.
[103] Commission on Intellectual Property Rights (n 100) 22.
[104] Keith Maskus, *Intellectual Property Rights in the Global Economy* (Institute for International Economics 2000) 143.
[105] ibid.
[106] Ove Granstrand, 'Innovation and Intellectual Property Rights' in Jan Fagerberg, David Mowery and Richard Nelson (eds), *The Oxford Handbook of Innovation* (Oxford University Press 2006) 272.
[107] ibid 270–71.
[108] Petra Moser, 'How Do Patent Laws Influence Innovation? Evidence from Nineteenth-Century World's Fairs' (2005) 95 The American Economic Review 1214, 1220.
[109] Granstrand (n 106) 271.

not extend patent protection to chemical compounds until 1907, after Germany had threatened trade sanctions.[110]

While the production and the innovation countries face fairly clear policy choices with respect to dynamic efficiency considerations, the middle group of countries may confront a dilemma. These countries can be further divided into two groups. The first group consists of countries that only possess the capacity to absorb or imitate foreign technology. These may be called the imitation or technology absorption countries. Frontier innovation, or genuine along the global technological frontier, is out of their reach. Innovation in the domestic context only encompasses absorption and adaptation of foreign technology. Dynamic efficiency considerations for these countries should not focus on encouraging frontier innovation, but on facilitating technology transfer from developed countries.

The second group consists of countries that may possess some innovation capacity or are on the cusp of developing such capacity in some industries. They may be close enough to acquiring innovation capacity that the extra financial incentives provided by the patent system may propel domestic firms to make the last push toward innovation. Dynamic efficiency considerations for these countries are concerned with encouraging frontier innovation in some industries while facilitating foreign technology transfer in some others. These may be called the proto-innovation countries. For instance, China, India and a few other developing countries are said to have world class capacity in 'space, nuclear energy, computing, biotechnology, pharmaceuticals, software development and aviation'.[111] It would be a mistake to overlook their innovation or

[110] ibid.
[111] Shamnad Basheer and Annalisa Primi, 'The Wipo Development Agenda: Factoring in the "Technologically Proficient" Developing Countries' in Jeremy DeBeer (ed), *Implementing WIPO's Development Agenda* (Wilfred Laurier University Press 2008) 104.

proto-innovation capacity and adopt an inappropriate policy stance towards the patent-competition interface. Industry-by-industry analysis may be needed.

(ii) Classification According to Technological Capacities

While determining the technological capacity of a country is fraught with difficulty and every measure of innovative effort and output suffers its own drawbacks, some commentators have attempted to identify the proto-innovation developing countries. Shamnad Basheer and Annalisa Primi rely on two indicators to measure the technological capacity of developing countries.[112] They identify two dimensions of technological capacity that are important: innovative effort and technological capabilities, and use R&D expenditure as a percentage of GDP and the share of medium- or high-technology products in total manufacturing value added respectively to quantify these two dimensions.[113] They call countries that demonstrate sufficient innovative effort and technological capabilities 'technologically proficient developing countries' ('TPDCs').[114] These include 'Russia, Taiwan, China, India, Brazil, South Africa, Ukraine, Malaysia, Belarus, Argentina, Mexico, Turkey, Chile, and Indonesia.'[115]

Another way to measure innovation output is patent count. Patent count is by no means the perfect measurement of genuine innovation. Firms may patent for reasons that have nothing to do with protecting genuine innovations. They may do so for defensive purposes or to fulfill government policy requirements, as alleged to be the case in China. They may also apply for multiple patents for different aspects of the same innovation, which may result in double-counting or even multiple-counting of innovations. Nonetheless, patent counts are the most readily accessible statistic for a

[112] ibid 105.
[113] ibid 106.
[114] ibid 102.
[115] ibid 105.

country's innovative output. What follows is an attempt to identify proto-innovation countries using patent counts.

The World Intellectual Property Organization ('WIPO') publishes an annual report on the number of patent applications by and grants to both domestic and foreign applicants across the world. This report provides a sense of the innovative activity and output of developing countries. WIPO reports that in 2017, China originated the greatest number of patent applications worldwide, filing more than twice as many applications as the U.S.[116] China was responsible for more than 1.38 million out of the total number of some 3.17 million patent applications worldwide.[117] This is to be contrasted with the patent applications from low-income and lower middle-income countries. They together only accounted for 4.4% of the patent applications across the globe that year.[118] Discounting the three innovation outliers of China, the U.S., and Japan, in general, high-income countries received almost four and a half times as many applications as upper middle-income countries, which in turn received somewhat less than twice as many applications as lower-middle income countries, which in turn received almost eight times as many patent applications as low-income countries.

The number of patent application received, however, may not provide an accurate indication of domestic innovation capacity. What matters is the number of applications originated domestically. Once China is excluded from the upper middle-income countries, the percentage of resident patent applications for the four income groups, from low to high, were 83.1%, 30%, 42.8%, and 58.6% respectively. The average number of resident patent applications for the four income groups were 437,

[116] World Intellectual Property Organization, 'Filings for Patents, Trademarks, Industrial Designs Reach New Records in 2017' <https://www.wipo.int/pressroom/en/articles/2018/article_0012.html> accessed 6 April 2019.
[117] ibid.
[118] World Intellectual Property Organization, *World Intellectual Property Indicators 2018* (2018) 39.

739, 1,358, and 15,450 respectively. To the extent that the number of domestic patent applications is a reliable indicator of technological capacity, one can see a considerable gulf in the technological capacity between industrialized economies on the one hand and developing countries on the other hand.

Statistics from the number of patent grants largely confirm the trends observed in patent applications. In 2017, 1,404,600 patents were granted worldwide, of which 62.3% were granted in high-income countries, 29.9% were granted in China, 5.5% in upper middle-income countries excluding China, 1.7% in lower middle-income countries, and 0.5% in low-income countries. The total percentage of patents granted in low-income and lower middle-income countries was just above 2% of the global total, and the total percentage of patents granted in developing countries excluding China was no more than 8% of the global total. Industrialized economies accounted for 57.3% of patents granted to resident innovators. China accounted for 37.7%. The remaining 5% was shared among all other developing countries. The average number of patents granted to resident innovators and overall can be calculated for each of the four income groups. China again is excluded from the upper middle-income countries to produce a more accurate picture. The average number of patents granted in each of the four income groups, from low to high, were 650, 612, 1707, and 15096 respectively. The average number of patents granted to resident innovators in each of the four income groups, from low to high, were 345, 136, 721, and 8421 respectively. These figures show a yawning gap between industrialized economies and developing countries as a whole excluding China.

Overall, the figures from the WIPO 2017 Report confirm that developing countries, with the notable exception of China, have considerably weaker technological capacity than industrialized economies. Based on the number of patent applications and

grants in 2017, developing countries with significant technological capacity, or the proto-innovation countries, can be identified. Using the average number of resident patent applications from the upper middle-income developing countries of 1,358 as the threshold, only Brazil (5,480), India (14,961), Indonesia (2,271), Iran (15,264), Russian Federation (22,777), Turkey (8,175), Ukraine (2,283), and of course China can be deemed to have significant innovation capacity.[119] Using the more generous figure for the lower middle-income developing countries of 739 as the threshold, the following developing countries can be considered genuine innovators: Brazil (5,480), India (14,961), Indonesia (2,271), Iran (15,264), Kazakhstan (1,055), Malaysia (1,166), Mexico (1,334), Romania (1,098), Russian Federation (22,777), Saudi Arabia (909), Thailand (979), Turkey (8,175), Ukraine (2,271), and China.[120]

The same exercise can be repeated using the number of patent grants to resident innovators. Again, using the stricter threshold of the average number of resident patent grants in upper middle-income countries in 2017 of 721, only Belarus (771), India (1,712), Iran (3,668), Russian Federation (21,037), Turkey (1,757), Ukraine (1,516) and China can be said to have significant innovation capacity.[121] Using the more generous threshold of 136 for lower middle-income countries, the following countries can be said to have significant innovation capacity: Argentina (176), Belarus (771), Brazil (714), Chile (161), Colombia (166), India (1,712), Iran (3,668), Iraq (323), Kazakhstan (650), Malaysia (437), Mexico (407), Romania (396), Russian Federation (21,037), South Africa (595), Sudan (165), Turkey (1,757), Ukraine (1,224) and China.[122] Combining the two lists, applying the higher threshold of upper middle-

[119] ibid 85–89.
[120] *ibid.*
[121] ibid 90–94.
[122] ibid.

income countries, only India, Iran, Russian Federation, Turkey, Ukraine and China can be said to have significant innovation capacity. Using the more generous threshold of lower middle-income countries, Brazil, India, Indonesia (?)[123], Iran, Kazakhstan, Malaysia, Mexico, Romania, Russian Federation, Turkey, Ukraine, and China can be said to be genuine innovators.

Thus, even with the more generous thresholds of the average for lower middle-income countries, only twelve of the 140 developing countries under the World Bank classification can be said to possess significant innovation capacity. Under the stricter thresholds of the average of upper middle-income countries, only six can be considered as genuine innovators. There is significant overlap between the countries on this list and the ones identified by Basheer and Primi.[124] Combining the two, the list of proto-innovation countries includes: Argentina, Belarus, Brazil, Chile, China, India, Indonesia, Iran, Kazakhstan, Malaysia, Mexico, Romania, Russia, South Africa, Turkey, and Ukraine. Taiwan is excluded because the World Bank no longer classifies Taiwan as a developing country.[125] To the extent these countries possess varying technological capacity in different industries, an industry-specific approach to the patent-competition interface may be required.

There are reasons to suspect that even this restrictive list may have overstated the strength of innovation capacity in developing countries. A patentee is likely to obtain protection from multiple jurisdictions for a frontier innovation. Innovations for which the patentee only obtains domestic protection is unlikely to

[123] Note that the number of resident patent grants in 2017 is not available for Indonesia.
[124] These include Russia, Taiwan, China, India, Brazil, South Africa, Ukraine, Malaysia, Belarus, Argentina, Mexico, Turkey, Chile, and Indonesia.
[125] World Bank, 'World Bank Country and Lending Groups – World Bank Data Help Desk' <https://datahelpdesk.worldbank.org/knowledgebase/articles/906519-world-bank-country-and-lending-groups> accessed 6 April 2019.

represent genuine improvement over existing technology (or perhaps one which only has commercial value in the domestic market for one reason or another). They are likely to be minor improvements over existing technologies. If it is true that patentees are more likely to apply for multi-jurisdictional protection for a frontier innovation, then the number of resident patent grants in developing countries may have overstated the amount of frontier innovation emanating from developing countries. China is beyond a doubt the most innovative developing country. Even for China, out of the 1,306,019 patent applications filed by Chinese innovators worldwide, only 60,310 were filed overseas.[126] This suggests a ratio of over 20 to 1. If this ratio is at all indicative of the situation in other developing countries, the amount of frontier innovation originating from developing countries is indeed very small. This may suggest perhaps that the more restrictive list compiled with the thresholds from the upper-middle income countries may be more indicative of genuine innovation capacity in developing countries. The proto-innovation countries thus may only include India, Iran, Russian Federation, Turkey, Ukraine and China.

The patent-competition interface will need to be handled with utmost care for these six developing countries which may contain both genuine domestic innovators and domestic imitators. The interests of the innovators and the imitators are likely to conflict at least in some instances as far as the patent-competition rules are concerned, the most obvious of which is the unilateral refusal to license intellectual property as a competition law violation. While the innovators would loathe compulsory licensing as it undermines the right to exclude bestowed upon them by the patent system, the imitators could benefit tremendously from it. In crafting the patent-

[126] World Intellectual Property Organization, 'Filings for Patents, Trademarks, Industrial Designs Reach New Records in 2017' (n 116).

competition rules, there needs to be a careful balancing of the interests of the domestic innovators and imitators.

(iii) Empirical Studies on the Impact of Increased Patent Protection on Innovation

Aside from this small number of proto-innovation countries or TPDCs, as Basheer and Primi call them, patentee reward is unlikely to spur innovation in developing countries. Carlos Correa has argued that

> The impact of strengthened IPRs on domestic innovation in developing countries will depend strongly on the available scientific and technological capabilities. With the exception of a few developing countries which have been able to build up a reasonable R&D infrastructure…, most developing countries are unlikely to substantially improve their innovative performance just on the basis of an expanded and stronger IPRs regime.[127]

Economic studies, which will be discussed below, have repeatedly shown that when a developing country raises patent protection, which presumably raises patentee reward, the main impact is to increase patenting by foreign innovators. The impact on the domestic innovators has been shown to be negligible, if not negative in some instances. Entry of foreign innovators into the domestic market crowds out domestic potential innovators and causes their innovative activity to drop. These studies have also shown that there is a threshold in terms of per capita income below which increased patent protection does not enhance innovation incentives. To the extent that per capita income serves as a proxy for innovation capacity, this corroborates the earlier point that patentee reward will only create its desired effects when there are domestic innovators to take advantage of the innovation incentives.

Josh Lerner has undertaken a fairly comprehensive study of 177 significant changes in patent protection, both changes that increase and decrease

[127] Carlos Correa, *Intellectual Property Rights, the WTO and Developing Countries: The TRIPS Agreement and Policy Options* (Third, Zed Books-Third World Network 2000) 38.

protection, in sixty countries from 1852 to 1998. The changes he studies include extensions of patent duration and expansion of patentable subject matter. The objective of his study is to determine the impact of these changes in patent protection on the amount of innovative activity, as reflected by patent applications by both domestic and foreign innovators in their home jurisdiction and by domestic innovators in the United Kingdom, which serves as a control. United Kingdom is chosen because of the relative constancy of its patent policy.[128] The event window is chosen to be five years before and after the change in the law.[129] The application data are normalized by the global patenting trends at the time of reform so that changes in patent applications are the result of the changes in the law and not of longer term trends.[130] Prior to the adjustment, Lerner finds that the number of domestic patent applications increases for both domestic and foreign innovators. There does not seem to be any change in the number of applications in the UK.[131] What is striking is that after adjustments, he finds that the number of foreign applications rises dramatically, while the number of domestic and British filings by domestic innovators drops.[132] Keith Maskus sums up Lerner's finding as follows:

> in most cases national patent reforms benefited international inventors, far more than domestic inventors, at least in the short term. Indeed, applications by domestic firms seemed to be crowded out, perhaps due to greater commercial competition from abroad.[133]

Patricia Higino Schneider studies the relationship between the level of patent protection, as encapsulated in this index often known as the Ginarte-Park Index

[128] Josh Lerner, 'Patent Protection and Innovation Over 150 Years' (National Bureau of Economic Research 2002) Working Paper 8977 13 <http://www.nber.org/papers/w8977> accessed 6 April 2019.
[129] ibid 15.
[130] ibid 17–18.
[131] ibid 17.
[132] ibid 19–20.
[133] Keith Maskus, *Private Rights and Public Problems: The Global Economics of Intellectual Property in the 21st Century* (Peterson Institute for International Economics 2012) 47.

compiled by Juan Carlos Ginarte and Walter Park, and innovation rate.[134] Her sample group includes nineteen developed and twenty-eight developing countries.[135] While she finds a moderately positive relationship between patent protection and innovation rate, as measured by the number of patent applications filed by residents of a particular country with U.S. Patent and Trademark Office, the results diverge dramatically after the sample group is split into developed and developing countries.[136] While the relationship becomes strongly positive in developed countries, the relationship turns negative for developing countries.[137]

One of the potential flaws in these studies is reverse causality. These studies are meant to determine whether enhanced patent protection leads to greater propensity to patent. But it is possible that the causation flows in the opposite direction and that a greater propensity to patent causes potential patent owners to push for heightened protection. Some authors have tried to avoid this problem by shifting their study from the macro-level to firm-level, the assumption being that R&D investments at the firm-level are unlikely to affect the level of patent protection nationwide. Brent Allred and Walter Park examine the relationship between the level of patent protection and what the authors call firm innovation investment, which is calculated by dividing R&D expenditures and sales.[138] The sample group consists of 706 firms in twenty-nine countries.[139] The Ginarte-Park Index is again used to measure the level of patent protection and changes in the level of protection.[140] Allred and Park find that 'even after

[134] Patricia Higino Schneider, 'International Trade, Economic Growth and Intellectual Property Rights: A Panel Data Study of Developed and Developing Countries' (2005) 78 Journal of Development Economics 529.
[135] ibid 534.
[136] ibid 536, 538.
[137] ibid 540–41.
[138] Brent Allred and Walter Park, 'The Influence of Patent Protection on Firm Innovation Investment in Manufacturing Industries' (2007) 13 Journal of International Management 91, 97.
[139] ibid.
[140] ibid.

controlling for firm size, industry structure, and other national factors, a country's patent rights and changes in patent rights are positively related to domestic firm innovation investment.'[141] Importantly, the authors test for reverse causality and find that it is absent in the relationship between levels of patent protection and changes in the level of protection on the one hand and firm innovation investment on the other hand.[142] Allred and Park's results replicate the developed and developing country divide found in Lerner's study. It transpires that the positive relationship only holds true for developed countries. They find that the positive relationship remains significant for countries with per capita GDP that exceeded USD10,000 in 1995.[143] The relationship remains positive but becomes only marginally significant for firms located in developing countries.[144] This is consistent with the results from previous studies that patent protection only spurs innovation in countries with meaningful technological capacity.

Allred and Park conduct another study that attempts to determine the relationship between the level of patent protection as measured by the Ginarte-Park Index on the one hand and patent filings by domestic and foreign innovators and firm-level R&D expenditures on the other hand.[145] The patent filing data cover 100 countries from 1965 to 2000.[146] R&D expenditure data cover a sample of 2,446 firms from thirty-five countries.[147] Allred and Park find a U-shape relationship between the level of patent protection and domestic patent filings in the overall sample.[148] Once the sample is

[141] ibid 101.
[142] ibid 102.
[143] ibid 103.
[144] ibid.
[145] Brent B Allred and Walter G Park, 'Patent Rights and Innovative Activity: Evidence from National and Firm-Level Data' (2007) 38 Journal of International Business Studies 878.
[146] ibid 885.
[147] ibid.
[148] ibid 889.

segregated into developed and developing countries, a generally positive relationship emerges between the level of patent protection and domestic patent filings in developed countries, and a significantly negative relationship for developing countries.[149] This causes the authors to conclude that 'that the effects of patent reform depend on the stage of development. Patent rights have a positive effect on domestic patenting after a critical level of protection has been reached.'[150] Contrary to the results of Lerner's study, however, Allred and Park do not find increased patent protection to lead to a rise in patent filings by foreign innovators.[151]

As for R&D expenditures, Allred and Park find that the level of patent protection has a U-shaped relationship with firm-level R&D in developed countries and 'no significant linear or nonlinear effect' on firm-level R&D in developing countries.[152] This result is doubly significant because patenting data may not always reflect the underlying innovative effort as not every innovation can be patented under domestic patent law and firms may choose to patent or not patent an innovation for a variety of reasons. This is especially the case in developing countries, where the level of innovation capacity may not reach a level that allows firms to produce patentable innovations. Instead, most innovations in developing countries may only warrant protection as utility models. For instance, China, Russia, Ukraine, Turkey, Brazil and Thailand are among the top ten countries with the highest number of utility model applications.[153] Developing countries together account for almost half of the top twenty countries with the highest number of utility model applications.[154] Domestic R&D

[149] ibid.
[150] ibid.
[151] ibid 892.
[152] ibid 893–94.
[153] World Intellectual Property Organization, *World Intellectual Property Indicators 2018* (n 118) 70.
[154] ibid.

expenditures, however, are a direct indication of the amount of innovative effort made by domestic firms. The two studies by Allred and Park together suggest that patent protection does not create the expected incentive effect on domestic innovative effort in developing countries.

Another study by Lee Branstetter and co-authors contradicts Allred and Park's finding and corroborates Lerner's conclusion that increased patent protection leads to a higher level of patenting by foreign innovators. Their study examines how patent reform events that raise patent protection influence the amount of technology transfer and resident and non-resident patenting in sixteen of mostly developing countries (Japan was the only exception).[155] Their study period spans almost two decades from 1982 to 1999 and the reform events hail from 1986 and 1997.[156] They find that technology transfer from developed country firms to developing countries clearly accelerate following the reform events.[157] They also find that the average number of patent filings by residents increased by 29% from 26,239 in 1994 to 33,896 in 1999, and that the average number of non-resident patent filings increased by almost 200% from 13,953 in 1994 to 41,482 in 1999.[158] Further regression analysis confirms that the reform events had no impact on resident patent filings but that at least 52% of the increase in non-resident filings can be attributed to the reform events.[159] The finding is clear that increased patent protection has a positive and significant impact on non-resident patent filings in developing countries.[160]

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[155] Lee Branstetter, Raymond Fisman and C Fritz Foley, 'Do Stronger Intellectual Property Rights Increase International Technology Transfer? Empirical Evidence from U. S. Firm-Level Panel Data' (2006) 121 Quarterly Journal of Economics 321, 333.
[156] ibid 332, 334.
[157] ibid 334–339.
[158] ibid 332.
[159] ibid 342.
[160] ibid.

Findings of a negative or negligible impact on domestic patenting is not confined to developing countries. Mariko Sakakibara and Lee Branstetter have found the same result even in Japan, one of the most innovative countries in the world.[161] They study the impact of the 1988 reform to Japanese patent law on R&D expenditures and innovative output. The reform in particular consists of two components: (1) switching from allowing only one independent, single claim for each invention to permitting multiple, dependent claims, as is the case under U.S. patent law; and (2) providing restoration of patent term of up to five years for time spent on obtaining drug approvals, including safety and efficacy tests.[162] These amount to fairly significant expansion of the scope of patent rights and should substantially raise patentee reward. In particular, the expansion of patent term for the pharmaceutical industry should lead to an increase in innovative activity, given the reliance of the industry on patent protection.

They conduct regression analysis to determine the impact of these reforms on the real R&D expenditure by 307 publicly traded Japanese manufacturing firms and find that the reforms had no impact on firm R&D spending.[163] They find that Japanese firms began to increase R&D spending in the early 1980s, but had cut back by the time of the reform.[164] There was in fact a relative decline in R&D spending in 1988 and 1989.[165] They conclude that '[o]ne sees in this picture no evidence of an increase in R&D spending that could plausibly be attributed to patent reform.'[166] They use the number of U.S. patent grants as another proxy of innovative activity because Japanese

[161] Mariko Sakakibara and Lee Branstetter, 'Do Stronger Patents Induce More Innovation? Evidence from the 1988 Japanese Patent Law Reforms' (2001) 32 The RAND Journal of Economics 77.
[162] ibid 79.
[163] ibid 88.
[164] ibid.
[165] ibid.
[166] ibid.

patent grants do not provide a reliable measure. While the number of Japanese patent applications decreases, the number of claims in each patent increases.[167] Similar to R&D expenditure, Sakakibara and Branstetter find that U.S. patenting began to pick up in the early 1980s and there is no evidence of a reform-induced increase in patenting around the time of the reform. They conclude that '[t]here is no evidence from this of a patent-reform-induced increase in innovative output.'[168]

> Summarizing the results of these empirical studies, Maskus asserts that:
>
> > the medium-term effect of patent revisions is to attract more patent applications from abroad as multinational firms seek to exploit their inventions in more locations. Even in the average lower-income to middle-income countries it seems to take some time for any domestic responsiveness to emerge. … legal patent reforms have little, if any, impacts on domestic innovation in poor countries. This lack of response is likely due to a mixture of factors, ranging from weak business and investment environments to poor governance to a virtual absence of IPRs enforcement.[169]

The fundamental premise of the patent system is that short-term static efficiency loss will be more than made up for by long-term dynamic efficiency gains. Once it is established that increased patent protection does not generate greater innovation incentives and produce higher innovative output, it should come as no surprise that the total welfare of these countries should suffer. This has been corroborated by a number of economic studies for a range of developing countries of different sizes and at different levels of development. Alan Dearborn finds that extending patent protection to a country with little innovation capacity will result in a welfare loss to that country that outweighs the welfare gain to the innovation country.[170] In fact, he argues that

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[167] ibid 93.
[168] ibid 95.
[169] Maskus, *Private Rights and Public Problems: The Global Economics of Intellectual Property in the 21st Century* (n 133) 63–64.
[170] Alan V Deardorff, 'Welfare Effects of Global Patent Protection' (1992) 59 Economica 35, 46–47.

extending patent protection across the world will lead to global welfare loss.[171] Arvind Subramanian has similarly found that the welfare of individual countries will be worse off as a result of extension of patent protection because static efficiency loss is not compensated for by dynamic efficiency gains.[172] Just as there is a minimum threshold of economic development and technological capacity above which patent protection will induce meaningful innovative activity, it has been suggested that a similar threshold exists for net welfare gains for raising IPR protection.[173]

The pharmaceuticals and chemicals industries particularly rely on patents as an appropriation mechanism. Therefore, one would expect the introduction of patent protection to have especially pronounced effect on the amount of innovative activity in these two industries, which also exhibit a very strong tendency to patent their innovations given their susceptibility to imitation and reverse engineering. Increased patent protection should have a strong positive correlation with patenting in these two industries.

Yi Qian sets out to verify this hypothesis in a study of twenty-six countries that introduced patent protection for pharmaceuticals between 1978 and 2002.[174] She uses citation-weighted U.S. patent awards as the measure of innovation output.[175] The U.S. is chosen presumably because the high patenting costs in the U.S. mean that only valuable innovations will be patented there. Somewhat surprisingly, Qian finds that the introduction of patent protection for pharmaceuticals had no impact on the number of

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[171] ibid 48.
[172] Arvind Subramanian, 'Trade-Related Intellectual Property Rights and Asian Developing Countries: An Analytical View' in Arvind Panagariya, Muhammad Ghulam Quibria and Narhari Rao (eds), *The Global Trading System and Developing Asia* (Cambridge University Press 1997) 328.
[173] Correa (n 127) 26.
[174] Yi Qian, 'Do National Patent Laws Stimulate Domestic Innovation in a Global Patenting Environment? A Cross-Country Analysis of Pharmaceutical Patent Protection, 1978-2002' (2007) 89 The Review of Economics and Statistics 436.
[175] ibid 444.

U.S. patents awarded to a particular country, suggesting that increased patent protection had no impact on innovative output.[176] She does, however, find that the introduction of patent protection increased the number of citation-weighted U.S. patents subject to the country's level of development, education attainment, and degree of economic freedom.[177] Qian concludes that

> patents are important for innovation conditional on a country's development level. A more developed country with pharmaceutical patents is likely to have more innovations compared to a similarly developed country without patents, or a less developed country with patents'[178]

She also finds that in countries with higher educational attainment and greater economic freedom, the extension of patent protection to pharmaceuticals exerts a positive and significant impact on U.S. patent awards.[179] Educational attainment is an indirect indicator of the human aspect of innovation capacity. And wealthier countries generally spend more on R&D. Her results together affirm the conclusion that increased patent protection will only lead to greater innovation in countries with the requisite innovation capacity.

In addition to cross-country studies, there have been a number of studies of the effects of the introduction of patent protection for pharmaceutical products on innovative output and overall welfare in individual countries. These are possible because a number of developed and developing countries did not introduce patent protection for pharmaceuticals until the late 1970s in the case of Italy and until after the adoptions of TRIPS in the case of some developing countries. Economists are able to study the impact of the introduction of patent protection for pharmaceuticals in these

[176] ibid 445.
[177] ibid 446–447.
[178] ibid 446.
[179] ibid 447.

countries. F.M. Scherer and Sandy Weisburst study the impact of the introduction of patent protection for pharmaceuticals in Italy.[180] Italy did not introduce patent protection for pharmaceuticals until the Italian Supreme Court declared in March 1978 that it was unconstitutional for a 1939 legislation to exclude pharmaceuticals from patentable subject matter.[181] Scherer and Weisburst find that (1) the patent reforms in Italy 'had little or no impact on the trend of inflation-adjusted R&D expenditures'[182], (2) there was no increase in the new pharmaceutical products introduced by Italian firms[183], and (3) Italy suffered from a serious deterioration in the balance of trade for drugs as imports soared due to the surge in the import of patented pharmaceutical products from other European countries.[184] There was much consolidation in the Italian pharmaceutical industry following the introduction of patent protection, with much of it in the form of takeover of Italian firms by foreign pharmaceutical companies.[185] Italy's prominent generic industry began to decline over time and generic production slowly shifted to India, which has since taken over as the leading generic manufacturer in the world.

The same sorry state of affairs was predicted for developing countries that introduced pharmaceutical patents following the TRIPS Agreement, which has largely been borne out by subsequent events. Correa concludes based on a number of economic studies of Lebanon, South Korea, and Argentina that pharmaceutical R&D in those countries were not expected to increase after the introduction of patent

[180] FM Scherer and Sandy Weisburst, 'Econoimic Effects of Strengthening Pharmaceutical Patent Protection in Italy' (1995) 26 International Review of Industrial Property and Copyright 1009.
[181] ibid 1009.
[182] ibid 1020.
[183] ibid 1021–22.
[184] ibid 1022.
[185] Maskus, *Intellectual Property Rights in the Global Economy* (n 104) 165.

protection.[186] This is because 'the development of new chemical entities is outside the reach of local companies in any developing country, since there are no firms in such countries big enough (in terms of total sales) to finance the high costs of pharmaceutical R&D.'[187] Maskus shares a similar view, asserting that

> Few, if any, firms in developing countries are likely to find it attractive to engage in fundamental R&D in competition with the major international research-based pharmaceutical companies, which have expertise in research and marketing and benefit from significant economies of scale.[188]

The lack of anticipated dynamic efficiency gains on the part of developing countries following the introduction of pharmaceutical patents means that these countries were expected to suffer overall welfare loss. Scherer concludes that the number of new drugs introduced must increase threefolds to compensate developing country consumers for the welfare loss they sustain from the increased prices following the introduction of pharmaceutical patents.[189] He predicts, however, that the actual increase would only be 15.5%.[190]

The foregoing discussion suggests that developing countries should be circumspect about claims of dynamic efficiency gains as a result of elevated patent protection. Numerous economic studies have suggested that raising patent protection in developing countries will not attract greater domestic innovation and will tend to benefit mostly foreign innovators. This means that dynamic efficiency considerations deserve less weight in developing countries. In a developing country bereft of innovation capacity, innovation incentives generated by the patent system do not tend to attract domestic innovation. Where there are no potential innovators in the country,

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[186] ibid.
[187] Correa (n 127) 43.
[188] Maskus, *Intellectual Property Rights in the Global Economy* (n 104) 220.
[189] Scherer, 'A Note on Global Welfare in Pharmaceutical Patenting' (n 95) 1129.
[190] ibid 1229.

innovation incentives will go to waste and will not spur innovation. This would be the case for countries that merely possess a production capacity. The focus of the patent-competition interface in these countries should be on minimizing consumer welfare loss. For the imitation or technology absorption countries, technological progress comes in the form of technology absorption and not origination. Dynamic efficiency considerations should not be concerned with innovation incentives, but with incentives for technology transfer. The patent-competition interface becomes a balancing of the interests of consumers and technology adopters. Lastly, for countries that possess the capacity to innovate in at least certain industries, which have been called the proto-innovation countries, there are three classes of conflicting interests involved, consumers, technology adopters, and domestic innovators. While the innovators will benefit from the innovation incentives provided by the patent system, the technology adopters would appreciate patent-competition rules that facilitate licensing and other forms of technology transfer. The patent-competition interface takes on the highest degree of complexity for these countries.

5. External Impact of Innovation Incentives Generated by Developing Country Patent Systems

The impact of the innovation incentives generated by the domestic patent system need not be confined within the national borders. A foreign innovator can patent her innovation in the host country and sell the product there. The product may be imported from a foreign location. The patented technology may be transferred to a local affiliate through foreign direct investment. Or it may be licensed to a local manufacturer. Whatever the means of transfer, patent protection plays a role. The existence of patent protection allows the foreign innovator to reap her financial reward.

The fact that a foreign innovator can tap into multiple markets means that she will no longer only consider the innovation incentives provided by her domestic patent system when considering her R&D investment decisions. She will pay attention to a number of patent systems. Innovation incentives thus spill over national boundaries and can have substantial externalities. The question is whether a developing country competition authority should consider these externalities when calibrating its approach to the patent-competition interface.

The answer to this question would depend on a number of factors. The first one is the likelihood that the innovative incentives created by the domestic patent system would be considered by foreign innovators. Economists have provided some guidance on this. The size of domestic market as reflected by population size or other measures has been found to be a key factor in the responsiveness of innovators to the innovation incentives generated by a patent system.[191] Although most of these studies focus on the responsiveness of domestic innovators, the same logic should apply to foreign innovators. A foreign innovator would not consider the profitability of every market across the globe when deciding whether to invest in a technology. She will focus on the lucrative markets, which should include the developed countries such as the U.S., Europe, and Japan and developing countries with a substantial domestic market such as China, India, and Brazil. Multinational firms are unlikely to attach much weight to the domestic market of small developing countries. The fact that most innovations are only patented in a limited number of jurisdictions lends support to this proposition.[192] Belize or Burundi, for example, are unlikely to feature in her decision-making process. Even when aggregated the profit potential of these countries' markets is unlikely to amount

[191] Elhanan Helpman, *The Mystery of Economic Growth* (Harvard University Press 2004) 50.
[192] Jeffery Atik and Hans Lidgard, 'Embracing Price Discrimination: TRIPS and the Suppression of Parallel Trade in Pharmaceuticals' (2006) 27 University of Pennsylvania Journal of International Law 1043, 1058.

to more than a few percent of the global profit of a multinational corporation.[193] An innovation that would have been abandoned after a slight loss of profit is unlikely to be groundbreaking and a huge boon to global welfare.[194]

The profit potential of a large developing country such as the BRICS countries cannot be dismissed so casually. Practically every multinational firm would consider the profit potential of a market like China's. While one may assume that larger patentee reward from a large developing country market would translate into greater innovation incentives for developed country firms, theoretical models by some development economists have shown the contrary. These models repeatedly reach the same conclusion that raising intellectual property protection, which has the same effect as relaxing competition law restrictions on patent exploitation practices, would retard innovation in developed economies. These models make different assumptions about the mode of technology transfer. Assuming imitation to be the only mode of technology transfer, Carmelo Parello constructs a model based on the international product cycle to examine the impact of increased patent protection in developing countries on the rate of innovation in developed countries and the rate of imitation in developing countries.[195] He concludes that increased patent protection reduces the rate of both in the absence of foreign direct investment ('FDI').[196] Edwin Lai incorporates FDI as an alternative means of technology transfer and examines the impact of increased patent protection on both developed and developing countries.[197] Lai reaches the same

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[193] Jean O Lanjouw, 'A Patent Policy Proposal for Global Diseases' (2001) 7 <https://www.brookings.edu/research/a-patent-policy-proposal-for-global-diseases-2/> accessed 8 April 2019.
[194] FM Scherer, *Industrial Market Structure and Economic Performance* (First, Houghton Mifflin 1980) 448.
[195] Carmelo Pierpaolo Parello, 'A North-South Model of Intellectual Property Rights Protection and Skill Accumulation' (2008) 85 Journal of Development Economics 253.
[196] ibid 135.
[197] Edwin Lai, 'International Intellectual Property Rights Protection and the Rate of Product Innovation' (1998) 55 Journal of Development Economics 133.

conclusion as Parello's when imitation is the only means of technology transfer, but finds that both the rate of innovation in developed countries and the rate of imitation in developing countries receive a boost when FDI is the mode of transfer.[198] Elhanan Helpman constructs a slightly more complicated model and reaches the same result as Parello's and Lai's under the assumptions of no FDI and low imitation rate.[199] Maskus speculates that innovation in developed countries slows down because innovators expect each innovation to be more profitable as a result of reduced imitation, thereby losing the incentive to engage in R&D.[200]

More recent research by Lee Branstetter and Kamal Saggi produces contradictory results. They find that an increase in patent protection in the global South reduces imitation in these countries, boosts innovation in the global North, and increases the inflow of FDI from developed countries to developing countries, resulting in a substantial relocation of production to the latter.[201] This difference in result can be explained by the perhaps more realistic assumption in Branstetter and Saggi's model that both imitation and FDI are endogenously determined.[202] In the real world, the local imitation rate will obviously be influenced by the level of patent protection prevailing in the country. Branstetter and Saggi's results notwithstanding, the preponderance of the literature firmly takes the view that increased patent protection in developing countries retards innovation in developed countries. This provides a persuasive reason for the competition authority of a large developing country to discount the incentive effect of

[198] ibid 265–66.
[199] Elhanan Helpman, 'Innovation, Imitation, and Intellectual Property Rights' (1993) 61 Econometrica 1247, 1275.
[200] Maskus, *Intellectual Property Rights in the Global Economy* (n 104) 139.
[201] Lee Branstetter and Kamal Saggi, 'Intellectual Property Rights, Foreign Direct Investment and Industrial Development' (2011) 121 The Economic Journal 1161, 1163.
[202] ibid 1162.

its domestic patent system for foreign innovators, at least where there is negligible technology transfer through FDI.

Even if one were inclined to question the conclusions of these theoretical models, there remains the question of how much weight a developing country competition authority would want to give to the dynamic efficiency gains of foreign innovators when these gains result from a welfare transfer from down-trodden domestic consumers to wealthy multinational firms. The fact of welfare transfer is the essential consequence of patent exclusivity. It is not up to competition law to revisit this policy trade-off. However, when competition law is asked to delineate the scope of patent rights which may influence the magnitude of this trade-off, a competition authority should be allowed to take into account the fact that the extra innovation incentives that may flow from permitting a patent exploitation practice will cause additional welfare loss on the part of its consumers. The justification is even stronger if the product concerned is a basic necessity consumed by a broad spectrum of consumers, some of whom can ill-afford higher prices.

D. Conclusion

It is didactic to tie back the foregoing discussion about patent protection to the patent-competition rules. As mentioned in the beginning of this section, patent rules and the patent-competition rules interact with innovation incentives in the same way by altering the size of the patentee reward. The causal link is that both sets of rules adjust the scope of patent rights, encompassing both the scope of protection and the freedom the patentee is given to exploit her technology, which generates a financial reward for the patentee, which in turn attracts potential innovators to innovate. In a nutshell, the link goes from legal rules to scope of patent rights to patentee reward to

innovation incentives to innovation. If the causal link is broken anywhere along the way, one can no longer be sure that adjusting the legal rules will produce the desired effect on innovation.

The foregoing discussion highlights a number of important gaps along this causal link that cast doubt on the weight that should be accorded to patent policy in the patent-competition interface in developing countries. The existence of multiple appropriation mechanisms and the varying degrees of reliance on patents in different industries mean that the link between patentee reward and innovation incentives is more tenuous than what the conventional wisdom assumes. Potential innovators derive motivations to innovate from many other sources than patents. Increasing patentee reward is not the only way to generate innovation incentives. The converse is also true that reducing patentee reward does not necessarily lower innovation incentives. The fact that the current patent system exhibits a tendency to overcompensate innovators means that it is possible to reduce patentee reward without undermining innovation incentives.

The perhaps obvious observation that innovative incentives will only translate into innovation when accompanied by the requisite technological capacity implies another break in the causal link between innovation incentives and innovation. The two cannot be directly equated with each other. The extent to which a developing country can take advantage of the innovation incentives generated by the domestic patent system is dependent on its technological capacity. In the production countries, innovation incentives will amount to nothing and the sacrifice by consumers to bear the supra-competitive pricing will be in vain. In the technology absorption countries, dynamic efficiency should not target innovation but technology transfer. Innovation policy should focus on facilitating technology transfer from foreign technology owners

rather than on attracting domestic innovation. Lastly, the proto-innovation countries, there needs to be a delicate balance of the interests of domestic innovators, imitators, and consumers. These countries require the most nuanced approach to the patent-competition interface.

Lastly, it was pointed out that innovation incentives need not only generate domestic innovation, they can also benefit foreign innovators. From the perspective of developing countries, however, sacrificing the welfare of downtrodden domestic consumers to subsidize innovation by multinational firms in advanced economies seems ill-advised at best. Consumer welfare deserves a greater weight in the patent-competition interface when domestic dynamic efficiency benefits are in doubt.

III. TECHNOLOGY TRANSFERS IN DEVELOPING COUNTRIES

A. Introduction

For developing countries that are devoid of innovation capacity, which include a vast majority of them, technological progress can only be achieved and measured in terms of technological absorption and adaptation. If these countries cannot originate cutting-edge technology, the only way for them to acquire it is through learning from others. Only a very small number of countries originate most of the technology in this world.[203] An earlier study found that foreign sources of technology account for over 90% of productivity growth in all but five countries in the world.[204] These five countries are the U.S., Japan, Germany, United Kingdom, and France, which served as the main research centers of the world.[205] Innovations from the U.S., Japan,

[203] Wolfgang Keller, 'International Technology Diffusion' (2004) 42 Journal of Economic Literature 752, 752.
[204] ibid.
[205] Jonathan Eaton and Samuel Kortum, 'Trade in Ideas Patenting and Productivity in the OECD' (1996) 40 Journal of International Economics 251, 252.

and Germany alone drove more than half of the growth in OECD ('Organization of Economic Cooperation and Development') countries.[206] One would expect the percentage to be even higher for developing countries. The balance of power has since shifted, with China and South Korea emerging as major research centers as reflected in patent grants to domestic innovators. According to the most recent report by the World Intellectual Property Organization, the U.S., Japan, South Korea, Germany, and China together accounted for 85% of patent grants to domestic innovators worldwide.[207] Although the cast of protagonists has changed, it remains the case that a handful of countries originate the vast majority of technology in the world. To the extent that patent grants represent novel productive technology, foreign sources of technology likely remain the predominant driver of productivity growth in most countries.

Technology absorption requires technology transfer from technology-originating countries, most of which are developed countries. There are different forms of technology transfer, some of which are voluntary or intentional in nature and some of which involuntary or unintentional. Voluntary or intentional technology transfer includes international trade, foreign direct investment ('FDI'), and licensing.[208] International trade refers to the importation of technological goods into a developing country. FDI entails a foreign firm investing to set up operational capacity through an affiliate in a host country. Technology is transferred intra-firm as part of the FDI process. Licensing takes place when a foreign technology owner licenses its technology to a local firm for royalty payments or a license fee. It requires the foreign firm to part with control of the technology.

[206] ibid.
[207] World Intellectual Property Organization, 'World Intellectual Property Indicators 2018' (2018) 78–81.
[208] Maskus, *Intellectual Property Rights in the Global Economy* (n 104) 136–37.

Involuntary or unintentional technology transfer refers to imitation of the technology. Imitation has been described as the process 'through which a rival firm invests resources to understand the technological or design secrets of another firm's formula or products.'[209] Imitation can be accomplished through outright copying from simple product inspection or reverse engineering, both of which could be curtailed by patent protection.[210] Which mode of imitation is necessary depends on the replicability of the technology. The technology in some industries such as pharmaceuticals and chemicals can be deciphered and replicated fairly easily. In some other industries such as complex machinery and electronics, the technology is deeply embedded in the product and requires sophisticated reverse engineering to be uncovered, if at all. Both methods of replication will be referred to as imitation as both are unauthorized forms of technology transfer. Either mode of imitation requires access to the embodiment of the technology. Importation of the technological good would thus be a prerequisite for imitation.[211] In assessing the impact of increased patent protection on involuntary technology transfer, one must also consider how such an increase affects trade in technological goods.

B. Technological Capacity and Technology Transfers

The extent to which technology transfer is a relevant consideration for a developing country depends on its technological capacity to absorb and adapt imported technology. For the production countries, technology transfer is largely irrelevant if not counter-productive. Unless and until these countries have acquired the capacity to

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[209] Maskus, *Private Rights and Public Problems: The Global Economics of Intellectual Property in the 21st Century* (n 133) 69.
[210] Maskus, *Intellectual Property Rights in the Global Economy* (n 104) 136–37.
[211] Maskus, *Private Rights and Public Problems: The Global Economics of Intellectual Property in the 21st Century* (n 133) 66.

absorb imported technology, it matters little whether the pertinent legal rules are conducive to technology transfer. The institutional environment will make little difference if there is no capacity to learn and acquire the imported technology. As the Commission on Intellectual Property Rights observes:

> The ability of countries to absorb knowledge from elsewhere and then make use and adapt it for their own purposes is also of crucial importance. This is a characteristic that depends on the development of local capacity through education, through R&D, and the development of appropriate institutions without which even technology transfer on the most advantageous terms is unlikely to succeed.[212]

Technology transfer will be of paramount importance to the technology absorption countries, which possess the capacity to absorb foreign technology but not the capacity to originate technology. The fact that there are only a handful of major research centers in the world means that imitation countries account for a vast majority of the countries in the world. Technological progress in these countries is mainly achieved through technology transfer from developed countries and not through domestic innovation. Therefore, contrary to the conventional sense of dynamic efficiency which focuses on incentives for domestic innovation, dynamic efficiency in these countries should be concerned with the encouragement of technology transfer from foreign firms. Whether the pertinent legal rules promote incentives to transfer technology thus matter. When balancing static efficiency against dynamic efficiency considerations under the patent-competition interface, the focus should be on how the patent-competition rules may affect the incentives of foreign technology owners to transfer their technology to developing countries. The same applies to the proto-innovation countries in those industries where the country currently lacks innovation capacity and relies on foreign technology.

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[212] Commission on Intellectual Property Rights (n 100) 24–25.

C. The More Nuanced Relationship between the Patent-Competition Rules and Technology Transfers

1. Comparison between Innovation and Technology Transfer

The paramount policy concern is how the patent-competition rules shape the incentives to transfer technology. There is a key difference, however, between innovation incentives on the one hand and incentives to transfer technology on the other hand. With innovation incentives, there is only one outcome which is of concern: the amount of innovation. The question is whether changes in legal rules boost or undermine innovation. R&D or innovation is the investment decision of interest. The situation with technology transfer is different. A foreign firm does not decide whether to transfer technology to a developing country. The decision is whether and how to enter a foreign market. There are three major methods of market entry: international trade of technological goods, FDI, and licensing. When a foreign firm decides to enter a developing country, it can import the good from an overseas manufacturing facility. It can build its own production facility in the host country, either through a subsidiary or by entering into a joint venture with a local partner. It can also license its technology to a local firm to supply the local market. Each of these methods brings about different extents of technology transfer. The existence of the various means of market entry and technology transfer means that it is necessary to consider the impact of the patent-competition rules on the incentives to undertake them separately.

Another important difference between innovation incentives and the incentives for technology transfer is the range of determinants for them. Profitability is what ultimately guides a profit-maximizing firm's decision regarding any investment option, be it to invest in R&D or to enter a market. The firm compares the costs and the

benefits of the contemplated course of action. The difference between R&D investments and market entry is that while the profitability of an innovation is largely determined by patentee reward, at least for industries that rely on patents as an appropriation mechanism (in any case, the profitability of other appropriation mechanisms is not directly affected by competition law and is not a focus of our inquiry) , the profitability of market entry is shaped by a wide range of economic factors beyond the legal rules. The patent system and the patent-competition rules hence do not play a determinative role in the decision-making process regarding market entry and technology transfer. The only exception is perhaps the robustness and effective enforcement of patent protection. One can imagine that if export to the local market exposes the technology owner to a high risk of local imitation, she may abstain from that market altogether. Imitation will inflict a heavy cost of market entry on the technology owner.

(i) Economic Studies on Patent Protection and Technology Transfer

The relevant research question is whether changes in the patent-competition rules alter incentives to transfer technology. As in the case of innovation incentives, economic studies on technology transfer focus on patent protection and not the patent-competition rules. These studies attempt to determine whether increased patent protection generates greater incentives for different modes of technology transfer. Therefore, there is the important question of the extent to which the outcome of studies about patent protection are applicable in the context of the patent-competition rules. Under the somewhat simplifying assumption that the sole determinant of innovation incentives is patentee reward, the question becomes how changes in legal rules, including patent law and the patent-competition rules, alter patentee reward. The fact that changes in patent law and changes in the patent-

competition rules both adjust the scope of patent rights in similar ways, which ultimately, together with patent term, determine the size of the patentee reward means that there is considerable parallel in the causal relationship between patent protection and innovation incentives and the causal relationship between the patent-competition rules and innovation incentives. Raising the level of patent protection has the same effect on patentee reward as relaxing competition regulation of patent-exploitation practices. Therefore, much of the economic literature on patent protection and innovation incentives can be readily applied to the context of the patent-competition rules.

The situation is more complex with the incentives for technology transfer. The economic literature on technology transfer is more varied. Some studies examine the relationship between patent protection and one mode of technology transfer. Other studies look at how changes in the level of patent protection cause foreign firms to shift between different modes of transfer. Moreover, the implications that can be drawn from the relevant economic studies are more subtle and complex because patent protection is not the sole, or even a major, determinant of the incentives for technology transfer. Most of the economic studies discussed below have attempted to isolate the effects of these other economic factors through various statistical techniques. What these authors have mostly focused on are the macro-level factors such as population size and educational level. They have not taken into account individual market characteristics (and they probably could not have) that ultimately determine the profitability of market entry through technology transfer. It is important to bear this in mind when reviewing these studies.

The way the economic evidence is used and interpreted by economists means that it is possible to draw different implications for various patent-competition

rules from their studies. In the case of innovation incentives, the patent-competition rules can be treated as a monolith because they are all assumed to affect patentee reward in the same way: by altering the scope of patent rights. In the case of the incentives for technology transfer, however, the economists have emphasized different aspects of patent protection that may have disparate degrees of relevance for various patent-competition rules. Before further exploration of this issue, it is first important to acquire some understanding of how economists have attempted to quantify and measure patent protection.

Most of the economic studies that will be discussed below use the Ginarte-Park Index, or some modification thereof, as a quantitative indicator of patent protection. The index consists of five main components: 'extent of coverage; membership in international patenting agreements; provisions for loss of protection; enforcement mechanisms; and duration of protection.'[213] Membership in international patenting agreements is not directly related to any substantive patent rules. Extent of coverage and duration of protection relate to the scope of patent rights and should affect the profitability of market entry generally. Lengthening patent term would extend the patent owner's period of exclusivity and allow her to reap greater benefit from her technology. Extending the scope of coverage means that more technology becomes patentable. Both raise the benefits of market entry. Owners of these technologies will be able to enter foreign markets more profitably than before. Provisions for the loss of protection and enforcement mechanisms reflect the robustness and the enforceability of patent protection. This determines the patent owner's ability to protect her rights and to forestall competition from imitators in the local market.

[213] Michael Nicholson, 'The Impact of Industry Characteristics and IPR Policy on Foreign Direct Investment' (2007) 143 Review of World Economics 27, 33–34.

In the context of the relationship between patent protection and technology transfer, what economists often refer to by patent protection are not changes in the scope of patent rights, but the existence and strength of patent protection in the first place. The argument is that the conferral and strengthening of patent protection creates an effectively enforceable property right, which facilitates property transfer and forestalls imitation by local firms. The focus is on the technology owner's right to exclude, and not the scope of her other patent rights. Weakness in patent protection may expose foreign firms to risks of imitation and raise the costs of technology transfer, thereby lowering the profitability of market entry for the technology owner. Imitation will be an especially significant consideration for foreign technology owners if there is high local imitation capacity.

2. Classification of the Patent-Competition Rules According to their Relationship with Technology Transfer

The subject of this inquiry is of course not patent law, but the patent-competition rules. Therefore, these economic studies would only be of use if they could be analogized to the patent-competition rules. This would require some understanding of the relationship between the patent-competition rules and technology transfer. As far as their impact on technology transfer is concerned, the patent-competition rules can probably be classified into three categories. The first category are the usual ones that adjust the scope of patent rights. Examples include whether it is legal to tie the sale of patented product with an unpatented product and whether it is legal to implement a resale price maintenance scheme for a patented product.[214] In the case of innovation incentives, any rule that adjusts the size of patentee reward by way of the scope of

[214] A famous U.S. case involving such a tie was International Salt Co. v. United States, 332 U.S. 392 (1947).

patent rights is presumed to influence innovation incentives.[215] The situation with technology transfer is more complicated. There is a more remote and tenuous link between the patent-competition rules and incentives to transfer technology. The decision to enter a foreign market and transfer technology is to a large extent determined by market factors. Therefore, only those patent-competition rules that have a significant impact on the profitability of market entry will affect incentives for technology transfer. And only for these rules would the economic studies on patent protection and technology transfer be relevant.

The second category of rules are those that implicate the robustness of patent protection. These arguably include no challenge clauses, which prohibit a licensee from launching a validity challenge against the patent owner[216], and reverse payments, which allow a patent owner to forestall validity challenges by paying off or otherwise compensating potential challengers[217]. These rules affect a technology owner's ability to exclude an imitating rival from the market by preempting invalidity challenges. The only patent-competition rule that directly implicates the right to exclude and hence the robustness of patent protection is regulation of unilateral refusal to license intellectual property.[218] The imposition of a duty to license would directly override a patent owner's right to exclude and allow imitating rivals to enter the market.[219] To the extent that the patent-competition rules allow the technology owner to effectively exclude rivals from the market, they will help lower the costs of market

[215] A famous U.S. case involving such an RPM scheme was United States v. General Electric, 272 U.S. 476 (1926).
[216] Thomas K Cheng, 'Antitrust Treatment of No Challenge Clause' (2016) 5 New York University Journal of Intellectual Property and Entertainment Law 437, 439.
[217] Einer Elhauge and Alex Krueger, 'Solving the Patent Settlement Puzzle' (2012) 91 Texas Law Review 283, 284.
[218] Herbert J Hovenkamp, Mark D Janis and Mark A Lemley, 'Unilateral Refusals to License in the U.S.' [2005] Faculty Scholarship 13, 13.
[219] Howard A Shelanski, 'Unilateral Refusals to Deal in Intellectual and Other Property' (2009) 76 Antitrust Law Journal 369, 370.

entry by the technology owner. Economic studies that focus on the robustness of patent protection would be relevant to these patent-competition rules. When economists speak of heightened patent protection in this context, it would be equivalent to reduced likelihood that competition law will impose a duty to license intellectual property, or greater tolerance on the part of competition of no challenge clauses and reverse payments.

The third category of rules pertain specifically to licensing. Some patent-competition rules focus on vertical agreements and licensing practices in particular. These include the permissibility of grantbacks[220], the legality of territorial allocation among licensees[221], and the enforceability of a FRAND (Fair, Reasonable, And Non-Discriminatory) obligation on owners of standard-essential patents ('SEPs')[222], among others. These rules do not affect uniformly the profitability of technology transfer but skew the relative attractiveness of the three modes of technology transfer. Although none of the economic studies focus on licensing rules specifically, some of them do touch on the profitability of licensing vis-à-vis other technology transfer options. These studies tend to focus on how patent rules help to lower the costs of licensing. Even though these studies may not be directly analogous as the patent-competition rules may influence both the costs and benefits of licensing, they nonetheless shed light on how the patent-competition rules may influence the incentives to license. The impact of these licensing rules on the relative attractiveness of the three market entry options would be particularly relevant to the extent that any of these options are more beneficial to developing countries.

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[220] U.S. Department of Justice and Federal Trade Commission (n 22) 33.
[221] ibid 5–6.
[222] Tuire Anniina Väisänen, *Enforcement of FRAND Commitments under Article 102 TFEU: The Nature of FRAND Defence in Patent Litigation* (Nomos Verlagsgesellschaft mbH 2011).

3. Some General Observations about The Relationship between Patent Protection and Incentives to Transfer Technology

The relationship between patent protection and the incentive to engage in intentional technology transfer has been characterized as 'at least as complex and ambiguous as the linkages between patents and innovation.'[223] In many ways, it is more complex and ambiguous, no less because patent rules are only one of the myriad considerations for technology transfer. A number of specific observations have been made about this relationship, the first two of which are related to the type of technology transferred. First, it has been noted that patent protection is particularly relevant for the transfer of easily imitable technology.[224] This is a corollary of the fact that easily imitable technology such as those in the pharmaceutical and chemical industries rely more heavily on patents as an appropriation mechanism. Without robust patent protection, it would be difficult for pharmaceutical and chemical firms to profit from their innovations, both domestically and abroad. This point, however, is perhaps more relevant to the robustness of protection than the scope of patent rights.

Second, it has also been contended that weaker patent protection will lower the quality of the technology transferred.[225] The idea is that weaker patent protection reduces the technology owner's ability to protect a licensed technology. Technology owners will hence choose to transfer an older technology to safeguard their economic interests. This again seems to pertain more to the effectiveness of enforcement and the robustness of protection rather than the scope of patent rights. If local patent law does not allow foreign technology owners to protect their technologies effectively, they will only choose to transfer an older technology to minimize the

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[223] Maskus, *Private Rights and Public Problems: The Global Economics of Intellectual Property in the 21st Century* (n 133) 64.
[224] Correa (n 127) 31.
[225] Maskus and others (n 99) 314.

potential loss of their competitive advantages. This point ties back to the earlier discussion about imitation risks. The greater are the imitation risks, the older is the technology transferred. This means that if the patent-competition rules allow the technology owner greater leeway to forestall imitation, foreign technology owners will be inclined to transfer more up-to-date technology.

Third, it has been argued that increased patent protection has a positive impact on inward voluntary technology transfer by increasing import of technological goods and raising the quality of inward FDI and licensing.[226] This assertion has been qualified by the observation that

> these impacts generally are found only in larger and middle-income countries, where domestic imitation threats are real. There is little evidence of these effects in the poorest and smallest developing economies, where, if anything, patents are not of much relevance for [technology transfer] or domestic industrial development. Similarly, some of these positive impacts seem to be governed by important threshold effects in the levels of income and education.[227]

This corroborates the earlier observation that technology transfer and FDI are unlikely to benefit developing countries with poor technological capacity and small domestic markets. No amount of favorable patent law can overcome a country's weak technical capability and unattractiveness as an investment destination.

With respect to involuntary technology transfer through imitation, its relationship with patent protection is relatively straightforward. The more robust is patent protection, the more difficult it will be to imitate a foreign technology. Therefore, one should expect a negative relationship between patent protection and imitation. This is implied in the observation that patent protection is particularly relevant for the transfer of easily imitable technology. After all, the essence of patent rights is the right

[226] Maskus, *Private Rights and Public Problems: The Global Economics of Intellectual Property in the 21st Century* (n 133) 81.
[227] ibid.

to exclude, or at least the right to try to exclude.[228] Part and parcel of patent protection is the ability to stop others from practicing and exploiting one's technology.

D. Choosing Among the Different Modes of Technology Transfer

It is argued that increased patent protection is generally conducive to intentional technology transfer. One of the greatest anomalies as far as the relationship between patent protection and intentional technology transfer is concerned is China. Proponents of the view that IPRs are important for technology transfer must confront the case of China, which has been by far the greatest beneficiary of technology transfer over the last three decades despite its lamentable record in intellectual property protection.[229] One obvious explanation for this apparent anomaly is the fact that intellectual property protection is only one of the many considerations facing a multinational firm contemplating technology transfer.[230] When a private firm approaches this decision, its objective is not to transfer technology to the host country. Instead, the firm seeks to optimize the mode of supplying the host country market. The decision-making process for the foreign firm is a choice among the three modes of market entry: import, FDI, and licensing. The firm has usually already decided to supply the host country and is merely considering the best way to do so. The patent-competition rules have disparate impact on these three options. Import is probably the least affected by these rules as it only entails the sale and transport of a patented good to an overseas location. Licensing, as mentioned earlier, is often directly regulated by

[228] Carl Shapiro, 'Antitrust Limits to Patent Settlements' (2003) 34 RAND Journal of Economics 392, 395.
[229] Maskus, *Private Rights and Public Problems: The Global Economics of Intellectual Property in the 21st Century* (n 133) 64.
[230] European Patent Office, 'Patents, Trade and Foreign Direct Investment in the European Union' (2017) 11 <http://www.iprhelpdesk.eu/news/epo-study-patents-trade-and-foreign-direct-investment-european-union> accessed 9 April 2019.

patent-competition rules and should be fairly sensitive to them. FDI probably stands somewhere in between.

John Dunning proposes a framework, the OLI paradigm, for conceptualizing a multinational firm's market entry decision.[231] OLI stands for the advantages of ownership, localization, and internalization.[232] Ownership advantages include 'technology and information, managerial, marketing and entrepreneurial skills, organisational systems, incentive structures, and favored access to intermediate or final goods markets'.[233] They identify the competitive advantages of a multinational firm in the global market that will allow it to enter multiple markets. Localization advantages include 'the costs and quality of particular factor endowments, the size, character, and growth of domestic markets[,] and the policies of host government, for example, taxes and fiscal incentives'.[234] To this list one can further add local demand patterns, transportation costs, proximity to customers, ability to build a supplier-customer network, and natural resources.[235] They determine whether the firm will choose to produce the good in a foreign location and export it to the host country or locate production facilities in that country. In other words, localization or location advantages explain the firm's choice between international trade on the one hand, and FDI or licensing on the other hand. Internalization advantages are reasons 'why a foreign firm prefers to retain full control over the production process instead of licensing its intangible assets to local firms.'[236] The decision may be due to 'high transaction costs

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[231] John H Dunning and Sarianna M Lundan, *Multinational Enterprises and the Global Economy* (2nd edn, Edward Elgar Publishing Ltd 2008) 116–33, 318–27.
[232] ibid 101–02.
[233] ibid 96.
[234] ibid 324.
[235] Maskus, *Intellectual Property Rights in the Global Economy* (n 104) 121–22.
[236] Beata Smarzynska Javorcik, 'The Composition of Foreign Direct Investment and Protection of Intellectual Property Rights: Evidence from Transition Economies' (2004) 48 European Economic Review 39, 41.

involved in regulating and enforcing licensing contracts.'[237] It may also be attributed to the rest of the legal regime such as rules that regulate licensing. To this one may also add some underlying economic factors such as the existence of suitable local partners. Internalization advantages refer generally to the costs and benefits of licensing and inform the firm's choice between FDI and licensing.

The OLI paradigm suggests that there is a wide range of considerations affecting the attractiveness of the host country for market entry and the relative merits of the different modes of entry. Labor costs, size of the domestic market, and other relevant government policies are probably more important considerations than the patent system or the patent-competition rules when a foreign firm chooses among the three modes of market entry. This is quite different from the situation with innovation incentives, under which patentee reward as partially determined by the patent-competition rules plays a much more direct and important role in the R&D decision. While the patent system or the patent-competition rules may play some role in the choice between trade and localization of production, they are unlikely to override the underlying economic considerations of labor costs and market size. Maskus notes that 'strong IPRs alone are insufficient for generating strong incentives to invest in a country. If that were the case, recent FDI flows to developing countries would have gone largely to Sub-Saharan Africa and Eastern Europe.'[238] If the economic factors are favorable, a foreign firm is likely to adhere to its decision to localize production regardless of the patent-competition rules.

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[237] ibid.

[238] Keith E Maskus, 'The Role of Intellectual Property Rights in Encouraging Foreign Direct Investment and Technology Transfer', *Intellectual Property and Development: Lessons from Recent Economic Research* (Oxford University Press 2005) 54.

The decision between FDI and licensing, which pertain to internalization advantages, is probably more susceptible to the influence of the patent-competition rules so long as there are suitable local licensing partners. A foreign firm is more likely to resort to licensing if permissible licensing rules allow it to impose restrictions on licensees to protect its economic interests.[239] Permissible licensing rules may also allow the firm to extract more rents from its licensees such that licensing may present a more profitable option than FDI.[240] Therefore, to the extent that licensing is preferable from a developing country's perspective, patent-competition rules can be adjusted to steer foreign firms' decision towards licensing.

If the patent-competition rules may steer a firm to choose one mode of technology transfer over others, then it is important to determine whether any mode of transfer is particularly advantageous to developing countries. Various modes of technology transfer contribute to a developing country's technological capacity in different ways. To the extent that a particular mode of transfer makes greater contributions to local technological capacity, developing countries may want to encourage it. Among the three modes of technology transfer, licensing probably results in the greatest enhancement to local technological capacity, followed by FDI, and by importation of technological goods.[241] Importation of technological goods can enhance local technological capacity in two ways. If the good being imported is a final product, it may present an opportunity for local firms to reverse engineer the technology.[242]

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[239] Maskus, *Private Rights and Public Problems: The Global Economics of Intellectual Property in the 21st Century* (n 133) 68–69.
[240] Ryuhei Wakasugi and Banri Ito, 'The Effects of Stronger Intellectual Property Rights on Technology Transfer: Evidence from Japanese Firm-Level Data' (2009) 34 Journal of Technology Transfer 145, 152.
[241] Vinod Kumar, Uma Kumar and Aditha Persaud, 'Building Technological Capability Through Importing Technology: The Case of Indonesian Manufacturing Industry' (1999) 24 Journal of Technology Transfer 81, 83.
[242] Maskus, *Private Rights and Public Problems: The Global Economics of Intellectual Property in the 21st Century* (n 133) 53.

However, this benefit would only materialize if there was local imitation capacity.[243] For countries that lack this capacity, this benefit could be illusory. If the good being imported is an advanced intermediate good such as a piece of complex machinery, importation would enhance local production capacity, allowing local firms to produce a more advanced product or an existing product at lower cost.[244] However, one can argue that this does not amount to a genuine improvement as it only enhances production capacity and does not augment the local capacity to innovate.

FDI and licensing both entail the transfer of a foreign technology to a host country, the only difference being the extent of local control of the technology transferred. Under FDI, the technology remains confined within the multinational firm, even though local employees will be given access to it. This gives rise to the possibility of spillover to local firms through lateral movement of employees between firms. Under licensing, there is true localization of the technology in the sense that the foreign technology will be in the full possession of local firms. While some economists have argued that ownership of technology does not matter so long as it is located in the host country[245], the better view is that ownership of technology and productive resources matters and that the host country receives greater benefit from the technology when it is in local possession.[246] At the very least this avoids the well-documented problem of enclave production where multinational firms set up local subsidiaries equipped with its own production network insulated from the rest of the economy, thereby

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[243] Helpman (n 199) 1276.
[244] Maskus, *Intellectual Property Rights in the Global Economy* (n 104) 138.
[245] Christian Gollier and Jullien Bruno, 'National Champions under Credit Rationing' in Oliver Falck, Christian Gollier and Ludger Woessmann (eds), *Industrial Policy and National Champions* (The MIT Press 2011) 153.
[246] Alice Amsden, *Escape from Empire: The Developing World's Journey through Heaven and Hell* (The MIT Press 2007) 142–47. Michele Di Maio, 'Industrial Policies in Developing Countries: History and Perspectives' in Mario Cimoli, Giovanni Dosi and Joseph Stiglitz (eds), *Industrial Policy and Development: The Poliitical Economy of Capabilities Accumulation* (Oxford University Press 2009) 129.

redounding minimal benefit to the local economy.[247] This will greatly limit the technological spillovers to local firms and reduce the overall beneficial effect of the technology transfer on the local economy. Therefore, if given a choice, developing countries should prefer licensing to FDI to import as a means of technological transfer. To the extent that patent-competition rules may influence the choice among these three modes of market entry, it will have to be taken into account by policymakers.

1. International Trade in Technological Goods

David Coe and Elhanan Helpman show that the technology embodied in traded goods is an important means of technology transfer.[248] International trade of technological goods contributes to local technological capacity in two ways, depending on the good at issue. If the good is a final product, importation of the good may allow local firms to reverse engineer the good to imitate the technology. This will enhance the technological capacity of the local firms regardless of whether they can produce and sell the product unfettered by patent protection. Knowledge of a more advanced product would enhance their capacity for product development in the future. Access to a large quantity of the product is often not necessary for successful reverse engineering. Usually only a small amount of the foreign product is needed. Another prerequisite for reverse engineering is a certain level of local technological capacity. As indicated earlier, imitation itself takes time, effort, and technical knowledge. The mere availability of the foreign product would not suffice if there was no local capacity to reverse engineer the technology. The patent-competition rules would have a bearing on the ease of imitation.

[247] Tilman Altenburg and Wilfried Lütkenhorst, *Industrial Policy in Developing Countries: Failing Markets, Weak States* (Edward Elgar Publishing Ltd 2015) 124.
[248] David Coe and Elhanan Helpman, 'International R&D Spillovers' (1995) 39 European Economic Review 859, 871–72.

If competition law requires the technology owner to share its technology with local firms, it may obviate the need for reverse engineering altogether.

If the good is an intermediate good such as advanced machinery, importation of such a good may enhance local production capacity without the need for local firms to engage in any reverse engineering. For instance, China acquired cutting-edge capacity to produce high-performing solar photovoltaic panels by purchasing machines or turnkey production lines from the U.S., Germany, and Japan.[249] For this kind of improvement to local technological capacity to materialize, local firms would need a steady flow of the intermediate good. Local firms are assumed not to have the capacity to reverse engineer such complex machinery. Therefore, it will matter to local firms whether the patent-competition rules will affect the willingness of foreign technology owners to continue to export such goods to the host country.

As in the case of innovation incentives, the economic literature is focused on the patent system and not the patent-competition rules. Therefore, the findings of the economic studies will need to be adapted for our purpose. Economists have studied the relationship between patent protection and the incentive to export a technological good, and their focus seems to be mainly on the robustness of protection, which presumably only concerns goods that can be reverse engineered. Pamela Smith argues that developing countries can be classified along two dimensions for this purpose: the strength of patent protection and imitation capacity.[250] The impact of patent protection on the import of technological goods depends on the interplay of these two attributes. Increased patent protection exerts two effects on import. First, there is the market power effect. Increased patent protection gives the technology owner more market

[249] European Patent Office (n 230) 12.
[250] Pamela Smith, 'Are Weak Patent Rights A Barrier to U.S. Exports?' (1999) 48 Journal of International Economics 151, 153.

power, which reduces the elasticity of the demand curve facing her.[251] She can thus boost profit by raising prices and cutting output. Second, there is the market expansion effect, which arises from the fact that heightened patent protection eliminates imitators from the market, thereby leaving more room for the technology owner to increase output. This effect shifts the firm's demand curve outward and induces larger sales to the local market.[252]

Keith Maskus and Mohan Penubarti hypothesize that 'the market-expansion effect is likely to dominate in larger countries with highly competitive local imitative firms, while the market-power effect would be stronger in smaller economies with limited ability to imitate. The effects would be expected to vary sector by sector as well.'[253] Whether the market expansion effect will materialize depends on whether there is currently any local imitation capacity. If there are no imitators in the local market to be ousted by heightened patent protection, the market power effect will dominate and there will be a drop in the import of the technological good. This leads Maskus to conclude that for industrializing economies with real imitative threats such as China and Turkey, the market expansion effect should dominate.[254]

This is precisely what Smith finds. She finds that in countries with a weak imitation capacity, the market power effect dominates the market expansion effect after patent protection is enhanced, thereby leading to a reduction in U.S. exports to those countries.[255] In countries with a strong imitation capacity, the market expansion effect dominates the market power effect, thereby raising U.S. exports to those countries.[256]

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[251] Maskus, *Intellectual Property Rights in the Global Economy* (n 104) 112.
[252] ibid.
[253] ibid.
[254] ibid 117.
[255] Smith, 'Are Weak Patent Rights A Barrier to U.S. Exports?' (n 250) 164.
[256] ibid.

This result has been corroborated by further studies.[257] In particular, Olena Ivus finds that increased patent protection following the TRIPS Agreement added about USD35 billion (2000 dollars) to the value of patent-sensitive exports from developed countries to eighteen developing countries.[258] Kristie Briggs finds that elevating patent protection has no impact on import of technological goods into low-income countries, but has a significant positive impact on import into middle-income countries.[259] To the extent that there is a positive correlation between income level and imitation capacity, Briggs' finding lends further support to the notion that raising patent protection increases inflow of technological goods into countries with high imitation capacity.[260]

Ivus obtains a similar result with respect to industry-level variations in imitation capacity.[261] Industries where there is the strongest local imitation capacity will see a surge in import following an increase of patent protection, whereas industries with a low local imitation capacity may witness a fall in import.[262] She emphasizes that while the amount of technology diffusion in a single industry may fall as a result of heightened patent protection, the number of industries in which multinational firms export to the country will increase, hence leading to greater amount of technology

[257] Catherine Y Co, 'Do Patent Rights Regimes Matter?' (2004) 12 Review of International Economics 359. Olena Ivus, 'Do Stronger Patent Rights Raise High-Tech Exports to the Developing World?' (2010) 81 Journal of International Economics 38.
[258] Ivus (n 257) 45.
[259] Kristie Briggs, 'Does Patent Harmonization Impact the Decision and Volume of High Technology Trade?' (2013) 25 International Review of Economics & Finance 35, 38–39.
[260] These studies suggest that there is a correlation between imitation capacity and importation of technological goods, which in turn indicates that the threat of reverse engineering has a bearing on foreign technology owners' willingness to export. One can thus infer that local imitators require a fairly significant amount of goods for reverse engineering purposes. Otherwise one should not see a correlation between imitation risk and the volume of import.
[261] Olena Ivus, 'Trade-Related Intellectual Property Rights: Industry Variation and Technology Diffusion' (2011) 44 The Canadian Journal of Economics 201.
[262] ibid 218–19.

transfer and also increased scope for imitation.[263] The overall imitation rate and the diffusion of technology to the country will rise.[264]

The foregoing focuses on the impact of elevating patent protection on the existing trade volume of technological goods. A slightly different way to look at the issue is whether patent protection shifts the mode of market entry between trade and localization of production. It has been noted that 'FDI is likely to supplant direct exports of a good where trade and transport costs are high, the fixed costs of building foreign plants are low, local productivity is high relative to wage costs, the size of the host market is large, and the research and development (R&D) and marketing intensity of the product is substantial.'[265] This suggests that this decision is largely informed by economic factors. Nonetheless, some studies have found that more robust patent protection tends to shift the mode of market entry away from trade to FDI and licensing.[266] The implication seems to be that FDI and licensing expose the technology owner to a greater risk of imitation, despite possibly promising a greater financial reward. Technology owners would prefer FDI and licensing if the imitation risk is manageable, which can be achieved through more robust patent protection.

Practically all of the studies discussed above focus on imitation risk and the robustness of patent protection. The inference would thus seem to be that only those patent-competition rules that implicate robustness of protection would affect trade volume and technology owners' willingness to export technological goods to a host country. These include no challenge clauses, reverse payments, and the unilateral

[263] ibid 217.
[264] ibid.
[265] Maskus, 'The Role of Intellectual Property Rights in Encouraging Foreign Direct Investment and Technology Transfer' (n 238) 55.
[266] Pamela Smith, 'How Do Foreign Patent Rights Affect U.S. Exports, Affiliate Sales, and Licenses?' (2001) 55 Journal of International Economics 411. Nicholson (n 213). Park and Lippoldt (n 102).

refusal to license intellectual property. Even then imitation risk would only be a relevant issue in countries that possess the requisite imitation capacity and in industries where imitation is easy and relatively low-cost. Under these circumstances, a reduced readiness on the part of competition law to compel a technology owner to share her technology would lead to a market expansion effect and an increase in the import of technological goods. This is because if the technology owner is subject to a duty to license, local imitators may be able to acquire the technology and start competing with the owner. The same applies to no challenge clauses, which would have prevented local licensees from challenging the validity of the patent. But all this would only be relevant for a product that is subject to the threat of reverse engineering.

Raising patent protection can also have some unintended negative effects on the prospect for developing countries to improve their technological capacity. Scherer argues that increased 'patent protection may shield product imports from imitative local competition, permitting production to be centralized in some other nation where economies of scale are exploited more fully and wage conditions are more favorable. Lacking such patent protection, MNEs [multinational enterprises] may feel compelled to commence on-shore production in order to neutralize 'made-at-home' advantages enjoyed by indigenous rivals.'[267] Given that localization of production redounds more benefit to the host country than mere importation, raising patent protection could in fact be counter-productive. Again, what Scherer has in mind here seems to be robustness of protection rather than scope of patent rights. His insight would be relevant to those patent-competition rules that implicate robustness of protection.

[267] Scherer and Weisburst (n 180) 1014.

2. Foreign Direct Investment

Commentators seem to have mixed views on whether increased patent protection will attract more FDI. Maskus describes the relationship between the two as 'subtle and complex. While the weight of the theory seems to lie on the side of a positive impact, overall it is ambiguous.'[268] Correa concurs, characterizing the available evidence on the issue as 'inconclusive. Data on FDI flows to countries with allegedly low levels of IPRs protection show that the perceived inadequacies of intellectual property protection did not hinder FDI inflows in global terms.'[269] The Commission on Intellectual Property Rights goes one step further, asserting that '[w]hat is clear from the literature is that strong IP rights alone provide neither the necessary nor sufficient incentives for firms to invest in particular countries. If this was the case, then large countries with high growth rates but weak IPR regimes would not have received large foreign investment inflows in the past and even now.'[270]

One consensus among commentators is that least developed countries ('LDCs') do not receive much FDI, especially technology-related FDI, and this will not change regardless of the amount of patent protection offered. This has been attributed to their extremely low productivity, education and skills, underdeveloped infrastructure, poorly designed government regulation, and prevalence of corruption.[271] Correa issues a damning assessment on the prospect of the least developed countries, asserting that for 'the least developed countries, which have historically received an insignificant amount of FDI[,] [t]here are no reasons to think that higher IPRs standards

[268] Maskus, *Intellectual Property Rights in the Global Economy* (n 104) 130.
[269] Correa (n 127) 27.
[270] Commission on Intellectual Property Rights (n 100) 23.
[271] Maskus, *Intellectual Property Rights in the Global Economy* (n 104) 122.

may by themselves change this situation in any substantial manner.'[272] This is corroborated by recent research by Siew Mei Chan and Tuck Cheong Tang, who find that there is no direct effect of increased intellectual property protection on FDI inflows into low-income countries.[273]

The relationship between intellectual property rights and FDI, at least in more developed countries, seems to be a favorite topic of study among economists, who have produced voluminous literature on the topic. Some studies have suggested that heightened patent protection increases the inflow of FDI, especially to developing countries.[274] After surveying the then-existing literature, Carlos Primo Braga and Carsten Fink find that there is generally a positive link between intellectual property protection and FDI.[275] Lee Branstetter and co-authors also find that intra-firm royalty payments by developing country affiliates to multinational firms increased following patent law reforms in sixteen countries between 1982-1999, suggesting greater amount of internal technology transfer through FDI.[276] Jeong-Yeon Lee and Edwin Mansfield find that weak patent protection has a significant negative impact on FDI by U.S. firms.[277] Some theoretical work also reaches the same conclusion. Hitoshi Tanaka and Tatsuro Iwaisako conclude that increased patent protection promotes FDI and innovation in developed countries.[278] Elias Dinopoulos and Paul Segerstrom reaches the

[272] Correa (n 127) 30.
[273] Siew Mei Chan and Tuck Cheong Tang, 'Foreign Direct Investment Inflows and Intellectual Property Rights: Empirical Evidence from Different Income Groups' (2017) 46 Global Economic Review 372, 383.
[274] Peter Nunnenkamp and Julius Spatz, 'Intellectual Property Rights and Foreign Direct Investment: A Disaggregated Analysis' (2004) 140 Review of World Economics 393.
[275] Carlos Primo Braga and Carsten Fink, 'The Relationship Between Intellectual Property Rights and Foreign Direct Investment' (1998) 9 Duke Journal of Comparative & International Law 163, 180.
[276] Branstetter, Fisman and Foley (n 155).
[277] Jeong-Yeon Lee and Edwin Mansfield, 'Intellectual Property Protection and U.S. Foreign Direct Investment' (1996) 78 The Review of Economics and Statistics 181, 184.
[278] Hitoshi Tanaka and Tatsuro Iwaisako, 'Intellectual Property Rights and Foreign Direct Investment: A Welfare Analysis' (2014) 67 European Economic Review 107.

same result, which they attribute to a lower relative wage for R&D personnel in developed countries.[279]

Other studies have indicated an inconclusive relationship. Peter Nunnenkamp and Julius Spatz fail to find any significant relationship between patent protection and U.S. FDI, concluding that 'IPR protection may not provide additional explanatory power to market- and location-related driving forces of FDI.'[280] Nunnenkamp and Spatz only find a significant relationship for patent protection once host-country characteristics and industry-specific factors are taken into account.[281] This is consistent with the earlier observation that the choice of FDI destination is largely determined by economic factors. Chan and Tang also find that in the short run, increased intellectual property protection has no significant impact on FDI inflows for all the countries surveyed, from low-income to high-income.[282]

A few studies have qualified the positive impact of patent protection on FDI by the type of industry and the type of activity at issue. The impact is greater where the industry is reliant on patents as an appropriation mechanism, which in turn depends on the kind of technology in use in the industry. If the technology sought to be transferred is relatively old or the industry is relatively low-tech such as textiles and apparel or service industries, patent protection is unlikely to be an important consideration.[283] Unsurprisingly, patent protection has been found to be a greater concern in industries where the technology is relatively imitable, including pharmaceuticals, chemicals, food processing, and software.[284] Nunnenkamp and Spatz

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[279] Elias Dinopoulos and Paul Segerstrom, 'Intellectual Property Rights, Multinational Firms and Economic Growth' (2010) 92 Journal of Development Economics 13, 23.
[280] Nunnenkamp and Spatz (n 274) 402.
[281] ibid.
[282] Chan and Tang (n 273) 383.
[283] Maskus, *Intellectual Property Rights in the Global Economy* (n 104) 125.
[284] ibid.

find that patent protection matters the most to FDI in transport equipment, electrical equipment, and machinery.[285] Somewhat counter-intuitively, and contrary to Maskus' finding, they find that FDI in the chemical industry is not sensitive to the level of patent protection.[286] One reason Nunnenkamp and Spatz offer for this slightly anomalous finding is that U.S. FDI in the chemical industry seems to be concentrated in the industrialized countries and that licensing seems to be the preferred mode of technology for U.S. chemical manufacturers.[287] Beata Smarzynska Javorcik finds that patent protection has a significant impact on FDI in six industries which she calls IPR-sensitive industries.[288] These include drugs, cosmetics and health care products, chemicals, machinery and equipment, and electrical equipment.[289] This is more consistent with Mansfield's finding about the degree of reliance on patents by different industries.

The impact of patent protection is also greater for R&D-related activities as opposed to marketing and distribution. Javorcik finds that FDI tends to shift from distribution to manufacturing in countries with higher levels of patent protection.[290] This effect is observed across all industries regardless of whether it is IPR-sensitive.[291] However, it has also been found that FDI in manufacturing tends to concentrate in countries with larger population.[292] In a survey of ninety-four U.S. firms on their FDI preferences, Mansfield finds that only 20% of the surveyed firms deem intellectual property protection to be important for investments in sales and distribution, 30% of

[285] Nunnenkamp and Spatz (n 274) 408.
[286] ibid 409.
[287] ibid.
[288] Javorcik (n 236) 49–51.
[289] ibid 44.
[290] ibid 55.
[291] ibid.
[292] ibid.

the firms for investments in rudimentary production and assembly facilities, 50% to 60% of the firms for investments in manufacturing facilities for components and complete products, and 80% of the firms for investments in R&D facilities.[293] Lee and Mansfield also find that among chemical firms, weak patent protection would deter them from investing in relatively sophisticated manufacturing and R&D.[294]

The strength of patent protection also interacts with a range of other factors, including distance from the location of the investor and the educational level in the host country, to influence FDI. Nunnenkamp and Spatz find that impact of patent protection on FDI depends on host-country characteristics. For example, they find that the quality of patent protection is no longer a significant factor for U.S. investors in countries within 3,900 miles of the U.S., suggesting that geographical proximity overrides the importance of patent protection.[295] They also find that patent protection fades in importance in countries with low levels of corruption and high regulatory quality.[296] They conjecture that for these countries, foreign investors may be willing to assume that overall excellence in regulatory quality extends to intellectual property enforcement as well. Lastly, they also find that high quality of local human capital together with strong patent protection causes foreign investors to shift away from FDI as the mode of technology transfer.[297]

The relationship between patent protection and FDI thus seems to be contingent and industry- and activity-specific. The positive impact seems to be much more pronounced in countries that are otherwise viable FDI destinations. Perhaps more

[293] Edwin Mansfield, 'Intellectual Property Protection, Foreign Direct Investment, and Technology Transfer' (International Finance Corporation 1994) No. 19 1–2.
[294] Lee and Mansfield (n 277) 185.
[295] Nunnenkamp and Spatz (n 274) 405.
[296] ibid.
[297] ibid 406.

worryingly, Biswajit Dhar and Reji Joseph report that FDI does not necessarily result in technology transfer, noting that 'the foreign firm usually exercises its superior bargaining power to refuse technology transfer to the host countries.'[298] The same concern does not exist for international trade and licensing. For international trade, the technology transfer happens when the good reaches the destination country. And licensing by definition entails technology transfer to a local partner. The technology transfer benefit through FDI cannot be taken for granted. Successful technology transfer through FDI usually requires the host country government to impose conditions, which both China and India have practiced to great effect.[299] This does not augur well for most developing countries, which lack the vast domestic markets of China and India to bargain effectively with multinational firms. If this was indeed true, FDI as a mode of technology transfer may deserve less attention from developing countries from the perspective of calibrating the patent-competition interface.

It remains to be determined what lessons can be drawn from the above studies for the patent-competition rules. This would require an understanding of how improvement in patent protection was measured in these studies. Of the studies surveyed in this section, including Mansfield (1994), Lee & Mansfield (1996), Nunnenkamp & Spatz (2004), Javorcik (2004), and Branstetter et al. (2006), the former two are based on surveys of business executives on their perception of the patent system in the country at issue. Nunnenkamp & Spatz (2004) relies on the Ginarte-Park Index and a survey by the World Economic Forum, again, on perceptions of business executives.[300] Jovorcik (2004) uses the Ginarte-Park Index and another index that is

[298] Biswajit Dhar and Reji Joseph, 'The Rise of the South and New Paths of Development in the 21st Century' (UNCTAD 2012) No. 6 18.
[299] ibid.
[300] Nunnenkamp and Spatz (n 274) 397–98.

more focused on copyright and trademark.[301] As mentioned earlier, the Ginarte-Park Index encompasses patent rules that pertain to both scope of patent rights and robustness of protection. Branstetter and co-authors do not rely on a particular index and instead focus on episodes of patent reform in sixteen countries, which cover: (1) scope of patentability, (2) effective scope of protection, (3) length of patent term, (4) effectiveness in enforcement, and (5) administration of the patent system.[302] Given the mixed focus of the measurements of patent protection used in these studies, their findings probably do not have special relevance to any category of patent-competition rules. These studies can be construed as saying that any patent-competition rules that adjust the scope of patent rights in a similar way to the patent rules examined in these studies would produce a similar effect on FDI, subject to the industry-specificity and activity-specificity highlighted above.

3. Licensing

Economists have produced a number of theoretical studies to model the relationship between patent protection and licensing. Guifang Yang and Keith Maskus construct a dynamic general-equilibrium model of the product cycle to study the effects of strong patent protection in the global South on the incentives of firms in the global North to innovate and to license advanced technologies to firms in the global South.[303] They conclude that stronger patent protection in the global South would increase both the rate of innovation in the global North and the extent of licensing to the global South.[304] They assert that:

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[301] Javorcik (n 236) 46.
[302] Branstetter, Fisman and Foley (n 155) 333–34.
[303] Guifang Yang and Keith Maskus, 'Intellectual Property Rights, Licensing, and Innovation in an Endogenous Product-Cycle Model' (2001) 53 Journal of International Economics 169.
[304] ibid 181.

> Stronger IPRs not only would create a better legal framework for the enforcement of licensing contracts, reducing the costs associated with establishing and policing an arm's-length relationship, but also would raise the rent share the licensor receives. Therefore, the degree of IPRs protection not only would determine the size of the pie (the size effect) but also the distribution of the pie between the two licensing parties (the distribution effect). Firms would be encouraged to license technology to the South in order to take advantage of lower labor costs there and earn higher instantaneous economic returns.[305]

Lei Yang and Keith Maskus produce another theoretical model to study the choice between export and licensing for a developed country firm with a superior product technology.[306] They find that strengthening patent protection boosts technology transfer through licensing to the global South and raises export from the South by reducing the Southern firm's marginal cost of production.[307] The amount of know-how transferred increases with the technological absorption capacity of the developing country firm.[308] They are, however, not as confident about the beneficial welfare effect of increased patent protection, concluding that the technological absorption capacity of the developing country will determine the welfare effects of increased protection and that excessive patent protection would hurt both competition and welfare.[309]

Sunil Kanwar finds that increased patent protection tends to raise royalty and license fee payments, from which he infers an increase in technology transfer.[310] Specifically, he finds that reforms implemented by developing countries to comply with the TRIPS Agreement increased the total value of technology transfer by between 2.6%

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[305] ibid.
[306] Lei Yang and Keith Maskus, 'Intellectual Property Rights, Technology Transfer and Exports in Developing Countries' (2009) 90 Journal of Development Economics 231.
[307] ibid 234.
[308] ibid.
[309] ibid 235.
[310] Sunil Kanwar, 'Intellectual Property Protection and Technology Licensing: The Case of Developing Countries' (2012) 55 The Journal of Law and Economics 539.

and 3.3%.[311] Kanwar's analysis suggests that most of this increase is due to the increase in the scope of patentability introduced by TRIPS in pharmaceuticals, chemicals, and agricultural products.[312] The validity of his conclusion, however, is open to question. If the same technologies had previously been accessible to developing countries, perhaps through reverse engineering, and TRIPS only forced these countries to pay for them, then there would be no increase in the amount of technology transferred. Kanwar is unable to distinguish between the two scenarios. Therefore, the only conclusion one can confidently draw from his study is that royalty payments made by developing countries increased after TRIPS, which is exactly what the multinational firms in developed countries had intended.

Usha Nair-Reichert and Roderick Duncan focuses on the substitutability between different modes of technology transfer.[313] They made a number of findings. First, increased patent protection renders licensing more attractive vis-à-vis export.[314] Second, when faced with a higher imitation capacity in the host country, technology owners tend to prefer licensing to export.[315] However, if imitation capacity is constrained by a high level of patent protection, there is reduced licensing and greater reliance on trade.[316] The implication seems to be that licensing is a preferred strategy for managing imitation risks. Interesting, they find no support in their data for the commonly held hypothesis that raising patent protection in countries with a strong imitation capacity shifts the mode of technology transfer from FDI to licensing.[317] The

[311] ibid 557.
[312] ibid 561.
[313] Usha Nair-Reichert and Roderick Duncan, 'Patent Regimes, Host Country Policies, and the Nature of MNE Activities' (2008) 16 Review of International Economics 783.
[314] ibid 795.
[315] ibid.
[316] ibid.
[317] ibid.

general belief is that more secure patent protection gives firms greater comfort in parting with their technology and licensing it to third parties.[318] This conclusion is hardly surprising as their results indicate an opposite relationship between patent protection and licensing from the conventional position. They find that licensing increases when patent protection weakens.

Results from Pamela Smith's study contradict those of Nair-Reichert and Duncan's. She finds that increased patent protection generally encourages technology transfer regardless of the mode, especially in countries with strong imitation capacity.[319] The positive effect, however, is greater with FDI and licensing than with exports. She finds that there is a 0.91 percent larger increase in FDI and licensing than in export for the same amount of increase in patent protection.[320] Therefore, stronger patent protection enhances the location advantage of the host country. She further finds that there is a 1.14 percent larger increase in licensing vis-à-vis export and FDI for the same amount of increase in patent protection.[321] Stronger patent protection lowers the internalization advantage of keeping production within the firm and renders licensing more attractive. She concludes that imitation risk is the greatest when a technology is transferred outside of the technology owner's home country and outside of the firm, and that this risk is the greatest when technology transfer takes place in a country with high imitation capacity.[322] FDI seems to be the compromise option for technology owners when there is a substantial risk of imitation.[323]

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[318] Guifang Yang and Keith Maskus, 'Intellectual Property Rights and Licensing: An Econometric Investigation' (2001) 137 Review of World Economics 58.
[319] Pamela Smith, 'How Do Foreign Patent Rights Affect U.S. Exports, Affiliate Sales, and Licenses?' (2001) 55 Journal of International Economics 411, 427.
[320] ibid.
[321] ibid.
[322] ibid 434.
[323] ibid 427.

Lastly, Michael Nicholson examines how variations in industry characteristics affect a technology owner's choice between different modes of transfer. He reports that '[w]hen a firm in an industry with high capital costs considers entering a country with high IPRs, they are less likely to engage in FDI. If IPRs are weak, firms with similar characteristics are more likely to engage in FDI. This suggests that the greater the risk to their proprietary asset, the more likely a firm is to internalize overseas production.'[324] When patent protection is high, foreign investors with a high level of knowledge-based assets are more willing to forego internalization and resort to licensing instead of FDI. This harkens back to the same theme that patent protection is more important to industries that are more susceptible to imitation.

Three of the four studies above use the Ginarte-Park Index, or a modified version of it, as an indicator of the level of patent protection. Kanwar incorporates an extra measurement that focuses on enforcement into the Ginarte-Park Index to add further weight to enforcement. This extra measurement covers 'the legal enforcement of contracts, judicial independence, impartiality of courts, integrity of the legal system, protection of property rights, restrictions on the sale of physical property, and military interference.'[325] Smith uses a slightly different index compiled by Rapp and Rozek that was actually the original basis of the Ginarte-Park Index. The Rapp-Rozek Index focuses on 'coverage of inventions, examination procedures, term of protection, transferability of rights, compulsory licensing, and effective enforcement against infringement.'[326] Therefore, the findings of these studies reflect the importance of patent rules that pertain to both robustness of protection and scope of patent rights, with Kanwar's

[324] Nicholson (n 213) 41.
[325] Kanwar (n 310) 546.
[326] Smith, 'How Do Foreign Patent Rights Affect U.S. Exports, Affiliate Sales, and Licenses?' (n 319) 421.

probably more tilted toward the former given his modification to the Ginarte-Park Index.

The foregoing discussion has a number of implications for the patent-competition rules. With the exception of Nair-Reichert and Duncan, the thrust of these studies seems to be that among the three modes of technology transfer, licensing faces the greatest imitation risk and therefore relies most heavily on patent protection. These studies find that heightened patent protection generally leads to a shift to licensing by technology owners. Nair-Reichert and Duncan's finding seems to suggest that international trade exposes technology owners to the greatest imitation risk and licensing is used as a risk management strategy. Overall, the weight of evidence seems to be against Nair-Reichert and Duncan.[327] Since imitation risk is related to the robustness of patent protection, this should mean that a tightening of the patent-competition rules that enhances the robustness of patent protection should similarly encourage more licensing by technology owners. It was suggested earlier that licensing redounds the greatest technical benefits to a developing country by transferring technology into the hands of local firms. Developing countries therefore should prefer licensing as a mode of technology transfer. This means that the patent-competition rules should be calibrated to minimize imitation risks. This would seem to suggest that no challenge clauses and reverse payments should be permitted and a duty to license intellectual property should only be imposed judiciously.

[327] Maskus, *Intellectual Property Rights in the Global Economy* (n 104) 123, 129.

4. Summing Up

An industry-specific approach to the patent-competition interface may be called for. The relationship between patent protection and all three modes of technology transfer have industry-specific variations dictated by the degree of imitability of the technology in the industry, which in turn determines the relative importance of different appropriation mechanisms. For trade in technological goods, the impact of increased patent protection on the volume of trade varies with local imitation capacity. Ivus finds that industries where there is the strongest local imitation capacity will see a surge in import following an increase in patent protection, whereas industries with a low local imitation capacity may witness a fall in import. Even though it was not explicitly spelled out in her study, one can imagine that local imitation capacity will only be an issue where the technology of the industry suffers from high imitability, which varies by industry.

The impact of increased patent protection on FDI also depends on the industry at issue. Industries where the technology is relatively imitable and that rely heavily on patents as an appropriation mechanism see a closer relationship between patent protection and FDI. According to Javorcik, drugs, cosmetics and health care products, chemicals, machinery and equipment, and electrical equipment are examples of such industries. Nicholson also reports industry-specific variations in the likelihood to resort to licensing as a mode of technology transfer which are based on the amount of knowledge-based assets in the industry. Foreign investors with a high level of knowledge-based assets are more willing to forego internalization and resort to licensing as opposed to FDI when the level of patent protection is high.

One further comment on the relationship between the patent-competition rules and licensing is in order. While increased patent protection tends to raise royalty

and license fee payments either through the 'market power' effect of allowing the technology owner to charge a higher fee for the same technology transferred or the 'market expansion' effect of increasing the amount of technology transferred, the patent-competition rules may have a different impact on the level of royalty payments. On the one hand, more relaxed patent-competition rules may enhance the technology owner's market power by giving her greater ability to forestall potential rivals. This should allow her to charge higher royalty. On the other hand, it is possible that if patent-competition rules are relaxed to allow the patentee to impose a range of licensing restrictions on the licensee, the patentee may be willing to accept a lower royalty payment. Presumably these restrictions redound other economic benefits to the patentee such that she is willing to accept lower royalty payments. To the extent that developing countries would like to minimize their royalty and license fee payments to foreign technology owners, they would need to calibrate their patent-competition rules accordingly.

5. Involuntary Transfers

Technology can be transferred voluntarily from technology owners in developed countries through various means such as international trade, FDI, and licensing. It can also be transferred involuntarily. There are two main ways in which this can take place. The first one is through imitation such as outright copying and reverse engineering. The second one is through compulsory licensing to local firms. The extent to which imitation is feasible is dependent on the robustness of patent protection. If patent law is vigorously enforced and patent owners can effectively halt imitators, imitation would be largely impractical. If, however, patent law is loosely enforced, imitation as a technology transfer mechanism would become a distinct possibility.

Therefore, the feasibility of imitation as a means of technology transfer is largely contingent on patent protection, in particular, the enforceability of the patent right to exclude. There is not much of a role for patent-competition rules to play.

In contrast, patent-competition rules can play a determinative role in the possibility of compulsory licensing. Although the patent law of some countries, such as China's, does permit compulsory licensing under some limited circumstances[328], compulsory licensing is very much the exception rather than the norm in patent law. Competition law, at least as practiced in some jurisdictions, does consider a unilateral refusal to license intellectual property as a possible violation. To the extent that patent-competition rules adopt an aggressive attitude toward unilateral refusal to license, they can serve to facilitate involuntary technology transfer.

There are two senses in which compulsory licensing can be ordered under the patent-competition rules. The first is where the technology owner is subject to a duty to actively assist rivals in acquiring the technology. The technology owner will be required to transfer know-how and other forms of tacit knowledge needed to implement the technology. The owner may also need to assist rivals in acquiring the capacity to implement the technology. The second is where rivals have acquired the ability to implement the technology through other means, perhaps reverse engineering or independent research, and the technology owner is only required to consent to rivals' implementation of the technology subject to a royalty payment. In other words, compulsory licensing in this second sense merely amounts to authorization rather than active assistance. Compulsory licensing under the second sense is only feasible in developing countries that are already fairly technologically advanced. They must

[328] Patent Law 2008, art. 50 (PRC).

possess imitation capacity in the industry concerned. It will be a much less intrusive obligation to technology owners. This does not mean that developing countries should embrace patent-competition rules as a means to compel technology transfer. The extent to which developing countries should compel technology transfer is highly complex and will be deferred to subsequent chapters on unilateral refusal to license.

One of the strongest objections to the imposition of a duty to license under competition law is that it will undermine innovation incentives. While it may seem to be a highly intuitive argument, there is in fact some counter-evidence. In a model incorporating market imperfections such as lack of information asymmetry about product quality, Jiahua Che and co-authors find that multinational firms refrain from entering developing country markets for a variety of reasons, with weak patent protection being only one of them.[329] In such case, local firms may engage in imitation when permitting such imitation is part of the equilibrium for the market. Che and co-authors argue that 'imitation in the shadow of IPR enforcement can be an alternative channel for technology transfer and that strengthening such enforcement may not be in the best interests of either the host country or multinationals.'[330] In particular, they find that where imitation is part of the equilibrium strategy under the assumption of information asymmetry about product quality, heightening patent protection reduces social welfare[331] and deferring increase in protection raises the profits of the multinationals without affecting the overall social surplus.[332]

Separately, the extent to which overriding patent protection undermines innovation incentives crucially depends on the degree of the industry's reliance on

[329] Jiahua Che, Larry Qiu and Wen Zhou, 'Entry, Reputation and Intellectual Property Rights Enforcement' (2014) 47 The Canadian Journal of Economics 1256.
[330] ibid 1276.
[331] ibid 1272.
[332] ibid 1276.

patents as an appropriation mechanism. Patents are only an important appropriation mechanism for a select few industries such as pharmaceuticals and chemicals. For the remaining industries, overriding patent protection may not have significant impact on innovation incentives. This opens the possibility for imposing a duty to license patents that may be less objectionable.

IV. A PROPOSED APPROACH TO THE PATENT-COMPETITION INTERFACE

A. A Development Stage-Specific Approach

The relevance of innovation and technology transfer as means of technological progress varies widely according to the technological capacity of the country at issue. For the production countries, innovation is mostly beyond reach and innovation incentives deserve very little weight. Competition authorities in these countries should emphasize consumer welfare in their approach to the patent-competition interface. It is only when these countries have acquired rudimentary technological capacity and developed the requisite human capital that technology transfer will start to become a relevant issue.

For the imitation or technology absorption countries, dynamic efficiency considerations should be about technology transfer rather than innovation, as technology transfer is likely to be the main way in which they will achieve technological progress. These countries face a dilemma between voluntary and involuntary technology transfer. As far as the patent-competition rules are concerned, developing countries can facilitate involuntary technology transfer by adopting an aggressive attitude toward unilateral refusal to license intellectual property. However, economic studies have shown that robustness of patent protection is an important consideration for foreign technology owners when contemplating export and licensing as modes of

technology transfer. Suppression of imitation, either by raising patent protection or showing reluctance to impose a duty to license, will increase the volume of importation of technological goods and licensing to local firms. Adopting an appropriate approach to the unilateral refusal to license intellectual property would hence be of paramount importance.

For the proto-innovation countries, the domestic constituencies comprise innovators, imitators, and consumers. While the imitators would clearly favor an approach to the patent-competition interface that favors technology transfer and protects the technology transferees, the innovators would prefer robust patent protection and permissive patent-competition rules that give them substantial leeway to exploit their patents. Meanwhile, domestic consumers would opt for lower prices and greater access to technological goods. It is probably impossible to fashion an overarching approach to the patent-competition interface across all kinds of practice and all industries for these countries. Each category of patent-exploitation practice presents different trade-offs between the interests of these three constituencies which may need to be resolved differently. For example, licensing rules would present particularly tricky issues as these countries contain both licensors and licensees and their conflicting interests may need to be balanced carefully when calibrating the appropriate approach to these rules.

B. An Industry-Specific Approach

Apart from an approach that is sensitive to the stage of development, developing countries require an approach to the patent-competition interface that takes into account the characteristics of specific industries. The foregoing discussion has already provided a number of justifications for an industry-specific approach. Lemley

argues that patent and competition laws should be treated as equals in the patent-competition interface and that the nature of the industry and the invention in question dictates which tool should be used. The relationship between patentee reward and innovation incentives turns out to be industry-specific, as different industries demonstrate varying degrees of reliance on patents as an appropriation mechanism. The extent to which innovation incentives will translate into concrete innovations depends on the existence of innovation capacity in the country at issue. Although the classification based on technological capacity has been done on a country-by-country basis, variations in innovation capacity are likely to be industry-specific, or perhaps firm-specific. Furthermore, economic studies have shown that the effect of increased patentee reward on FDI varies across industries, with industries that rely more on patents as an appropriation mechanism showing greater sensitivity to changes in patent protection. The impact of the robustness of patent protection on import of technological goods and licensing varies according to local imitation risks, which vary by industry both because of disparate local technological capacity and the ease of imitation inherent in the technology in different industries.

C. Feasibility of the Proposed Approach

1. Enforcement Capacity

One concern about the proposed approach to the patent-competition interface in developing countries is enforcement capacity. This is an especially valid concern for least developed countries, whose competition authorities may simply not have the capacity to apply complex competition rules to patent exploitation practices, which present highly intricate policy trade-offs. There is no question that competition law enforcement, especially effects-based rules, could be difficult to apply and place a

heavy demand on enforcement capacity. It is therefore important that constraints imposed by limited enforcement capacity be taken into account when devising analytical frameworks for developing countries, especially the least developed ones. For countries with low enforcement capacity, preference should be given to simple 'per se' rules or presumptive illegality rules. These rules will avoid the all-embracing, full-circumstance analysis that is often required under effects-based rule.

It is no doubt going to be a difficult balancing act to devise rules that are simple enough for developing countries to apply but not so blunt that they may give rise to high error costs. But this difficulty should not be reason for giving up. Developing countries and their competition authorities owe it to themselves and their consumers to try their best to police against patent exploitation practices that may harm their consumers without creating any significant dynamic efficiency benefits for them. Giving up would leave vulnerable consumers to exploitation by patentees, who are often multinational corporations. One can argue that there are other areas of law, such as intellectual property law, that are also highly complex to administer and could be beyond the enforcement capacity of some developing countries. But that has not stopped industrialized economies from forcing developing countries to adopt them. It would seem duplicitous for industrialized economies to insist that developing countries have the capacity to enforce complex intellectual property law, which tends to benefit the former, but not the capacity to apply competition rules that may be no more complex to protect the interests of their domestic consumers.

2. Concerns under the TRIPS Agreement

Another possible concern with the proposed approach, especially the industry-specificity aspect of it, is that it may be inconsistent with the TRIPS Agreement,

in particular with Article 27, which stipulates that patent protection shall be available for all products and processes 'in all fields of technology'[333] and more importantly, that patent rights shall be enjoyable 'without discrimination as to … the field of technology'[334]. This can be interpreted to limit a developing country's ability to apply an industry-specific approach to the patent-competition interface.

A closer examination of the provisions in the TRIPS Agreement, however, suggests that this concern may be overstated. Article 28 of the TRIPs Agreement delineates the scope of patent rights guaranteed by the agreement. It provides two main rights, the right to exclude and the right to assign, transfer by succession, and to conclude licensing agreements. The right to exclude is usually not implicated in the patent-competition rules apart from the unilateral refusal to deal doctrine. Article 31 specifically addresses conditions that need to be met for compulsory licenses to be deemed compatible with the TRIPS Agreement. None of the rights guaranteed by Article 28 are meant to be absolute. They are qualified by Article 30, which allow TRIPS signatories to impose limited exceptions to patent rights so long as they 'do not necessarily conflict with a normal exploitation of the patent'[335] and 'do not unreasonably prejudice the legitimate interests of the patent owner, taking account of the legitimate interests of third parties.'[336] More pertinently, Article 40(1) of the TRIPS Agreement acknowledges that 'some licensing practices or conditions pertaining to intellectual property rights which restrain competition may have adverse effects on trade and may impede the transfer and dissemination of technology.'[337] Article 40(2)

[333] 'Agreement on Trade-Related Aspects of Intellectual Property Rights (Adopted 15 April 1994, Entered into Force 1 January 1995) 1869 UNTS 299 (TRIPS Agreement)' art 27.
[334] ibid.
[335] ibid art 30.
[336] ibid.
[337] ibid art 40(1).

further authorizes WTO member states to adopt 'appropriate measures to prevent or control such practices'[338]. The provision then proceeds to enumerate a number of anticompetitive licensing practices that may be subject to regulation, such as exclusive grantbacks, no-challenge clauses, and coercive package licenses.

There is scant WTO jurisprudence on the precise scope of Articles 30 and 40. There has been one case decided on the scope of Article 30 and none on Article 40. The one case that dealt with the scope of Article 30 was the *Canada—Pharmaceutical Patents* case, which was not concerned with the patent-competition rules in general but with an exception provided by Canadian patent law for generics to accelerate the regulatory approval process.[339] Therefore, the case is of limited relevance except for the notion that patent rights are not absolute, which should be uncontroversial, and that any exception to patent rights must meet the cumulative conditions of being limited, consistent with the normal exploitation of patent rights, and not unreasonably prejudicing the legitimate interests of patent owners.

Article 40 is directly concerned with competition regulation of patent exploitation practices. The lack of jurisprudence on Article 40 means that there is no WTO decisional practice on whether an industry-specific approach to the patent-competition interface is consistent with this Article. The key to answering this question is the meaning of 'appropriate measures' in Article 40 and whether an industry-specific approach to the interface constitutes discrimination of patent rights by field of technology under Article 27. The possible meaning of appropriate measures is so broad that it is certainly possible to fit an industry-specific approach within it, especially when

[338] ibid art 40(2).
[339] WTO, *Canada—Pharmaceutical Patents* (17 March 2000) WT/DS114/R.

the approach is derived from sound competition principles with due regard to consumer welfare, the widely acknowledged objective of competition law.

As to whether such an approach constitutes discrimination, the WTO has a very well-developed body of jurisprudence on non-discrimination in one particular context, i.e., whether like products are accorded differential treatment under the rubric of the national treatment and most favored nation obligations of the WTO member states. This body of jurisprudence, however, principally focuses on the existence of distinctions between similar products and is not concerned with disparate treatment across industries. Therefore, it is of limited relevance as well.

While a definitive answer to the question of whether an industry-specific approach to the patent-competition interface violates the non-discrimination obligation awaits adjudication, a good argument can be made that it does not. The nature of competition analysis requires an examination of market, and by extension, industry, conditions. By authorizing WTO member states to regulate exercise of patent rights under competition law, Article 40 must have implicitly endorsed such an analytical approach, as indicated by the reference in paragraph two to 'an adverse effect on competition in the relevant market.'[340] The proposed industry-specific approach is but nothing more than a more formalized version of such analysis. It merely represents a more permanent incorporation of industry conditions in the analysis. In any case, the industry-specific approach only prescribes the analytical approach but not the outcome of cases. Whether a particular patent exploitation practice violates domestic competition law still requires a case-by-case determination of adverse effects in a relevant market, which seems to be what Article 40 requires.

[340] 'Agreement on Trade-Related Aspects of Intellectual Property Rights (Adopted 15 April 1994, Entered into Force 1 January 1995) 1869 UNTS 299 (TRIPS Agreement)' (n 333) art 40(2).

The Doha Ministerial Declaration on the TRIPS Agreement and Public Health subsequently adopted by the WTO member states recognizes that individual countries can use to the fullest extent the flexibilities for competition law provided in the Agreement. Clause 5(b) of the Declaration recognizes that each member 'has the right to grant compulsory licenses and the freedom to determine upon which such licenses are granted'.[341] While this declaration is set in the context of public health and aims to promote access to affordable medicine for all, it does illustrate the degree of flexibility afforded to each member state to craft its own competition policies.

D. Conclusion

The chapter puts forward a developmental approach to the patent-competition interface that was built upon in the previous two chapters by illustrating that developing countries face different policy considerations from developed countries when tackling the patent-competition interface. While developed economies have a tendency to emphasize patent policy and dynamic efficiency considerations, developing countries may be able to ill-afford to do that given the level of poverty of the vast majority of their consumers. Developing countries need to be much more cautious about sacrificing consumer welfare for the sake of uncertain dynamic efficiency gains. This is especially in light of the tendency of the patent system to overcompensate innovators, the existence of a variety of appropriation mechanisms for innovators to recoup their investments, and the fact that most developing countries simply do not possess the technological capacity to benefit from the innovation incentives generated by their patent systems. Studies have repeatedly shown that patentee reward tends to

[341] WTO, *Ministerial Declaration on the TRIPS Agreement and Public Health* (14 November 2001) WT/MIN(01)/DEC/W/2.

benefit foreign innovators rather than domestic innovators in developing countries. A developing country competition authority may rightfully ask whether it would want to sacrifice the welfare of downtrodden domestic consumers to provide often negligible innovation incentives to multinational firms.

The lack of genuine domestic innovation capacity means that most developing countries rely on technology transfer by foreign technology owners to attain the technological progress that is critical to economic growth. This means that dynamic efficiency in the context of these countries is no longer concerned with innovation incentives, but with the incentives to transfer technology. Developing countries hence need to be mindful of how their patent-competition rules may affect such incentives. Technology transfer can be voluntary and involuntary. Voluntary technology transfer may take place through international trade of technological goods, FDI, or licensing. Involuntary technology transfer can be accomplished by imitation or compulsory licensing. Economic studies show that the robustness of patent protection affects incentives to export technological goods and to license technology. They further show that the impact of patent protection on FDI depends on the industry and the type of activity at issue. The impact is greater in industries that tend to rely more heavily on patents as an appropriation mechanism and in activities that are more research-intensive.

Analogizing these results to the patent-competition rules, this means that those rules that have the strongest implications for the robustness of patent protection, such as unilateral refusal to license intellectual property, reverse payments, and no challenge clauses, will have the most significant impact on the incentives to export technological goods and to license technology. Enforcing these rules in favor of stronger patent protection may attract more import of such goods and more technology

licensing. More permissive competition regulation of licensing may also encourage more licensing activities. Given that licensing tends to redound greater benefits to the host economy than other means of technology transfer, developing countries that rely on technology transfer may want to adjust their patent-competition rules to encourage technology licensing. All this of course only applies to those developing countries with an imitation or technology absorption capacity. For those that only possess the capacity to engage in basic production, technology transfer is not a matter of concern and these countries should focus on protecting domestic consumer welfare when approaching the patent-competition interface.

V. UNILATERAL REFUSAL TO LICENSE—A THEORETICAL PERSPECTIVE

A. Patent Exploitation Practices in Developing Countries: A Classification

There is a wide variety of patent exploitation practices. As in the rest of competition law, these practices can be categorized into horizontal agreements, vertical agreements, and abuse of dominance or monopolization. Some of these practices, such as traditional price fixing and other forms of cartel conduct, resale price maintenance, and vertical non-price restraints, are common across both patent-related and non-patent-related areas of competition law. The remainder are specific to the patent context. Patent-specific horizontal agreements include cross-licensing, patent pools, conduct arising out of the standard-setting context, R&D-related joint ventures, and patent settlements, often involving a payment by a patentee to a patent challenger known as a reverse payment[342]. Patent-specific vertical agreements mostly arise in the licensing context when the licensor attempts to impose licensing restrictions on the licensee.[343] Among these are price- or output-restricted licenses, tying or exclusive dealing obligations, package and blanket licenses, various grantback provisions, royalty-related violations, and restrictions on the licensee's right to challenge the patent's validity, also known as no challenge clauses. Lastly, abuses of dominance encompass unilateral refusal to license patent rights, fraudulent conduct in the patent application process, improper enforcement of patent rights, predatory innovation or product changes, and, perhaps only in the European Union, excessive pricing as applied to technological goods or even to the determination of royalty payments.[344]

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[342] Although reverse payments can also be classified as vertical agreements because they are between a putative licensor and a licensee. However, the main competitive concern between these agreements is the elimination of potential competition. Classification as horizontal agreements is hence more apt.
[343] Herbert Hovenkamp and others, *IP and Antitrust: An Analysis of Antitrust Principles Applied to Intellectual Property Law* (2nd edn, Aspen Publishers 2011) Part C.
[344] ibid Part B.

These patent exploitation practices are not equally relevant to developing countries. Some only have salience to those countries where there are potential competitors to global technological leaders. Horizontal practices among technology owners such as cross-licensing and patent pools will be of little concern to countries bereft of potential technology owners. Some, such as licensing restrictions, will only be of enforcement interest to countries where potential licensees are located. For countries that lack the capacity to generate innovative technology that can be cross-licensed to technology owners elsewhere and the capacity to import foreign technology through licensing, i.e., innovation capacity and technology adaptation capacity respectively, many of these practices are unlikely to have significant domestic impact. Some practices, however, affect every country that imports and consumes products incorporating patented technology.

All these practices, including those taking place in the upstream market, may ultimately harm end consumers to the extent that upstream anticompetitive conduct raises the final retail price. A patent pool consisting of competing technologies may result in higher royalty payments for downstream manufacturers that may be passed on to end consumers.[345] Yet if the locus of the conduct is in the upstream market, all the parties to the conduct are likely to be located elsewhere.[346] It will be difficult for a developing country competition authority to exercise jurisdiction and enforce against such conduct. There will be significant practical difficulties for developing countries to go after every conduct that may affect their domestic consumers.

[345] ibid s 34.3c.
[346] Excluding China, 874,800 of 980,456 patents granted in the world in 2017 were granted in high-income countries. This means over 90% of all the patents worldwide were granted in these countries. World Intellectual Property Organization, 'World Intellectual Property Indicators 2018' (n 207) 42, 44.

It is thus possible to put forward a classification of some kind for the degree of relevance of a patent exploitation practice to developing countries based on their technological capacities. Such classification is not meant to be iron-clad; it would be imprudent to assert categorical irrelevance of a particular patent exploitation practice for a developing country. It may be possible for a certain case to arise under some unusual set of circumstances, which spawns a case-by-case approach to the issues that may defy neat classification. Nonetheless, some generalization about the relevance of a patent exploitation practice to a country in light of its technological capacity should be feasible. Such generalizations, while not entirely airtight—as generalizations tend not to be—will facilitate the ensuing discussion and allow us to approach the subject matter in a more systematic manner.

For developing countries that lack even basic technology adaptation capacity and confine themselves to straightforward implementation of foreign technologies in domestic production, which have been called production countries, patent exploitation practices that arise in the licensing context and horizontally between competing technology owners are unlikely to be an enforcement priority. These countries should focus on those practices that directly harm their domestic consumers, such as excessive pricing and non-patent-specific conduct in the form of price fixing or resale price maintenance involving a patented product. For the latter category of conduct, the fact that the product is patented only tangentially affects the analysis, despite the contrary holding in the famous *General Electric* case by the U.S. Supreme Court that patent protection gives a patentee greater power to impose resale price maintenance.[347] Unilateral refusal to deal may also be of interest to the extent that

[347] United States v. General Electric Co., 272 U.S. 476 (1926).

these countries rely on a patented input in their production. Compulsory licensing of a patented technology under the essential facilities doctrine, however, is unlikely to feature in these countries. They probably need not delve into the most complex patent-competition issues that may require the competition authority to balance competition policy against patent policy.

Even though it may seem like a practice that affects an upstream relationship between potential technological competitors which should be left to more established jurisdictions, reverse payments should be an enforcement concern even for these production countries, which are also likely to be the poorest developing countries with the most rudimentary enforcement capacity. This is because despite being relatively removed from the final consumers, reverse payments can have a significant impact on the retail prices for pharmaceutical products. Reverse payments are widely suspected for raising drug prices.[348] As complex as reverse payments may be, they are too important for developing country consumers to be ignored by any competition authority, developing country or otherwise. Enforcement against reverse payments, however, will be fraught with difficulty for developing country competition authorities, no less because the parties involved are likely to be located elsewhere.[349] It may be

[348] Keith M Drake, Martha A Starr and Thomas McGuire, 'Do "Reverse Payment" Settlements of Brand-Generic Patent Disputes in Pharmaceutical Industry Constitute an Anticompetitive Pay for Delay?' (National Bureau of Economic Research 2014) 20292 6. The authors report that announcement of a reverse payment settlement is followed by 6% increase in the share price of the brand manufacturers.
[349] Almost all of the brand manufacturers and a vast majority of the generic manufacturers hail from the industrialized economies. According to Market Research Reports, all of the top ten pharmaceutical companies in the world in 2019 by revenue are based in developed countries. 'World's Top 10 Pharmaceutical Companies by Revenue' (*Market Research Reports*, 7 March 2019) <https://www.marketresearchreports.com/blog/2019/01/30/world%E2%80%99s-top-10-pharmaceutical-companies-revenue> accessed 4 March 2020. With the notable exception of India, all of the top ten generic manufacturers in the world in 2019 are based in industrialized economies. 'The World's Biggest Generic Pharmaceutical Companies in 2018' (*Pharmaceutical Technology*, 3 April 2019) <https://www.pharmaceutical-technology.com/features/biggest-generic-pharmaceutical-companies-2018/> accessed 4 March 2020.

difficult for these authorities to exercise jurisdiction and impose an effective remedy on the firms involved.

The situation is more complicated for those developing countries that possess the capacity to receive technology transfer from global technological leaders through voluntary means such as foreign direct investment ('FDI') or licensing or involuntary means such as outright imitation by way of reverse engineering. These technology adaptation countries will need to pay attention to a much wider range of patent exploitation practices, including licensing restrictions. Unilateral refusal to license will obviously be of interest to these countries where firms with the capacity to replicate foreign technology exist. It may also be invoked by domestic firms that compete with foreign technology owners in the aftermarket or the downstream market. While these firms may not yet be capable of producing genuine innovation along the global technological frontier, which can be called frontier innovation, they may acquire important technical know-how or product knowledge through their involvement in the aftermarket or the downstream market. Acquisition of such know-how and knowledge may be play a pivotal role in the country's technological upgrade.

Horizontal practices arising between owners of substitute or complementary technologies, such as cross-licensing, patent pools, standards setting-related issues, and R&D joint ventures, are likely to be pertinent only to developing countries that are capable of generating frontier innovation in industries in which these practices are common. The ICT industry is one in which standard setting activities and patent pools feature prominently.[350] Developing countries that possess genuine innovation capacity at least in certain sectors have been previously called proto-

[350] Valerio Torti, *Intellectual Property Rights and Competition in Standard Setting: Objectives and Tensions* (Routledge 2016) 50–51. Claudia Tapia Garcia, 'Realities of Patent Pools in the Telecommunication Sector' (IEEE 2011).

innovation countries or technologically proficient developing countries by Shamnad Basheer and Annalisa Primi.[351] Only countries that have nurtured genuine competitors and collaborators in the global technological arena need to be concerned with horizontal patent exploitation practices.

Patent-related abuse of dominance such as fraudulent conduct in the patent application process, improper enforcement of patent rights, and predatory innovation or product changes tend to be brought by firms that are directly affected by the conduct, which may include technological competitors and imitators. A firm whose innovation is blocked by a fraudulently obtained patent will have the incentive to bring what is known in the U.S. as a *Walker Process* claim.[352] A firm selling a product that does not infringe the dominant firm's technology may be subject to a vexatious lawsuit by the dominant firm.[353] These firms can be found in both technology adaptation countries and proto-innovation countries. Because even proto-innovation countries are likely to have highly varied innovation capacity in different sectors, competition authorities in these countries will need to adopt a sector-specific enforcement focus.

The foregoing discussion can be summarized in the table below, with the last three columns listing those patent exploitation practices that may be of particular interest to the category of countries at issue, where practices that are relevant to countries with lower technological capacity are presumed to be of interest also to countries with higher technological capacity:

Table 2. Table Showing Patent Exploitation Practices of Enforcement Interest to Different Developing Countries based on their Technological Capacity

[351] Basheer and Primi (n 111) 104.
[352] Walker Process Equipment v. Food Machinery & Chemical Corp., 382 U.S. 172 (1965).
[353] Professional Real Estate Investors v. Columbia Pictures, 508 U.S. 49 (1993).

Type of Country	Technological Capacity	Horizontal Restraints	Vertical Restraints	Abuse of Dominance
Production Countries	Production and technology implementation	▪ General cartel conduct ▪ Reverse payments	▪ Resale price maintenance ▪ Vertical non-price restraints	▪ Excessive pricing ▪ Unilateral refusal to supply
Technology Adaptation Countries	Voluntary and involuntary imitation	None	▪ Licensing restrictions	▪ Excessive royalty issues ▪ Unilateral refusal to license ▪ Fraud in patent application ▪ Improper patent enforcement ▪ Predatory innovation
Proto-innovation Countries	Frontier innovation in some sectors	▪ Cross-licensing ▪ Patent Pools ▪ Standard-setting related practices ▪ R&D-related joint ventures	▪ None	▪ None

B. General Discussion

1. Unilateral Refusal to Supply Patented Technology in the Developing Country Context

There are two ways in which a firm can be accused of refusing to supply a technology. It can either refuse to supply a physical product or input that embodies a patented technology or refuse to license the technology outright, although there are some situations in which firms have required the buyer of a physical product to take out

a license as well.[354] Setting aside this hybrid scenario, these two types of refusal can have different ramifications in terms of remedies and significance for developing countries. The obvious remedy for a refusal to supply a patented input is to compel the firm to supply. To the extent that the patented technology cannot be easily reverse engineered from the product itself, the product sale need not amount to technology transfer to the buyers.[355] Being found liable for unilateral refusal to license patent rights usually results in the competition authority or the courts imposing a duty to license on the patentee.[356] Compulsory licensing will force the patentee to part with her technology and authorize the plaintiff to use it subject to reasonable compensation.[357] From the perspective of promoting technological upgrade, compulsory licensing is more beneficial so long as the country at issue possesses the capacity to absorb the transferred technology.

Compulsory licensing poses an acute dilemma for many developing countries. On the one hand, it is a powerful tool for developing country competition authorities to provide domestic firms access to foreign technology. On the other hand, liberal use of compulsory licensing may deter foreign technology transfer. Depending on the industry at issue, readiness to impose compulsory licensing affects the robustness of patent protection that has been shown to affect the readiness of foreign technology owners to engage in technology transfer.[358] In developing countries with a substantial

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[354] Qualcomm's "no license no chip" practice was subject to a U.S. Federal Trade Commission enforcement action. Judge Lucy Koh of the United District Court for the Northern District of California held in the FTC's favor. The case is currently on appeal in front of the Ninth Circuit. FTC v. Qualcomm Corp., 2019 WL 2206013. (N.D. Cal. 2019).

[355] Kim Linsu, 'Technology Transfer & Intellectual Property Rights: The Korean Experience' (UNCTAD 2002) Issue Paper No. 2 17.

[356] Hovenkamp and others (n 343) s 13.3.

[357] 'Compulsory Licensing of Pharmaceuticals and TRIPS' (*World Trade Organization TRIPS and Health: Frequently Asked Questions*, March 2018) <https://www.wto.org/english/tratop_e/trips_e/public_health_faq_e.htm> accessed 4 March 2020.

[358] Nunnenkamp and Spatz (n 274) 408. Javorcik (n 236) 49–51. Smith, 'How Do Foreign Patent Rights Affect U.S. Exports, Affiliate Sales, and Licenses?' (n 319) 427.

technology adaptation capacity, more robust patent protection will create a market expansion effect, leading to an increase in the importation of technological goods.[359] Liberal use of compulsory licensing may retard importation of such goods.

Robustness of patent protection also has a bearing on the preferred mode of technology transfer. More robust patent protection will steer foreign technology owners from trade of technological goods to FDI or licensing, especially to the latter.[360] This is particularly true in countries with a substantial technology adaptation capacity. Licensing exposes the technology owner to the highest degree of imitation risk.[361] Where this risk can be kept in check by minimizing instances of compulsory licensing, foreign technology owners may be more willing to license technology to the country. Licensing redounds the greatest technical benefits to a developing country by transferring technology into the hands of local firms.[362] Therefore, developing countries face conflicting considerations as far as compulsory licensing is concerned. On the one hand, compulsory licensing can be deployed as an outright means of involuntary technology transfer. On the other hand, doing so too readily could deter future technology transfer by foreign technology owners. Applying the same standard to domestic innovation, to the extent there is any, could also deter domestic R&D investment. A delicate balance will need to be struck between these considerations.

2. Competition Policy vs. Patent Policy Revisited

The prohibition of the unilateral refusal to supply patented technology, either in the form of a refusal to supply a patented product or a refusal to license a

[359] Smith, 'Are Weak Patent Rights A Barrier to U.S. Exports?' (n 250) 164. Briggs (n 259) 38–39.
[360] Smith, 'How Do Foreign Patent Rights Affect U.S. Exports, Affiliate Sales, and Licenses?' (n 319) 411.
[361] ibid.
[362] Di Maio (n 246) 129. Amsden (n 246) 142–47. Altenburg and Lütkenhorst (n 247) 124.

patented technology, is a highly controversial area within the patent-competition interface. The essence of patent rights is the right to exclude[363], or as Carl Shapiro has famously asserted, to try to exclude others from practicing or commercializing an innovation.[364] In particular, compulsory licensing, which is the usual remedy in a unilateral refusal to license case, overrides this right to exclude and is thus a direct affront to patent protection.[365] For this reason, commentators have called for 'special scrutiny' of cases involving unilateral refusal to supply patented technology.[366] When a competition authority or a court imposes a duty to supply or license, it is essentially invoking competition policy to override patent rights. To some commentators, this amounts to a usurpation of the patent system.

Given that unilateral refusal to supply patented technology implicates the essence of patent protection, it should come as no surprise that the controversy surrounding this area of law closely parallels the debate on the appropriate balance between competition and patent policies in the patent-competition interface. There are supporters on either side of the debate. Some U.S. commentators believe that patent law should enjoy primacy over competition law and that a unilateral refusal to supply patented technology claim should rarely if ever be upheld. According to Professor Herbert Hovenkamp and his co-authors, '[t]he starting point for understanding the unilateral refusal to license cases is the fundamental principle that an intellectual property owner has no obligation to use its right at all.'[367] David McGowan goes one step further and asserts that '[i]n patent cases, the right to engage in pure exclusion is

[363] For example, Section 154 of the U.S. Patent Act provides for the right to exclude by a patentee. 35 U.S.C. § 154 (2018).
[364] Shapiro (n 228) 395.
[365] Herbert J Hovenkamp, Mark D Janis and Mark A Lemley, 'Unilateral Refusals to License' (2006) 2 Journal of Competition Law & Economics 1, 1.
[366] ibid.
[367] ibid 2.

all but absolute.'[368] He defines cases of pure exclusion as 'those in which the owner of a valid intellectual property right, validly obtained, unilaterally refuses to sell or license the technology covered by the right to a party wishing to obtain the technology.'[369] He contrasts pure exclusion with conditional exclusion, where the patentee's willingness to license is premised on the licensee's acceptance of certain terms and conditions.[370]

Section 271(d)(4) of the U.S. Patent Act explicitly provides that a patent owner cannot be found guilty of patent misuse solely for her refusal to license the patent.[371] Although patent misuse is only a defense in a patent infringement suit, some U.S. commentators have argued that the implication of Section 271(d)(4) must be that unilateral refusal to license cannot be an antitrust violation.[372] It would defy common sense if unilateral refusal to license does not constitute a patent misuse, which would only temporarily suspend a patentee's ability to enforce her rights, but could be grounds for an antitrust violation, which can result in trebled damages.[373] The U.S. Department of Justice and Federal Trade Commission seem to concur, taking the view that unilateral refusal to license patent rights should rarely, if ever, amount to an antitrust violation.[374] It has been argued that even if patent law needs to recalibrate its balance between generating innovation incentives for inventors and ensuring consumers adequate access to patented technology, adjustments should be made within patent law and not by antitrust law.[375] In the slightly different context of platform

[368] David McGowan, 'Networks and Intention in Antitrust and Intellectual Property' (1999) 24 Journal of Corporation Law 485, 493.
[369] ibid 491.
[370] ibid.
[371] Hovenkamp, Janis and Lemley (n 365) 3.
[372] Peter M Boyle, Penelope M Lister and J Clayton Everett Jr., 'Antitrust Law at the Federal Circuit: Red Light or Green Light at the IP-Antitrust Intersection' (2001) 69 Antitrust Law Journal 739, 749.
[373] ibid 749.
[374] U.S. Department of Justice and Federal Trade Commission (n 22) 3.
[375] Thomas F Cotter, 'Intellectual Property and the Essential Facilities Doctrine' (1999) 1999 The Antitrust Bulletin 211, 250.

interoperability, Alan Devlin and his co-authors argue that if any adjustments need to be made to the innovation incentives provided by intellectual property, it should be done through industry-specific legislation adopted by the legislature.[376]

Not everyone subscribes to the patent primacy view. Simon Genevaz asserts that '[a] careful reading of intellectual property laws shows that immunity runs contrary to congressional intent.'[377] This is echoed by Marina Lao, who observes that a '[c]lose examination of the purposes of the patent and copyright laws suggests that such limited application of antitrust principles [in unilateral refusal to license cases] would not subvert'[378] the policy objectives of the patent system. The patent statute does not clearly delineate the limits of the right to exclude.[379] It is up to antitrust law to do so applying antitrust principles.

The uncertainty about the proper boundary of patent rights is compounded by the general perception that the U.S. patent system is heavily skewed toward patentees. The patent examination system in the U.S. strongly favors patent applicants. It has been commented that the U.S. Patent and Trademark Office ('USPTO'), the agency responsible for reviewing patent applications, is more concerned about helping applicants get patents than scrutinizing patent applications for worthy innovation.[380] The *ex parte* nature of patent application proceedings means that the examiner only receives information from the applicant during the examination

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[376] Alan Devlin, Michael Jacobs and Bruno Peixoto, 'Success, Dominance, and Interoperability' (2009) 84 Indiana Law Journal 1157, 1182.
[377] Simon Genevaz, 'Against Immunity for Unilateral Refusals to Deal in Intellectual Property: Why Antitrust Law Should Not Distinguish between IP and Other Property Rights' (2004) 19 Berkeley Technology Law Journal 742, 753.
[378] Marina Lao, 'Unilateral Refusals to Sell or License Intellectual Property and the Antitrust Duty to Deal' (1999) 9 Cornell Journal of Law and Public Policy 193, 213.
[379] ibid 198.
[380] Jaffe and Lerner (n 35) 137.

process.[381] Fortunately, this design flaw has been ameliorated somewhat by recent reforms.[382] This is further exacerbated by the highly publicized shortage of staff and resources at the USPTO.[383] It has been reported that patent examiners in the USPTO had less than twenty hours to examine each patent application.[384] The poor quality of patent examination is perhaps reflected in the fact that 46% of patents that are litigated to judgment in the U.S. are eventually invalidated, despite the presumption of validity under the Patent Act.[385] If patents are of such questionable quality, they should not be entitled to deference from antitrust law.

Advocates of a pro-competition view do not base their argument solely on the flaws of the patent system. Some have argued that even if the patent system worked perfectly, it still suffers from some inherent limitations that render patent law unsuitable for the role of fine-tuning the balance between these two policies in individual cases. Béatrice Dumont and Peter Holmes contend that:

> It is impossible to design an optimal system in advance. The actual conditions in the innovation market and product market will emerge after a patent has been granted. There has to be a degree of flexibility in any event. Given that competition policy is case law driven and IPR rules tend to be set in stone for many years, it makes sense for the ground rules to be set in IPR legislation and for tweaking to be done by the application of competition policy.[386]

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[381] James Langenfeld, 'Intellectual Property and Antitrust: Steps Toward Striking a Balance' (2001) 52 Case Western Reserve Law Review 91, 106.
[382] The 2011 Patent Reform Act provides for inter partes review on the grounds of novelty and obviousness. John Villasenor, 'The Comprehensive Patent Reform of 2011: Navigating the Leahy-Smith America Invents Act' (Brookings Institution 2011) Policy Brief No. 184 <https://www.brookings.edu/research/the-comprehensive-patent-reform-of-2011-navigating-the-leahy-smith-america-invents-act/>.
[383] Langenfeld (n 381) 106.
[384] Quentin Hardy, 'Search 500,000 Documents, Review 160,000 Pages In 20 Hours, And Then Do It All Over Again' (*Forbes*, 24 June 2002) <https://www.forbes.com/asap/2002/0624/050.html> accessed 4 March 2020.
[385] John R Allison and Mark A Lemley, 'Empirical Evidence on the Validity of Litigated Patents' (1998) 26 American Intellectual Property Law Association Quarterly Journal 185, 205.
[386] Béatrice Dumont and Peter Holmes, 'The Scope Of Intellectual Property Rights and Their Interface with Competition Law and Policy: Divergent Paths to the Same Goal?' (2002) 11 Economics of Innovation and New Technology 149, 161.

If case-by-case calibration of the policy balance needs to be done in unilateral refusal to license cases, it can only be accomplished through competition law, which 'is the only device available to address the point that the optimal degree of patent protection depend[s] on the market conditions, something which cannot be handled ex ante by the patent law.'[387] Some commentators, however, have cautioned against the expansive use of competition law to second-guess the patent system. Mattias Ganslandt notes that competition law can be used by national governments 'to redistribute rents from foreign IPR holders to domestic consumers or competing firms.'[388] Devlin and his co-authors warn that 'there will invariably be 'sore losers' eager to seek pecuniary compensation through the competition laws.'[389]

The foregoing discussion highlights a number of important themes that will be explored below. These themes point to some central considerations in the adjudication of cases involving unilateral refusal to supply patented technology. The first is the extent to which the patent system should be accorded deference by competition law, especially in light of its tendency to overcompensate inventors and it not being relied upon as a major appropriation mechanism in many industries. This necessitates an assessment of the impact of competition law intervention on innovation incentives in the concrete setting of the imposition of a duty to supply or license. The second is the extent to which the boundary of a duty to supply or license should be demarcated by patent scope if competition law were to intervene to restrict the patentee's right to exclude. This is a concept that seems to be popular among some courts and commentators. The problem is that no one seems to know exactly how to

[387] ibid 161.
[388] Mattias Ganslandt, 'Intellectual Property Rights and Competition Policy', *Intellectual Property, Growth and Trade* (Emerald Insight 2015) 243.
Ganslandt 243.
[389] Devlin, Jacobs and Peixoto (n 376) 1185.

define patent scope, even though everyone who invokes the concept seems to have some implicit notion in mind. The third is what considerations should inform the adjudication of cases involving unilateral refusal to supply patented technology, and whether a duty to supply or license should only be imposed under highly exceptional circumstances. If so, what should those circumstances be. Lastly, implicit in the foregoing discussion seems to be this assumption that competition law can intervene on the simple ground that patent protection results in supracompetitive prices for consumers. There is scant mention of the weighing of competitive harm caused by the refusal to supply or license against the benefits of imposing a duty to do so. Does the rather exceptional nature of the offense of unilateral refusal to supply patented technology mean that the need for a coherent theory of harm can be dispensed with? If not, what should those theories be?

C. Overview of Relevant Legal Doctrines

1. Introduction of the Unilateral Refusal to Deal and the Essential Facilities Doctrines

Before turning to a full discussion of the theoretical and policy arguments pertaining to the unilateral refusal to supply patented technology, it is important to introduce the two relevant legal doctrines that are relevant for our purposes: the unilateral refusal to deal doctrine and the essential facilities doctrine. The former can be found on both sides of the Atlantic whereas the latter is largely confined to the U.S. These are two closely intertwined yet distinct doctrines that can be applied to scenarios involving unilateral refusal to supply patented technology. The unilateral refusal to deal doctrine holds that, under some specific circumstances, it will be illegal for a dominant firm to withhold supply of a product or input to a competitor if the refusal to supply

forecloses a competitor in either the primary product market, the downstream market, or an aftermarket. The essential facilities doctrine compels a dominant firm to share an essential facility in its possession with competitors if the facility is critical to the competitors' ability to compete and it is feasible to provide access to the facility.[390] Applied in the patent context, the essential facility[391] will be a patented technology.

The U.S. and the EU courts hold divergent attitudes toward the two doctrines. Despite having been invoked on a number of occasions by the U.S. courts, some U.S. commentators harbor great hostility to the two doctrines. Notably, Justice Antonin Scalia has imposed significant constraints on the vitality of the unilateral refusal to deal doctrine in *Trinko*.[392] Meanwhile, the European courts have not displayed the same degree of aversion to imposing a duty to share a critical input. Despite having never explicitly endorsed or invoked the essential facilities doctrine, the EU courts have at times decided cases in ways that are reminiscent of the doctrine. On the whole, the European courts have displayed greater willingness to impose to duty to supply or share, especially in recent years, than the U.S. courts. The case law applying these doctrines have been subject to different formulations on both sides of the Atlantic, even though they tend to point to the same underlying policy considerations.

The line between these two doctrines is not always so clear. It is at times difficult to draw a clear distinction between them.[393] One way to distinguish the two doctrines is based on their scope of application. Although the boundary between them has not always been very clear, one can generally deduce that the unilateral refusal to

[390] Herbert Hovenkamp, *Federal Antitrust Policy: The Law of Competition and Its Practice* (4th edn, West Publishing Co 2011) s 7.5.
[391] Hovenkamp and others (n 343) s 13.3c.
[392] Verizon Communications v. Law Offices of Curtis Trinko, LLP, 540 U.S. 398 (2004).
[393] Cyril Ritter, 'Refusal to Deal and ``Essential Facilities'': Does Intellectual Property Require Special Deference Compared to Tangible Property?' (2005) 28 World Competition 281, 283–85.

deal doctrine tends to apply to a physical product or input while the essential facilities doctrine is more often invoked in cases involving an infrastructure or an intangible asset. The *Commercial Solvents*[394] case in the EU and *Aspen Skiing*[395] in the U.S., both of which involve a product or a service, are generally understood to be unilateral refusal to deal cases. Meanwhile, the *Associated Press*[396] case in the U.S. is usually viewed as essential facilities cases (although *Associated Press* was a concerted refusal to deal case). Without insisting on a strict categorization of cases, we will generally apply the unilateral refusal to deal doctrine and the essential facilities doctrine to physical input and intangible assets respectively. This categorization is also consistent with the evolution of the EU case law, where one can see a clear line of cases involving physical input and another line implicating critical infrastructure or intellectual property. Where the possibility of compulsory licensing of a patented technology is suggested, it will be done through application of the essential facilities doctrine. The unilateral refusal to deal doctrine will mostly be mentioned in the context of a refusal to supply a patented input.

2. Theories of Harm

Every competition law case requires a theory of harm. This is especially important in unilateral refusal to deal cases where it is usually very easy to demonstrate how competitors are harmed by the refusal to supply. A survey of the leading unilateral refusal to deal and essential facilities cases, however, suggests that the courts have not always been explicit in specifying the theory of harm in the case. In the unilateral refusal

[394] Cases 6 and 7/73, *Istituto Chemioterapico Italiano Spa and Commercial Solvents Corp. v. Commission* [1974] ECR 223.
[395] Aspen Skiing Co. v. Aspen Highlands Skiing Corp., 472 U.S. 585 (1985).
[396] Associated Press v. United States, 326 U.S. 1 (1945).

to deal cases, the emphasis is often on the factual circumstances surrounding and the justifications for the refusal to supply. The courts do not often articulate how the refusal to supply harms competition and consumers. In the essential facilities cases, the focus is instead the degree of essentiality of the facility, which in turn hinges on the uniqueness of the facility and the extent to which competition will be eliminated by a denial of access. Nonetheless, most of these cases seem to be implicitly based on the premise that denial of access to the facility forecloses downstream competition. Before further exploring the implications of the use by developing countries of these doctrines to widen access to technology, it is important to acquire a clearer understanding of the various scenarios in which a refusal to supply an essential input or provide access to an essential facility can harm competition.

(i) Unilateral Refusal to Deal

Commentators such as Richard Gilbert, Carl Shapiro, and Dennis Carlton have articulated a number of scenarios in which a refusal to supply an essential input or provide access to an essential facility (collectively referred to as 'refusal to deal') may harm competition. According to Gilbert and Shapiro, a unilateral refusal to deal may create competitive harm in the following four scenarios: (1) enhancement of entry barriers and creation of the double-entry requirement[397]; (2) facilitation of price discrimination[398]; (3) foreclosure of upstream or downstream competition[399]; (4) creation of effective exclusivity.[400] They do not clearly specify whether these theories of harm only apply to tangible input or to intellectual property as well. They speak

[397] Richard J Gilbert and Carl Shapiro, 'An Economic Analysis of Unilateral Refusals to License Intellectual Property', *Proceedings of National Academy of Sciences* (1996) 12750.
[398] ibid 12751.
[399] ibid.
[400] ibid.

generally of essential input.[401] Nor do they draw a distinction between the unilateral refusal to deal doctrine and the essential facilities doctrine, which makes sense because there is probably no meaningful distinction between the two from an economic perspective.[402] In the ensuing discussion, it will be important to determine the applicability of these theories of harm to intellectual property and hence their relevance to the essential facilities doctrine.

In addition to these four scenarios, commentators have noted that a unilateral refusal to deal may allow the dominant firm to leverage its market power into related markets such as the aftermarkets.[403] Such monopoly leveraging theories of harm are highly reminiscent of the competitive harm created by tying and bundling. Therefore, to the extent that unilateral refusal to deal is used to achieve results that are tantamount to tying or bundling, as in many of the U.S. refusal to deal cases, the discussion will be deferred to chapter VII**PATENT TYING**.

(a) Enhancement of Entry Barriers and Creation of the Double-Entry Requirement

A unilateral refusal to deal may raise entry barriers if competitors have to produce a substitute for the input to which they have been denied access.[404] Denial of access by the dominant firm would not create much problem for competitors if there were alternative sources of supply of the sought-after input. But if competitors cannot source the input from elsewhere and need to produce the input themselves, the refusal to supply would raise entry barriers. The dominant firm's refusal to supply may be motivated by a desire to forestall entry of a new competitor in either the input market

[401] ibid.
[402] ibid 12750–51.
[403] Lao (n 378) 213, 217–18.
[404] Gilbert and Shapiro (n 397) 12750.

or the final product market.[405] How the denial of access to a critical input would forestall entry into the final product market probably needs no explanation. Such denial can also erect barriers in the input market if, by denying downstream rivals access to the critical input, the dominant firm succeeds in keeping the size of these rivals small enough that they do not generate sufficient demand for an alternative supplier of the input. Any potential alternative supplier would be denied minimum efficient scale. A potential entrant into either market must enter both at the same time, creating a two-level entry requirement.[406]

The application of this theory of harm to the unilateral refusal to license patented technology presents some difficulty. In characterizing the denial of access to an input and the two-level entry requirement as a competitive harm, the implicit presumption is that a producer of the downstream final product should not be expected to produce the input also. The input and the final product are often produced by different firms. Such kind of presumption may have greater applicability to a physical input than to intellectual property. For instance, Boeing is not expected to produce every component in the aircraft it produces.[407] Component producers expect to sell their aircraft components to Boeing. In contrast, there is no expectation that Boeing should be able to license any technology it needs for its aircraft.[408] The denial of access to technology may not be deemed to raise entry barriers or create the two-level entry requirement. Therefore, this theory of harm should have more limited application to a

[405] ibid 12751.
[406] ibid 12751.
[407] Boeing outsources up to 65% of the airframe of 787 Dreamliner to outside suppliers, for example. Jeremy Bogaisky, 'Boeing's Vertical Leap: Where Will It Squeeze Suppliers Next?' (*Forbes*, 6 June 2018) <https://www.forbes.com/sites/jeremybogaisky/2018/06/06/boeings-vertical-leap-where-will-it-squeeze-suppliers-next/#5a175a5f248a> accessed 4 March 2020.
[408] Catherine Jewell, 'Giving Innovation Wings: How Boeing Uses Its IP' (*World Intellectual Property Organization*, February 2014) <https://www.wipo.int/wipo_magazine/en/2014/01/article_0004.html> accessed 4 March 2020.

refusal to license patented technology, while it readily applies to a refusal to supply an intermediate input that incorporates a patented technology. This means that this theory of harm is more relevant for the unilateral refusal to deal doctrine.

The situation is different if a complementary product market is involved. A patentee can refuse to license her technology to a complementary product supplier not because it wants to leverage its market power from the primary product market into the complementary product market, but because she wants to prevent the emergence of a viable supplier of the complementary product, thereby creating a two-level entry requirement for a future entrant into the primary product market.[409] An apt illustration of this strategy would be the slew of unilateral refusal to deal cases in the U.S. in the late 1990s involving photocopier manufacturers and independent service organizations ('ISOs').[410] By making it impossible for customers to obtain repair services from ISOs, the likes of Kodak and Xerox managed to eliminate ISOs from the market, effectively requiring any future entrant into the photocopier market to provide repair service at the same time.

(b) Facilitation of Price Discrimination

Whether enabling price discrimination counts as a theory of harm depends on whether price discrimination harms or benefits consumers. It is well known in the economic literature that price discrimination can be either anticompetitive or pro-competitive depending on its effect on the output level.[411] Price discrimination can be output-enhancing if it results in an increase in output by allowing the supplier to

[409] Dennis W Carlton, 'A General Analysis of Exclusionary Conduct and Refusal to Deal: Why and Kodak Are Misguided' (National Bureau of Economic Research 2001) Working Paper 8105 14. Lao (n 378) 218.
[410] Image Technical Services v. Eastman Kodak, 125 F.3d 1195 (9th Cir. 1997); In re Independent Service Organizations Antitrust Litigation (Xerox), 203 F.3d 1322 (Fed. Cir. 2000).
[411] Mark Armstrong and John Vickers, 'Price Discrimination, Competition and Regulation' (1993) 41 Journal of Industrial Economics 335, 336.

lower its price to price-sensitive customers.[412] Price discrimination can be output-reducing if the market-wide output level would be higher when the seller charges a uniform price.[413] Therefore, establishing this theory of harm would entail two steps. The first one is to determine whether the unilateral refusal to deal does in fact facilitate price discrimination. The second one is to ascertain whether the price discrimination at issue is output-enhancing or -reducing.

Assuming that the price discrimination at issue is output-reducing, a unilateral refusal to deal can facilitate price discrimination as follows. Imagine a producer of a raw material which has a low-value use and a high-value use. The producer cannot prevent arbitrage between low-value users and high-value users once the raw material is sold. The producer would ideally prefer to charge the high-value users a higher price and the low-value users a lower price. But the high-value users would simply purchase the raw material from the low-value users if she does that. If the producer can accurately estimate the low-value users' needs, she can control the amount of the raw material sold to these users such that they do not have surplus to resell to the high-value users. But if the producer cannot do that, the only way for her to extract the full surplus from the downstream users is by forward integrating into the downstream production of the low-value use and continue to sell the raw material to the high-value users at an elevated price. The producer would need to refuse to supply the raw material to other low-value users.

It is again not entirely clear that this theory of harm has much relevance for patented technology. Downstream integration and unilateral refusal to supply are necessary to accomplish price discrimination in the example because arbitrage is

[412] ibid.
[413] ibid.

unpreventable. The same is not true of patented technology. The raw material producer, in this case the patentee, can easily prevent arbitrage by including a clause that prohibits sub-licensing and any further transfer of the technology in the licensing agreement. This should suffice unless the patentee is somehow prohibited from charging different levels of royalty to different users. This could be the case if the patentee is subject to a stringent FRAND licensing obligation imposed by a standard-setting body.[414] Even then, a FRAND obligation appropriately construed should allow a patentee to charge different royalties to licensees that put the technology into different uses.[415] Therefore, this theory of harm is mainly relevant for a refusal to supply a patented input under the unilateral refusal to deal doctrine.

(c) Foreclosure of Upstream or Downstream Competition

Unilateral refusal to deal may help a firm protect its market power in the downstream market.[416] The owner of an essential input would only supply an input if she can secure adequate compensation for the loss of revenue following market entry.[417] There would be no reason for her to refuse to supply the input if she could extract all the surplus through pricing of the input.[418] She would be indifferent between supplying the input to a downstream competitor and exploiting the downstream market herself by withholding supply. But if she cannot secure adequate compensation, the owner would foreclose downstream competition by withholding the essential input.

Apart from protecting the input owner's downstream market power, Yongmin Chen provides another motive for an input owner to refuse to supply. Refusal

[414] Joseph Farrell and others, 'Standard Setting, Patents, and Hold-Up' (2007) 74 Antitrust Law Journal 603, 636–38.
[415] ibid 638–41.
[416] Gilbert and Shapiro (n 397) 12751.
[417] ibid.
[418] Carlton (n 409) 10.

to deal can help shield the input owner from future upstream competition. He posits that an essential input owner may refusal to supply 'when there is potential upstream competition in the future, and the downstream dominance achieved through refusal to deal enables the monopolist to maintain monopoly profit via vertical control even when the upstream market becomes competitive.'[419] The incentive to refuse to deal would be stronger if supplying an independent downstream firm would render future upstream competition more likely.[420] There are two ways in which this could be the case. First, the existence of independent downstream firms provide potential customers for future upstream competitors and allow them to reach minimum efficient scales more quickly. Second, if a follow-on innovation on the essential input is possible and likely, the incumbent input supplier may reduce the likelihood of follow-on innovation by foreclosing competitors from the downstream market, thereby making it more difficult for the innovator to recoup her investment. In a slightly different vein, Carlton argues that a refusal to deal strategy will allow the dominant firm to transfer its market power downstream, which will in turn let the dominant firm hang on to its market position despite changes and innovation in the upstream market.[421] In this case, upstream innovation will continue, but the innovator will receive few benefits as she would still be subject to the dominant firm's market power.

The classic version of this theory of harm, which entails simple foreclosure of downstream competition, is readily applicable to unilateral refusal to license patented technology under the essential facilities doctrine as well as general unilateral refusal to deal. In fact, foreclosure of downstream competition is the

[419] Yongmin Chen, 'Refusal to Deal, Intellectual Property Rights, and Antitrust' (2013) 30 Journal of Law, Economics & Organization 533, 553.
[420] ibid.
[421] Carlton (n 409) 16.

quintessential theory of harm under the essential facilities doctrine. Chen and Carlton's variations of the theory, which emphasizes the use of downstream foreclosure to protect the dominant firm's upstream market position, are likely to be less relevant to the essential facilities doctrine. An essential facility owner should have an iron-clad position in the upstream market and need not use downstream foreclosure to protect it.

(d) Creation of Effective Exclusivity

One final theory of harm was articulated by Dennis Carlton and is largely based on the facts of the famous *Aspen Skiing* case*. Aspen Skiing* has been generally interpreted as standing for the proposition that it is illegal monopolization when a dominant firm sacrifices an existing profit-maximizing course of conduct with the intent to harm a rival.[422] According to Carlton, Ski Co., the dominant ski mountain operator in the case, could have attained exclusivity in the operation of ski slopes in Aspen by refusing to deal with customers and other intermediaries that deal with Highlands.[423] This would clearly amount to exclusive dealing. Direct imposition of exclusivity in this manner, however, was not feasible in that case. Instead, what Ski Co. did was to use a non-linear pricing schedule, which was facilitated by the termination of the 6-day, 4-mountain ski pass and the refusal to sell ski slope day passes to Highlands at retail prices.[424] Consumers' vacation habit in Aspen was such that most skiers skipped Highlands' facilities, effectively resulting in exclusivity. This would prevent Highlands from becoming an effective competitor if there were significant scale economies in the maintenance of ski slopes.[425] Carlton stops short of arguing that this constellation of

[422] Trinko, 540 U.S. at 408-09.
[423] Carlton (n 409) 24.
[424] ibid.
[425] ibid.

facts would always establish a viable theory of harm, but suggests that it is at least worth investigating under a Rule of Reason analysis.[426]

A case which provides a more direct illustration of the use of unilateral refusal to deal to achieve exclusivity is the U.S. *Lorain Journal* case. In that case, the incumbent newspaper met the emerging threat of a radio station by refusing to accept advertisements from any firms that also advertised with the radio station.[427] The exclusivity desired by the newspaper was accomplished by its refusal to deal with any customers that advertised with the rival radio station.[428] The U.S. Supreme Court found that the newspaper's actions were designed to destroy its competitor given that it was an indispensable medium of advertising in the town.[429] Where unilateral refusal to deal is used to accomplish exclusivity, the theory of harm is well-established and should not present much difficulty.

A slight variation of the aforementioned theory of harm involves complementary products. It applies when the forestalling of effective rivals in the complementary product market harms other consumers who only consume the complementary product and not the primary product. It is possible to imagine a situation in which the complementary product can be independently consumed, and these consumers will be harmed if suppliers of the complementary product are prevented from attaining efficient scales by the dominant firm's refusal to deal.[430]

Carlton illustrates this with the example of a monopoly resort hotel on an island and restaurants.[431] The hotel is the primary product and restaurants the

[426] ibid.
[427] Lorain Journal v. United States, 342 U.S. 143, 150-51 (1951).
[428] 342 U.S. 152-53.
[429] 342 U.S. at 152.
[430] Carlton (n 409) 12.
[431] ibid.

complementary product.[432] The hotel guests are already subject to the market power of the resort.[433] By requiring all the guests to eat in the hotel and refusing to let those who prefer to eat out stay in the hotel (or at least by incorporating the meal costs into the room rate so that guests will have no incentive to eat out), the resort hotel can deny scale economies to independent restaurants that serve both the hotel guests and the locals.[434] The locals have no need for the hotel service and only care for good restaurants.[435] By forcing all the hotel guests to eat at the in-house restaurants, the resort hotel manages to harm the downtown restaurants and their customers.[436] This is another example of the use of unilateral refusal to deal to achieve exclusivity. The competitive harm of the conduct arises not from the refusal to deal but from the coerced exclusivity.

On its face, this theory of harm can apply to both the unilateral refusal to deal doctrine and the essential facilities doctrine. In fact, this theory of harm shares many similarities with the foreclosure of downstream competition. The one main difference is that under this theory of harm, exclusivity is usually attained in the primary product market itself. In *Aspen Skiing* it was ski slope operations in Aspen and in *Lorain Journal* media advertising in Lorain. There was no downstream market involved. Given that the facility in essential facilities cases usually does not constitute its own market, the use of unilateral refusal to deal to attain exclusivity in that market is unlikely to be a salient concern.

Overall, while all four aforementioned theories of harm may apply to unilateral refusal to supply a patented input, the foreclosure of downstream

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[432] ibid.
[433] ibid.
[434] ibid.
[435] ibid.
[436] ibid.

competition will be chiefly relevant to unilateral refusal to license patented technology in essential facilities cases. The theory of harm involving complementary products is likely to be less relevant for the essential facilities doctrine. The case law shows that essential facilities cases rarely involve a complementary product.

(ii) The Essential Facilities Doctrine

Theories of harm in essential facilities cases and the corresponding European cases (collectively referred to as essential facilities cases) share some ostensible similarities with those under the unilateral refusal to deal doctrine. Almost by definition the focus of an essential facilities case cannot be the market at which the facility is situated, if it is theoretically sound to define such a relevant market.[437] This is because by virtue of being essential, which is most often understood as being critical to a rival's ability to compete and being incapable of economically practical replication by rivals, the facility owner has monopolized that market. The facility owner cannot acquire further power in that market. If the facility is truly essential, it is not necessary for the facility owner to undertake any action to defend her market position. The main competitive concern under the essential facilities doctrine is foreclosure of vertically related markets.

The facility owner may leverage her position in the facility market into vertically related markets.[438] The market most often at issue is the downstream market. In most cases, the essential facility serves as a critical input in downstream production and the facility owner is accused of using the essential facility to exclude rivals in the downstream market.[439] Some have argued that foreclosure of downstream competition

[437] Gregory J Werden, 'The Law and Economics of the Essential Facility Doctrine' (1987) 32 St. Louis University Law Journal 433, 459.
[438] ibid.
[439] A Douglas Melamed and Ali M Stoeppelwerth, 'The CSU Case: Facts, Formalism and the Intersection of Antitrust and Intellectual Property Law' (2002) 10 George Mason Law Review 407, 422. Robert Pitofsky,

is the only acceptable theory of harm under the doctrine.[440] Douglas Melamed defends the use of the doctrine to police foreclosure of downstream competition, asserting that such use of the doctrine is consistent 'with the fundamental antitrust notion that a monopolist is entitled to the fruits of its 'skill, foresight and industry''[441] but not more.

In the intellectual property context, Genevaz insists that the essential facilities doctrine should only apply when downstream competition is impaired because competition law

> should not impose duties to share when the refusal is proper exercise of exclusionary IP-related privileges. On the other hand, imposing duties to share on downstream markets does not 'rip-off' the owner of the facility because the innovator's legal reward is not altered in the primary market for the product embodying its intellectual property'[442]

The implicit assumption in this argument is that the rightful reward to an innovator under the patent system is the primary product within the scope of her invention and not products or markets that are derived from, or related to the original invention. Patent protection does not empower the innovator to collect rent in the downstream market. This is reminiscent of the scope of patent test mentioned earlier.

Tying the boundary of the doctrine to the patent scope test immediately invites a number of problems, not least of which is the fact that patent scope is not self-defining and is instead determined by relevant legal rules. It smacks of circular logic to argue that the boundary of a legal doctrine is determined by a legal test which itself is defined by legal rules. There needs to be a principled basis to determine what those rules are. A further problem with Genevaz's logic is that if the intellectual property itself does not constitute a relevant product and cannot only be put to commercial use by

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Donna Patterson and Jonathan Hooks, 'The Essential Facilities Doctrine Under United States Antitrust Law' (2002) 70 Antitrust Law Journal 443, 452.

[440] Hovenkamp, Janis and Lemley (n 365) 11.

[441] Melamed and Stoeppelwerth (n 439) 422. (internal quotations in the original)

[442] Genevaz (n 377) 761.

being deployed in the production of a downstream product, it is not clear whether the patentee's control should be limited to the technology market or also extends to the downstream product market. How far do the so-called exclusionary IP-related privileges extend? What if the technology itself is practically worthless unless it is used to produce a downstream product, which is the only commercial use of the technology? Does it make a difference if the technology has many downstream uses? Ultimately, there is only one principled benchmark for determining the permissible scope of patent rights, which is the amount that is necessary to allow the innovator to recoup her R&D investments. Patent rights should allow an innovator to do no more and no less.

It is worth noting that much of the EU case law on unilateral refusal to license intellectual property rights has concerned weaker rights such as copyright on TV programming information and database rights. The implication of this on the applicability of the EU case law on unilateral refusal to license patent rights in the developing country context will be explored in the next chapter.

(iii) Applicability to Developing Countries

The aforementioned theories of harm have varying applicability to developing countries in the patent context. Developing countries could be seeking to gain access to the patented technology directly or to a physical product embodying the patented technology. The physical product could be either an intermediate input or a final product sold directly to consumers. While it is in theory possible for a dominant firm to refuse to sell a final product to consumers, it is highly unlikely in reality. So long as consumers are willing to pay the profit-maximizing price and the firm has sufficient supply, there should be no reason why the firm would refuse to sell. A quick look at the U.S. and the EU unilateral refusal to deal and essential facilities cases suggests that an overwhelming majority of the cases involves an intermediate input, either in the form of

a physical input or an asset or infrastructure. Therefore, we can tentatively narrow down the possible scope of application to a patented physical input or a patented technology as an essential facility. Refusal to supply a patented intermediate input will be analyzed as general unilateral refusal to deal while refusal to license a patented technology will fall under the rubric of the essential facilities doctrine and its corresponding EU cases.

The extent of applicability of the various theories of harm—enhancement of entry barriers, facilitation price discrimination, foreclosure of vertically related markets, and creation of effective exclusivity—to developing countries would depend on the level of the country's technological capacity. This is because these theories of harm pertain to competitors in different markets, some in the primary market itself, some in vertically related upstream or downstream market, and some in complementary product market. To be a competitor in these various markets with a global technological leader requires different levels of technological capacity.

A competitor in the primary market competes head-on with the global technological leader and therefore should require the highest level of technological sophistication. The competitor itself must be able to generate genuine novel, patentable innovation along the global technological frontier. Such a firm is unlikely to be found in any developing country with the possible exception of proto-innovation developing countries. Of the four theories of harm, creation of effective exclusivity is most directly pertinent to competitors in the primary product market. The competitive animus is targeted at a direct primary competitor in both *Aspen Skiing* and *Lorain Journal*. Therefore, creation of effective exclusivity is chiefly only applicable to proto-innovation countries, although it could also be relevant to technology adaptation countries where

imitation allows their firms to compete in the primary product market with a global technological leader.

The remaining three theories of harm all implicate vertically related markets to varying extents. Focusing on the downstream market, a competitor that purchases a patented intermediate input can be simply an assembler or a manufacturer with no independent innovation capacity of its own. It could be an iPhone assembler who imports all the components and whose only responsibility is to assemble the product. Product assembly does not require an ability to innovate, and can be found in all sorts of developing countries, from production to technological adaptation to proto-innovation.[443] Therefore, all theories of harm that can arise in this scenario will have universal applicability to developing countries. These include enhancement of entry barriers, facilitation of price discrimination, and foreclosure of vertically related markets.

A competitor that licenses a patented technology will need to have the capacity to absorb and utilize a licensed technology. In order words, it must have the capacity for technology adaptation. A firm that has nothing more than rudimentary technical capabilities will not be able to make use of a sophisticated technology licensed from a global technological leader. Such a licensee will not be found in a production country. Therefore, a theory of harm that is predicated on technology licensing, namely foreclosure of downstream competition under the essential facilities doctrine, will only be applicable to technology adaptation countries and proto-innovation countries. As mentioned earlier, the other three theories of harm have limited application in the licensing context. Facilitation of price discrimination only applies to physical input.

[443] Sachs (n 96) 133.

Creation of effective exclusivity only applies to the primary product market, to which the essential facilities doctrine by definition does not apply. Enhancement of entry barriers may have some residual relevance to technology licensing.

Lastly, a competitor in a complementary product market is probably harder to generalize in terms of technological capacity. While a complementary product generally should require less sophistication than the primary product, it could nonetheless be somewhat technologically advanced. If the complementary product is paper used in a printer, then the technological capacity required to produce it is low. But if the complementary product is the flat-screen monitor for a computer, then some technological capacity is definitely needed. Therefore, a theory of harm that implicates competitors in a complementary product market could, depending on the complementary product at issue, have relevance for all three types of developing countries. This includes both enhancement of entry barriers and creation of effective exclusivity.

Table 3. Table Showing Relevant Theory of Harm for Different Developing Countries based on their Technological Capacity

Theory of Harm	Scope of Application	Directly Affected Markets	Relevant Developing Countries
Enhancement of entry barriers	Physical input	Primary product; Downstream (two-level entry requirement); Complementary product	All
	Technology Licensing	Downstream; Complementary product	All (depending on product or technology)
Facilitation of price discrimination	Physical input	Downstream	All
Foreclosure of vertically related markets	Physical input	Downstream	All
	Technology licensing	Downstream	Technology adaptation; Proto-innovation
Creation of effective exclusivity	Physical input	Primary product	Technology adaptation (only if imitation allows

			firms to compete with global technological leader); Proto-innovation
		Complementary product	All (depending on product)

D. Critique of the Doctrines

The unilateral refusal to deal doctrine and the essential facilities doctrine have been subject to a number of criticisms, some of which focus on the substance of the doctrines and some of which on implementation. The most common and important one is that compelled sharing of an input or an asset would lower the incumbent's incentive to invest in developing the input or the asset. Another common criticism of both doctrines is that compelled sharing of an input or asset would require the competition authority or the courts to determine the terms of dealing, which in turn would require the authority or the courts to engage in ongoing supervision, or worse still, to become a rate-setting regulatory authority. It was said that the U.S. government litigation against AT&T that culminated in a consent decree mandating the break-up of the company effectively turned the presiding judge, Judge Harold Greene, into a ''one man Federal Telephony Commission.'[444]

One reason for the overwhelming aversion to compulsory licensing is the property right-centric view on intellectual property. Patents and intellectual property are generally viewed as a form of property.[445] Given that owners of physical property are usually given almost absolute right to exclude unwanted physical entry into their properties, the analogy to physical property imbues defenders of intellectual property

[444] Brett Frischmann and Spencer Weber Waller, 'Revitalizing Essential Facilities' (2008) 75 Antitrust Law Journal 1, 41.
[445] Stephen L Carter, 'Does It Matter Whether Intellectual Property Is Property' (1992) 68 Chicago-Kent Law Review 715, 715.

with an equally broad right to exclude.[446] This probably explains why the general refusal to deal doctrine and the essential facilities doctrine elicit such visceral reaction from some American commentators, who tend to hold private property in much higher regard.[447] Not everyone, however, shares this view of intellectual property. As Bruce Abramson points out, post-Chicagoans tend to view intellectual property as a regulatory device. Under this post-Chicagoan view:

> If patents create great opportunities for exploitation, antitrust law should scrutinize patentees closely, examine the data, and identify abuses. If the abuses are systematic, the policymakers in Congress should consider rewriting the patent laws to frustrate their recurrence. If such a rewrite results in a weakening of patent rights, so be it; the entire purpose of a liberal regulatory mechanism is to serve the public by filling an economic gap that the free market is unable to fill on its own. In the patent context, that means rewarding innovation to generate innovation. At the patent/antitrust interface, it means curtailing those rewards before they harm the competitive markets that we want them to bolster.[448]

Post-Chicagoans are less afraid to tinker with the policy balance underlying the patent system. They are mindful that '[t]he nature of the IP system, as a general framework that essentially grants the same legal rights irrespective of the value and cost of innovation, implies, almost by necessity, that some innovations are excessively rewarded.'[449] There is much greater room for intervention by competition law when the innovation incentives generated by the patent system are excessive.

1. Detrimental Impact on Innovation Incentives

One of the most powerful, and to many fatal, criticisms of compelled sharing of an input or asset is that it undermines innovation incentives, both on the part

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[446] Mark A Lemley, 'Property, Intellectual Property, and Free Riding' (2005) 83 Texas Law Review 1031, 1031–32.
[447] Gerald Friedman, 'The Sanctity of Property Rights in American History' (University of Massachusetts Amherst 2001) No. 14.
[448] Bruce Abramson, 'Intellectual Property and the Alleged Collapsing of Aftermarkets' (2007) 38 Rutgers Law Journal 399, 466.
[449] Ganslandt (n 388) 242.

of the incumbent and the competitors.[450] This is a particularly salient criticism in the context of patents because the main policy justification for a patent system is to generate innovation incentives. Undermining innovation incentives would disrupt if not usurp the patent system. If compulsory licensing has such a devastating effect on innovation incentives, it would constitute a sufficient reason to counsel against it.

That compulsory licensing undermines innovation incentives is a mainstream, but by no means consensual, view in the field. Many have argued that the incentive dampening effect of compulsory licensing is overstated. Recall the conclusions in chapter II that the patent system has a tendency to overcompensate innovators and that the degree of dependence on patents as an appropriation mechanism varies widely by industry. The incentive dampening effect is thus only a serious concern in the industries that rely heavily on patents as an appropriation mechanism, namely chemicals and pharmaceuticals.[451] In other situations, the industry may not be one where patents play an important role for appropriation. The innovator may not rely on the market to recoup investments as the market in question may be secondary to the firm's primary profit-making activity.[452] Competitive pressure may already be sufficient to drive the firm to innovate.[453] The innovation may have been developed with limited investment.[454] In these situations, it should be possible to pare back patentee reward somewhat without a significant loss in innovation incentives. This suggests that reduction in innovation incentives is not the silver bullet against compulsory licensing as is often suggested.

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[450] Devlin, Jacobs and Peixoto (n 376) 1162.
[451] Richard Levin and others, 'Appropriating the Returns from Industrial Research and Development' (1987) 1987 Brookings Papers on Economic Activity 801–02.
[452] *Purple Parking Ltd. & Anor v Heathrow Airport Ltd*, [2011] EWHC 987 (Ch).
[453] Case T-201/04 *Microsoft v. Commission* [2007] ECR II-3601.
[454] Case C-418/01, *IMS Health GmbH & Co OHG v. NDC Health GmbH & Co KG* [2004] ECR I-5039.

(i) Incumbent's Innovation Incentives

Analysis of the impact of compulsory licensing on innovation incentives can be approached from three perspectives: the incumbent innovator, the competitor innovator, and the cumulative innovator. These are the three main groups of stakeholders whose innovation incentives can be affected by compulsory licensing. While much of the discussion about the incentive dampening effect of compulsory licensing has focused on the incumbent, the impact on the latter two groups should not be overlooked. As the General Court noted in the *Microsoft* case, incentives effects have to be assessed from an industry-wide perspective.[455] It is possible that the boost to the competitors' innovation incentives more than outweighs the loss of incentives on the part of the incumbent. Cumulative innovation also should not be overlooked. It plays a critical role in the technological progress in society. If compulsory licensing facilitates cumulative innovation, it could tilt the argument in favor of it.

The mainstream view is that patent protection is needed to generate innovation incentives for the incumbent and that any rolling back of such incentives will reduce innovation. Devlin and his co-authors label as 'myopic'[456] attempts to use compulsory licensing to reduce consumer harm, asserting that 'it will rarely be true that depriving an intellectual property holder of its right to exclude will not affect ex ante investment incentives.'[457] McGowan launches an even more powerful attack, suggesting that the over-compensating tendency of the patent system should not be construed to support intervention. He cautions against the illusion of precision in judicial making, noting that

> While we may presume that the goal of intellectual property laws is (or should be) to allow exclusion to the point where the marginal gain in

[455] Case T-201/04 *Microsoft v. Commission* [2007] ECR II-3601, para. 706.
[456] Devlin, Jacobs and Peixoto (n 376) 1159.
[457] ibid 1162.

> innovation or creation equals the marginal social cost of excluding access to the work, courts deciding concrete cases will find it difficult to make such decisions.[458]

This difficulty is compounded by the fact that adverse decisions affect not only the incentives of the original innovator, but also those of future innovators, which are very difficult to ascertain.[459]

Many commentators have disputed this view. Howard Shelanski questions many of the fundamental assumptions of this view:

> Development of IP does not always require more capital or risk than, for example, construction of specialized manufacturing facilities, natural resource exploration, or real estate development. Moreover, not all IP investment improves social welfare. Many patents lack economic value and are never practiced or enforced. Other IP may be developed for purely defensive purposes of protecting markets and blocking competition, although such cases may be hard to distinguish from bona fide innovation efforts. On the other side, much valuable innovation is never patented, and scholars have cast doubt on the link between innovation incentives and IP protections.[460]

Shelanski thus believes that R&D investments should not be entitled to special protection and that patents do not always represent socially valuable innovation. Echoing the views mentioned earlier about the flaws in the patent system, Shelanski argues that

> The more invalid patents there are, the greater the likelihood that the balance between costs and benefits of mandatory dealing in IP weighs in favor of a legal standard more likely to result in liability. Imprecision in the patenting process is another reason not to have a conclusive presumption that an assertion of IP rights constitutes a valid business justification for otherwise anticompetitive conduct.[461]

Genevaz also highlights the erroneous assumptions of the mainstream view that 'the acquisition of monopoly power is the only way to appropriate revenues deriving from

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[458] McGowan (n 368) 495.
[459] Jeffrey K Mackie-Mason, 'What to Do about Unilateral Refusals to License?', *Competition and Intellectual Property Law and Policy in the Knowledge-Based Economy* 11.
[460] Shelanski (n 219) 386.
[461] ibid 387.

inventions'[462] and that 'antitrust liability would necessarily have overall adverse effects on incentives to innovate.'[463] In a nutshell, Shelanski and Genevaz believe that patents are not necessary to secure innovation.

Lao questions the primacy of patent protection as a source of innovation incentives by implicitly taking Arrow's side in the famous Schumpeter-Arrow debate and arguing that competition may spur more innovation than monopoly. She challenges the idea that exclusivity or monopoly power is needed to attract innovation, arguing that if competition is more effective in attracting innovation, increasing intellectual property protection may in fact be counter-productive.[464] Other commentators seem willing to concede that patentee reward incentivizes innovation, but caution that it is possible for the patent system to provide excessive incentives. Concurring with Shelanski that R&D investment need not improve social welfare, Thomas Cotter notes that R&D is subject to the law of diminishing returns and that beyond a certain point, greater protection does not necessarily lead to more innovation.[465] Concurring with Cotter, Joe Bauer observes that 'it does not follow that every increase in the duration or scope of protection for intellectual property will maximize consumer welfare. Indeed, there is substantial evidence that affording too much protection will actually lessen incentives for innovation.'[466] James Langenfeld believes that in addition to failing to generate more innovation, excessive patent protection also reduces overall welfare by allowing the innovator to appropriate all the social benefits from an innovation and leaving nothing behind for society.[467]

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[462] Genevaz (n 377) 745.
[463] ibid.
[464] Lao (n 378) 216.
[465] Cotter (n 375) 218.
[466] Joseph P Bauer, 'Refusals to Deal with Competitors by Owners of Patents and Copyrights: Reflections on the Image Technical and Xerox Decisions' (2006) 55 DePaul Law Review 1211, 1224.
[467] Langenfeld (n 381) 96–97.

The efficacy of the patent system has been said to be 'indeterminate and highly situation-specific.'[468] Even then, those who defend the patent system argue that despite its tendency to overcompensate innovators, the high degree of information asymmetry between the system's administrators and innovators means that attaining the optimal level of protection will be elusive.[469] Even assuming that this is true, it is unclear why this indeterminacy should be resolved in favor of innovators. This is especially questionable in light of the system's proven tendency to overcompensate. The best argument commentators have offered is that the high risk and uncertainty of R&D investments mean that innovators should be given every benefit of the doubt.[470] This is hardly a satisfactory argument. If the efficacy of the patent system is case-specific, there are strong reasons for competition law to intervene. The case-by-case analysis under competition law would counter-balance the systemic and sweeping tendencies of the patent system.

The imprecise nature and the overcompensating tendencies of the patent system means that there is room for competition law intervention without significant loss in innovation incentives. Applying the envelope theorem, Ian Ayres and Paul Klemperer have offered a theoretical proof for this proposition. They argue that reducing the monopolist's market power and supra-competitive pricing at the margin will substantially reduce deadweight loss while causing little loss to the monopolist.[471] The basic geometry of the demand curve means that the last bit of monopolist pricing contributes only small profit to the incumbent while inflicting heavy deadweight loss on society.[472] Patentee reward thus can be reduced at the margin without substantial loss

[468] Frischmann and Waller (n 444) 34.
[469] Devlin et al. 1181.
[470] Ayres and Klemperer (n 76) 994.
[471] ibid.
[472] Genevaz (n 377) 751–52.

of innovation incentives. Although the focus in their article is on limited patent infringement, their insight has equal application to compulsory licensing. Their model provides that the infringer pay full damages for the infringement.[473] When transposed to the setting of compulsory licensing, their model would imply that the putative compulsory licensee pay the monopolist royalty rate. Ayres and Klemperer ascribe great importance in their model to the infringer (compulsory licensee), calling her the 'perfect agent[] of society - restraining the excesses of monopoly pricing without personal profit.'[474]

Ayres and Klemperer's argument has two premises. First, there is uncertainty and delay in the adjudication of infringement.[475] This should not pose a serious obstacle, as uncertainty and delay are inherent in every legal proceeding, patent infringement or competition. Second, there needs to be sufficiently high price elasticity of demand in the market.[476] When price elasticity is low, a small drop in monopolist price has negligible impact on deadweight loss but significantly reduces innovation incentives. Genevaz thus concludes that 'the validity of Ayres and Klemperer's conclusion varies from industry to industry.'[477] This condition raises some concern. Every case in which unilateral refusal to license could be in dispute is by definition a monopolization or abuse of dominance case, which means the defendant's product is unlikely to face an elastic demand.[478] This may limit the applicability of Ayres and Klemperer's insight.

[473] Ayres and Klemperer (n 76) 994.
[474] ibid.
[475] ibid 999.
[476] Genevaz (n 377) 752.
[477] ibid.
[478] ibid.

Going beyond Ayres and Klemperer's theoretical insights, some commentators believe that selective compulsory licensing should have negligible impact on innovation incentives. Genevaz encapsulates the issue succinctly when he states that

> the question is not whether monopoly power fosters incentives to innovate, but rather is whether incentives to innovate in the industry at issue are sufficiently sensitive that liabilities for unilateral refusals to deal would induce a significant decrease of incentives to invest in R&D.[479]

Ritter is convinced that innovation incentives have low sensitivity to compulsory licensing, questioning if one

> compare[s] the number of compulsory licenses ordered by antitrust enforcers with the total amount of IP produced in any given timeframe[, i]s it reasonable to believe that firms will scale back their R&D investment because they observe, say, Microsoft having to grant a compulsory license and being deprived of some revenue?[480]

Ritter's instinct is confirmed by F.M. Scherer, who has produced case studies that show that compulsory licensing has not lowered the innovation incentives of U.S. corporations historically.[481]

The incentive dampening effect of compulsory licensing will be further ameliorated by royalty payments. Compulsory licensing does not mean free licensing.[482] The licensee still needs to offer the patentee adequate compensation. The financial impact of compulsory licensing can be effectively managed. McGowan describes the patent system as a 'rate of return structure'[483], under which innovators are provided a rate of return through 'the right to preclude others from using the creator's work. This 'property' right to exclude forces those who wish to use an innovation to bargain with

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[479] ibid 751.
[480] Ritter (n 393) 296.
[481] FM Scherer, 'Antitrust, Efficiency, and Progress' (1987) 62 New York University Law Review 998, 1018.
[482] Daniel A Crane, 'Intellectual Liability' (2009) 88 Texas Law Review 253, 257.
[483] McGowan (n 368) 493.

the owner and to pay him or her for the use.'[484] Conceptualizing the patent system as a rate of return structure implies that there is no unqualified right to exclude and that it is possible to fully compensate a patentee with monetary payments. The only question is the appropriate royalty rate. The royalty can be set between the monopoly profit that the incumbent would earn if she were allowed to monopolize the innovation and the duopoly profit that would result once a new entrant is introduced to the market so that the incumbent would not be made completely worse off by compulsory licensing.[485] In fact, it is possible to set the royalty at such a level that, in theory, the patentee should be indifferent as to whether compulsory licensing is imposed or not.

One issue that has long bedeviled commentators in this area of law is to what extent a patentee should be allowed to leverage its market position from the primary product market into complementary product markets or aftermarkets. Some have attempted to apply standard monopoly leveraging analysis.[486] Some have tried to answer the question with reference to the scope of the patent, which has been discussed earlier.[487] Others retort that patent scope was always meant to be a technical specification and was never intended to demarcate the permissible scope of recovery for the patentee.[488] A more detailed treatment of this will be deferred to the discussion of the scope of patent test in the next chapter. Suffice it to note for now that ultimately whether a patentee should be allowed to recover from adjacent markets comes down to adequacy of innovation incentives. It seems very difficult to try to resolve this dispute over patent scope through logic or doctrinal arguments.

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[484] ibid.
[485] John T Wenders, 'Entry and Monopoly Pricing' (1967) 75 Journal of Political Economy 755.
[486] Genevaz (n 377) 762–63.
[487] Lao (n 378) 198.
[488] Herbert J Hovenkamp, 'IP and Antitrust Policy: A Brief Historical Overview' (University of Iowa 2005) No. 05-31 37.

If one accepts that the patent system exists to provide innovation incentives, the strongest argument for allowing the patentee to extend its exclusivity into adjacent markets would be to ensure adequate compensation for the patentee's R&D investments. Recall that most commentators who have expressed a view on the issue concur that a patentee should not be allowed to make up for a shortfall in patentee reward from related markets.[489] Frischmann and Waller note that the primary product market should generate sufficient innovation incentives and opening the secondary markets to competitors should have little impact.[490] Langenfeld asserts that even an absolute property right for an innovation does not extend the patent monopoly to products or services beyond the scope of the patent.'[491] Lao characterizes claims that prohibiting a patentee from leveraging into complementary product markets would undermine innovation incentives as 'unfounded or, at least, exaggerated.'[492] If the protection of innovation incentives in the primary market is an insufficient reason to preclude all unilateral refusal to license claims, it is only logical that it fails to justify giving the patentee carte blanche to leverage into related markets.

(ii) Competitor's Innovation Incentives

Compulsory licensing does not only affect the incumbent's innovation incentives, it may also influence competitors' willingness to invest in innovation. Being granted access to the incumbent's technology means that competitors will no longer have to develop their own technology. Using a stylized model, Gilbert and Shapiro argue that in a competitive R&D race scenario, imposing compulsory licensing will reduce the innovation incentives of both the winner and the loser.[493] The winner's payoff is

[489] Lao (n 378) 213.
[490] Frischmann and Waller (n 444) 33.
[491] Langenfeld (n 381) 99.
[492] Lao (n 378) 218.
[493] Gilbert and Shapiro (n 397) 12753.

reduced because she needs to share the fruit of her success with the loser through compulsory licensing.[494] The loser's payoff from losing the race is augmented by compulsory licensing, which means that the loser is less afraid of losing and tries less hard to win the race.[495]

Whether there is a loss in social welfare in this scenario depends on the degree of similarity between the competitor's and the incumbent's technologies. If the competitor's innovation is largely duplicative and redundant from a social perspective, a reduction in the competitor's innovation incentives may have little impact. Economists have concluded that in a patent race, where two firms vie to be the first to come up with an invention, the addition of one firm to hasten the arrival of an invention is often highly lucrative for the first inventor but redounds little extra value to society.[496] In Gilbert and Shapiro's competitive R&D race scenario, the kind of R&D engaged by the winner and the loser could in fact be duplicative. Having the loser try less hard may not be so detrimental after all. In contrast, if a competitor's innovation would create a different path for follow-on innovation, society would gain from the competitor's R&D effort and the loss of the competitor's innovation incentives would be a real cost for society.

The case for a loss of competitor's innovation incentives due to compulsory licensing is more nuanced than is generally assumed. The fact that a competitor has been granted access to the incumbent's technology does not necessarily mean that there will be only one path for follow-on innovation. Competitors may build on the incumbent's technology, improve it, and develop new complementary products for it. Having two innovators work on the same product may augment the long-run level

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[494] ibid.
[495] ibid.
[496] PA David, 'Intellectual Property Institutions and the Panda's Thumb: Patents, Copyrights, and Trade Secrets in Economic Theory and History' in MB Wallerstein, ME Mogee and RA Schoen (eds), *Global Dimensions of Intellectual Property Rights in Science and Technology* (National Academic Press 1992) 33.

of innovation.[497] By opening the door for the competitor to pursue further improvements, compulsory licensing may augment a competitor's innovation incentives. It is exactly in light of this kind of situation that the European Commission declare in the *Microsoft* case that Microsoft's reduced innovation incentives may be more than offset by competitors' enhanced willingness to invest in R&D such that the industry benefits overall.[498]

(iii) Cumulative Innovator's Innovation Incentives

Cumulative innovation would not be an issue at all if the initial innovation were a dead-end technology that could not be further improved upon. In reality, not many technologies belong to this category. Even paper clips have been improved by plastic casing.[499] Numerous scholars have noted the importance of cumulative innovation for technological progress.[500] They have also asserted that overly expansive patent protection retards cumulative innovation.[501] Imposition of compulsory licensing may facilitate cumulative innovation.

Suppression of cumulative innovators' innovation incentives would be of little concern if the initial innovator is always better positioned to improve on her initial invention than are other innovators, or is at least better able to spot potential improvers and enter into licensing arrangements with them. This would not be the case if the

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[497] Shelanski (n 219) 383.
[498] Commission Decision Case COMP/C-3/37.792, at para. 783. (Devlin et al. 1170-71)
[499] Henry Petroski, *Invention by Design; How Engineers Get from Thought to Thing* (1st edn, Harvard University Press 1996) 8–43.
[500] Edmund Kitch, 'The Nature and Function of the Patent System' (1977) 20 Journal of Law & Economics 265. Merges and Nelson (n 32) 870. Lemley, 'Economics of Improvement in Intellectual Property Law' (n 45) 997. Scotchmer, 'Standing on the Shoulders of Giants' (n 43) 29. Joel Mokyr, 'The Industrial Revolution and the New Economic History' in Joel Mokyr (ed), *The Economics of the Industrial Revolution* (1 edition, Routledge 2012) 1. Baumol (n 47) 12, 51. Jaffe and Lerner (n 35) 18. Michele Boldrin and David K Levine, *Against Intellectual Monopoly* (Cambridge University Press 2008) 147. Landes and Posner (n 58) 318.
[501] Jaffe and Lerner (n 35) 48–49. Lemley, 'Economics of Improvement in Intellectual Property Law' (n 45) 998. John Vickers, 'Competition Policy and Property Rights' (2010) 120 The Economic Journal 375, 383–84.

sources of improvement are often unexpected and unpredictable, defying coordination by the initial innovator and if unrelated third parties are equally good, if not better, at producing improvements. Compulsory licensing may be called for if a subsequent innovator comes up with an improvement but is refused a license to use the initial technology for one reason or another.[502]

Keen believers in market efficiency would argue that if the improvement creates substantial value beyond the initial invention, the initial innovator and the improver would always be able to enter into a mutually advantageous licensing agreement that splits the surplus created by the improvement between them.[503] Such an agreement would be especially likely if the improvement would not put the cumulative innovator in direct competition with the initial innovator. This would indicate a limited role for compulsory licensing. Competition law should abstain if intervention would not increase cumulative innovation but would merely alter the split of surplus between the initial and the cumulative innovators. The reality, however, is often more complicated than that. The incumbent's sole concern may not simply be the monetization of her innovation. Yongmin Chen notes that there could be anticompetitive motivations for the incumbent's refusal to supply a possible downstream follow-on innovator:

> By not supplying the downstream rival now, the monopolist may either reduce this possibility or maintain monopoly profit through downstream dominance even when the upstream market becomes competitive. This strategic, or 'anticompetitive' motive, may outweigh the short-term benefits of surplus extraction from supplying the downstream competitors.[504]

[502] Scotchmer, *Innovation and Incentives* (n 15) 138.
[503] ibid 137–142.
[504] Chen (n 419) 535.

One can go further and question whether competition law should be agnostic about allocation of surplus between the initial and cumulative innovators, for this allocation can have implications for the innovation incentives of the respective innovator. John Vickers notes that:

> Stronger IP rights would favour division of joint profit that favoured the original incumbent, so higher rather than lower [lump sum license fee]. But Segal and Whinston show that the innovation incentives of the challenger are greater when the incumbent has a lower profit share in the duopoly phase. … So laissez-faire towards the incumbent, even though that maximises the value of incumbency, does not necessarily maximise innovation incentives.[505]

A larger share of surplus will obviously allow the cumulative innovator to invest more in R&D. The question is how these enhanced incentives should be balanced against the initial innovator's innovation incentives.

Vickers provides another reason for why compulsory licensing, which may foster technical parity between the initial and the cumulative innovators, may benefit innovation competition. He attributes this to the neck-and-neck effect, which holds that firms often compete harder in innovation when they are neck-and-neck with each other.[506] Therefore, while allowing the incumbent innovator to keep most of her innovation reward would give her greater incentives to strive to win the innovation competition, it would also reduce the neck-and-neck effect when the incumbent innovator has a substantial technological lead over rivals.[507] Vickers thus concludes that

> in a sequential setting, bolstering the prize for innovating [by refusing compulsory licensing] need not boost innovation. There is a composition effect - if firms compete hardest to innovate when neck-and-neck, then reducing the prize for innovating may nevertheless promote innovation if it increases the proportion of neck-and-neck competition.[508]

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[505] Vickers (n 501) 384.
[506] ibid 385.
[507] ibid.
[508] ibid.

The conflicting interests of the initial and cumulative innovators create an acute dilemma for competition authorities. On the one hand, refusal to impose compulsory licensing has the unequivocal effect of increasing the initial innovator's patentee reward, which may increase her innovation incentives.[509] On the other hand, such reluctance reduces the opportunities for cumulative innovators to pursue follow-on innovation,[510] which requires access to the original invention.[511] These countervailing effects make it difficult to strike an appropriate balance between the interests of the initial and the cumulative innovators.[512] In a theoretical model, Chen shows that whether prohibiting unilateral refusal to license advances consumer welfare or not crucially depends on the likelihood of follow-on innovation.[513] Consumer welfare will be harmed by compulsory licensing if such innovation is sufficiently unlikely, but should otherwise be improved by a prohibition of unilateral refusal to license.[514] Empirical evidence on this issue, however, is largely inconclusive.[515] This balance of interests will depend on market characteristics and will vary by industry and country as well.[516] Suzanne Scotchmer, a leading scholar on cumulative innovation, suggests that the nature of the product and innovation markets are relevant considerations.[517]

Setting aside these more variable factors, a number of considerations affect whether compulsory licensing is favorable to cumulative innovation. Competition law intervention may be particularly appropriate against 'overly broad and too all-

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[509] Howard F Chang, 'Patent Scope, Antitrust Policy and Cumulative Innovation' (1995) 26 The RAND Journal of Economics 34, 48. Carmen Matutes, Pierre Regibeau and Katharine Rockett, 'Optimal Patent Design and Diffusion of Innovations' [1996] The RAND Journal of Economics 60, 80.
[510] Lao (n 378) 216–17.
[511] Dumont and Holmes (n 386) 151–52.
[512] Gilbert and Shapiro (n 397) 12749.
[513] Chen (n 419) 536.
[514] ibid.
[515] Dumont and Holmes (n 386) 154.
[516] ibid 152.
[517] Suzanne Scotchmer, 'Incentives to Innovate' in Peter Newman (ed), *New Palgrave Dictionary of Economics and the Law* (MacMillan 1998) 275–76.

encompassing patents' that foreclose cumulative innovation and inflict costs on consumers.[518] Moreover, the case for competition law intervention would be the strongest if the initial innovator is not the best positioned to pursue or coordinate follow-on innovation, and there are systemic failures for the initial and cumulative innovators to reach an agreement. While it is impossible to predict the likelihood of difficulties in bargaining on a systemic level, as it probably varies according to the idiosyncrasies of individual parties, there has been much theorization about models of cumulative innovation and their implications for whether the initial or cumulative innovator should be tasked with coordination.

There seems to be two views on the relative efficiency of the initial and cumulative innovators in pursuing and coordinating further improvements. Under Edmund Kitch's prospect theory, the initial innovator is assumed to be best positioned either to come up with further improvements or to identify innovators able to do so. Kitch postulates that the main purpose of the patent system is not to generate innovation incentives, but to encourage the commercialization of existing ideas and the exploration of improvements.[519] This is achieved by granting prospective property rights over these as yet undiscovered ideas.[520] The initial innovator is entrusted with the responsibility to coordinate the commercialization of existing innovations and the search for further improvements, with a view to avoiding duplicative investments.[521] This theory leaves very little role for the unilateral refusal to license doctrine to play in facilitating cumulative innovation.

[518] Dumont and Holmes (n 386) 153.
[519] Kitch (n 500) 275–80.
[520] ibid.
[521] ibid.

Other commentators have disputed Kitch's rosy view of the initial innovator's efficiency, if not omniscience and good faith. First, they have questioned Kitch's assumption that the initial innovator is better positioned than her rivals to identify and pursue improvements. Given that the initial innovator is outnumbered by possible improvers, the initial innovator would have to possess vastly superior capability to pursue potential improvements or identify possible improvers.[522] There is no reason to believe that the initial innovator would possess such a capability. The evolutionary model of innovation presumes that innovation is

> best understood as a quasi-Darwinian process—a process almost of trial and error in which the market selects from among diverse approaches whose relative promise cannot be assessed in advance. This approach implies that a multiplicity of sources of inventive activity is superior to a centralized process directed by the patentee.[523]

This model of innovation implies that new ideas will emanate from unexpected sources and successful coordination by the initial innovator would be well-nigh impossible. Adherence to the prospect theory will lead to a sub-optimal level of improvements as 'a single rightholder [will] *under*develop—or even ignore totally—many of the potential improvements encompassed by their broad property rights.'[524]

Second, even assuming perfect information on the part of the initial innovator, the transaction costs involved in reaching agreements with potential improvers would be significant, if not prohibitive.[525] It can be enormously time-consuming and costly for the incumbent innovator to negotiate licensing agreements with these improvers.[526] Uncertainty in R&D further adds to the transaction costs. The potential improver faces an acute dilemma. The improver could alleviate the

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[522] Scotchmer, *Innovation and Incentives* (n 15) 146–47.
[523] Landes and Posner (n 58) 318.
[524] Merges and Nelson (n 32) 873–84.
[525] Lemley, 'Economics of Improvement in Intellectual Property Law' (n 45) 1053, 1055.
[526] Lemley, 'Property, Intellectual Property, and Free Riding' (n 446) 1056.

uncertainty if she began the negotiation *ex post* after developing the improvement.[527] Yet that would expose the improver to potential holdup by the initial innovator.[528] To avoid strategic behavior on the part of the initial innovator, negotiations must take place *ex ante*.[529] Conducting negotiations *ex ante* would require both parties to predict the prospect and the value of the follow-on innovation, which could be a highly speculative exercise.[530] If the cumulative innovator generally has difficulty persuading the initial innovator of her likelihood of success, or there is a systemic imbalance in bargaining power between the initial and the cumulative innovators, there could be systemic under-compensation of follow-on innovators.

Third, the behavioral assumption of the prospect theory that the initial innovator will behave rationally has also been challenged. The initial innovator may irrationally eschew licensing for non-economic reasons[531], such as a bitterly fierce rivalry between two competing firms, distrust of a rival's good faith to abide by the licensing agreement, or rational or irrational fear that the licensed technology will somehow assist rivals in ways that are unforeseen by the initial innovator.[532] The personal animosity between Guglielmo Marconi, the patent holder for the diode technology—a crucial component of the early radio—and Lee de Forest, the inventor of triode, which was a significant improvement over the diode[533], means that the world was denied the benefits of this significant improvement for years.[534] In light of these three arguments, the prospect theory should be roundly rejected.

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[527] Lemley, 'Economics of Improvement in Intellectual Property Law' (n 45) 1051.
[528] Scotchmer, *Innovation and Incentives* (n 15) 138.
[529] ibid 146–47. Daniel G Swanson and William J Baumol, 'Reasonable and Nondiscriminatory (RAND) Royalties, Standards Selection, and Control of Market Power' (2005) 73 Antitrust Law Journal 1, 7–10.
[530] Lemley, 'Property, Intellectual Property, and Free Riding' (n 446) 1068.
[531] Lemley, 'Economics of Improvement in Intellectual Property Law' (n 45) 1055–58.
[532] Lemley, 'Property, Intellectual Property, and Free Riding' (n 446) 1055, 57–58, 61.
[533] Jaffe and Lerner (n 35) 51.
[534] ibid.

Whether the initial innovator or potential improvers are best positioned to generate improvements is ultimately an empirical question. It is possible that despite all these theoretical objections to the prospect theory, initial innovators are nonetheless better positioned than potential improvers to pursue improvements. Yet absent overwhelming evidence to the contrary, competition law should favor competition over market power. Kitch himself admits that the prospect theory condones substantial market power and supra-competitive pricing[535] and yet offers no solution for it.[536] A repudiation of the prospect theory means that it is critical to ensure that potential improvers have adequate access to the initial innovation. There is hence a role for compulsory licensing to play to facilitate cumulative innovation.

Cumulative innovation arises under different circumstances. Economists distinguish three scenarios of cumulative innovation: first, where an initial innovation spawns numerous follow-on innovations; second, where many initial innovations, mostly in the form of research tools, are needed to create a single second-generation innovation; and third, where the subsequent innovation represents an improvement of the initial one and yet the two compete with each other.[537] The second and the third scenarios have been called the 'anticommons' and the 'quality ladder' models of cumulative innovation.[538] This author will call the first scenario the 'trunk-branch' model for lack of a better name in the literature. The three scenarios present disparate challenges for competition law interventions.

The need for intervention is the lowest under the quality ladder model for a number of reasons. First, in most quality ladder scenarios, improved versions of the

[535] Kitch (n 500) 274.
[536] Lemley, 'Economics of Improvement in Intellectual Property Law' (n 45) 1047.
[537] Scotchmer, *Innovation and Incentives* (n 15) 132–33.
[538] ibid 146.

innovation directly compete with, and replace, the initial innovation in the primary product market.[539] Such direct competition may prevent the initial innovator from recouping her initial R&D investment. Second, the loss of cumulative innovation in this case would be less costly for society as it would not deprive society of a product altogether. Society will simply be left with an unimproved version of it. This is in stark contrast with the other two scenarios, where obstacles to the cumulative innovator may preclude the emergence of a new product altogether.

In contrast, there are significant social benefits for the widespread deployment of the 'trunk' technology under the 'trunk-branch' model. The trunk technology can be the basis for many subsequent improvements or new product development.[540] So long as the initial innovator is compensated for her R&D costs, technology diffusion should be the overriding consideration. From a social welfare perspective, the Ramsey intuition dictates that society would be better off if the initial innovator distributed its cost recovery among a wide range of uses, while minimizing the distorting effect within each use.[541] Society would be better off if the trunk technology was deployed as widely as possible. Where the trunk technology can be licensed for multiple uses, there is a persuasive case for competition law intervention as it would be possible to guarantee the initial innovator's recovery without causing much deadweight loss in the market for each use.

The term 'anticommons' was originally coined by Michael Heller and Rebecca Eisenberg in 1998.[542] It describes a situation where a variety of inputs are required for a follow-on innovation. Anticommons presents a particularly tricky

[539] ibid.
[540] ibid 132.
[541] Ayres and Klemperer (n 76) 992.
[542] Michael A Heller and Rebecca S Eisenberg, 'Can Patents Deter Innovation? The Anticommons in Biomedical Research' (1998) 280 Science 698, 698–99.

situation from a competition law perspective because of the significant possibility of holdup by the owner of any one of the inputs.[543] It would seem to suggest a possible role for competition law intervention to play. As suggested by Scotchmer, the best solution to an anticommons scenario may be joint ownership of the various research tools through consolidation.[544] She notes that the joint price for complimentary inputs would be lower than if they were sold separately.[545] It is, however, beyond the remit of a competition authority to compel joint ownership. It would certainly require the authority to go beyond mere compulsory licensing. Therefore, there is a limit to what competition law can do to alleviate an anticommons situation. In sum, the case for competition law intervention is the strongest under the 'trunk-branch' model, followed by the anticommons model, which is in turn followed by the quality ladder model. The relevance of these three models of cumulative innovation for developing countries will be addressed subsequently.

The foregoing discussion analyzes the impact on competitor and cumulative innovators' innovation incentives under the assumption that they themselves directly demand access to technology from the incumbent. That need not be the case. These innovators' innovation incentives could be affected even if they were not the parties requesting access. This will be apparent when one combines the various theories of harm with the analysis of innovation incentives. To the extent that the party suffering from competitive harm under these theories, such as the firm that is being subject to the two-level entry requirement, could have entered the market with a substitute technology or a follow-on innovation, the fact that it has now been excluded from the market means that there is a loss of innovation. Under enhancement of entry

[543] Scotchmer, *Innovation and Incentives* (n 15) 142–43.
[544] ibid 143–44.
[545] ibid.

barriers and foreclosure of downstream competition, if the firm that would have entered the downstream market would have done so with either a substitute technology or cumulative innovation, the unilateral refusal to deal would have cost society potentially important innovation. The same is true of the upstream competitor subject to the two-level entry requirement that would have entered the market if it had not been compelled to enter the downstream market as well and instead could have sold its input to other downstream firms. Recall also Yongmin Chen's postulation that foreclosing downstream rivals can help forestall follow-on innovation in the upstream market by making it more difficult for the innovator to recoup her investment. Cumulative innovation would be retarded in this scenario. Creation of effective exclusivity could also cause a loss of innovation if the firm which would have entered the primary product market but for the exclusivity would have done so with competing or cumulative innovation.

The variations of enhancement of entry barriers and creation of effective exclusivity that are premised on a complementary product are more likely to implicate cumulative innovation than competing innovation. Complementary products are more likely to build on the incumbent's technology in the primary product than to feature a completely novel technology. Therefore, to the extent that unilateral refusal to deal results in exclusion in the complementary product market, the exclusion could additionally inflict a cost in terms of cumulative innovation. Meanwhile, it is unlikely that facilitation of price discrimination will result in a loss of innovation as price discrimination does not entail exclusion of competitors, upstream, downstream, or in a complementary product market.

(iv) Implications for Developing Countries

The central argument of this thesis is that developing countries need to adopt a different and a contextualized approach to the patent-competition interface in light of their domestic technological capacity and their differing needs to attract foreign technology export. The underlying policy dilemma of the patent-competition interface is a balance between static efficiency and dynamic efficiency considerations. Dynamic efficiency considerations may carry different weight and play out differently in different countries depending on the domestic capacity to innovate. This in turn affects how the balance should be struck between static and dynamic efficiencies. In addition, the enforcement capacities of the domestic competition authorities and the courts will need to be taken into account. Complex rules that may reduce error costs and help achieve accurate outcomes could be beyond the capability of a developing country authority or court. Developing countries may need to tailor the applicable rules to their domestic enforcement capacity. In light of their vastly different technological capacities, developing countries cannot blindly follow the approach to the patent-competition interface prevailing in the industrialized economies and will need to fashion an approach that suits their domestic circumstances.

The implications of the foregoing discussion for developing countries can be separated into three perspectives: incumbent innovators, competitor innovators, and cumulative innovators. Despite the highly intuitive argument that compulsory licensing will dampen the incumbent innovator's innovation incentives, many commentators have questioned this view on various grounds. Shelanski points to the many flaws in the patent system and argues that the more flawed is the patent system, the stronger is the justification for compulsory licensing under competition law. Lao challenges the notion that market power is needed to incentivize innovation. While Cotter, Bauer, and Langenfeld acknowledge the incentive effects of the patent system, they observe that it

is possible, and in fact not uncommon, for the incentives to be excessive. Lastly, invoking the envelope theorem, Ayres and Klemperer argue that reducing monopolist pricing somewhat will have negligible impact on patentee reward.

Other commentators such as Genevaz and Ritter go beyond the patent system in general and focus specifically on the impact of compulsory licensing. They argue that given the small number of compulsory licensing cases, it is unlikely that judicial intervention will have substantial impact on innovation incentives. While their observation may be valid for the current level of compulsory licensing, which is admittedly quite restrained on both sides of the Atlantic, one cannot be sure that further expansion of compulsory licensing will not reduce innovation incentives. The point will come when increased incidence of compulsory licensing will catch the potential innovators' attention. Fortunately, the negative incentive effect of compulsory licensing can be kept in check by imposing an appropriate level of royalty.

If one agrees with these commentators that compulsory licensing will have negligible impact on the incumbent innovator's innovation incentives or that the negative impact can be effectively managed, then competition authorities in developing countries will have a freer rein in imposing compulsory licensing. If one believes that compulsory licensing will dampen the incumbent innovator's innovation incentives, then the question becomes the extent to which developing country competition authorities should take these innovators' interests into account. The appropriate response varies in accordance with the technological capacity of the country at issue. For a production country with negligible innovation capacity, a more liberal stance on compulsory licensing will have little impact on domestic firms, which are unlikely to undertake any meaningful innovation anyway. For a technology adaptation country, there is still negligible domestic innovation and thus compulsory licensing will have

minimal effect on domestic firms as incumbent innovators. The impact on domestic competitor innovators, or rather technology adaptors, is more complex and will be examined subsequently. For a proto-innovation country where there are some domestic firms capable of genuine innovations, compulsory licensing may reduce domestic innovation. This could be a matter of serious concern as the innovation capacity in these countries is likely to be relatively nascent and fragile and compulsory licensing may fatally undermine such capacity.

Lastly, compulsory licensing may also deter innovation by foreign incumbent innovators. With respect to these innovators, it was argued in chapter II that multinational corporations are unlikely to take into account the patentee reward provided by every country in which they operate. They are likely to focus on industrialized economies and relatively wealthy developing countries with a substantial domestic market. This means that most developing countries can place little weight on the incentive effects generated by their domestic patent system for foreign innovators. As for the relatively large and wealthy developing countries, even if they subscribe to the more realistic model produced by Branstetter and Saggi and conclude that the incidence of compulsory licensing imposed domestically will affect innovation in industrialized economies and the FDI inflow into developing countries, there remains the question of how that should be traded off against harm to domestic consumer welfare.

In terms of competitor innovators' innovation incentives, the foregoing discussion in the context of industrialized economies will need to be modified to suit the context of developing countries. First of all, competitor innovators' innovation incentives are unlikely to be a relevant issue for production countries that possess little genuine technological capacity. These incentives, however, deserve the attention of

competition authorities in technology adaptation and proto-innovation countries, except that in the technology adaptation countries, competitors to foreign incumbent innovators are technology adaptors rather than innovators. In the context of the industrialized economies, the main concern is whether competitor innovation will merely be duplicative of the incumbent's or whether it is likely to lead to alternative paths for future innovation. In the context of developing countries, there is no question that innovation by domestic firms will be duplicative. Most developing country firms do not produce genuine frontier innovations. Domestic innovation is mostly likely an adaptation of the foreign technology, which is one type of laggard innovation—innovation by developing country standard. However, this does not mean that the resources invested into such innovation will go to waste. The innovation is only duplicative in the global sense, but not in the local sense. The innovation still enhances domestic innovation capacity.

This can be illustrated by an adapted version of Gilbert and Shapiro's competitive R&D race. A competitive R&D race in the developing country context is likely to feature a developing country firm catching up with the global technology leader through technology adaptation. The race will not be between two equally technologically competent firms trying to produce a genuine innovation along the global technological frontier. If an R&D race were to exist at all, it would take the form of a developing country firm trying to imitate a global technological leader's technology while the latter firm rushes to commercialize the technology and bring it to the market before the imitation succeeds. Gilbert and Shapiro pessimistically predict that in the typical competitive R&D race, the loser will lose the incentive to invest in R&D when she knows that she can share the fruits of the winner's efforts through compulsory license. The dynamics is different in a developing country competitive R&D race. The two firms

do not start from the same starting point. Instead, the developing country firm is likely to possess significantly inferior technological capacity. The prospect of a compulsory license at the end of the race may not dampen its incentive to invest in R&D. The domestic firm may still need to improve its technological capacity so that it is in a position to make use of the new technology transferred under a compulsory license. Compulsory licensing may help to promote technological upgrade in developing countries. And if compulsory licensing merely amounts to authorization to use a technology which the licensee acquires independently, which will be discussed in the next chapter, the incentive effect will be even stronger. The developing country firm will be highly motivated to reverse engineer foreign technology which it will be allowed to commercialize under a compulsory license. A compulsory license would be of no use to the firm unless it could acquire the technology independently.

The discussion about competitor innovators in developing countries, or competing technology adaptors as they may be more appropriately called, cannot only focus on compulsory licensing and how that affects these adaptors' innovation incentives. For technology adaptors in developing countries, compulsory licensing and other forms of involuntary technology transfer are likely to be a minor source of foreign technology. The bulk of the foreign technology will be likely to be imported through voluntary means such as import of technological goods, foreign direct investment ('FDI'), and licensing.[546] Recall that chapter III shows that robustness of patent protection affects the amount and the mode of technology transfer. More robust patent

[546] UNCTAD, 'Transfer of Technology and Knowledge Sharing for Development: Science, Technology and Innovation Issues for Developing Countries' (UNCTAD 2014) No. 8 15–20 <file:///Users/tkhcheng/Desktop/dtlstict2013d8_en.pdf> accessed 4 March 2020. Bernard M Hoekman, Keith E Maskus and Kamal Saggi, 'Transfer of Technology to Developing Countries: Unilateral and Multilateral Policy Options' (World Bank 2004) No. 3332 6–9 <http://documents.worldbank.org/curated/en/737591468762912473/pdf/wps3332.pdf> accessed 4 March 2020.

protection generally increases the flow of technology transfer and also helps to steer technology transfer to modes that redound greater benefit to the host country, such as FDI and licensing, especially the latter.

Incidence of compulsory licensing obviously has a bearing on the robustness of patent protection. Foreign technology owners may be less willing to engage in FDI or licensing if they know that doing so would expose them to the risk of compulsory licensing and hence of losing their future royalty payment stream. Robustness of patent protection particularly matters for those developing countries with a significant technology adaptation capacity where foreign technology is exposed to an elevated risk of imitation. Therefore, while compulsory licensing may help technology adaptors obtain foreign technology directly through judicial coercion, it may cost these adaptors access to voluntary sources of foreign technology. Given that instances of voluntary technology transfer are likely to outnumber that of compulsory licensing by orders of magnitude, the overall effect of compulsory licensing on competitor innovators/technology adaptors in developing countries may be negative.

As for cumulative innovator's innovation incentives, the first observation that can be made in the developing country context is that Kitch's prospect theory carries even less credibility. It is difficult enough to coordinate cumulative innovation among many possible sources when all the potential innovators are confined to one country or at least to industrialized economies in general. The task would be well-nigh possible if potential innovators are spread all over the globe. On a global scale, it is clear that a centralized, coordinative approach to cumulative innovation is impractical. Potential innovators must be given adequate access to initial technologies for cumulative innovation to materialize.

One can safely assume that the incentive effect on cumulative innovators deserves little attention in production countries. For the remainder of developing countries, the extent to which this effect deserves the competition authority's attention depends on the existence of possible cumulative innovators in the country at issue. Here the previous classification of developing countries into technology adaptation and proto-innovation countries may be less useful. There are reasons to believe that improving an existing technology requires lower technological capacity than coming up with a brand new technology *de novo*. Tinkering with or improving one part of a machine or an aspect of a technology should require less technological capacity than inventing the machine or creating the technology itself. Developing an application for a basic technology may also be technically less demanding than coming up with the basic technology itself in the first place. Therefore, a country that is bereft of genuine initial innovators may nonetheless possess some possible cumulative innovation capacity. The incentive effects on cumulative innovators may hence deserve attention from more developing countries as compared to the effects on incumbent innovators.

Effects on cumulative innovators may deserve special attention from developing countries because cumulative innovation could play an important role in the development of a developing country's technological capacity. It allows the innovator to focus on one aspect of the technology while acquiring some understanding of the rest of the technology. By making improvements to different aspects of the technology over time, eventually the cumulative innovator may acquire the capacity to produce and innovate on the entire technology. The possibility of cumulative innovation allows a technological laggard to acquire innovation capacity on a piecemeal basis.

It was suggested in the context of industrialized economies that the quality ladder model presents the thorniest case for competition law intervention

because imposing compulsory licensing where cumulative innovation follows the quality ladder model could severely undercut the initial innovator's recoupment of R&D investment and may not result in the emergence of a brand new product. In the developing country context, this reason for caution has to be balanced against the potential contribution of cumulative innovation to the acquisition of technological capacity. There may be a stronger reason for competition law intervention under a quality ladder model of cumulative innovation in developing countries. The kind of technological learning and upgrade mentioned in the previous paragraph is especially relevant for the quality ladder model. The quality ladder model of cumulative innovation presents the likeliest scenario for technological upgrade through cumulative innovation. It was mentioned that competition law will only have a limited role to play in the context of the anticommons model of cumulative innovation. Joint ownership is often the superior solution and that usually cannot be achieved through competition law intervention. Developing country competition authorities can overlook the anticommons model of innovation.

Lastly, with regards to the 'trunk-branch' model of cumulative innovation, it was argued that compulsory licensing could yield significant social benefits. If the trunk technology has widespread applications, compelled sharing of the technology could make possible many new uses that may redound benefits to consumers. In the context of developing countries, allowing a domestic firm to develop applications for a trunk technology may also have the salutary effect of giving that firm the opportunity to develop its technological capacity. In the process of developing an application for a basic technology, the firm may come to acquire a better understanding of the underlying technology, which may allow it to innovate better in related fields.

The alignment of interests of the various groups of innovators is different in developing countries as compared to industrialized economies. In an industrialized economy, compulsory licensing pits an incumbent innovator's interests against the interests of competitor innovators and cumulative innovators. The three groups of innovators could be found in the same country and there would be a need to balance the countervailing interests of the three groups of innovators when contemplating whether to impose compulsory licensing. The situation is different in developing countries. Incumbent innovators are likely to be absent in most developing countries with the exception of the proto-innovation countries. Developing countries hence predominantly only need to focus on the competitor and cumulative innovators. Cumulative innovators, especially those under the quality ladder and 'trunk-branch' models, benefit from compulsory licensing. Competitor innovators or technology adaptors, however, may lose out if increased incidence of compulsory licensing deters voluntary technology transfer through FDI and licensing.

It was suggested in chapter IV that the relationship between patent protection and the various modes of technology transfer differs by industry and that an industry-specific approach to the patent-competition interface may be called for. The feasibility of an industry-specific approach has to be balanced against the competition authority's enforcement capacity. Such an approach could be beyond the reach of authorities with low enforcement capacity. An industry-specific approach may only be feasible for authorities with relatively high enforcement capacity. They are likely to be found in the proto-innovation countries and other wealthier technology adaptation countries.

2. Implementation Difficulties

Another major line of critique of the unilateral refusal to deal doctrine and the essential facilities doctrine centers on implementation difficulties. The argument is that if the competition authority or the courts were to impose compulsory licensing under either doctrine, they would also have to stipulate the terms of dealing or the royalty rate. This is especially true because it has been emphasized that compulsory licensing is not free licensing and adequate compensation must be offered. Absent judicial intervention, the patentee would charge an exorbitant royalty unaffordable to the putative licensee.[547] The compulsory licensing order will not have improved matters and the putative licensee is still denied access to the patentee's technology. Therefore, for a compulsory licensing order to make a meaningful difference, the licensing terms must be stipulated or regulated.[548] This would require the authority or the courts to come up with a royalty rate for the license, which can be notoriously difficult.

The authority or the courts' obligation does not end here. They may have to engage in ongoing supervision to ensure compliance with the order. [549] Given the contentious nature of a compulsory license, there are bound to be disputes between the patentee and the putative licensee. The patentee will understandably drag her feet or offer incomplete access to her technology to minimize the competitive advantage the licensee can obtain from the license. The authority or the courts will have to get involved to settle these disputes for as long as the license is in effect, which could be years after the original dispute. As mentioned earlier, Judge Harold Greene continued his supervision in the original AT&T breakup for years after the consent decree was reached.

[547] Hovenkamp, Janis and Lemley (n 365) 8.
[548] ibid 16.
[549] ibid.

The authority and the courts are not completely at sea when trying to determine the appropriate royalty. In the U.S., the famous *Georgia-Pacific* case provides what is essentially a bucket list of factors to consider when setting royalty.[550] The inquiry under *Georgia-Pacific*, however, is so open-ended that it is unclear how much guidance is actually given by the case.[551] The difficulty goes beyond coming up with the correct determination once all the relevant data are presented to the authority or the courts. Obtaining accurate data for royalty determination could be fraught with difficulty as the authority and the courts suffer from significant information asymmetry.[552] Most of the relevant information is likely to be in the hands of dominant firm, which has great incentives to supply misleading or outright false information to obtain a favorable outcome.[553] An erroneously set royalty can have serious welfare consequences.[554]

Some commentators, however, believe that the difficulty in royalty setting is often overstated. Ritter asserts that the difficulty in setting the appropriate royalty is exaggerated and that it is no greater than setting the correct access terms for a physical facility.[555] Waller concurs with Ritter. Commenting specifically on the U.S., where remedies in refusal to deal cases are set by the courts, he concludes that there is no reason to suspect that the U.S. federal courts would not be up to the task.[556] He characterizes the objection to the essential facilities doctrine on institutional capacity grounds as a straw man, noting that

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[550] Makan Delrahim, 'Forcing Firms to Share the Sandbox: Compulsory Licensing of Intellectual Property Rights and Antitrust' (2004) 2004 European Business Law Review 1059, 1967.
[551] Georgia-Pacific Corp. v. United States Plywood Corp., 318 F. Supp. 1116 (1970).
[552] Thomas F Cotter, 'Four Principles for Calculating Reasonable Royalties in Patent Infringement Litigation' (2011) 27 Santa Clara Computer & High Technology Law Journal 725, 730.
[553] Gilbert and Shapiro (n 397) 12753.
[554] Werden (n 437) 472.
[555] Ritter (n 393) 295.
[556] Frischmann and Waller (n 444) 379–80.

> Areeda and most of the subsequent critics raising the issue of remedy have argued at a high level of abstraction and provide few examples of where the courts have gone wrong. It is simply not clear in which cases the critics believe the courts have embroiled themselves in an endless regulatory process beyond their institutional capabilities.'[557]

Focusing on damages and injunctive relief, Waller observes that the U.S. courts have been more than capable of calculating damages awards and crafting and enforcing injunctive relief.[558] He notes a shift from injunctive relief to damages awards in recent essential facilities cases in the U.S.[559] Calculation of damages is well within judicial expertise. Even if the courts are asked to craft an injunctive relief, most of the cases have involved the incumbent discriminating against one particular user in the provision of access and the injunction would be a simple order to provide nondiscriminatory access.[560] The U.S. courts have done a good job at it.[561] In cases where rate-setting is needed, Waller endorses Professor Phillip Areeda's proposal to involve an appropriate regulatory agency.[562] Waller thus concludes that:

> When considering the combination of those few successful essential facilities doctrine cases, those that concern damage awards only, those injunctive cases where there is a preexisting course of dealing, those injunctive cases where the parties can bargain out their differences or resolve them through other dispute resolution procedures, those injunctive cases where a regulatory body can assist the court, and the existence of some degree of judicial common sense, it is hard to see how often Areeda's legitimate concerns will counsel in favor of doing nothing to remedy an actual violation of the law.[563]

Waller's solution is likely to be of relatively limited use in patent compulsory licensing cases. In most of these cases, what the plaintiff wants is access to the defendant's technology. Damages awards may help, but injunctive relief is what the

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[557] Spencer Weber Waller, 'Areeda, Epithets, and Essential Facilities' (2008) 2008 Wisconsin Law Review 359, 380.
[558] ibid 379. Frischmann and Waller (n 444) 43.
[559] Waller (n 557) 379.
[560] Frischmann and Waller (n 444) 43.
[561] ibid 42.
[562] Waller (n 557) 381.
[563] ibid 381–82.

plaintiff is truly after. Royalty setting is hence an inevitable part of the case. In the context of patent royalty setting, there is no regulatory agency to which the U.S. courts can turn for assistance.[564]

Waller's discussion focuses on the courts because in the U.S. only the courts can impose remedies. The same is obviously not true in the EU, where first instance decisions are made by the European Commission, which are then appealed to the European courts. Assessment of damages awards is left to the national courts[565]; the European Commission would only be concerned with the issuance of injunctive relief and setting of an appropriate royalty rate, usually after negotiations with the party involved.[566] While the difficulty in crafting injunctive relief should not be insurmountable, as Waller has argued, the challenge in setting the appropriate royalty would be significant for both the U.S. courts and the European Commission. The Directorate for Competition of the European Commission focuses on competition law matters and does not possess special expertise in rate setting, and certainly not in royalty determination.[567] The only thing that could be of assistance to the U.S. courts and the Commission would be if there are existing licenses under the patent, which could provide some benchmark for the royalty rate. If royalty setting is difficult for the U.S. courts and the European Commission, it would be even more challenging for an developing country authority.

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[564] Stanley M Besen, 'Why Royalties for Standard Essential Patents Should Not Be Set by the Courts' (2015) 15 Chicago-Kent Journal of Intellectual Property 19.
[565] Alison Jones and Brenda Sufrin, *EU Competition Law: Text, Cases, and Materials* (5th edn, Oxford University Press 2014) 105–07.
[566] Nicholas Economides, Ioannis Lianos and Luca Rubini, 'The Quest for Appropriate Remedies in the EC Microsoft Cases: A Comparative Appraisal', *Microsoft on Trial: Legal and Economic Analysis of a Transatlantic Antitrust Case* (Edward Elgar 2010) 420–23.
[567] Jones and Sufrin (n 565) 102–04.

Given the inevitability of some royalty setting in a compulsory licensing case, it will be helpful to have some guidance, which Gilbert and Shapiro have provided. To the extent that a fixed license fee can be used in lieu of a per-unit royalty rate, a fixed license fee is to be preferred.[568] The only consequence of a flat license fee is a wealth transfer between the licensor and the licensee; it has no impact on overall welfare.[569] A royalty that is proportional to the licensee's total sales has similar welfare effects as a fixed license fee so long as the royalty rate is low.[570]

When still a private practitioner, Makan Delrahim, the current Assistant Attorney General for Antitrust in the U.S., raises two further implementation issues with compulsory licensing. First, a compulsory license need not be limited to existing patents. A court can theoretically apply the license to future patents in the pipeline.[571] The *General Electric* case in 1953 was one such example.[572] Extending the license to future patents, however, poses an acute dilemma:

> On the one hand, [extending the license to future patents] makes sense because the value of a compulsory license would evaporate if a monopolist could come out the very next day with a new blocking patent. But on the other hand, the license could potentially harm innovation by taking away or at least reducing the incentives to invest in future research and development in that field.[573]

Second, a compulsory license may extend beyond codifiable knowledge to cover tacit knowledge or technical know-how. Economists have distinguished between codifiable knowledge, which can be written down in blueprints, and tacit knowledge, which refers to know-how that is often difficult to capture in writing.[574] Deployment of a new

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[568] Gilbert and Shapiro (n 397) 12753.
[569] ibid.
[570] ibid.
[571] Delrahim (n 550) 1067.
[572] United States v. General Electric Co., 115 F. Supp. 835 (D.N.J. 1953).
[573] Delrahim (n 550) 1067.
[574] Bernard Ancori, Antoine Bureth and Patrick Cohendet, 'The Economics of Knowledge: The Debate about Codification and Tacit Knowledge' (2000) 9 Industrial and Corporate Change 255, 257–58.

technology requires both codified technical information spelled out in the patent and blueprint and uncodified know-how.[575] The question is whether a compulsory license should cover know-how as well as codified information.[576] This goes to the fundamental question of the nature of the assistance expected from the patentee. If the patent meets the disclosure requirement and contains sufficient information to allow 'a person having ordinary skill in the art' ('PHOSITA') to practice the claimed invention, in theory the patentee needs to do no more than merely authorizing the putative licensee to use the technology under a compulsory license.[577] The licensee should be able to recreate the technology based on the patent itself.

If the compulsory license imposes no obligation on the patentee to assist in the licensee's deployment of the technology and the licensee is merely expected to rely on the technical information contained in the patent, the compulsory license will be quite different from a conventional license and effectively amounts to a covenant not to sue. If the patentee is expected to impart know-how to the licensee as well, the obligation to assist becomes considerably more expansive. The patentee may be expected to ensure the licensee's successful deployment of the technology. A compulsory license that covers technical know-how as well as codified information will require more active supervision by the authority or the courts.[578] Given the intangible nature of tacit knowledge, disputes are bound to arise as to the sufficiency of assistance rendered by the licensor.[579] These disputes will need to be settled by the authority or the courts.

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[575] Pranab Bardhan and Christopher Udry, *Development Microeconomics* (Oxford University Press 1999) 153.
[576] Delrahim (n 550) 1067.
[577] Jeanne C Fromer, 'Patent Disclosure' (2008) 94 Iowa Law Review 539, 544–47.
[578] Delrahim (n 550) 1068.
[579] ibid.

In light of the numerous pitfalls for crafting an effective compulsory license, Delrahim issues a list of guidelines for the issuance of compulsory licenses. He urges a 'less is more' approach to compulsory licensing, arguing that 'an overriding goal should be to use the simplest, minimum necessary combination of transfer of rights and government oversight'.[580] The license should rely on objective, verifiable criteria as benchmarks for compliance to avoid needless litigation.[581] The scope of the patent should be narrowly and clearly construed as to field of use, products, or geography.[582] Transfer of know-how should be avoided to the extent possible.[583] The license should be time-limited and should be as clear about the royalty as possible.[584] The scope of potential licensees should also be as clear as possible.[585] Lastly, he argues that compulsory licensing should only be possible when there is 'an extraordinary level of market dominance and a demonstrated history of monopolization and resistance to reform.'[586]

Returning to the implementation of compulsory licensing in the developing country context, while it is important to be honest about the implementation difficulties, there is no need to throw the baby out with the bath water and abandon the enterprise completely. Few things are easy in competition law, especially in the area of the patent-competition interface, which is always fraught with complicated theoretical issues. Even if there is no fully satisfactory solution to some of these implementation issues, one must guard against the tendency to let the best be the enemy of the good.

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[580] ibid.
[581] ibid.
[582] ibid.
[583] ibid.
[584] ibid.
[585] ibid.
[586] ibid 1069.

The choice should not be conceived as one between a perfectly crafted and executed compulsory license and none at all.

It is true that an erroneously set royalty rate will distort resource allocation. The resource allocation function of royalty rates, however, should not be overstated. One should try to understand the true nature of the royalty setting process in a usual commercial setting. Unlike the determination of a market-clearing price of a widely-traded commodity, which is set by the interplay between market supply and demand, royalty is usually set through private negotiations between the patentee and the putative licensee.[587] In a general commodity market, the market price serves to allocate the product among consumers according to the strength of their demand and their willingness to pay and to signal to producers how much to produce.[588] It performs a resource allocation function on both sides of the market.[589] In the patent licensing context, royalty rates are but a mere reflection of the relative bargaining power of the two parties and only determine how the surplus is split between them.[590] Nor does the royalty give a decisive signal to the patentee as to how much to invest in R&D. Recall that patent protection is only one of the numerous appropriation mechanisms for a technology developer. Her willingness to make R&D investment will not be solely determined by her royalty income. Therefore, while one should endeavor to set royalty accurately, some deviation from the hypothetical 'efficient' rate will not significantly distort allocation.

[587] Mark A Lemley and Carl Shapiro, 'Patent Holdup and Royalty Stacking' (2007) 85 Texas Law Review 1991, 1995–98.
[588] Hal R Varian, *Intermediate Microeconomics with Calculus: A Modern Approach* (1st edn, W W Norton & Company 2014) 5–6.
[589] ibid.
[590] Lemley and Shapiro (n 587) 1995–98.

The implementation difficulties for a unilateral refusal to deal or an essential facilities claim should be manageable when the remedy sought is confined to damages or injunctive relief, especially when there is a course of prior dealing between the patentee and the putative licensee or when there are other current licensees. The implementation difficulties will be more significant when it comes to royalty setting, which it was argued will be inevitable in many compulsory licensing cases. A competition authority, however, is not entirely at sea when attempting to set royalty. The case law sheds some light on how it should be done. Gilbert and Shapiro and Delrahim have provided some useful guidance, such as a preference for a flat fee and a royalty based on a low percentage of total sales. The compulsory licensing obligation should be extended to future patents. Delrahim contends that the licensing obligation should not extend to tacit know-how. Whether active assistance by the patentee should be required as part of the compulsory license depends on the nature of the licensing obligation. It will be discussed in the next chapter.

3. Critiques Specific to the Essential Facilities Doctrine

Apart from the aforementioned critiques that are applicable to both the unilateral refusal to deal doctrine and the essential facilities doctrine, some commentators have offered criticisms that are specific to the essential facilities doctrine. Cotter has observed three weaknesses of the essential facilities doctrine. First, he argues that the essential facilities doctrine is largely superfluous because most of the cases involve unlawful attempts to create or extend monopoly power, which is well covered by the main body of the monopolization or abuse of dominance law.[591] Second,

[591] Cotter (n 375) 233.

application of the doctrine reduces incentives to invest to create the facility in the first place.[592] Third, the doctrine facilitates collusion by requiring firms to share a facility.[593]

Whether the first critique is valid depends on how it is understood. With the exception of exploitative abuses under EU law, virtually every abuse of dominance or monopolization claim involves the creation or protection or leveraging of monopoly power through some exclusionary conduct.[594] In the case of the essential facilities doctrine, the exclusionary conduct is denial of access to an essential facility. If what Cotter meant is that every essential facilities case entails the creation or protection or leveraging of monopoly power, that is a rather unremarkable observation. If what he meant is that every abuse of dominance claim premised on the essential facilities doctrine can be reformulated by substituting other exclusionary acts for the denial of access to facility, a quick review of the case law and the aforementioned theories of harm shows that this is clearly not the case. But if what he meant is that those essential facilities doctrine cases that cannot be so reformulated should be excised from the doctrine, which he seems to suggest, then his critique is highly problematic.[595] If it is true that most of the essential facilities cases entail creation or leveraging monopoly power, then they are rightly within the purview of monopolization or abuse of dominance law. And if some of these cases cannot be reformulated by substituting other exclusionary conduct for the refusal to supply, then it means that abolishing the doctrine and relying on other areas of monopolization law will leave some instances of creation or leveraging of market power unaddressed. Cotter has not made a convincing

[592] ibid 233–34.
[593] ibid 234.
[594] Hovenkamp, *Federal Antitrust Policy: The Law of Competition and Its Practice* (n 390) s 6.4.
[595] Cotter (n 375) 233.

case for why instances of creation or leveraging of monopoly power that are the result of refusal to deal deserve less protection under the law.

Cotter's second critique has already been addressed and the arguments will not be repeated here. Finally, the potential of compelled sharing to facilitate collusion is overstated. First, if the incumbent is so keen on collusion and if collusion is profitable, which it most probably is, she would not have to be judicially compelled to provide access.[596] She would have done so voluntarily. Second, the potential for facilitation of collusion should be manageable given that the sharing is publicly known and subject to some level of regulatory control or judicial oversight.[597] Furthermore, the collusion facilitation potential of mandated sharing carries much less weight in the patent context. In the context of a physical facility single-handedly developed by one firm, sharing of the facility is admittedly not the ordinary state of affairs and compelled sharing of the facility may create more opportunities for competitors to communicate with each other. In the case of a patented innovation, sharing of the technology happens on a regular basis through licensing.[598] Unless the patentee decides to exploit the technology all by herself, some amount of licensing must take place.[599] The potential for a licensor and a licensee to collude is always there and compelled sharing under the essential facilities doctrine does not significantly increase the risk.

The essential facilities doctrine has also been criticized for its inability to improve consumer welfare. Abbott Lipsky and Gregory Sidak observe that '[a]dmission of a new entrant to an undersized facility (even one charging rates that are no higher than necessary to cover all costs of operation) cannot improve the downstream

[596] Frischmann and Waller (n 444) 39.
[597] ibid.
[598] Carl Shapiro, 'Patent Licensing and R&D Rivalry' (1985) 75 The American Economic Review 25, 25–26.
[599] ibid.

equilibrium without capacity expansion.'[600] So long as courts refrain from requiring the facility owner to expand the facility's capacity, compelled sharing under the essential facilities doctrine will simply result in more users sharing the existing limited capacity, which will not improve consumer welfare.

Ignoring for now whether their observation is accurate in the context of physical facilities—and it is certainly possible to imagine scenarios in which that need not be the case, such as if the firm being granted access is a lower-cost producer of the downstream product than existing competitors, or, as Frischmann and Waller argue, even nondiscriminatory access at monopoly price is beneficial[601]—it is clear that their observation has no application to patented technology, which as a public good is by definition non-rivalrous in use.[602] Innovation in the form of knowledge does not suffer from limited physical capacity as in the case of physical facilities. Consumer welfare will definitely be improved if a patented technology is shared with a lower-cost producer or implementer. Even if the new firm being given access only has the same cost structure as existing competitors, the increase in market supply following entry by the new firm will drive down the market price, thereby improving consumer welfare. Some commentators[603], including Lipsky and Sidak themselves[604], have argued that the essential facilities doctrine is particularly unsuitable for intellectual property. From the perspective of consumer welfare, it seems that the converse is true and compulsory licensing of intellectual property has a greater potential to improve consumer welfare than does mandated sharing of a physical facility.

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[600] Abbott B Lipsky Jr. and J Gregory Sidak, 'Essential Facilities' (1999) 51 Stanford Law Review 1187, 1222.
[601] Frischmann and Waller (n 444) 29.
[602] Peter Drahos, 'The Regulation of Public Goods' (2004) 7 Journal of International Economic Law 321, 321.
[603] Werden (n 437) 479.
[604] Lipsky Jr. and Sidak (n 600) 1193–94.

Gregory Werden has offered not so much a criticism as a significant narrowing of the scope of the essential facilities doctrine. He argues that the doctrine should only be invoked in regulated industries, observing that

> Since there appear to be no situations in which a refusal to deal would be the optimal strategy absent regulation, and since regulation is necessary for relief, liability should be imposed only if the essential facility is subject to pre-existing price regulation. … The conclusion that the essential facility doctrine should be invoked only if the facility is subject to pre-existing price regulation reasonably leads to the proposal that the doctrine be entirely abandoned in favor of regulation.[605]

He further argues that invocation of the doctrine would not address a competition problem in cases involving 'an arbitrary refusal to deal, a refusal to buy, vertical integration into the distribution of one's own product, upstream integration from an unregulated market, or competition for a monopoly franchise.'[606] He asserts without much justification or elaboration that compelled access to intellectual property is harmful.[607] The only scenario in which compelled sharing of a facility would be beneficial is '[i]f the essential facility is a bottleneck that prevents the delivery of the relevant product to certain customers',[608] but only in the presence regulatory oversight over the price and other terms of access. Despite their different views on the desirable scope of the doctrine, Frischmann and Waller concur with Werden that regulated industries present particularly well suited targets for the application of the doctrine.[609] Frischmann and Waller argue that Justice Scalia got it exactly backwards in *Trinko* when he argues that sectors subject to regulation have less need for antitrust intervention to mandate access to an essential facility.[610]

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[605] Werden (n 437) 478.
[606] ibid 479.
[607] ibid.
[608] ibid.
[609] Frischmann and Waller (n 444) 24.
[610] ibid.

The argument that the essential facilities doctrine should only apply in regulated industries implies that the essential facilities doctrine has no application to patented technology. In contrast, Frischmann and Waller believe that the doctrine should be readily available for intellectual property. Because Werden does not spell out any independent reasons for excluding intellectual property from the scope of the doctrine, one can only surmise from his general view that it is because intellectual property is not subject to a regulatory regime and therefore the terms of access cannot be readily determined. This harkens back to the aforementioned implementation difficulties of the doctrine. Werden's objection carries less weight to the extent that a satisfactory solution to the challenges of royalty setting is found.

Werden is not the only commentator who has argued that the essential facilities doctrine should not apply to intellectual property. Professor Herbert Hovenkamp and his co-authors has made a similar argument on the grounds that there seems to be no U.S. case law that has so applied the doctrine and that if the barriers to competition are the result of an intellectual property right, the market control conferred by those barriers are 'part and parcel of the incentives conferred by the intellectual property laws themselves.'[611] They advocate a per se legality rule for refusal to license intellectual property, subject to the caveat that the intellectual property is valid and is the very facility to which access is sought instead of being merely incidental to the control of the facility itself.[612] Therefore, while Werden's objection seems to be principally motivated by difficulty in determining the terms of access, Hovenkamp and his co-authors take the more traditional view that the right to exclude is the essence of intellectual property and should not be overridden. This per se legality approach to a

[611] Hovenkamp, Janis and Lemley (n 365) 15.
[612] ibid 19.

unilateral refusal to license intellectual property will be addressed and rejected in the next chapter.

Other commentators take a slightly different view. Concurring with Frischmann and Waller, Robert Pitofsky and his co-authors contest that there are no *a priori* reasons why the essential facilities doctrine should not apply to intangible assets such as intellectual property.[613] Reading the U.S. case law slightly differently, Pitofsky and his co-authors believe that the U.S. case law poses no barriers to applying the doctrine to intellectual property.[614] Citing cases such as *Data General Corp. v. Grumman Systems Support Corp*.[615], they observe that '[n]umerous U.S. courts have squarely held or otherwise indicated that the essential facilities doctrine applies to intellectual property and other intangibles.'[616] There is no reason why the doctrine should not apply to intellectual property as the effect of the denial of access is the same regardless.[617]

Going beyond asserting the equivalence of physical facility and intellectual property, Shelanski proposes a benchmark for determining how intellectual property should be treated under the doctrine. He asserts that while there are times when intellectual property should be treated deferentially by antitrust law, such deference is not tantamount to an outright exemption from antitrust law altogether.[618] Instead, how intellectual property should be treated under antitrust law in general and the unilateral refusal to deal doctrine in particular should be determined with reference to impact on incentives to innovate and invest, which is precisely what has been

[613] Pitofsky, Patterson and Hooks (n 439) 453.
[614] ibid.
[615] 36 F.3d 1147 (1st Cir. 1994).
[616] Pitofsky, Patterson and Hooks (n 439) 452–53.
[617] ibid 453.
[618] Shelanski (n 219) 370.

advocated thus far.[619] If one accepts the proposition that compulsory licensing does not significantly dampen innovation incentives, there are no strong arguments for giving intellectual property in general and patents in particular special treatment under the essential facilities doctrine. Even if one does not completely accept this proposition, the foregoing discussion should illustrate that there is room for competition law to intervene without significant impairment of innovation incentives.

E. Conclusion

This chapter examines the various theoretical issues presented by the application of the unilateral refusal to deal doctrine and the essential facilities doctrine to patented technology. It first clarifies that the unilateral refusal to deal doctrine is usually applied to patented input or product while the essentially facilities doctrine has greater salience in the context of technology licensing. It surveys the various theories of harm for the two doctrines, including enhancement of entry barriers, facilitation of price discrimination, foreclosure of downstream competition, and creation of effective exclusivity. All four are potentially relevant to the unilateral refusal to supply a patented input or product while foreclosure of downstream competition is likely to be the main concern in essential facilities cases. The extent of relevance of these theories of harm to developing countries varies in accordance with their technological capacity. Theories of harm that are premised on harm to a primary product competitor, such as some variation of enhancement of entry barriers and creation of effective exclusivity, will have limited applicability to the production countries. Theories of harm that implicate

[619] ibid.

the downstream market or the complementary product market should be of concern to all developing countries.

The chapter also addresses the various critiques that have been launched against both doctrines. It argues that compulsory licensing is unlikely to dampen the incumbent innovator's innovation incentives in light of a variety of reasons, such as flaws in the patent system, the lack of correspondence between patents and genuine innovation, the greater incentive effect of competition as compared to market power for innovation, and the tendency of the patent system to generate excessive incentives. If having an additional innovator to work on the initial innovation will create more paths to follow-on innovation, then compulsory licensing may spur further innovation by competitor innovators. By opening the door for the competitor to pursue further improvements, compulsory licensing may augment a competitor's innovation incentives. As for cumulative innovators' innovation incentives, it rejects Kitch's prospect theory and argues that a coordinated approach to cumulative innovation is inferior to a decentralized approach and therefore compulsory licensing could be useful where negotiations fail between the initial innovator and improvers. The case for competition law intervention varies in accordance with the model of cumulative innovation. The case is the strongest under the 'trunk-branch' model, followed by the anticommons model, and then the quality ladder model.

The chapter further acknowledges the practical difficulties with royalty setting, but argues that these difficulties are manageable and that in any case, compulsory licensing should not be abandoned simply because of these difficulties. Lastly, the chapter examines some of the critiques directed specifically at the essential facilities doctrine and rejects the argument that the doctrine should be inapplicable to intellectual property. Having addressed all the theoretical issues pertaining to the

application of the unilateral refusal to deal doctrine and the essential facilities doctrine to patented technology, the next chapter will attempt to fashion a suitable approach for developing countries with different technological capacity after surveying various theoretical approaches found in the case law and the literature and the doctrinal considerations raised by the case law. The suggested approach will take into account developing country-specific considerations and enforcement capacity concerns.

VI. UNILATERAL REFUSAL TO LICENSE PATENTS—A PROPOSED FRAMEWORK

A. Theoretical Approaches

Having examined the circumstances under which a refusal to supply a patented intermediate input and a refusal to license an essential patented technology can pose competitive harm and critique of the two doctrines, it remains to be seen what is the appropriate analytical framework for determining the legality of these two practices. It turns out that commentators and the courts have proposed a variety of approaches. These approaches run the gamut, ranging from per se legality to tests that focus on the permissible scope of patent rights to tests that hinge on pretexts or business justifications or extenuating circumstances. Interestingly, none of these approaches require an express articulation of concrete harm to consumers. The monopoly leveraging test probably comes closest to it. The remainder of the approaches seem to focus on the justifiability of the refusal with reference to some objective benchmarks such as the scope of patent rights or the existence of a valid business justification.

It is perhaps because of this focus on justifications in these tests that has caused the two doctrines to be so controversial. It represents a somewhat inexplicable departure from the usual practice in competition law, where it is necessary first to articulate ways in which a particular business practice can harm competition before entertaining possible justifications.[620] Another source of controversy is that these two doctrines seem to be premised on the default position that a firm or a facility owner is free to refuse to supply an essential input or to provide access to an essential facility absent exceptional circumstances. This effectively frames the entire debate on property right terms instead of focusing on competitive effects.

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[620] Hovenkamp, *Federal Antitrust Policy: The Law of Competition and Its Practice* (n 390) s 6.4.

One may retort that unilateral refusal to deal is unique among the business practices scrutinized by competition law in how it directly implicates property rights. Therefore, it is natural that the analytical approach should focus on property rights. While this argument may have some superficial credibility, it falls apart upon careful consideration. As long ago as 1911 in the *Dr. Miles* case, the U.S. Supreme Court was confronted with the argument that resale price maintenance should be legal because the owner of some proprietary medicine should, by virtue of her property rights, be free to decide whether and how she sells her product, including the terms of the sale.[621] Resale price maintenance can be characterized as a conditional refusal to sell the product unless the resale price stipulation is acceded to. The Supreme Court resoundingly rejected the argument.[622] In fact, all vertical restraints and patent licensing practices can be reconceptualized in the same way. Any vertical restraint is but an owner's refusal to sell her product unless the buyer accepts the distribution condition. Any patent licensing restriction amounts to a refusal to license the patented technology unless the licensee acquiesces to the licensing terms.[623] The difference between unilateral refusal to deal and these other business practices is only one of degree. The former amounts to pure refusal or exclusion whereas the latter constitutes conditional refusal or exclusion.[624] There is no meaningful distinction between the two from a property right perspective.

Therefore, a better approach to determining the legality of a unilateral refusal to deal should be to focus on consumer harm. A coherent theory of harm should be formulated in every case. This is especially true because the property right

[621] Dr. Miles Medical Co. v. John D. Park & Sons Co., 220 U.S. 373, 382 (1911).
[622] 220 U.S. at 383.
[623] McGowan (n 368) 491.
[624] ibid 491–92.

justifications in the patent context—arguments based on innovation incentives—have been dismissed. A unilateral refusal to deal should not be viewed from the lens of patent property rights but instead should be analyzed in light of its competitive harm.

1. Per Se Legality

The first legal standard that has been proposed by commentators is per se legality, under which a patent owner should have an absolute and unqualified right to refuse to sell a patented intermediate input or to license a patented technology. A refusal to supply or license should be completely beyond the scrutiny of competition law.[625] Hovenkamp and his co-authors endorse this view, arguing that

> Antitrust law does not itself impose an obligation to use or license intellectual property rights, such that a refusal to use or license the right would violate the antitrust laws. Further, such an obligation would-unlike the vast majority of the antitrust rules we discuss in this text-conflict directly with the rights granted to an intellectual property owner by the intellectual property laws.[626]

Taking a decision-theoretic perspective, Yannis Katsoulacos argues that when the presumption of legality is strong, as in the case of unilateral refusals to deal, a 'low false-acquittals' rule such as per se legality is superior to alternative rules on welfare grounds.[627]

The justifications for this per se legality approach are apparent. A right unilaterally to refuse to supply or license is the corollary of the quintessential patent right to exclude.[628] The right to exclude, however, does not necessarily justify a per se legality approach. While it is true that the right to exclude is a fundamental patent right,

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[625] Makan Delrahim, 'The "New Madison" Approach to Antitrust and Intellectual Property Law' (University of Pennsylvania Law School, Philadelphia, 16 March 2018) 2.
[626] Hovenkamp, Janis and Lemley (n 365) 4–5.
[627] Yannis S Katsoulacos, 'Optimal Legal Standards for Refusals to License Intellectual Property: A Welfare-Based Analysis' (2009) 5 Journal of Competition Law & Economics 269, 291.
[628] 35 U.S.C. § 154 (2018).

it is important not to contemplate this right in a vacuum. It should be viewed in light of the policy rationale for the patent system, i.e., to generate innovation incentives by providing innovators a financial reward. This right to exclude cannot and should not be an absolute right. It should only be upheld to the extent necessary to generate innovation incentives. It is thus not surprising that the per se legality approach has been challenged. Genevaz asserts that per se legality for unilateral refusal to deal directly contradicts the policy objectives of the patent system and is indefensible.[629] Per se legality is doubly unjustifiable in light of the previously discussed theories of harm, which clearly posit scenarios in which unilateral refusal to supply or license can harm consumers. If property rights did not save resale price maintenance from condemnation in *Dr. Miles*, there are no reasons why these rights should justify per se legality for unilateral refusals to deal.

2. Scope of Patent Test

A very popular test in this area of law is the scope of patent test. It is largely only relevant for the unilateral refusal to deal cases and not the essential facilities cases. The essence of the scope of patent test is that a patent owner violates competition law if she 'attempt[s] to broaden the physical or temporal scope of the patent monopoly.'[630] The test is supported by a long line of U.S. Supreme Court cases on tying.[631] It has also been endorsed by commentators.

It is a test that is very often invoked but whose content and precise boundary remain shrouded in mystery. While most commentators seem to agree that it

[629] Genevaz (n 377) 746.
[630] John E Lopatka and William H Page, 'Monopolization, Innovation, and Consumer Welfare' (2001) 69 George Washington University Law Review 368, 392.
[631] Lao (n 378) 198.

should be unlawful for a patentee to use unilateral refusal to deal to attempt to monopolize a market beyond that of the primary product covered by the patented technology, the consensus largely ends there.[632] Joseph Bauer contends that it has been an accepted position for nearly a century that a patentee cannot extend her market power to compel customers to purchase unpatented staple supplies from her.[633] There is, however, very little agreement on what the scope of patent means beyond standing for a simple rule against monopoly leveraging. Lao observes that it is unclear under the patent scope test

> whether a firm's refusal to license a patent may be considered an antitrust violation if the practice does not merely bar competitors from the particular area of the invention, but also excludes them from a related antitrust market in which the firm would otherwise have faced competition.[634]

This is partly due to the fact that the case law often neglects to specify the patent scope and instead seems to evince a belief that the boundary of patent scope is self-evident.[635] The concept lacks any economic rationale or underpinning. Jackie Mackie-Mason asserts that there is no theoretical support for the position that 'the correct amount of expected rent is provided if the property right is unlimited only within the 'scope' of the grant, but is limited outside the scope.'[636]

Some have attempted to associate patent scope with the concept of the relevant market under competition law.[637] Such attempts, however, reflect the widely held misconception in competition law that there is a direct correspondence between a patent and a product. It has been noted that 'patents describe inventions, not markets,

[632] Lao (n 378). Genevaz (n 377).
[633] Bauer (n 466) 1242.
[634] Lao (n 378) 198.
[635] Rita Coco, 'Antitrust Liability For Refusal To License Intellectual Property: A Comparative Analysis and the International Setting' (2008) 12 Marquette Intellectual Property Law Review 1, 36–37.
[636] Mackie-Mason (n 459) 9.
[637] Bauer (n 466) 1225, 1234.

and that an intellectual property right typically does not create a monopoly or market power'.[638] An antitrust market corresponds with a relevant product and its reasonable substitutes, while a patent may only cover a component of a product or a small part of the overall technology.[639] It is often erroneously assumed that one relevant product embodies one patented technology.[640] Once that is no longer true, any attempt to link patent scope to relevant market becomes untenable. With a product that incorporates multiple technologies, the question arises as to whether the patent scope covers only the patented technology, which may have no independent value, or the entire product, which will inevitably lead to overlapping claims and possible over-compensation.

Allowing the patentee to extend her control over the entire product could give rise to abuse. Peter Boyle and his co-authors note that

> precluding antitrust scrutiny [of the extension of monopoly power from a component to the entire product], as a matter of law, would enable an IP owner to contrive antitrust immunity merely by adding to a competitively significant product an insignificant feature that just happens to be subject to patent or copyright protection.[641]

The reverse of this situation is if the same technology can be used in multiple products. Does the scope of patent test mean that the patent owner should be allowed to monopolize each of these multiple markets even though it may amount to gross over-compensation of the owner? Some commentators seem to think so.[642] The justification for this position, however, is far from clear. A further complication with this test arises because monetization of a patent may require sales in an ancillary market.[643] In fact, such sales could be the only way for the patentee to recoup her investments. The scope

[638] Hovenkamp, 'IP and Antitrust Policy: A Brief Historical Overview' (n 488) 37.
[639] Melamed and Stoeppelwerth (n 439) 425–26.
[640] Burk and Lemley (n 30) 162.
[641] Boyle, Lister and Everett Jr. (n 372) 760.
[642] ibid 754.
[643] Lopatka and Page (n 630) 397.

of patent test, however, should exclude an ancillary market from the patent scope as it lies beyond what should be the primary product. This highlights a problematic fundamental assumption of the scope of patent test that innovators will be adequately rewarded so long as they have exclusive right to profit within the scope of its innovation. This need not be the case.

If competition law does not provide a satisfactory answer, the alternative could be economics. Unfortunately, economics is again of not much help either. Mackie-Mason notes that 'no coherent economic analysis […] gives precise operational meaning to the concept of scope'.[644] One notable attempt to do so is by Paul Klemperer, who defines patent scope as 'the distance from the preferred point to that point beyond which competitors are allowed to produce.'[645]. This understanding of patent scope, however, is different from what is relevant in the context of unilateral refusal to deal. Klemperer's notion measures 'the degree of protection against imitations'[646], not the breadth of a patentee's rights over a well-defined innovation. His notion of patent scope only sets out the scope of the innovation, not the scope of one's rights over it.

The lack of an economic basis for the concept of patent scope should come as no surprise. Louis Kaplow has noted long ago the indeterminacy of patent scope as a concept.[647] Apart from as a simple rule against tying with unpatented staple supplies or complementary products, patent scope does not shed much light on the boundary of the unilateral refusal to deal doctrine.

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[644] Mackie-Mason (n 459) 8.
[645] Paul Klemperer, 'How Broad Should the Scope of Patent Protection Be?' (1990) 21 RAND Journal of Economics 113, 114.
[646] Dumont and Holmes (n 386) 152.
[647] Kaplow (n 2) 1848–49.

3. Monopoly Leveraging Test

Another legal test that is very closely related to the scope of patent test is monopoly leveraging, which 'refers to a company with power in a relevant market using, or leveraging, that power to monopolize or gain an unmerited competitive advantage in another related, or complementary, market.'[648] One difference between monopoly leveraging and patent scope is that the former explicitly refers to the patentee's monopoly power in one relevant product market while patent scope, as noted earlier, is not predicated on the concepts of relevant market and market power. Because monopoly leveraging most often arises in the context of tying or bundling, or conduct that effectively accomplishes a tie, it will be discussed in the next chapter on tying and bundling.

4. Intent/Pretext Test

The previous three tests are meant to be benchmarks for assessing the competitive harm of unilateral refusal to deal. The following two tests focus on whether the refusal to deal is justified. The first one directs the attention to the intent of the dominant firm and inquires whether the firm can only offer a pretextual justification for the refusal to deal. The test, which is chiefly associated with the unilateral refusal to deal doctrine, is primarily concerned with the firm's subjective intent. The second one examines the existence or absence of a legitimate business justification. Under this 'no business justification' rule propounded by Jonathan Baker based on *Aspen Skiing* and *Kodak*, a unilateral refusal to deal under certain market conditions will be condemned if it lacks a valid business justification.

[648] Lao (n 378) 195.

The subjective intent/pretext test is clearly inspired by the *Image Technical Services v. Eastman Kodak* decision by the United States Court of Appeal for the Ninth Circuit.[649] In that case, the Ninth Circuit ruled that Kodak's refusal to supply spare parts was unlawful refusal to deal because the justification it offered—that it was trying to protect its intellectual property rights—was pretextual.[650] Kodak's manager testified in trial that intellectual property rights had never crossed his mind.[651] The Court concluded that a refusal to supply intellectual property will be presumed lawful unless the justification for refusal is pretextual.

It is no exaggeration to say that the subjective intent/pretext test has been roundly criticized. Hewitt Pate criticizes the test for turning competition law analysis from a focus on objective effects into an inquiry into subjective intentions.[652] He also characterizes the subjective intent/pretext test as 'impractical and unworkable'[653]. The test entails an inquiry into the subjective intention of a corporate body that 'is likely to confuse jurors and complicate litigation'[654]. Identification of corporate intentions is fraught with difficulty due to a lack of a single controlling mind. What constitutes a corporation's subjective intention crucially depends on which employee or officer is deemed to represent or act on behalf of the corporation.[655] A subjective intent test will also be susceptible to circumvention. Corporate counsel would merely have to stamp every internal document or corporate strategy with an

[649] 125 F.3d 1195 (9th Cir. 1997)
[650] 125 U.S. at 1219-20.
[651] 125 U.S. at 1219.
[652] R Hewitt Pate, 'Refusals to Deal and Intellectual Property Rights' (2002) 10 George Mason Law Review 429, 438.
[653] ibid 439.
[654] ibid.
[655] Mihailis E Diamantis, 'Corporate Criminal Minds' (2016) 91 Notre Dame Law Review 2049. Ellis Ferran, 'Corporate Attribution and the Directing Mind and Will' (2011) 127 Law Quarterly Review 239. Ernest Lim, 'A Critique of Corporate Attribution: "Directing Mind and Will" and Corporate Objectives' (2013) [2003] Journal of Business Law 333.

intention to exercise and protect intellectual property to escape liability.[656] While ease of circumvention is a genuine concern, the difficulty in determining corporate intentions should not be overstated. Determination of corporate intentions is regularly done in other legal contexts and the difficulty should not be insurmountable.[657]

A more fundamental critique[658] is that the subjective intent/pretext test 'would seem to stand intellectual property law on its head.'[659] The crux of the argument is that the right to exclude is a fundamental right under patent law and exclusion is the essence of patent protection.[660] A patentee should be free to refuse to sell or license her patented product or technology for any and no reason. All acts of exclusion should be within the scope of patent rights and there should be no inquiry into her intent. The logical conclusion of this argument is that unilateral refusal to sell a patented input or license a patented technology should be per se legal, which has already been rejected. Even if one dismisses the premise that a patentee should have an unqualified right to exclude, it remains true that the application of the subjective intent/pretext test diverts attention from objective effects. It can also be very complicated to apply in a jury trial. Yet it is important to point out that while this may be a valid concern in the U.S., not every jurisdiction uses juries in competition law cases. This may not be a serious consideration for most countries.

One way to render the subjective intent/pretext test more defensible is to conceptualize it from an innovation incentive perspective. The purpose of the patent system is to generate innovation incentives. In the first-best scenario, it should reward

[656] McGowan (n 368) 514–15.
[657] See footnote 655.
[658] Jill Boylston Herndon, 'Intellectual Property, Antitrust, and the Economics of Aftermarkets' (2002) Summer-Fall The Antitrust Bulletin 309, 324–25. McGowan (n 368) 514. Pate (n 652) 440.
[659] Herndon (n 658) 324–25.
[660] McGowan (n 368) 514.

patentees up to the point of their R&D investments, including the opportunity costs of such investments, which should render the patentee indifferent between R&D and alternative investments. That would require perfect information on the part of the patent system administrator and would not be feasible in reality. But when the justification of intellectual property protection is judged to be pretextual, as in the case of *Kodak*, it reveals that the innovator did not deem the practice as essential to the recovery of her R&D investments. It is not always easy to determine what the patentee expressly relies on to recoup her R&D investments. This is one of those instances where we can confidently exclude certain practice from her calculus. If she does not consider the practice essential, permitting it would amount to a windfall and would be counterproductive from an innovation incentive perspective. In this sense, the subjective intent/pretext test produces sensible results.

Ultimately, the most relevant criticism of the subjective intent/pretext test is likely its limited applicability. While the court was able to reach the conclusion of pretext under the particular facts of the *Kodak* case, it is difficult to imagine other circumstances in which the same conclusion can be confidently drawn. This would be especially true if McGowan's prediction came true and corporations habitually rubberstamped every document with an intention to protect intellectual property in order to circumvent that the subjective intent/pretext test. In-house counsel of corporations will also ensure that incriminating evidence of predatory intent will be removed from internal communications.

5. Jonathan Baker's No Business Justification Rule

Another test that is focused on the justifiability of the unilateral refusal to deal is Baker's no business justification rule. This rule is based on *Aspen Skiing* and

Kodak and is specifically designed for refusal to license intellectual property.[661] He sums up the rule as requiring the examination of 'two readily observable factors—exclusion that exploits a complementary or collaborative relationship and the absence of a satisfactory business justification—without taking on the task of evaluating harm to competition.'[662] The rule only applies to markets characterized by 'winner-take-all innovation competition', which takes place 'when intellectual property protections and network externalities are both strong and buyers have a low demand for variety.'[663]

The existence of a complementary or collaborative relationship is important because it provides the defendant a leverage with which to harm the plaintiff.[664] Baker argues that there is ample support in the case law for condemning a unilateral refusal to deal without an inquiry into harm to competition or consumers[665], and justifies doing away with this inquiry on the ground that '[h]arm to competition is probably more difficult to evaluate than the adequacy of the business justification, even in prospect, and particularly in the dominant firm setting, where the fringe is already weak.'[666]

Baker does not specify what constitute valid business justifications. Other commentators have offered some suggestions. Yongmin Chen believes that it would be efficient for a monopolist to refuse to supply '[w]hen the variable profits under monopoly pricing are not high enough to cover such costs [additional fixed (setup or transaction) cost to supply the downstream rival]'.[667] Douglas Melamed and Ali

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[661] Jonathan Baker, 'Promoting Innovation Competition through the Aspen/Kodak Rule' (1999) 7 George Mason Law Review 495, 496–97.
[662] Baker (n 661).
[663] ibid 496.
[664] ibid 502.
[665] ibid 503, 506.
[666] ibid 518.
[667] Chen (n 419) 535.

Stoeppelwerth suggest that a monopolist may justifiably refuse to trade with a counterparty if the latter is 'an opportunist, untrustworthy with trade secrets, or an unreliable shepherd of the former's goodwill.'[668] Under Baker's rule, even if the defendant offers a valid business justification, the plaintiff can still prevail by showing that the competitive harm from exclusion outweighs the pro-competitive benefits.[669]

John Lopatka and William Page have criticized Baker's rule on two main grounds. First, they argue that it is premised on harm to innovation that is by nature highly speculative, noting that

> A finding of harm to innovation requires, first, a counterfactual inference that innovators would have invented new products but for the predatory conduct and, second, that those products would have been better or cheaper than others in the market. There is reason to be skeptical of the claim of harm to innovation.[670]

Second, they rightly insist that proof of consumer harm, which is obviated in Baker's rule, should be required in every monopolization case.[671] In Baker's defense, he seems to intend to use harm to innovation as a proxy for consumer harm. While it is no doubt true that harm to innovation can be speculative, that seems to be an inevitable part of every case involving innovation unless one adopts simple default rules such as per se legality.

The biggest drawback of Baker's rule is not that it is poorly conceived, but that it again has limited applicability. It only applies to cases where the plaintiff and the defendant share a collaborative or a complementary relationship and are engaged in winner-take-all innovation competition. This rule is unlikely to have much salience for

[668] Melamed and Stoeppelwerth (n 439) 420.
[669] Genevaz (n 377) 772.
[670] Lopatka and Page (n 630) 371.
[671] ibid 388.

the majority of developing countries that are bereft of firms capable of engaging in innovation competition with firms from the industrialized economies.

All five benchmarks explored here have their drawbacks. The per se legality approach is clearly too permissive and fails to recognize instances in which unilateral refusal to deal can inflict consumer harm. The scope of the patent test suffers from fatal indeterminacy. The concept of patent scope is not self-defining and an accurate determination of the appropriate amount of patentee reward would impose such high information costs that is beyond the capability of any competition authority or courts. The monopoly leveraging test is only relevant when the patentee attempts to extend its market power from the patented product to adjacent markets. The intent test is too easy to circumvent, especially once corporate in-house counsel have adjusted to the rule and learned to insert a reference to a desire to protect intellectual property in every instance of refusal to license or supply. Baker's no business justification rule also suffers from limited applicability as it only applies to cases where the plaintiff and the defendant share a collaborative or a complementary relationship and are engaged in winner-take-all innovation competition.

B. Doctrinal Approaches

Having surveyed various theoretical approaches to determining the legality of the unilateral refusal to deal doctrine and the essential facilities doctrine, let us add an additional dimension and explore the case law in the U.S. and the EU and the doctrinal issues raised in these cases. While developing countries should not slavishly follow the approaches from the advanced jurisdictions, these approaches will serve as a useful basis upon which a contextualized approach to these doctrines for developing

countries can be crafted. Developing countries can decide which elements of these approaches to accept and reject in light of their specific policy considerations.

1. U.S. Case Law

(i) Case Law on Unilateral Refusal to Deal

There have been three leading unilateral refusal to deal cases in the context of intellectual property in the U.S., *In re Independent Service Organizations Antitrust Litigation (Xerox)*, *Data General Corp. v. Grumman Systems Support Corp*., and *Kodak*. All were decided in the 1990s. All concerned the aftermarket of maintenance in which the defendant denied the plaintiff access to a critical input which the plaintiff needed to provide maintenance services. The primary product was photocopying machines in *Xerox* and *Kodak* and mini-computers in *Data General*, and the input sought by the plaintiff were spare parts in *Xerox* and *Kodak* and diagnostic software in *Data* General. In none of the cases did the plaintiff ask for a direct transfer of the technology in the primary product.

Kodak has already been discussed and will not be repeated here. *Xerox* is of particular importance because it is the leading case on the unilateral refusal to supply intellectual property decided by the Court of Appeals for the Federal Circuit, the appellate court that hears appeals of all patent-related cases. In *Xerox*, the Federal Circuit held that a patentee's refusal to deal will not be questioned absent fraud on the U.S. Patent and Trademark Office, sham litigation, or illegal tying.[672] In *Data General Corp. v. Grumman Systems Support Corp*., the Court of Appeals for the First Circuit did not go as far as the Federal Circuit, but nonetheless proclaimed that 'while exclusionary

[672] 203 F.3d 1322, 1327 (Fed. Cir. 2000).

conduct can include a monopolist's unilateral refusal to license a copyright, an author's desire to exclude others from use of its copyrighted work is a presumptively valid business justification for any immediate harm to consumers.'[673] Even in *Kodak*, the Ninth Circuit only imposed a duty to deal because the court found that the defendant's intellectual property justification for refusing to deal was pretextual.[674] There is some tension between *Data General* and *Kodak* in terms of their willingness to scrutinize the authenticity of the intellectual property holder's desire to exercise her right to exclude. The *Data General* court's approach is tantamount to per se legality because every IP owner can assert a desire to exclude others in a unilateral refusal to deal case. If such a desire is always taken to be a presumptively valid business justification, unilateral refusal to supply intellectual property is always justified. The Ninth Circuit is at least willing to inquire whether the justification is genuine.

These cases thus do not provide useful guidance for our purpose. It was suggested that the Ninth Circuit's subjective intent/pretext test can only apply under narrow circumstances. The *de facto* per se legality approach espoused by *Data General* has already been dismissed as unjustifiably permissive. The *Xerox* court's approach overlooks situations in which unilateral refusal to supply or license intellectual property can inflict competitive harm beyond the three high circumscribed scenarios described by the court. The monopoly leveraging test could have applied in these cases, especially *Kodak* and *Xerox*, where the defendant was clearly trying to extend its market power into aftermarkets. In fact, before its remand from the U.S. Supreme Court, Kodak was mainly a tying case.

[673] 36 F.3d 1147, 1187 (1st Cir. 1994).
[674] 125 F.3d 1195, 1219–20 (9th Cir. 1997).

The two leading cases on unilateral refusal to deal in the U.S. outside of the intellectual property context are *Aspen Skiing Co. v. Aspen Highlands Skiing Corp.* and *Verizon Telecommunications v. Trinko*. These cases probably provide more useful lessons for us than the previous three cases. *Aspen Skiing* involved two ski slope operators in Aspen, Colorado, a major ski resort town in the U.S. One of them, Ski Co. was the dominant firm and operated three out of the four mountains in Aspen.[675] The rival operator, Highlands, owned the remaining mountain.[676] The two operators had been collaborating to offer a six-day, four-mountain pass, which allowed skiers to use any of the four mountains on any given day during a six-day period.[677] Revenue from the pass was split between the two operators based on actual usage.[678] For the 1977-78 ski season, Ski Co. offered a lower percentage of revenue share than was customary to Highlands.[679] For the next season, Ski Co. offered an even lower percentage that effectively forced Highlands to walk away from the negotiation.[680] The six-day, four mountain pass was thus terminated.[681] After that, Highlands attempted to revive the pass through other means, such as by offering vouchers which could be used to redeem ski lift tickets at Ski Co's mountains.[682] Highlands also attempted to purchase the ski lift tickets directly from Ski Co. at retail prices, but was rebuffed.[683] Highlands' business continued to suffer as skiers shunned its facilities.[684]

The U.S. Supreme Court held that Ski Co's refusal to continue to offer the six-day, four-mountain pass with Highlands constituted unlawful unilateral refusal to

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[675] 472 U.S. at 587.
[676] 472 U.S. at 588.
[677] 472 U.S. at 589.
[678] 472 U.S. at 589.
[679] 472 U.S. at 592.
[680] 472 U.S. at 593.
[681] 472 U.S. at 593.
[682] 472 U.S. at 594.
[683] 472 U.S. at 593.
[684] 472 U.S. at 594-95.

deal. In reaching this conclusion, the Court emphasized a number of facts. Ski Co. terminated an existing arrangement with Highlands instead of refusing to deal with Highlands *de novo*.[685] Ski Co.'s refusal to deal evinced a predatory intent as it turned down opportunities to sell ski lift tickets at retail prices.[686] There was demonstrable consumer demand for the six-day, four-mountain pass.[687] And Ski Co's failed to offer any valid business justification for the refusal.[688]

The more recent unilateral refusal to deal case decided by the U.S. Supreme Court is *Trinko*.[689] The case concerned a constructive refusal to deal by Verizon, the incumbent Local Exchange Carrier ('LEC'), which served the state of New York. The U.S. Congress passed the Telecommunications Act in 1996 to liberalize the fixed line telephony market, by compelling the incumbent LECs to open access to their networks to competitive LECs.[690] The incumbent LECs were required to provide access to individual network elements on an unbundled basis.[691] This allowed competitive LECs to provide fixed line telephony services by combining individual network elements from the incumbent with its own network elements. AT&T was a competitive LEC, which had signed an agreement to obtain access to Verizon's unbundled network elements ('UNEs'), in particular, the Operations Support Systems ('OSS').[692] The OSS allowed Verizon to provide services to customers and to ensure quality.[693] In late 1999, competitive LECs, including AT&T, complained to the telecom regulators that Verizon provided discriminatory access to its UNEs; some of their orders for access to the OSS

[685] 472 U.S. at 603-04.
[686] 472 U.S. at 593.
[687] 472 U.S. at 606-07.
[688] 472 U.S. at 608-09.
[689] 540 U.S. 398 (2004).
[690] 540 U.S. at 402.
[691] 540 U.S. at 402.
[692] 540 U.S. at 403.
[693] 540 U.S. at 403.

were unfulfilled.[694] Mr. Trinko, an attorney, brought suit on behalf of similarly situated customers of fixed-line telephony service alleging that Verizion's failure to provide AT&T adequate access to the unbundled network elements constituted unlawful refusal to deal under Section 2 of the Sherman Act.

The U.S. Supreme Court held for Verizon, refusing to impose a duty to deal. The Court established the general principle that a dominant firm had no obligation to deal with rivals under U.S. antitrust laws.[695] This principle was supported by a number of reasons. First, compelling the dominant firm to provide access would impair incentives by both the incumbent and the competitors to invest in the acquisition of facilities.[696] Second, compelled sharing would require the antitrust courts to act as central planners and to identify the proper terms for dealing.[697] Third, compelled sharing might encourage collusion among competitors.[698] The Court concluded that this case did not fall within the exception to this general principle established in *Aspen Skiing*.[699] There was no course of prior dealing between AT&T and Verizon.[700] There was also no profit sacrifice by Verizon as Verizon never voluntarily made the unbundled network elements available to customers.[701] Furthermore, the Court suggested that the facts of the case did not warrant the creation of a new exception to the general principle.[702] The Court emphasized that the existence of sectoral regulation under the Telecommunications Act governing access obviated the need for antitrust intervention.[703]

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694 540 U.S. at 403.
695 540 U.S. at 408.
696 540 U.S. at 408.
697 540 U.S. at 408.
698 540 U.S. at 408.
699 540 U.S. at 409.
700 540 U.S. at 409.
701 540 U.S. at 410.
702 540 U.S. at 411.
703 540 U.S. at 412.

(ii) Case Law on the Essential Facilities Doctrine

The discussion about the essential facilities doctrine in the U.S. will be relatively brief as the courts there have reportedly never applied the doctrine to intellectual property, even though application of the doctrine to intellectual property has never been explicitly ruled out by any U.S. court. As is well known, the essential facilities doctrine originated from the U.S. case of *United States v. Terminal Railroad Association of St. Louis* in the early twentieth century.[704] Even though the U.S. Supreme Court did not invoke the doctrine by name, the case has been interpreted as having applied the doctrine in substance. What followed is a string of cases over the next century, including *United States v. Associated Press*[705], *Otter Tail Power Co. v. United States*[706], *Gamco Inc. v. Providence Fruit & Produce Building, Inc.*[707], *Hecht v. Pro-Football, Inc.*[708], and *Fishman v. Estate of Wirtz*[709] that have applied the doctrine in substance or in name. *Hecht* was the first case to invoke the term the 'essential facilities doctrine'.[710] All of these cases except for *Associated Press*, which concerned copyrighted news, involved physical facilities.[711] *Associated Press* could thus count as a case where a U.S. court has applied the essential facilities doctrine to an intellectual property, albeit only in substance. One U.S. case that unequivocally held that intellectual property could constitute an essential facility is *BellSouth Advertising vs. Donnelley Information*.[712] The district court in that case, however, only held that there is no reason why the doctrine

[704] 224 U.S. 383 (1912).
[705] 326 U.S. 1 (1945).
[706] 410 U.S. 366 (1973).
[707] 194 F.2d 484 (1st Cir.), *cert denied*, 344 U.S. 817 (1952).
[708] 570 F.2d 982 (D.C. Cir. 1977), *cert denied*, 436 U.S. 956 (1978).
[709] 807 F.2d 520 (7th Cir. 1986).
[710] Werden (n 437) 443–44.
[711] ibid 436, 441–47.
[712] 719 F. Supp. 1551 (S.D. Fla. 1988), *rev'd on other grounds*, 999 F.2d 1436 (11th Cir. 1993).

cannot apply to intellectual property and did not reach the merit of the essential facilities claim.[713]

The authoritative formulation of the essential facilities doctrine in the U.S. can be found in the *MCI v. AT&T* case. In that case, the United States Court of Appeal for the Seventh Circuit spelled out the elements for the essential facilities doctrine as follows: '(1) control of the essential facility by a monopolist; (2) a competitor's inability practically or reasonably to duplicate the essential facility; (3) the denial of the use of the facility to a competitor; and (4) the feasibility of providing the facility.'[714] Unlike the equivalent EU cases, there is no mention of any requirement of a new product or technical improvements that may tailor the doctrine to the specific context of intellectual property. The criterion of the feasibility of providing the facility seems to suggest that the doctrine was formulated with physical facilities in mind as intellectual property does not suffer from capacity constraints. The most recent pronouncement by the U.S. Supreme Court on the doctrine has cast doubt on its remaining vitality. In *Trinko*, Justice Scalia asserted that the Supreme Court has never affirmed or disavowed the doctrine.[715] While the Court stopped short of repudiating doctrine, Justice Scalia's dictum was hardly a ringing endorsement.

2. EU Case Law

(i) General Refusal to Deal Cases

As Europe has never embraced the essential facilities doctrine, the corresponding dichotomy in the case law in Europe is general refusal to deal cases and

[713] Hovenkamp, Janis and Lemley (n 365) 14.
[714] 708 F.2d 1081, 1132-33 (7th Cir. 1983).
[715] *Trinko*, 540 U.S. at 410-11.

refusal to license intellectual property cases. The *Sealink/Holyhead*[716] decision by the Commission and *Oscar Bronner* are highly reminiscent of an essential facilities case, while *Magill*, *IMS Health*, and *Microsoft* concern refusal to license intellectual property.[717] Meanwhile, a number of cases, including *Commercial Solvents*, *Télémarketing*, and *United Brands*, can be classified as general unilateral refusal to deal cases.

Commercial Solvents involved the upstream supplier of a chemical ingredient for an anti-tuberculosis drug.[718] The supplier terminated supply of the ingredient to a downstream producer of the drug when its Italian subsidiary decided to enter the downstream market.[719] The CJEU held that

> an undertaking which has a dominant position in the market in raw materials, refuses to supply a customer, which is itself a manufacturer of these derivatives, and therefore risks eliminating all competition on the part of this customer, is abusing its dominant position within the meaning of Article [102].[720]

The Court emphasized it was no excuse that the dominant firm had plans to enter the downstream market and that the plaintiff had itself cancelled its order first.[721] It is particularly noteworthy that the refusal to supply need not result in the exclusion of all competition, as stated in *Magill*, or even the elimination of all effective competition, as stipulated in *Microsoft*. It suffices when the refusal to supply precludes the downstream rival from competing in the market.[722] The implication seems to be that it will not make a difference if there are other downstream suppliers of the anti-tuberculosis drug. The

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[716] *Sealink/B&I Holyhead: Interim Measures* [1992] CMLR 255.
[717] Ritter (n 393) 283.
[718] Cases 6 and 7/73, *Istituto Chemioterapico Italiano Spa and Commercial Solvents Corp. v. Commission* [1974] ECR 223, para. 23.
[719] ibid, para. 23.
[720] ibid, para. 25.
[721] ibid, para. 25.
[722] ibid, para. 25.

existence of a course of prior dealing clearly seems to have weighed in favor of the party seeking access.

United Brands is a slightly different case which concerns a dominant undertaking's right to use refusal to deal to defend its commercial interests. In that case, United Brands stopped the supply of its Chiquita brand of bananas to its Danish ripener and distributor when the distributor started selling competing bananas under the Dole brand and devoting less effort to selling Chiquita bananas.[723] The Court asserted that

> an undertaking in a dominant position for the purpose of marketing a product—which cashes in on the reputation of a brand name known to and valued by the consumers—cannot stop supplying a long standing customer who abides by regular commercial practice, if the orders placed by that customer are in no way out of the ordinary.[724]

Again, the presence of an existing commercial relationship between the dominant firm and the party seeking supply featured in the Court's analysis.[725] The Court emphasized that 'the refusal to sell would limit markets to the prejudice of consumers and would amount to discrimination which might in the end eliminate a trading party from the relevant market.'[726] As in *Commercial Solvents*, the Court paid no heed to the fact that there might be, and in fact there were, other suppliers of banana in Denmark. Consumers were in no way deprived of bananas.

In response to United Brands' argument that a dominant firm must be allowed to take action to defend its commercial interests, the CJEU suggested that the firm's counter-measures 'must still be proportionate to the threat taking into account the economic strength of the undertakings confronting each other.'[727] The Court proceeded to conclude that a termination of supply was disproportionate in light of the

[723] Case 27/76, *United Brands v. Commission* [1978] ECR 207, para. 175.
[724] ibid, para. 182.
[725] ibid, para. 182.
[726] ibid, para. 183.
[727] ibid, para. 190.

Danish distributor's conduct.[728] Cessation of supply would deter other distributors from promoting other brands of banana, effectively turning the distribution relationships into exclusive ones, which would serve to strengthen United Brands' dominant position.[729] The cessation of supply also undermines the independence of small- and medium-sized firms, which should be given the freedom to favor competing products over the dominant firm's products.[730] This case again involves a course of prior dealing between the dominant firm and the party seeking access.

In *Télémarketing*, the dominant television station would only sell advertising to advertisers if they also used the firm's own advertising agent.[731] In other words, if an advertiser wanted to advertise with the television station, it must also use the station's affiliated advertising agent to host the telephone number which TV viewers could call in response to the advertisement. The Court held that the conduct at issue constituted refusal to supply services and was governed by the *Commercial Solvents* case.[732] It further added that

> If, further, that refusal is not justified by technical or commercial requirements relating to the nature of the television, but is intended to reserve to the agent any telemarketing operation broadcast by the said station, with the possibility of eliminating all competition from another undertaking, such conduct amounts to an abuse prohibited by Article [102].[733]

The Court again took the view that elimination of one competitor in the related market of telemarketing services would suffice. This case differs from *Commercial Solvents* and *United Brands* in that it is not predicated on a course of prior dealing. As Professors

[728] ibid, para. 191.
[729] ibid, para. 192.
[730] ibid, para. 193.
[731] Case 311/84, *Centre Belge d'Etudes du Marché-Télémarketing v. Compagnie Luxembourgeoisie de Télédiffusion SA and Information Publicité Benelux SA* [1985] ECR 3261, para. 2.
[732] ibid, para. 25.
[733] ibid, para. 26.

Alison Jones and Brenda Sufrin have noted, the facts of the case are highly suggestive of a tying arrangement.[734] It was a conditional refusal to supply premised on the acceptance of a tie.

Overall, the EU cases seem to suggest that a course of prior dealing is a relevant consideration in a unilateral refusal to deal case and that there is no need for all competition or even all effective competition to be eliminated by the refusal to deal. It suffices that a competitor is foreclosed from the relevant market, which condition is almost always met. The EU cases therefore seem to apply a lower bar on imposing a duty to deal than do the U.S. cases. A closer examination of *Commercial Solvents* and *United Brands* suggests that other dispositive factors are at play in the two cases. In *Commercial Solvents*, the Court's main concern seemed to be that the dominant firm refused to supply to facilitate its own downstream market entry. In *United Brands*, the Court viewed the refusal to supply as a means to enforce exclusive distribution. *United Brands* probably constituted a conditional exclusion as opposed to pure exclusion and may be more appropriately analyzed as an exclusive dealing case. Only *Commercial Solvents* stands for a pure exclusion case.

(ii) Refusal to License Intellectual Property Cases

The EU has not formally adopted the essential facilities doctrine. It has been noted that the Court has never made any references to the doctrine in its judgments.[735] *Oscar Bronner*[736] arguably comes closest to an essential facilities case in the EU. Instead, there has been a string of cases involving unilateral refusal to license

[734] Jones and Sufrin (n 565) 510.
[735] Estelle Derclaye, 'Abuses of Dominant Position and Intellectual Property Rights: A Suggestion to Reconcile Community Courts Case Law' (2003) 26 World Competition 685, 702.
[736] Case C-7/97, *Oscar Bronner GmbH & Co KG v. Mediaprint* [1998] ECR I-7791.

intellectual property rights. These include *Magill*[737], *IMS Health*[738], and *Microsoft*[739]. None of them involves patent rights and, with the exception of *Microsoft*, have concerned what is generally perceived to be weaker intellectual property rights. This, however, should not detract from their relevance for our discussion. The European courts have so far not suggested that patent rights will be treated differently as far as unilateral refusal to license is concerned. Even though *Microsoft* concerns copyright protection for software, the explicit recognition in that case of the potential impact of competition law intervention on innovation incentives renders that case particularly relevant to patent rights.

Magill originated what is known as the exceptional circumstances test, which has been modified and expanded in subsequent cases. In that case, which concerned copyrighted TV listing information, the Court of Justice of the European Union ('CJEU') held that a refusal by a dominant firm to license its intellectual property does not in itself constitute an abuse under Article 102 of the Treaty on the Functioning of the European Union ('TFEU') unless exceptional circumstances are found.[740] The CJEU determined that exceptional circumstances were present in that case, namely (i) there was no actual or substitute for the product that would have been created, for which there was a specific, constant and regular potential demand on the part of consumers;[741] (ii) the refusal concerned an indispensable raw material for the new product that would have been created;[742] (iii) the refusal prevented the appearance of a new product for which there was a potential consumer demand;[743] (iv) there was no

[737] Case C-241-242/91 P, *RTE & ITP v. Commission* [1995] ECR I-743.
[738] Case C-418/01, *IMS Health GmbH & Co OHG v. NDC Health GmbH & Co KG* [2004] ECR I-5039.
[739] Case T-201/04 *Microsoft v. Commission* [2007] ECR II-3601.
[740] Case C-241-242/91 P, *RTE & ITP v. Commission*, para. 50.
[741] ibid, para. 52.
[742] ibid, para. 53.
[743] ibid, para. 54.

justification for the refusal; and (v) the refusal allows the dominant undertaking to exclude all competition in the secondary market.[744]

It has been said that the judgment 'sent shockwaves among IP and antitrust lawyers'[745] in Europe, although Ritter argues that the threat of the judgment to intellectual property was 'grossly exaggerated'[746]. The general view is that the Court's stance was largely informed by the weak nature of the intellectual property in the case; Ireland was unusual within the Union in providing copyright protection to TV listing information.[747] Devlin and his co-authors hypothesize that '[h]ad Magill sought mandatory licensing of the copyright over the television companies' prime-time shows, no one could seriously posit that the outcome would have been the same.'[748] The implication seems to be that the exceptional circumstances test would not have been available against more robust intellectual property rights such as copyright and patent. The CJEU is yet to apply this test to compel sharing of a patented technology.

Oscar Bronner did not involve intellectual property; what was at issue in the case was a newspaper distribution system in Austria.[749] The discussion of the case will hence be brief as some of the elements of the exceptional circumstances test that are relevant in intellectual property cases are absent. But it is nonetheless relevant for our purpose as it constitutes an instance of the application of the exceptional circumstances test. The CJEU held that the dominant firm did not commit an abuse by refusing to share its distribution network. There would be only be an abuse if the dominant firm (i) refused to grant access to its facility for which there was no actual or

[744] ibid, para. 56.
[745] Ritter (n 393) 285.
[746] ibid.
[747] ibid 286. Delrahim (n 550) 1064. Devlin, Jacobs and Peixoto (n 376) 1168.
[748] Devlin, Jacobs and Peixoto (n 376) 1168.
[749] Case C-7/97, *Oscar Bronner v. Mediaprint*, para. 7.

potential substitute; (ii) the facility was indispensable to the business of the party requesting access; (iii) the refusal was likely to eliminate the party requesting access from the relevant market; and (iv) such refusal could not be objectively justified.[750] The Court held that the refusal was not abusive because other distribution methods for newspapers were available and hence the dominant firm's distribution network was not indispensable to competition.[751]

The key significance of this case was in illustrating a clearer application of the *Magill* criteria. The Court made clear that it was relying on *Magill* and that refusal to supply could be abusive regardless of the type of property at issue.[752] Some adaptations of the analytical framework to physical property, however, were necessary. What is missing in the Court's analytical framework in *Oscar Bronner* as compared to that in *Magill* was the new product requirement and the reference to a secondary market, which would make more sense in the context of intellectual property. Intellectual property is almost always used as an input to produce another product in the downstream market. Estelle Derclaye notes that the omission of the new product requirement could make a substantial difference; compelled sharing would be more likely under the *Oscar Bronner* standard.[753] She further comments that despite the Court's suggestions to the contrary, it is clear from the case that unilateral refusal to deal is treated differently depending on whether physical or intellectual property is at issue.[754]

The third EU case that has tackled the issue of refusal to licence intellectual property is *IMS Health*. The intellectual property at issue is what is known

[750] ibid, para. 7.
[751] Case C-7/97, *Oscar Bronner v. Mediaprint*, para. 41.
[752] ibid, para. 43-47.
[753] Derclaye (n 735) 693–94.
[754] ibid 695.

as a brick structure, under which Germany is divided into 1,860 geographical units for the purpose of collecting and marketing pharmaceutical sales information.[755] IMS was the incumbent in the relevant market. A new firm called NDC was trying to enter the market but soon encountered difficulty because IMS's brick structure had become the *de facto* industry standard.[756] It would be very difficult for NDC to compete without access to the structure.[757] The main issue in the case was whether IMS could be compelled to share its brick structure with NDC. The CJEU, upon a reference for a preliminary ruling from a German national court, clarified that three cumulative conditions have to be met in order for the refusal to supply to be deemed abusive. These include 'that refusal is preventing the emergence of a new product for which there is a potential consumer demand, that it is unjustified and such as to exclude any competition on a secondary market.'[758] The Court emphasized that the conditions were cumulative, which settled a long-running debate since *Magill* as to whether the four conditions set out in *Magill* were cumulative.[759]

IMS Health is widely seen as having significantly diluted the four-part test laid down in *Magill*. It has been argued that despite the Court's protestations to the contrary, the Court did not apply the new market requirement in any meaningful manner. Matthias Lamping argues that '[b]y applying the 'two market requirement' developed in the leveraging cases of the 1970s to ordinary essential facility situations, the ECJ had no choice but to consider the essential facility a market in itself, even though it falls short of the economic definition of a market' and that defining an

[755] Case C-418/01, *IMS Health v. NDC Health*, para. 4.
[756] ibid, para. 12.
[757] ibid, para. 12.
[758] ibid, para. 38.
[759] Derclaye (n 735) 694–95.

upstream market for the brick structure was entirely artificial.[760] Other commentators have echoed his view.[761]

The significance of the dilution of the new product requirement is that a dominant firm can be ordered to share its intellectual property even if doing so will give rise to a product directly competing with its own.[762] This is a notable departure from *Magill*, in which the CJEU seemed to have placed some emphasis on the fact none of the firms at issue was supplying the product, a composite weekly TV guide, that would have been created.[763] The requirement of potential consumer demand for the second product has also been effectively dispensed with because in *IMS Health*, the consumers, the pharmaceutical companies, had no need for another sales database.[764] *IMS Health* is significant for our purpose because it imbues the EU approach to refusal to license intellectual property with important flexibility. If competition law would intervene only where the party seeking access must come up with a new product, the potential use of competition law intervention would be much more limited, as not every developing country possesses the technological capacity to create a new product from an advanced technology.

The last notable case that featured compelled sharing of intellectual property is *Microsoft*. The facts of the case are too well known to be repeated here. The General Court held that Microsoft's refusal to share interoperability information with

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[760] Matthias Lamping, 'Refusal to Licence as an Abuse of Market Dominance: From Commercial Solvents to Microsoft' in Reto M Hilty and KC Liu (eds), *MPI Studies on Intellectual Property and Competition Law* (Springer-Verlag 2015) 133.
[761] Haris Apostolopoulos, 'Refusal-to-Deal Cases of IP Rights in the Aftermarket of US and EU Law: Convergence of Both Law Systems through Speaking the Same Language of Law and Economics' (2007) 5 DePaul Business and Commercial Law Journal 237, 259.
[762] Frédéric Marty and Julien Pillot, 'Intellectual Property Rights, Interoperability and Compulsory Licensing: Merits and Limits of the European Approach' (2012) 2012 Journal of Innovation Economics and Management 35, 46.
[763] ibid.
[764] Derclaye (n 735) 696.

competitors infringed Article 102 of the TFEU. The Court explained that for a refusal to share intellectual property to be abusive, these conditions must be met:

> (a) the refusal relates to a product or service indispensable to the exercise of a particular activity on a neighbouring market; (b) the refusal is of such a kind as to exclude any effective competition on that neighbouring market; and (c) the refusal prevents the appearance of a new product for which there is potential consumer demand.[765]

This case has been accused of further watering down the second and third requirements for compulsory licensing set out in the earlier cases.[766] It is no longer necessary that all competition in the second market would be eliminated as a result of the refusal to share. Mere elimination of effective competition would suffice.[767] In that case competitors have remained viable despite Microsoft's refusal to supply interoperability information.

The new product requirement has also been pared back to a showing of retardation of technical development resulting from a loss of innovation incentives on the part of competitors.[768] The General Court placed much emphasis on the fact that Microsoft's competitors had lost their innovation incentives. The Court reasoned that denial of a new product cannot be the only relevant harm to consumers under Article 102 of the TFEU.[769] Retardation of technical developments must count as well. A crucial factor in the Court's consideration was that 'Microsoft's competitors would likely offer different products, providing innovative features that were considered important by consumers in terms of safety, reliability, ease of use and speed performance.'[770] There is, however, no requirement that these technical improvements are incorporated in a

[765] Case T-201/04 *Microsoft v. Commission*, para. 332.
[766] Katsoulacos (n 627) 288.
[767] Alan Devlin and Michael Jacobs, 'Antitrust Divergence and the Limits of Economics' (2010) 104 Northwestern University Law Review 253, 280.
[768] Case T-201/04 *Microsoft v. Commission*, para. 647.
[769] Mauro Squitieri, 'Refusals to License Under European Union Competition Law After Microsoft' (2014) 11 Journal of International Business and Law 65, 75.
[770] ibid 82.

clearly identifiable new product.[771] Alan Devlin and Michael Jacobs sum it up when they assert that

> The *Microsoft* ruling significantly expanded the set of so-called exceptional circumstances to include relatively prosaic situations in which smaller rivals demonstrate that they need access to the relevant intellectual property in order to compete 'effectively' with the dominant firm in a neighboring or secondary market, in which access to the intellectual property would enable them either to develop a 'new' product or to make 'technical developments' to their existing ones.[772]

The *Microsoft* court also attaches some importance to the fact that in withholding the interoperability information, Microsoft was ending an established course of dealing.[773] Microsoft was willing to supply interoperability information when it was not active in the market. It gradually restricted supply as its market share grew. Frédéric Marty and Julien Pillot argue that the Court considered 'this kind of behaviour [a]s a form of predation which creates a risk of elimination of competition on the work-group server market.'[774] In this respect the CJEU's approach is similar to the U.S. Supreme Court's stance in *Aspen Skiing*.

As compared to the essential facilities doctrine in the U.S., the EU approach to refusal to license is more readily applicable to intellectual property. The string of cases from *Magill* and *Microsoft* explicitly or implicitly wrestle with the question of what adaptations to the intellectual property to which access is sought are required of the putative licensee, which should be a crucial question for any court considering mandatory sharing of intellectual property. If no adaptations are required whatsoever, imposition of a duty to license can risk undermining the entire body of intellectual property law. Meanwhile, an overly stringent new product requirement

[771] Katsoulacos (n 627) 288.
[772] Devlin and Jacobs (n 767) 273.
[773] Marty and Pillot (n 762) 47.
[774] ibid.

would render the doctrine largely irrelevant for developing countries. Separately, one may question the applicability of the EU case law to patents. None of the EU cases examined in this chapter have implicated patents. In two of the three cases the intellectual property at issue could be regarded as weak ones.

Even though the US and the EU case law may not be directly applicable to developing countries, it nonetheless provides a good starting for developing countries in trying to derive their own contextualized approach to unilateral refusal to supply patented products or license a patented technology. Regardless of the country at issue, the interface presents certain policy trade-offs which every country must confront. Developing countries can draw lessons from how the U.S. and the EU have tackled these policy dilemmas and adjust their approaches to suit their own circumstances.

3. The Competitive Relationship between the Parties and Preservation of Innovation Incentives

The two doctrines differ in terms of the nature of the competitive relationship implicated by them. The case law suggests that there are three capacities in which the party seeking access can share a competitive relationship with the dominant firm in a refusal to deal or essential facilities case: in the primary product market[775], the downstream market[776], and an aftermarket[777].

Many unilateral refusal to deal cases in the U.S. have involved aftermarket competitors. The defendant is usually the producer of the primary product, in a few cases a photocopier, and is trying to foreclose the repair service market by denying

[775] Case C-418/01, *IMS Health GmbH & Co OHG v. NDC Health GmbH & Co KG* [2004] ECR I-5039.
[776] Case C-241-242/91 P, *RTE & ITP v. Commission* [1995] ECR I-743.
[777] Case 53/87, *CICCRA v. Renault* [1988] ECR 6039; Case 238/87, *AB Volvo v. Erik Veng* [1988] ECR 6211.

plaintiff competing service providers access to spare parts.[778] The U.S. courts have never declared that unilateral refusal to deal claims are confined to aftermarkets and will not be entertained if brought by a primary market competitor, such as a competing photocopier manufacturer. Yet the recurring factual scenario in these cases has spurred some commentators to advocate the use of the scope of patent test for adjudicating unilateral refusal to deal claims.[779] The lack of a clear definition of patent scope notwithstanding, there at least seems to be a consensus that it would cover the primary product. The implication of this test would be that a primary product market competitor, or a horizontal competitor, will have no judicial recourse under the unilateral refusal to deal doctrine. Some have even contended that the ban should apply to vertical competitors as well.[780] Meanwhile in the EU, the unilateral refusal to deal doctrine may be available to competitors in the primary product market, as evidenced by the *IMS Health* case.

It has been suggested that patent scope should be delineated by the relevant market under competition law.[781] Although no good reasons have been offered for equating these two concepts, the underlying premise for this position seems to be that a patentee should be allowed to exclude in at least one relevant market to recoup her R&D expenses. To put it slightly differently, the permissible scope of a unilateral refusal to deal claim should be demarcated with reference to its impact on innovation incentives. Patent scope is used as a tacit way to balance the competing imperatives of protecting consumer welfare and safeguarding innovation incentives. Tying patent scope to the concept of the relevant market does not seem to change the outcome of the

[778] Image Technical Services v. Eastman Kodak, 125 F.3d 1195 (9th Cir. 1997); In re Independent Service Organizations Antitrust Litigation (Xerox), 203 F.3d 1322 (Fed. Cir. 2000).
[779] Lao (n 378); Bauer (n 466); Lopatka and Page (n 630).
[780] Devlin, Jacobs and Peixoto (n 376) 1189.
[781] Bauer (n 466) 1225, 1234.

analysis. Under either formulation, the patent scope test would exclude a primary product competitor from the unilateral refusal to deal doctrine. However, it has the benefit of giving the test a sounder theoretical basis.

The U.S. essential facilities and the EU refusal to license cases introduce another wrinkle to the question of the nature of the competitive relationship between the party seeking access and the dominant firm. These cases rarely, if ever, feature an aftermarket. Instead, the typical factual scenario involves the owner of an upstream physical facility or intellectual property that is crucial to a downstream competitor's ability to compete denying that competitor access to the facility or intellectual property.[782] This means that the plaintiff and the defendant compete in the downstream market. The market of interest in an essential facilities case is not the market for the facility and its reasonable substitutes but the one downstream to it.[783] This explains why the widely accepted formulation of the doctrine from the *MCI v. AT&T* case[784] requires the plaintiff to be the facility owner's competitor.[785] What motivates this requirement is the need to ensure that 'a denial of access may in fact result in monopolization; would-be competitors in the vertically related market are excluded, thereby preserving or creating a monopoly.'[786] Hovenkamp and his co-authors emphasize the importance of a direct competitive relationship between the plaintiff and the defendant, observing that '[a]n antitrust violation is even less likely where the intellectual property owner does not compete directly with the disfavored licensee; in the absence of some showing of monopoly leveraging, it is not clear what incentive the

[782] MCI Communications v. AT&T, 708 F.2d 1081 (7th Cir.), *cert denied*, 464 U.S. 891 (1983); Hecht v. Pro-Football, Inc., 570 F.2d 982 (D.C. Cir. 1977), cert denied, 436 U.S. 956 (1978); *Gamco Inc. v. Providence Fruit & Produce Building, Inc.*194 F.2d 484 (1st Cir.), *cert denied*, 344 U.S. 817 (1952).
[783] Werden (n 437) 459.
[784] MCI, 708 F.2d at 1132.
[785] Werden (n 437) 459.
[786] ibid.

intellectual property owner would have to try to eliminate competition in the downstream market.'[787]

The relevance of a competitive relationship thus seems to go both ways. While the existence of a competitive relationship in the primary product market would raise serious hurdles for a unilateral refusal to deal claim, the lack of any competitive relationship would be similarly problematic in an essential facilities or refusal to license claim. While this makes eminent sense from a competition law perspective—after all, the incidence of competitive harm is a prerequisite for competition law intervention—it also leads to the question of how this relates to the need to preserve innovation incentives. The rationale for disallowing a primary product competitor from bringing a unilateral refusal to deal claim is that the main market in which the patentee competes should be preserved for the patentee to recoup her R&D investment. The same logic should mean that the main market in which the essential facility owner competes should be protected from judicial encroachment as well.

One way to reconcile these conflicting positions is to say that the essential facilities and the EU refusal to license cases only require the parties to share a vertical competitive relationship between the upstream and the downstream markets, and not a horizontal one as direct competitors in the facility or primary product market. In fact, the plaintiff in an essential facilities case by definition cannot be an effective competitor in the facility market or she would not need access to the defendant's facility to compete. If the plaintiff owned a comparable facility which makes her a horizontal competitor, there would be no need for an essential facilities claim.

[787] Hovenkamp, Janis and Lemley (n 365) 5.

A close examination of many essential facilities cases, however, suggests that the vertically related, and most often downstream, market in which the plaintiff and the defendant compete is the one in which the facility is put to its most profitable, or even only possible, use. The railroad bridge and switching yards in St. Louis in the *Terminal Railroad* case could only be used by railroad companies.[788] AT&T's local telephone network, at least at the time of the case, had only one commercial use: provision of fixed-line telephony service.[789] The football stadium in *Hecht v. Pro-Football, Inc.*, was used to play football.[790] Among the EU refusal to license cases, the brick structure in *IMS Health* could only be used to supply pharmaceutical sales data.[791] The interoperability information in *Microsoft* was only of interest to competing workgroup server providers, who sought to improve on Microsoft's product.[792] Restricting availability of the essential facilities doctrine or the EU refusal to license doctrine to a competitor in the vertically related market which constitutes the most profitable use of the facility or the intellectual property seems to undermine the imperative of incentive preservation.

Defenders of the vertical competitive relationship requirement may argue that the seeming contradiction between the unilateral refusal to deal cases and the essential facilities cases can be explained by the fact that the latter is not meant to apply to intellectual property. Commentators have noted that there is no reported case in the U.S. in which the doctrine has been applied to intellectual property to impose a duty to license.[793] But this would require a robust justification for why intellectual property

[788] Pitofsky, Patterson and Hooks (n 439) 446.
[789] MCI, 708 F.2d at 1094-95.
[790] Hecht v. Pro-Football, Inc., 570 F.2d 982 (D.C. Cir. 1977), *cert denied*, 436 U.S. 956 (1978).
[791] Case C-418/01, *IMS Health v. NDC* Health, para. 4.
[792] Case T-201/04, *Microsoft v. Commission*, para. 367.
[793] Devlin and Jacobs (n 767) 277.

should be treated more deferentially than tangible property as far as the essential facilities doctrine is concerned. Physical facilities such as railroad bridges, football stadia, and power transmission networks also require substantial investment.[794] There is no reason to believe that a football stadium is less costly to build than a patentable innovation. It is an untenable proposition that preservation of investment incentives is a less critical concern in physical facilities cases as opposed to intellectual property ones.

From the perspective of incentive preservation, it seems that the current essential facilities doctrine has gotten it exactly the other way round. The doctrine should only be invocable by firms that do not compete with the facility owner at all, or at least not in the owner's principal market, and this includes firms that compete both upstream and downstream with the facility owner. One explanation for this seemingly counter-intuitive position is that the essential facilities cases have mostly featured physical facilities. It would be difficult in most cases to imagine how a physical facility can be used to compete in a completely unrelated market. After all, there is a limited number of purposes to which a football stadium can be put to use. Mandating a lack of a material competitive relationship between the plaintiff and the defendant in an essential facilities case could amount to an evisceration of the doctrine.

The situation in the EU refusal to license cases is slightly different. The EU courts seem to have dealt with the paramount issue of incentive preservation not by limiting availability of relief to a certain class of plaintiffs, but by imposing an additional requirement that the plaintiff use the intellectual property obtained to develop a new product. The new product requirement originated from the *Magill* case,[795] and seems to have been watered down in subsequent cases, most prominently in the *IMS Health*

[794] Shelanski (n 219) 382.
[795] Case C-241-242/91 P, *RTE & ITP v. Commission*, para. 52.

case,[796] and subsequently morphed into a requirement of product improvement in *Microsoft*.[797] The original intention behind the requirement in the *Magill* case seems to be to ensure that the claimant is not simply seeking to replicate the dominant firm's product, which would put the claimant in direct competition with the dominant firm. In that case, the undertaking seeking access to TV programming information wanted to publish a weekly TV guide that was not being produced in the market at all.[798] Access to the dominant firm's copyrighted materials would not allow the claimant to frustrate the dominant firms' effort to recoup their investment. In fact, it is not clear that the TV stations invested specifically to produce TV programming information. Such information was merely incidental to the stations' program production.[799] Although the CJEU did not explicitly emphasize this point, it is fair to assume that the Court paid some attention to the need to preserve investment incentives when compelling sharing of programming information. Some commentators have also surmised that the Court's decision was partly motivated by the perception that at issue in the case was a form of weak intellectual property, which was not generally copyrightable across the EU at the time.[800] The Court's decision in *Magill* probably did not have a severe impact on investment incentives.

The narrative changed quite dramatically in the *IMS Health* case, in which the Court bent over backwards to fit the facts of the case under the new product requirement.[801] The brick structure that was at issue in the case was critical to the dominant firm's main line of business, the sale of pharmaceutical sales data.[802] Although

[796] Case C-418/01, *IMS Health v. NDC Health*, para. 48-49.
[797] Case T-201/04, *Microsoft v. Commission*, para. 647-65.
[798] Case C-241-242/91 P, *RTE & ITP v. Commission*, para. 10, 52.
[799] ibid, para. 10, 53.
[800] Ritter (n 393) 286.
[801] Case C-418/01, *IMS Health v. NDC Health*, para. 48-49.
[802] ibid, para. 12.

the court seems to have characterized the brick structure as belonging to the upstream market, the dominant firm was not in the business of developing and selling organizational structure for sales data.[803] It was in the business of selling pharmaceutical sales data.[804] Setting aside the issue of whether the Court's distinction of an upstream and a downstream market in that case made sense, it is clear that compelled sharing of the brick structure would have had a direct and immediate impact on the dominant firm's main business and hence should have serious implications for investment incentives.

Broadly construed, *IMS Health* may stand for the proposition that incentive preservation carries little weight when the European courts approach cases involving compelled sharing of intellectual property. Some would argue that the General Court's decision in the *Microsoft* case lends further support to that proposition. The Court did consider innovation incentives, but concluded that such incentives would not be impaired by a duty to supply.[805] The Court also argued that Microsoft's refusal to license would impair rivals' incentive to innovation.[806] To the extent that the European courts accord less weight to incentive preservation considerations, it could represent a significant departure from the U.S. approach and may call for special consideration by developing countries. While the U.S. approach to unilateral refusal to deal and essential facilities cases suffers from confusion and internal inconsistency, the EU approach provides greater clarity by focusing directly on incentive preservation and the extent of the technical contribution required by the party seeking access. The EU approach may be a more promising route for those developing countries seeking to obtain foreign

[803] Case C-418/01, *IMS Health v. NDC Health*, para. 43-47.
[804] ibid, para. 4.
[805] Case T-201/04, *Microsoft v. Commission*, para. 698-701.
[806] ibid, para. 653-54.

technology through the essential facilities or a refusal to license doctrine. The EU approach is also promising because it is narrowly tailored to the facts of each case, which helps to limit wider chilling effects. The evolution of the EU case law on refusal to license is characterized by a case-by-case approach, under which minor adjustments are constantly made to take into account the facts of the case. The EU approach is applied judiciously and with much restraint. As Ariel Ezrachi and Mariateresa Maggiolino argue, the case-by-case 'European interventionist approach did not override the incentive to innovate'[807] and is relatively measured. Possible adverse effects on innovation are considered in each case. It does not amount to a wholesale usurpation of intellectual property rights that opponents of compulsory licensing fear.

4. Doctrinal Considerations Raised in the Case Law

Before we can formulate a coherent approach to the two doctrines for developing countries, it is important to acquire a deeper understanding of some doctrinal issues that have been raised in the case law. As it turns out, some of them have special salience for developing countries for reasons that are unrelated to why the U.S. and the EU courts paid attention to them in the first place.

(i) A History of Prior Dealing

One issue that has repeatedly surfaced in the unilateral refusal to deal cases is whether the law should make a distinction between cases in which there is an existing course of dealing between the dominant firm and the party seeking access and cases in which there is none. Cases such as *Aspen Skiing* in the U.S. and the EU *Microsoft* case have tackled the issue and concluded that the existence of a course of prior dealing

[807] Ariel Ezrachi and Mariateresa Maggiolino, 'European Competition Law, Compulsory Licensing, and Innovation' (2012) 8 Journal of Competition Law & Economics 595, 605.

should favor the party seeking access. The weight of the scholarly opinion, however, seems to be firmly against this view. No less an authority than Professor Hovenkamp has argued that favoring existing licensees could be highly problematic. He offers two reasons for it. First, he argues that technology markets often change rapidly and it would be particularly detrimental and counterproductive to lock companies in these markets in an existing business relationship.[808] Second, he observes that intellectual property licenses are often exclusive and thus locking patentees in existing licensing relationships may foreclose future licensees.[809] Both Ritter and Carlton make the obvious argument that attaching extra weight to a course of prior dealing in the analysis would deter intellectual property owners from entering into licensing arrangements in the first place, which could result in great inefficiencies for the economy.[810]

Despite these criticisms, there are good reasons why a course of prior dealing should tilt the case in favor of the party seeking access. In a patent licensing context, the licensee may have made extensive relationship-specific investments to adapt the technology for production purposes.[811] To the extent that these investments or assets cannot be effectively deployed elsewhere, they represent sunk costs that will be lost forever once the licensing relationship is terminated.[812] Such a waste of resources could particularly costly for developing countries, which suffer from a lack of investments in the first place.[813] Developing countries should guard against such waste

[808] Hovenkamp, Janis and Lemley (n 365) 30.
[809] ibid.
[810] Ritter (n 393) 284–85. Carlton (n 409) 23–24.
[811] Lori Pressman and others, 'Pre-Production Investment and Jobs Induced by MIT Exclusive Patent Licenses: A Preliminary Model to Measure the Economic Impact of University Licensing' (1995) 7 Journal of the Association of University Technology Managers 28.
[812] Richard Schmalensee, 'Sunk Costs and Antitrust Barriers to Entry' (2004) 94 The American Economic Review 471, 471.
[813] Tildane Kinda, 'Investment Climate and FDI in Developing Countries: Firm-Level Evidence' (2010) 38 World Development 498.

of resources. This constitutes a strong argument for developing countries to offer special protection to existing licensees.

It is also true that developing countries are in great need of technology transfers. A legal rule that may deter licensing activities in the first place could be hugely costly for them. This potentially puts developing countries in a dilemma. These two considerations, however, need not deserve equal weight. While allowing a licensor to terminate an existing licensing arrangement will bring about a definite loss of relationship-specific investments, the deterrent effect of the alternative rule on investments is much less certain. Many factors go into a licensing decision, most of which are business considerations.[814] The legal regime is but one of many factors. A somewhat unfavorable rule in the event of a distant possibility is unlikely to change a patentee's decision, especially when a course of prior dealing is not a dispositive factor in these cases. It is only one of the relevant considerations.

Further reflection will reveal that the arguments made by Hovenkamp and other commentators do not only counsel against attaching greater weight to a course of prior dealing. Carried to their logical conclusion, they would argue against imposing any duty to deal at all where there is an existing licensing arrangement. That would be a radical position to take. Overall, the weight of the arguments suggests that developing countries adopt the existing position of U.S. and EU case law and emphasize a course of prior dealing in the analysis. The more interesting question perhaps is whether developing country authorities should only pursue unilateral refusal to deal cases where there is a course of prior dealing.

(ii) Predatory Intent

[814] Dunning and Lundan (n 231) 116–44, 318–27.

Intent has featured in some cases where there is suspicion that the justification for the refusal to deal was pretextual. It has also arisen in some other cases where the question is whether the refusal to deal is motivated by a predatory intent to eliminate rivals.[815] The presence of a predatory intent is sometimes helpful to the courts because a unilateral refusal to deal is usually considered such innocuous and competitively neutral conduct that courts are reluctant to condemn it absent evidence of a desire to harm rivals. Almost all cases in which a predatory intent was found have involved a course of prior dealing.[816] When the competitor has been receiving supply of an input to take part in a downstream market, a sudden cessation of that supply can be aptly interpreted as part of an attempt to drive out the competitor. Courts generally believe that taking a competitor's business away by cutting off her supply of a crucial input goes beyond competition on the merits.

Courts have relied on other facts to infer a predatory intent. The obvious one is the defendant's intention to enter the downstream market which the plaintiff has been squeezed out of following the termination of supply. A cessation of supply of a critical input and subsequent entry into the downstream market completes the predation story. This is arguably what the CJEU had in mind when it condemned the refusal to supply in *Commercial Solvents*.[817] Even *Microsoft* partly follows this fact pattern. It was alleged that Microsoft only started to withhold interoperability information when it had plans to enter the workgroup server market.[818]

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[815] Cases 6 and 7/73, *Istituto Chemioterapico Italiano Spa and Commercial Solvents Corp. v. Commission* [1974] ECR 223.
[816] Aspen Skiing Co. v. Aspen Highlands Skiing Corp., 472 U.S. 585 (1985); Cases 6 and 7/73, *Istituto Chemioterapico Italiano Spa and Commercial Solvents Corp. v. Commission* [1974] ECR 223.
[817] Cases 6 and 7/73, *Commercial Solvents Corp. v. Commission*, para. 25.
[818] Marty and Pillot (n 762) 47.

In *Aspen Skiing*, the U.S. Supreme Court emphasized the fact that the defendant sacrificed profits—it had allegedly refused to sell ski tickets to the rival ski slope operator even at retail prices, which is presumably profit maximizing—to infer an intent to harm rivals.[819] The essence of the Court's reasoning is that a unilateral refusal to deal motivated by a predatory intent, as evinced by a willingness to sever a profitable course of dealing and sacrifice of profits, that clearly harms consumers and is not justified by pro-competitive justifications should be condemned under Section 2 of the Sherman Act.[820] Given that *Aspen Skiing* has been described as being at or near the outer boundary of the unilateral refusal to deal doctrine under the Sherman Act[821], a predatory intent can be considered a necessary element in a successful unilateral refusal to deal claim under U.S. antitrust law.

Developing country authorities need to take predatory intent seriously. Because predatory intent is almost always only found where there is a course of prior dealing, the discussion here necessarily overlaps somewhat with that of prior course of dealing. It was argued that developing countries need to attach significant weight to the existence of a course of prior dealing because such dealing suggests the existence of relationship-specific investments, which need to be protected. The rationale for developing countries to take predatory intent seriously is similar in that if the unilateral refusal to deal is driven by a desire to harm or even eliminate a domestic firm that has licensed a technology, it could be particularly costly to the country's technological capacity. The firm being eliminated has the capacity to utilize a foreign technology to engage in downstream production. Developing country authorities should be particularly vigilant against conduct that could further reduce their domestic

[819] Aspen Skiing, 472 U.S. at 593.
[820] Trinko, 540 U.S. at 409-11.
[821] 540 U.S. at 409.

technological capacity given the dearth of technological capacity in these countries in the first place. Technological capacity could be lost once the firm is driven out of the market.[822] Standing up to predatory unilateral refusal to deal may help to protect domestic technological capacity. While it is often said that competition law protects competition, and not competitors[823], when the competitor is one of the few domestic firms that possess the technological capacity to adapt foreign technologies, it deserves special solicitude from a developing country competition authority.

(iii) New Product or Secondary Market

The requirement of a new product or a secondary market is only found in the EU refusal to license cases. The CJEU declared in *IMS Health* that

> the refusal by an undertaking in a dominant position to allow access to a product protected by an intellectual property right, where that product is indispensable for operating on a secondary market, may be regarded as abusive only where the undertaking which requested the license does not intend to limit itself essentially to duplicating the goods or services already offered on the secondary market by the owner of the intellectual property right, but intends to produce new goods or services not offered by the owner of the right and for which there is a potential consumer demand.[824]

The U.S. essential facilities cases do not speak of a new product or a secondary market, mostly because none of them, with the possible exception of *Associated Press*, have involved intellectual property. The secondary market can sometimes be a downstream market or a complementary product market. Complementary product markets raise issues about monopoly leveraging that falls under the rubric of tying and bundling and will be discussed in the next chapter. The ensuing discussion will thus focus on downstream markets and new primary products.

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[822] Annetta Fortune and Wil Mitchell, 'Unpacking Firm Exit at the Firm and Industry Levels: The Adaptation and Selection of Firm Capabilities' (2012) 33 Strategic Management Journal 794, 802.
[823] Brown Shoe Co. v. United States, 380 U.S. 294, 320 (1962).
[824] Case C-418/01, *IMS Health v. NDC Health*, para. 49.

The second market requirement originated from *Magill*, but was subsequently watered down in *IMS Health* where there was arguably only one relevant market of the pharmaceutical sales database, even though the Court did seem to rely on some notion of a hypothetical market. The new product criterion was also diluted in *Microsoft*, where the Court held that it was sufficient to show that the refusal to deal prevented competitors from making technical improvements to the product.

It has been argued that the new product or second market requirement is largely superfluous and is only the legacy of the earlier refusal to deal cases such as *Commercial Solvents* and *Telemarketing*, upon which, according to Lamping, the CJEU 'has erroneously based its subsequent case law involving intellectual property rights'.[825] An alternative interpretation is that the CJEU had a clear objective behind imposing the requirement in intellectual property cases. It has been said that the European courts have adopted a more stringent standard in cases involving intellectual property than those that feature physical property.[826] In requiring the party seeking access to an intellectual property to create a new product or at least make substantial technical improvements to it, the Courts may be trying to prevent the plaintiff from merely replicating the dominant firm's product.[827] This may be motivated by a desire to accord greater respect and protection for intellectual property rights. The Courts believe that they should override such rights only when society will obtain significant benefits in the form of a new or a substantially improved product.

In doing so, the European courts have implicitly made a value judgment that only consumer welfare gains in the form of new product innovations would justify a judicial order of compulsory licensing; mere lower prices for an existing product do

[825] Lamping (n 760) 132–33.
[826] Ritter (n 393) 288.
[827] Case C-418/01, *IMS Health v. NDC Health*, para. 49.

not suffice. When a plaintiff only replicates the dominant firm's product after obtaining access to that firm's intellectual property, the likely consequence is lower prices for consumers.[828] If the dominant firm previously had a monopoly over the product, prices will drop from a monopolistic level to a duopolistic level. The European courts will not trade the integrity of intellectual property for lower prices. Innovation incentives will only be sacrificed in the name of further innovation.

Another more practical reason for the European courts to impose a new product requirement in intellectual property but not tangible property cases is perhaps that it is often not possible to come up with a new product with a physical property. What kind of new product can one come up with after being granted access to a critical port facility or a newspaper distribution network after all? The scope for innovation with a physical property is usually smaller. An insistence on a new product would effectively foreclose the application of the unilateral refusal to deal doctrine to physical property.

The new product requirement has important implications for developing countries. Regardless of whether a new product or mere technical improvements to an existing product is required, what is clear is that under EU case law, a competitor cannot seek access to the dominant firm's intellectual property merely to replicate its product. Either the competitor has to create a new derivative product, as in *Magill*, or improve on an existing product, as in *Microsoft*. In an industrialized economy, where the capacity to innovate is abundant, such a stance can be a reasonable compromise. This requirement, however, would greatly limit the utility of the doctrine to developing countries. It means that only firms that possess the technological capacity to innovate

[828] Walter Elberfeld and Elmar Wolfstetter, 'A Dynamic Model of Bertrand Competition with Entry' (1999) 17 International Journal of Industrial Organization 513, 515.

from or improve on the technology of a global technological leader can avail themselves of the doctrine. A more promising approach for developing countries would be *IMS Health*, which seems to sanction compelled sharing of intellectual property when the result is the creation of a highly comparable product. There was no mention in the case that NDC would produce a technically superior product. The only likely consumer benefit was going to be lower prices for pharmaceutical companies. Alternatively, the technical improvement requirement under *Microsoft* can be interpreted loosely such that any non-negligible technical improvement suffices.

(iv) Definition of Essentiality or Indispensability

The essentiality requirement is the lynchpin of the essential facilities doctrine. The requirement is all the more important because, as it is usually formulated and applied in the U.S, the doctrine does not have a separate requirement of a showing of consumer harm. The essential facilities doctrine is probably unique under U.S. antitrust law in that a monopolization claim can be sustained absent a showing of consumer harm. The most that can be said is that the doctrine presumes that compelled access will increase supply of the downstream product, which will lower prices. Therefore, consumers suffer harm from the denial of access by being forced to pay higher prices. This is different from the kind of harm to competition that is usually required to substantiate a monopolization claim. Although one can argue that the denial of access constitutes one form of exclusion, most commentators would concur that excluding a competitor by refusing to share a private property amounts to competition on the merits and should not be deemed a cognizable harm to competition.[829] In some way compelled sharing of an essential facility is similar to prohibition of excessive

[829] Devlin, Jacobs and Peixoto (n 376) 1170–71.

pricing, which aims to rectify a consumer harm unaccompanied by any harm to competition. This may help to explain the widespread discomfort with the doctrine in the U.S.

The discomfort with the doctrine is further aggravated by the perception that the doctrine suffers from a significant lack of clarity. Brett Frischmann and Spencer Waller observe that ''[e]ssentiality' in the existing test appears to be a rather inarticulate and unrefined demand-side consideration. … Many have critiqued the essential facilities doctrine on the grounds that it is too open-ended and insufficiently defined.'[830] Commentators have raised two important questions regarding the meaning of essentiality. The first is what is the requisite degree of difficulty of replicating the facility. The second is the relationship between the defendant's market power and the uniqueness of the facility.

It has been said that the *Terminal Railroad* case, from which the doctrine emanated, may have implied that physical impossibility of duplicating the facility is needed to demonstrate essentiality.[831] Recent cases, however, seem to have lowered the bar from impossibility to impracticability.[832] In *Hecht*, the Court held that '[t]o be 'essential' a facility need not be indispensable; it is enough that duplication of the facility would be economically infeasible and if denial of its use inflicts a severe handicap on potential market entrants.'[833]

According to Gregory Werden, the authoritative formulation of the essential facilities doctrine in the *MCI* case still left three questions unanswered, one of which is 'what quantum of effect on the competitor from denial of the facility is

[830] Frischmann and Waller (n 444) 10.
[831] Lipsky Jr. and Sidak (n 600) 1212.
[832] ibid.
[833] Hecht, 570 F.3d at 992.

necessary'.[834] While *Hecht* only requires a severe handicap, Werden believes that complete exclusion of a competitor is necessary.[835] Abbott Lipsky and Gregory Sidak recognize the difficulty in drawing a clear line between a severe competitive advantage and complete exclusion.[836] They ultimately conclude that '[t]he present case law recognizes this distinction, and permits application of the doctrine where the competitive disadvantage is severe, rather than fatal.'[837] Bounded in the concept of essentiality is the notion of uniqueness, which suggests that no feasible alternative is presently available for the facility and that the facility cannot be replicated.[838] The more unique is a facility, the more difficult it is to find a reasonable substitute for it and hence the more essential it is for the competitor. Even though uniqueness and essentiality are analytical distinct concepts, their application is often collapsed into one.

Richard Gilbert and Carl Shapiro have attempted to formulate a definition of essentiality in economic terms. They propose that 'an input is essential only if an equally efficient firm cannot compete when the input is not available, or equivalently, when its price is infinite'[839], which means 'an equally efficient firm cannot profitably produce any level of output even if the output is sold at the integrated firm's monopoly price.'[840] Essentiality must be assessed with reference to the price of the input and the price of the final product incorporating the input. Gilbert and Shapiro argue that the *MCI* case implicitly uses market prices as the reference point.[841] They further argue that judicial intervention would only be justified when it is impossible for the facility owner

[834] Werden (n 437) 453–54.
[835] ibid 454.
[836] Lipsky Jr. and Sidak (n 600) 1212–13.
[837] ibid.
[838] ibid 1211.
[839] Gilbert and Shapiro (n 397) 12751–52.
[840] ibid.
[841] ibid.

and the party seeking access to reach a mutually acceptable agreement, which would only happen when total industry profit absent sharing is higher than that in the presence of sharing.[842]

A related yet distinct issue is the relationship between the dominant firm's market power and the essentiality of the facility. To put it slightly differently, the question is to what extent the defendant's market power can be attributed to the essential facility. Werden notes that this question is still largely shrouded in uncertainty.[843] Lipsky and Sidak argue that the inquiry into essentiality and the assessment of market power should be one and the same.[844] The corollary of this argument is that the inquiry into essentiality should be equally stringent as the legal tests for monopoly power under Section 2, which means that market conditions that preclude a finding of monopoly power would equally negate the application of the doctrine.[845] Werden suggests that the relevant legal test seems to be 'the existence of monopoly power arising from control over a facility'.[846] He, however, observes that separating the inquiry into essentiality from the assessment of market power ultimately may not be practical because 'it is difficult for a monopolist to possess substantial market power by virtue of control over a facility, and yet have the denial of access not exclude competitors completely.'[847]

One issue that has not been explicitly articulated in this discussion is power in which market. If the relevant market is defined as that for the supply of the relevant input or facility, then the facility owner must possess monopoly power by

[842] ibid.
[843] Werden (n 437) 453–54.
[844] Lipsky Jr. and Sidak (n 600) 1212–13.
[845] ibid 1214–15.
[846] Werden (n 437) 454.
[847] ibid.

virtue of her ownership of an essential facility. If the relevant market is defined as that for the downstream product for which the essential facility is a critical input, then the equivalence of the two concepts is no longer certain. Even if downstream production is impossible without the essential input or facility, it is possible for the facility owner to face competition in the downstream market. This could be the case if the facility owner has licensed a critical technology to a number of downstream producers. It is then highly relevant whether the essential facilities doctrine should remain applicable in such a market.

The equivalent concept of essentiality under EU law is indispensability. In *Magill*, the CJEU held that the refusal to supply programming information was abusive because the information was indispensable for the publication of a weekly TV guide.[848] In *Oscar Bronner*, the Court reiterated the requirement of indispensability, but proceeded to conclude that the newspaper distribution network was not indispensable to rival publication because other distribution channels were available.[849] An input is only indispensable when there is no actual or potential alternative for it and that was not true for the distribution network.[850] Rita Coco notes that although the indispensability condition was not met in the case, the decision extended the application of the concept of indispensability to tangible property.[851] In *IMS Health*, the CJEU emphasized the indispensability requirement, noting that a refusal to supply may constitute an abuse if 'the products or services are indispensable in order to carry on a particular business and where there is an actual demand for them on the part of undertakings which seek to carry on the business for which they are indispensable.'[852]

[848] Case C-241-242/91 P, *RTE & ITP v. Commission*, para. 53.
[849] Coco (n 635) 18.
[850] ibid.
[851] ibid.
[852] Case C-418/01, *IMS Health v. NDC Health*, para. 44.

In *Microsoft*, the Court again applied the requirement, noting that 'the refusal relates to a product or service indispensable to the exercise of a particular activity on a neighbouring market'.[853] The Court proceeded to endorse the Commission's conclusion that interoperability with the Windows operating system is essential to the ability of competing workgroup server operating systems to compete.[854]

The condition of essentiality or indispensability needs to be defined judiciously to suit the circumstances of developing countries. For the essential facilities doctrine to apply to intellectual property, essentiality or indispensability cannot be defined as physical impossibility. It should be understood as impracticability. It would hardly ever be physically impossible to replicate a patented technology unless the requirement expressly takes into account the firm's and the country's current technological capacity. Moreover, there cannot be an insistence on complete exclusion. A severe competitive disadvantage should suffice. Short of standard-essential patents and software that has become a de facto standard by virtue of network effects, it is highly unlikely that denial of access to a technology will result in outright exclusion. Therefore, essentiality and indispensability should refer to a technology that is economically unfeasible and impractical to replicate, the denial of access to which will puts a competitor at a severe competitive disadvantage.

Impracticality of replication also needs to take full account of the existing technological capacity of the firm and the country at issue. It would be rather pointless to insist that a technologically advanced firm in an industrialized economy could replicate the technology when the technology is completely beyond the reach of a developing country firm. Lastly, in terms of the implicit market prices underlying the

[853] Case T-201/04 *Microsoft v. Commission*, para. 332.
[854] ibid, para. 428.

definition of essentiality, it must take full account of the price reductions after market entry. Even though Gilbert and Shapiro do not clearly specify this point, they must have intended it. It only makes sense to use the post-entry market prices to assess a potential entrant's efficiency.

To sum up, all four doctrinal considerations raised in the U.S. and EU jurisprudence require special attention from developing country authorities. A course of prior dealing often indicates the existence of relationship-specific investments by the licensee. It is important for developing countries to protect investments that are made for technology deployment and adaptation. Predatory intent against a developing country firm, especially one with the technological capacity to utilize an advanced technology, also requires vigilance. The new product requirement imposed under the EU jurisprudence needs to be adjusted according to the technological capacity of the developing country at issue. For a production country, insistence of a genuinely new product would be tantamount to a repeal of the essential facilities doctrines. Production countries are highly unlikely to be able to come up with a genuinely novel product with a frontier technology. The arguments are similar for a technology adaptation country. For sectors in which a proto-innovation country possesses innovation capacity, a heightened new product requirement such as under *Microsoft* or even *Magill* may make sense. Finally, under the essentiality requirement, the standard should be impracticality rather than physical impossibility. Impracticality should be adjudged in light of the technological capacity of the country at issue. A severe competitive disadvantage rather than complete exclusion should suffice.

C. A Proposed Framework for Developing Countries

Developing countries need to fashion their own approach to the patent-competition interface. Despite calls for convergence in global competition law in recent years, developing countries need to be cognizant of the limitations of legal transplant.[855] Transplanting legal rules from foreign jurisdictions that do not fit the local circumstances will only lead to confusion and rejection. The global mainstream approach to competition law is largely informed by the experiences of industrialized economies of continental scale such as the U.S. and the EU. What has worked for them need not work for developing countries. In fact, in light of the disparate technological capacity of developing countries and the varying enforcement capacity of their competition authorities, there are good reasons to believe that developing countries need to develop an approach to the patent-competition interface that is sensitive to their domestic circumstances. One size does not fit all even among developing countries.

1. A Proposed Doctrinal Framework

Having examined how the U.S. and the EU have approached the two doctrines and the various doctrinal considerations raised in the case law, we are in a position to canvass the previous discussions about theoretical issues, theories of harm, and doctrinal considerations to propose an analytical framework for developing countries to apply them. What follows, however, is merely intended as a suggestion. The foregoing discussion should provide enough ideas for a developing country authority from which to draw to fashion its own approach. For unilateral refusal to supply a

[855] Larry A DiMatteo, 'Terminology Matters: Dangers of Superficial Transplantation' (2019) 37 Boston University International Law Journal 35. John W Cairns, 'Watson, Walton, and the History of Legal Transplants' (2013) 41 Georgia Journal of International and Comparative Law 637. Emilian Ciongaru, 'Negative Effects of Incorrect Legal Transplantation of European Union Legislation' (2013) 92 Procedia - Social and Behavioral Sciences 186.

physical input, a competition authority may deem refusal by a dominant firm to supply unlawful if (i) it entails the termination of an existing course of dealing between the plaintiff and the defendant, (ii) the refusal evinces a predatory intent as shown by a variety of evidence such as the intent to enter the market from which the plaintiff will be displaced or a willingness to sacrifice profit opportunities, (iii) the refusal inflicts competitive harm, which can be illustrated through one of the four proffered theories of harm, among others, and (iv) the refusal is not excused by a valid business justification.

Meanwhile, a unilateral refusal to license patented technology will be deemed unlawful if (i) the refusal pertains to a technology that is essential or indispensable for the plaintiff's operations, with essentiality and indispensability understood as impracticality rather than physical impossibility, (ii) the refusal prevents the emergence of a new product which satisfies an unmet consumer demand, where the new product requirement is interpreted flexibly in accordance with the technological capacity of the country at issue, (iii) the refusal is not excused by a valid business justification, and (iv) the refusal will foreclose the party seeking access from the downstream or other relevant markets, leading to a significant loss of competition in that market.

2. A Summary of Prior Discussions Relevant for Application of Framework

It will be helpful to summarize the foregoing discussion. First and foremost, it is important to reiterate that compulsory licensing under the unilateral refusal to deal doctrine and the essential facilities doctrine is unlikely to have a significant adverse effect on innovation incentives. The impact on the innovation incentives of the incumbent innovator, the competitor innovator, and the cumulative

innovator is likely to be benign or neutral. Even if there was any detrimental effect, it is likely to be insubstantial. This is of paramount importance because one of the strongest objections to applying the two doctrines to patented technology is that doing so would undermine innovation incentives. A host of other implementation difficulties have also been addressed. It is also important, however, to recall that liberal use of compulsory licensing may deter voluntary technology transfer by foreign technology owners and may cause them to resort to means of transfer that redound fewer technological benefits to developing countries.

Although it is not meant to be taken as a rigid classification, in general, the unilateral refusal to deal doctrine is more readily applicable to physical input while the essential facilities doctrine is more suitable for technology licensing. The EU refusal to license cases law is obviously mostly applicable to technology licensing as well. This is partly because of the way the doctrines are crafted. It also seems to make sense from the perspective of reconciling the conflict between competition policy and patent policy. The essential facilities doctrine imposes the more stringent requirements of essentiality and infliction of a severe competitor disadvantage. Compulsory licensing is more burdensome on patent rights than the compelled supply of a patented input and hence should be used more sparingly. The European courts seem to have made a less explicit distinction between these two doctrines. They have never even mentioned the essential facilities doctrine by name. In substance, however, one can clearly distinguish the *Commercial Solvents* line of cases, which were crafted with physical input in mind, from *Magill* and its progeny, which were intended for intellectual property. For ease of reference we will refer to the *Commercial Solvents* line of cases as the EU unilateral refusal to deal cases.

The two doctrines take divergent analytical approaches. The emphasis under the essential facilities doctrine or its EU equivalent is essentiality or indispensability. The new product or a second market requirement seems to have replaced theories of harm as an indication of consumer harm. Recall, however, that foreclosure of downstream competition is a pertinent theory of harm and should be required in essential facilities cases. Developing countries face a dilemma with respect to the new product requirement. On the one hand, the requirement helps to ensure consumer harm, at least in the form of denial of innovation. On the other hand, insisting on a demanding new product requirement could erect significant hurdles for developing countries to invoke the doctrine. Most developing countries do not possess the technological capacity to utilize an advanced technology to create a new product. The stringent approach to the requirement under *Magill* is probably unrealistic for most of them as it would effectively put the doctrine beyond their reach.

Depending on their technological capacity, developing countries may prefer to emulate the approach to the new product requirement in *IMS Health* and *Microsoft* instead. Those with nothing more than a technology adaptation capacity will probably fail the new product requirement. A more flexible approach to the requirement under *IMS Health* may be advisable. This is further justified by the fact that even under this approach, denial of access to a critical facility would result in higher prices for consumers. As argued earlier, applying the essential facilities doctrine or its EU equivalent in this manner effectively turns it into regulation of excessive pricing. While some advanced jurisdictions such as the U.S. vehemently object to applying competition law to police excessive pricing, such application is more justified in poorer developing countries. Consumers in these countries can ill-afford higher prices and would expect their competition authorities to tackle excessive prices. Those with a

higher technological capacity—the proto-innovation countries—are better positioned to improve on the technology to deliver a better product. The *Microsoft* approach would be suitable.

Meanwhile, commentators have stressed the importance of formulating a coherent theory of harm for these cases, which include enhancement of entry barriers, facilitation price discrimination, foreclosure of vertically related markets, and creation of effective exclusivity for the unilateral refusal to deal cases and foreclosure of downstream competition in the essential facilities cases. Given the lack of an essentiality or indispensability requirement, it becomes particularly important for the application of the unilateral refusal to deal doctrine to be guided by a coherent theory of harm. This is especially so because none of the legal tests for the doctrine that have been examined earlier, such as the scope of patent test, the subjective intent/pretext test, and Baker's no business justification rule, seem to provide a principled way in which the doctrine can be broadly applied. If none of these tests can capture most of the circumstances in which a unilateral refusal to deal can inflict consumer harm, it becomes important to articulate a coherent theory of harm.

Other doctrinal considerations that have been previously discussed include a course of prior dealing and predatory intent. It was argued earlier that developing countries need to take cases involving a course of prior dealing and predatory intent seriously. Cases involving prior dealing would most probably feature a plaintiff that has made significant relationship-specific investments. Given the low level of investments in developing countries, investments related to technology implementation deserve special protection. Cases involving predatory intent also call for attention because they involve attempts to drive a developing country firm with

technological capacity out of the market. Given the dearth of technological capacity in developing countries, such conduct should not be facilely condoned.

With regards to the competitive relationship between the plaintiff and the defendant, there seems to be a consensus in the U.S. that they not be competitors in the primary product market as far as the unilateral refusal to deal doctrine is concerned. This is motivated by a desire to preserve the primary product market for the patentee to recoup her R&D investments. The consequence is that most of the cases have involved aftermarkets. In the essential facilities cases, the U.S. courts seem to have adopted contrary logic. As opposed to barring competitors in the downstream market from bringing these cases—and the downstream market in most cases is the market from which investments are recovered—commentators believe that the party seeking access needs to be a downstream competitor. In the EU refusal to license cases, the European courts do not seem to share the same apprehension about letting a primary product competitor seek access to an intellectual property, as evidenced by *IMS Health* and *Microsoft*. In *IMS Health*, the intellectual property was developed with input from the industry.[856] In *Microsoft*, the market from which rivals were allegedly excluded was the work group server operating systems market, which was considered in the case as a secondary market.[857] *Commercial Solvents* does not involve a primary product market; at issue is a downstream market for the chemical ingredient. Still the Court did not express much concern about cordoning off the primary product market from the party seeking access.

To the extent that the U.S. approach is motivated by the need to preserve innovation incentives, these concerns no longer deserve much weight. Therefore, the EU

[856] Case C-418/01, *IMS Health v. NDC Health*, para. 5.
[857] Case T-201/04, *Microsoft v. Commission*, para. 454.

approach, which allows cases involving a primary product competitor to proceed, is advisable. The requirement of a downstream competitor under the essential facilities doctrine or its EU equivalent serves a useful purpose. In reality, however, it is highly unlikely that a firm which shares no competitive relationship with the facility owner whatsoever will seek access to the facility. And if the facility owner and the party seeking access do compete, they most often do in the downstream market.

3. Nature of Compulsory License and Technological Capacity

One of the issues that has been left unaddressed thus far is the nature of compulsory licensing. Compulsory licensing can be imposed in two senses. The first is where the putative licensee already possess the technology, either through reverse engineering or other means, and is prevented from implementation by the patentee's rights. If a compulsory license is imposed in this situation, it merely requires the patentee to authorize the putative license to use the technology subject to reasonable compensation. It does not entail actual technology transfer. A putative licensee cannot use the compulsory license to obtain technical capability that it does not already possess. This can be called an authorization license. An authorization license is tantamount to an 'independent invention defense', which exists in U.S. copyright law but not patent law, whereby the infringer will escape infringement if she can prove that she came up with the creation independently.[858]

The second sense in which a compulsory license can be imposed is the conventional understanding that the patentee is required to transfer an actual technology to the licensee. The patentee most probably will also need to transfer the

[858] Samson Vermont, 'Independent Invention as a Defense to Patent Infringement' (2006) 105 Michigan Law Review 475.

technical know-how necessary for the implementation of the transferred technology. Such kind of compulsory license permits genuine technology transfer. This can be called an active assistance license. It will redound greater benefits to developing countries, but also invites stronger objection from technology owners.

These two kinds of compulsory license have different degrees of usefulness for developing countries. Different levels of technological capacity are required by the two kinds of license. Authorization licenses require the domestic firm to come up with the technology independently through its own imitative effort. The level of technological capacity required may not be much lower than that needed for the original innovation. Recall it was noted in chapter II that the time and effort it takes to imitate a technology is often not much less than that required to create it in the first place. Even active assistance licenses pose technological requirements on the licensee. The licensee must possess sufficient technological capacity to acquire and adapt foreign technology.

The very important question for developing countries is what type of compulsory license should be imposed even if a unilateral refusal to deal or essential facilities claim is established. Liberal use of compulsory licensing would of course improve the country's access to technology. It would, however, be a meaningless exercise if firms in the country do not possess the capacity to utilize the technology. Therefore, the first pre-requisite for the imposition of compulsory license is that firms in the country must possess the requisite technological capacity to absorb and implement the transferred technology. For countries that possess technology adaptation and innovation capacity, they are most likely capable of imitating a foreign technology if given the incentives and the opportunity to. For these countries, the

prospect of an authorization license may help to spur these domestic firms to invest in R&D to reverse engineer an overseas technology.

Recall the competitive R&D race posited by Gilbert and Shapiro. They argue that the prospect of compulsory licensing would remove the incentives of the competitor to invest to win the race. If, however, the license is an authorization one, the prospect of compulsory licensing may have salutary effects on domestic innovation incentives in the context of an R&D race between a developing country technology follower and a developed country technology leader. The developing country firm will still have full incentives to catch up as it will need to reverse engineer the technology first before it can avail itself of the compulsory license. Therefore, for technology adaptation and proto-innovation countries, compulsory licensing should be confined to authorization licenses.

Only production countries should be entitled to active assistance licenses. Because of their poor technology capacity, these countries are unlikely to be beneficiaries of compulsory licenses of technology, especially relatively advanced ones, under the essential facilities doctrine. They are most likely to make use of the unilateral refusal to deal doctrine to obtain essential patented input. To the extent that the supply of such input requires technical assistance such as transfer of know-how, foreign technology owners should be required to provide it. Doing so would allow production countries to make meaningful use of the doctrines to gain access to technology. This approach is also justified from a doctrinal perspective. Under the various theories of harm under the unilateral refusal to deal doctrine, the competitive or consumer harm goes beyond the simple denial of access to a technology and concomitant supra-competitive prices charged by the incumbent. There is independent consumer harm that needs to be remedied. It may hence be more justified to require the patentee to

provide active assistance to the licensee to ensure that the patented input can be successfully deployed.

In contrast, even with the theory of harm of foreclosure of downstream competition, the competitive or consumer harm in most essential facilities cases stems from the denial of access to technology. The main theory of harm is that the plaintiff needs access to the defendant's patented technology to compete with the defendant. Where the competitive harm is more confined, it may be appropriate to limit the defendant's obligation to mere authorization and require the plaintiff to bear the responsibility of independently developing the technology.

4. Developing Country-Specific Considerations

(i) Using Compulsory Licensing to Facilitate Technology Transfer

One of the most conflicting policy questions facing developing countries is to what extent compulsory licensing should be used to facilitate technology transfer. On the one hand, compulsory licensing provides the most effective means for developing countries to secure technology transfer. Despite admonitions about the need to have a coherent theory of harm, the fact is that foreclosure of downstream competition is often not difficult to prove once it has been proven that the technology is essential and denial of access would inflict a severe competitive disadvantage on rivals. More liberal interpretations of the various elements in the essential facilities doctrine or its EU equivalent could open the door to an aggressive use of the doctrine to import foreign technology coercively. An active assistance license directly transfers technology to the licensee. Even an authorization license would be highly beneficial to those developing countries that possess the technological capacity to reverse engineer advanced

technologies from industrialized economies. These countries do not yet have the capacity to innovate, but they have the ability to imitate. Compulsory licensing would remove the most critical barrier to the commercialization of a reverse engineered technology.

On the other hand, using competition law to facilitate technology transfer would be fraught with difficulties. First, as mentioned earlier, aggressive use of compulsory licensing may undermine robustness of patent protection, causing foreign technology owners to abstain from technology transfer or to shift to modes of transfer that redound fewer technology benefits to the country. This is especially pertinent as most of the countries that stand to benefit from an authorization license are heavily reliant on foreign technology transfer. Second, the TRIPS Agreement restricts what developing countries can do in terms of compulsory licensing. Third, even if developing countries manage to stay on the right side of TRIPS, they would incur the opprobrium if not the wrath of industrialized economies, especially the U.S. under the current administration, which has taken a more much confrontational approach in trade matters and a more aggressive stance in protecting its intellectual property rights.[859] The industrialized economies would most certainly retaliate against developing countries. The political reality of the situation is such that the freedom of action for developing countries may be much more limited than suggested by purely legal analysis. These are the risks that need to be taken into account in formulating a policy regarding the use of compulsory licensing.

[859] Jerome H Reichman, 'Compulsory Licensing of Patented Pharmaceutical Inventions: Evaluating the Options' (2009) 37 Journal of Law, Medicine & Ethics 247, 258–59. Donald Harris, 'TRIPs after Fifteen Years: Success or Failure, as Measured by Compulsory Licensing' (2011) 18 Journal of Intellectual Property Law 367, 392–93.

The TRIPS Agreement imposes restrictions on the scope of action for developing countries in terms of competition law regulation of patent licensing practices and compulsory licensing. Article 40 of the TRIPS Agreement expressly authorizes developing countries to apply competition law to police abusive patent exploitation practices.[860] Article 31 of the TRIPS Agreement imposes a host of conditions which must be met before a compulsory license can be granted.[861] A compulsory license imposed under competition law, however, is exempted from most of these conditions. Only two conditions continue to apply, which are that the determination shall be made on an individual basis and that adequate compensation shall be offered to the patentee.[862] Any unilateral refusal to supply claim would be individually adjudicated, as is true of every competition law case. Adequate compensation does not mean fully commercial terms. Article 31(k) explicitly provides that 'the need to correct anti-competitive practices may be taken into account in determining the amount of remuneration in such cases.'[863] Therefore, while some compensation must be offered to the patentee for the compulsory license, the royalty need not reflect the full commercial value of the licensed technology. In any case, it has been insisted throughout the foregoing discussion that compulsory licensing is not free licensing and that the patentee must be offered adequate compensation. Both conditions will be fully met under the framework proposed in this chapter.

The TRIPS Agreement does not set out any limitations on how competition law can regulate patent exploitation practices. Article 40(1) acknowledges that 'some licensing practices or conditions pertaining to intellectual property rights

[860] General Agreement on Trade-Related Aspects of Intellectual Property (hereinafter "TRIPS Agreement"), 1869 U.N.T.S. 299, 33 I.L.M. 1197 (1994), art. 40.
[861] ibid art. 31.
[862] ibid art. 31.
[863] ibid.

which restrain competition may have adverse effects on trade and may impede the transfer and dissemination of technology.'[864] Article 40(2) further authorizes WTO member states to adopt 'appropriate measures to prevent or control such practices'[865]. The provision then proceeds to enumerate a number of anticompetitive licensing practices that may be subject to regulation, such as exclusive grantbacks, no-challenge clauses, and coercive package licenses.

There is some uncertainty as to whether unilateral refusal to license intellectual property falls within the scope of conduct that can be subject to competition law regulation under the TRIPS Agreement. On the one hand, one can argue that Article 40(1) only refers to licensing practices or conditions. It would be a stretch to argue that licensing practices also encompass a unilateral refusal to license, which clearly contemplates the absence of a license. It is thus arguably not within the intended scope of Article 40(1) for signatories of the TRIPS Agreement to regulate unilateral refusal to license. On the other hand, unilateral refusal to supply intellectual property is well within the ambit of EU competition law. Given that the EU is one of the two leading competition law jurisdictions in the world, it would be plausible to argue that Article 40, in authorizing TRIPS signatories to apply competition law to regulate patent exploitation practices, permits these signatories to pursue conduct that is regulated under EU competition law. There is, however, the further complication that EU competition law has never prohibited the unilateral refusal to license patent rights. One could hence argue that patents are beyond the scope of the unilateral refusal to deal doctrine under EU competition law. Given the sparse language in the relevant provisions in the TRIPS Agreement and the lack of WTO jurisprudence on these

[864] ibid art. 40(1).
[865] ibid art. 40(2).

provisions, a definitive answer to this question may be elusive at this point. For our purpose, we will assume that it is permissible to regulate unilateral refusal to license patent rights under the TRIPS Agreement.

The greatest practical difficulty for developing countries to use compulsory licensing to facilitate technology transfer is probably the reaction of the industrialized economies. Especially in light of the current global political climate, aggressive use of competition law to override intellectual property rights, no matter how well justified doctrinally and policy-wise, would probably invite fierce backlash from the industrialized economies. Developing countries, especially the smaller ones with less political clout internationally, would need to tread carefully. This is despite the fact it was established previously that even extensive use of compulsory licensing may not undermine innovation incentives in most instances. Therefore, the imperative to obtain a foreign technology on its own should not support a duty to license. The invocation of both doctrines should be substantiated by a coherent theory of harm. Under the essential facilities doctrine or its EU equivalent, there should be careful consideration of the requirement of essentiality or indispensability. Denial of access should clearly result in foreclosure in the downstream market. And compulsory licenses should be limited to authorization licenses in technology adaptation and proto-innovation countries. The patentee should only be required to provide active assistance to the counterparty when a production country compels the patentee to supply patented products under the unilateral refusal to deal doctrine.

(ii) Using Compulsory Licensing to Satisfy Development Needs

Developing countries often suffer severe shortage of basic necessities such as foodstuffs, healthcare, education, energy and basic sanitation. Poor nutrition, healthcare, and education do not only affect the current well-being of citizens in

developing countries, it also undermines their future development potential. Poor nutrition, especially during childhood, retards growth and cognitive development.[866] Lack of access to timely and adequate healthcare could leave behind lifelong disabilities and prevent citizens of developing countries from reaching their full potential as productive members of society.[867] This is probably an especially timely concern. The same is also true of limited educational opportunities.[868] Therefore, facilitating access to basic necessities is of the utmost importance to developing countries. The United Nations has incorporating access to these necessities as part of the Millennium Development Goals.[869] If the compulsory licensing of a patented technology or the compelled supply of a patented product can make an immediate and substantial contribution to the satisfaction of these basic needs, the two doctrines should be called into service. The archetypal case is if access to a patented drug at affordable prices could significantly improve the public health situation of the country, for example by bringing an epidemic under control.[870]

Compulsory licensing, however, cannot be imposed when access to the technology will only make indirect or insignificant contribution to the development needs of the country. For instance, access to a technology that significantly improves the yield of a cash crop does not meet the immediate and substantial standard. Access to the

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[866] Susan P Walker and others, 'Child Development: Risk Factors for Adverse Outcomes in Developing Countries' (2007) 369 The Lancet 145.
[867] World Health Organization, 'Economic Costs of Malaria' <https://www.malariaconsortium.org/userfiles/file/Malaria%20resources/RBM%20Economic%20costs%20of%20malaria.pdf> accessed 4 March 2020.
[868] Pedro Nicolaci da Costa, 'A Lack of Education Can Literally Be Deadly' (*World Economic Forum*, 13 February 2018) <https://www.weforum.org/agenda/2018/02/this-startling-imf-chart-shows-how-poverty-and-lack-of-access-to-education-are-literally-deadly> accessed 4 March 2020.
[869] United Nations, 'Sustainable Development Goals Kick off with Start of New Year' <https://www.un.org/sustainabledevelopment/blog/2015/12/sustainable-development-goals-kick-off-with-start-of-new-year/> accessed 4 March 2020.
[870] Reichman (n 859). Reed Beall and Randall Kuhn, 'Trends in Compulsory Licensing of Pharmaceuticals Since the Doha Declaration: A Database Analysis' [2012] Plos Medicine <https://journals.plos.org/plosmedicine/article%3Fid%3D10.1371/journal.pmed.1001154> accessed 4 March 2020.

technology would raise farmers' income. Although there are no doubt many abjectly poor farmers in developing countries whose well-being would be dramatically improved if the yield of a cash crop was boosted, permitting compulsory licensing in such a situation would risk an excessive erosion of the intellectual property regime. If compulsory licensing can be justified because it merely raises income, it would be very difficult to draw a principled limit on the scope of the doctrine. The argument would be different for a staple crop that serves as the main food source for the citizens of a developing country. Boosting the yield of such a crop would help to secure adequate food supply for the citizens of the country, hence fulfilling one of their basic needs.

5. Country-Specific Recommendations

(i) Production Countries

The production countries lack the technological capacity to absorb advanced technology from industrialized economies. They will be unlikely to benefit from compelled technology transfer under the essential facilities doctrine or its EU equivalent. And if the doctrine could somehow be invoked in a production country, perhaps when applied to a more basic technology, the new product requirement should be kept to a minimum. These countries stand to benefit from low prices even if no new or improved product is created. The unilateral refusal to deal doctrine, which mostly applies to patented product, will be of greater interest to these countries. Insisting on a coherent theory of harm will be important when applying the unilateral refusal to deal doctrine. Creation of effective exclusivity is unlikely to be a relevant theory of harm for them given their lack of technological capacity to be a primary product competitor with a global technological leader. Production countries should focus on the other theories of harm, namely enhancement of entry barriers, facilitation of price discrimination, and

foreclosure of vertically related markets. Prior dealing and predatory intent will be particularly important considerations for these countries because of the dearth of domestic investments and technological capacity. For these countries, the patentee could only be required to provide active assistance to the counterparty when the patentee is compelled to supply patented products under the unilateral refusal to deal doctrine. Lastly, these countries, being the poorest of developing countries, are the most likely to be in a position to deploy these doctrines to help satisfy development needs.

(ii) Technology Adaptation Countries

The technology adaptation countries will have the capacity at least to absorb imported technology and reverse engineer foreign technology. Therefore, both the unilateral refusal to deal doctrine and the essential facilities doctrine or its EU equivalent will be of relevance. Obtaining a critical physical input may allow these firms to compete with a technologically advanced firm in its primary product market as well as the aftermarket. Therefore, all four theories of harm under the unilateral refusal to deal doctrine will be of interest. Protecting relationship-specific investments and firms with technological capacity from predatory conduct are still important for these countries. When applying the essential facilities doctrine or its EU equivalent, these countries would be wise to follow the approach of *IMS Health* to the new product requirement. These countries are unlikely to possess the technological capacity to make significant improvements to a technologically advanced product. Applying a more stringent new product requirement would effectively eviscerate the essential facilities doctrine in these countries. Compulsory licenses issued under the essential facilities doctrine should be authorization licenses only.

These countries, however, also need to balance the imperative to impose compulsory licensing with the need to attract foreign technology transfer. More robust

patent protection generally attracts more technology transfer and helps to steer the mode of transfer to FDI and licensing, which redound greater benefit to developing countries. Overseas technology firms will be less likely to engage in technology transfer through FDI and licensing if they know that doing so will improve the technological capacity of local firms to such an extent that these firms will be in a position to reverse engineer other related technologies, which will render them more likely to invoke the essential facilities doctrine to overcome patent protection.

(iii) Proto-Innovation Countries

The proto-innovation countries possess innovation capacity in at least some industries. In some of them their technological capacity may even rival that of industrialized economies. These countries will need to adjust their approach according to the industry at issue. First of all, both the unilateral refusal to deal doctrine and the essential facilities doctrine will be pertinent to these countries. In those industries in which they do not possess innovation capacity, the analysis largely follows that of the technology adaptation countries. In those industries in which these countries possess innovation capacity, the essential facilities doctrine will need to be applied judiciously. The argument for using compulsory licensing to facilitate technology transfer is even weaker when the country itself possesses the capacity to innovate in the industry at issue. In such an industry, the new product requirement will need to be elevated to provide a meaningful hurdle for the application of the doctrine. The *Microsoft* approach, which requires a technically improved product, should be considered. Among the various theories of harm under the unilateral refusal to deal doctrine, creation of effective exclusivity will be particularly applicable to these countries as they are more likely to possess firms that are primary product market competitors with a global technological leader.

6. Enforcement Capacity Issues

One needs to be mindful of the constraints on the enforcement capacity of developing country authorities when offering suggestions on how they should approach certain competition law issues. Analytical approaches that take into account all the relevant factors, make use of the most advanced theoretical insights, and require the most sophisticated statistical analysis may work well for industrialized economies but be ill-suited for developing countries. Developing country authorities may lack the expertise or resources to employ such advanced analytical approaches.[871] This is especially true for those from the poorest developing countries, whose authorities may be most inadequately funded and most lacking in expertise. Analytical approaches that require a comprehensive account of market conditions and competitive effects may be beyond their reach.

While it is impossible to quantify precisely the institutional capacity of a competition authority (nor would such an exercise be entirely useful), it may be possible to come up with some rough classification and offer suggestions accordingly. For our purpose, we will categorize the institutional capacity of a developing country authority into low, medium, and high. A low-capacity authority would be one that possesses little in-house legal and economic expertise, lacks the resources to undertake large-scale and complex investigations, and is capable of not much more than simple cartel cases and the most straightforward merger review cases, such as a merger to monopoly. Abuse of dominance and complex vertical agreement cases are beyond their reach.

[871] Michal Gal, 'The Ecology of Antitrust Preconditions for Competition Law Enforcement in Developing Countries', *Competition, Competitiveness and Development* (UNCTAD 2004) 28–30.

A high-capacity authority would be one that is almost on par with the authorities in advanced jurisdictions in terms of personnel, resources, level of sophistication, and experience. CADE in Brazil, COFECE in Mexico, and the South African Competition Commission come to mind. A high-capacity authority has the capability to handle all sorts of difficult conduct cases and undertake sophisticated economic analysis of the most complicated mergers.

A medium-capacity authority falls somewhere in between. It possesses some modicum of legal and economic expertise and is capable of handling somewhat complex conduct and merger cases. Highly sophisticated economic analysis of mergers such as merger simulation, however, is probably beyond its reach. While external assessment of an authority's institutional capacity may be more impartial and objective, ultimately an authority itself knows best what it is capable of and has no reason to misrepresent its capacity or manipulate the assessment exercise when the purpose of the assessment is to determine an appropriate analytical approach for particular conduct.

Thankfully, most of the elements required under the two doctrines, such as a course of prior dealing and predatory intent under the unilateral refusal to deal doctrine and essentiality or indispensability under the essential facilities doctrine, are generally factual issues that do not require extensive use of economic theory or evidence. Determination of these requirements should entail relatively straightforward factfinding, at least as compared to a full competitive effects analysis. Authorities at all levels of capacity should be able to handle the analysis under these elements. Analysis under the various theories of harm, however, may require more expertise and may present more difficulties for low-capacity authorities. Authorities that are unable to muster the technical expertise and resources to handle the analysis may need to forego

these doctrines. While this may represent a significant loss of enforcement opportunity for these authorities, the risk of erroneous decisions may be too great if no coherent theory of harm is presented in the case. Analysis under these theories of harm are unlikely to present difficulties for the medium-capacity and high-capacity authorities.

It was also mentioned in the last chapter that the extent to which level of patent protection affects technology transfer differs by industry, which suggests that an industry-specific approach may be called for. It was also suggested that such an approach may require a relatively high level of enforcement capacity. For authorities with relatively low level of enforcement capacity, it may not be practical to implement an industry specific approach and these authorities may need to arrive at an assessment of the overall relationship between compulsory licensing and voluntary and involuntary technology transfer. If it is concluded that the negative effect on voluntary technology transfer could be significant, these authorities may need to be particularly cautious about imposing compulsory licensing. This is especially true if the country at issue possesses substantial imitation capacity. It may be somewhat ironic that having established that compulsory licensing need not dampen innovation incentives, developing countries are told to eschew compulsory licensing because of the effects on technology transfer. This, however, seems inevitable if the country at issue relies heavily on FDI or licensing as sources of foreign technology. For countries with a higher level of enforcement capacity, a more discriminating industry-specific approach may help the authority arrive at more precise decisions.

It was mentioned in chapter V that royalty setting will be inevitable in most compulsory licensing cases. In light of the lower institutional capacity of the competition authorities and the courts in developing countries, implementation will present even greater challenges to developing countries as compared to developed

ones. If royalty setting is difficult even for developed country decision-makers, it may present insurmountable obstacles to developing country authorities. How a developing country authority or court should handle royalty setting will depend on its institutional capacity. A low-capacity authority is unlikely to encounter the need to set royalty because instances of compulsory licensing imposed under the essential facilities doctrine are likely to be extremely rare in production countries. For a medium-capacity authority, the best that it can do may be to set a range for the royalty and let the parties bargain between them. While proposing a precise number for the royalty without the capacity to digest a large volume of highly technical information and to undertake complex analysis may amount to guesswork, it should be easier to arrive at a relatively broad range of acceptable royalty.

The breadth of the range depends on a number of considerations. First, an authority with a relatively high level of expertise will have the confidence and the ability to arrive at a narrower range. Regardless of the authority's capacity, the authority should compel the parties to negotiate under the threat of direct intervention by the authority. The authority will step in to set the royalty if the parties fail to reach an agreement. Here it is important for the authority to appear impartial. If the authority is known for a pro-licensee tendency, for example, the putative licensee will have greater incentives to hold out knowing that it is likely to obtain a favorable outcome from the authority should the negotiation fail.[872] Second, the authority may adjust the range in light of policy reasons to achieve a desired outcome. If the authority believes that there are policy reasons for a relatively higher (or lower) royalty, the authority can adjust the

[872] Richard A Epstein and Kayvan B Noroozi, 'Why Incentives for "Patent Holdout" Threaten to Dismantle FRAND. and Why It Matters' (2017) 32 Berkeley Technology Law Journal 1381. Bowman Heiden and Nicolas Petit, 'Patent "Trespass" and the Royalty Gap: Exploring the Nature and Impact of Patent Holdout' (2017) 34 Santa Clara High Technology Law Journal 179. Colleen V Chien, 'Holding Up and Holding Out' (2014) 21 Michigan Telecommunications & Technology Law Review 1.

maximum (or the minimum) accordingly to push for a desired level of royalty. For a high-capacity authority, royalty can be set in accordance with the prevailing approaches in the advanced jurisdictions, such as application of the *Georgia-Pacific* factors, while cognizant of the difficulties attendant in the exercise.

D. Conclusion

These two chapters have tried to illustrate how the unilateral refusal to deal doctrine and the essential facilities doctrine or its EU equnivalent can be applied by developing countries to improve their access to technology. Overall, it cannot be said that there is a strong case for these countries to enforce these doctrines against patented technologies aggressively. While there are no strong valid objections to the measured and case-by-case application of these doctrines with respect to patented technology, as dampening of innovation incentives has been shown not to be a persuasive argument against the doctrines when applied on a case-by-case basis, practical considerations and the political reality are such that there is a need for caution. Compulsory licensing may deter technology transfer and cause such transfer to shift to modes that redound fewer technological benefits to developing countries. Moreover, aggressive use of compulsory licensing may invite retaliation from the industrialized economies to the great peril of developing countries, especially the poorer ones with smaller economies. While this does not mean that developing countries should repudiate these doctrines altogether, they will need to apply them in a principled manner, grounded by a valid and coherent theory of harm and taking full account of the myriad policy considerations. This admittedly will not be an easy task for many developing countries. But the reward in terms of alleviation of consumer harm and gains in technological capacity could render the effort worthwhile.

VII. PATENT TYING

A. Introduction

Tying involving a patented product ('patent tying') is another patent exploitation practice that deserves our attention. Compared to unilateral refusal to license, tying probably poses a less acute dilemma in terms of the policy conflict underlying the patent-competition interface. After all, it does not seek directly to override patent protection. The main policy question presented by patent tying is whether it can be justified in the name of generating additional innovation incentives. By imposing a tie, a patentee can implement price discrimination, which would allow the patentee to extract more consumer surplus and hence boost her financial reward from the patent system. It is argued that increasing patentee reward will boost innovation incentives. If this argument is indeed valid, developing countries will have an additional consideration to pay heed to in the regulation of patent tying. If it is shown, however, that patent tying does not boost patentee reward or innovation incentives, or would do so at significant costs in terms of consumer welfare, the case for caution in regulating patent tying would be much weaker.

Once the innovation incentive argument is properly disposed of, attention can be turned to the anticompetitive effects and procompetitive benefits of tying, especially as they impact technological upgrade in developing countries, which is the overriding concern in our inquiry. It will be demonstrated that tying can result in foreclosure effects in both the tying and the tied product markets, excluding potential entrants from these markets. To the extent that foreclosure retards the acquisition of technological capacity, tying should be a matter of enforcement interest to developing country authorities.

B. Tying and Innovation Incentives

One of the first questions that need to be answered concerning the desirability of patent tying is its relationship with innovation incentives. Unsurprisingly, defenders of the practice have argued that patent tying should be permitted because it will boost the financial reward to the patentee, which in turn will spur innovation incentives. Whatever the short-run static efficiency effects of patent tying, the increased innovation it will spur in the long term will outweigh the static efficiency loss. The difficulty in quantifying dynamic efficiency gains means that it will be well-nigh impossible to verify and rebut this argument. Dynamic efficiency benefits will effectively become a trump card and immunize patent tying from competition law scrutiny. Acceptance of this argument would be tantamount to adopting per se legality for patent tying, which is effectively what some commentators have advocated.[873] Therefore, this argument needs to be properly analyzed and disposed of before we can determine how developing countries should approach patent tying.

1. Tying Enhances Patentee Reward and Hence Innovation Incentives

In a way, patent tying is the quintessential kind of tying conduct. Many of the earliest tying cases in the U.S. involved patented products. This fact to some extent tainted the U.S. Supreme Court's initial views on tying and was partly responsible for the Court's hostility toward the practice. The Court viewed patent tying as an unlawful attempt to leverage the market power that comes with patent protection into unpatented product markets. Even though the Court's stance on tying has gradually softened over time, the historical legacy of patent tying partly explains the current

[873] Christian Ahlborn, David S Evans and A Jorge Padilla, 'The Antitrust Economics of Tying: A Farewell to Per Se Illegality' (2004) 49 Antitrust Bulletin 287, 337–38. Mark A Hurwitz, 'Bundling Patented Drugs and Medical Services: An Antitrust Analysis' (1991) 91 Columbia Law Review 1188, 1208.

anomalous treatment of tying as the only non-horizontal restraint that is still subject to the per se rule, albeit of a qualified or modified kind, under U.S. antitrust law. As Justice John Paul Stevens noted in the *Jefferson Parish* case, '[i]t is far too late in the history of our antitrust jurisprudence to question the proposition that certain tying arrangements pose an unacceptable risk of stifling competition and therefore are unreasonable 'per se''.[874] It was not until 2006 when the U.S. Supreme Court abandoned the presumption that patent protection creates a presumption of market power in tying cases.[875]

As in the case of unilateral refusal to deal, before delving into the arguments for and against the practice in general, it is important to first tackle the patent-specific arguments applicable to tying. As is true of most business practices involving patented products or technology, it is frequently argued that allowing a patentee to practice tying will raise her patentee reward, which in turn will boost her innovation incentives. There are wide-ranging views on the validity of this argument, which will be examined below. Another related issue is the extent to which tying can be defended on the grounds that it facilitates price discrimination. This is because the main way in which patent tying increases patentee reward is by facilitating price discrimination. Whether facilitation of price discrimination can serve as a justification for tying hinges on its welfare effects. If price discrimination enhances welfare, the justification stands a greater chance of being accepted. But if, on the contrary, price discrimination harms welfare, the justification loses its validity.

The resolution of this question leads to the even broader theoretical question of what is the appropriate welfare standard for competition law.[876] This is

[874] Jefferson Parish Hospital District No. 2 v. Hyde, 466 U.S. 2, 9 (1984).
[875] Illinois Tool Works v. Independent Ink, 547 U.S. 28 (2006).
[876] Gregory J Werden, 'Consumer Welfare and Competition Policy' in Josef Drexl, Wolfgang Kerber and Rupprecht Podszun (eds), *Competition Policy and the Economic Approach: Foundations and Limitations* (Edward Elgar 2010). Kenneth Heyer, 'Welfare Standards and Merger Analysis: Why Not the Best?'

because price discrimination is often shown to harm consumer welfare by transferring consumer surplus to the producer, while raising or at least having ambiguous effects on total welfare.[877] Facilitation of price discrimination would be highly suspect under a consumer welfare standard, but would be more defensible under a total welfare standard. Even a total welfare standard is not enough to placate all critics of price discrimination. Christopher Leslie best encapsulates the sentiments of these critics when he asserts that:

> Chicago School adherents may argue that if tying gets the patentee more money, it is a transfer of wealth. We must ask, however, from whom the wealth is being transferred and whether such a transfer is appropriate. It may be that the transfer of wealth from consumers of the tied bundle to the patentee is justifiable because the consumers presumably benefit from the patented invention and from their consumption of the bundle. But part of the transfer comes from excluded sellers of the unpatented tied product, who are making fewer sales and perhaps being driven from that product market altogether. These sellers should not be subsidizing the patent holder because they are neither infringing the patent nor benefitting from it.[878]

The implicit challenge is whether competition law should be entirely agnostic as to the source of the welfare loss. Leslie believes that it should not.

There are diverse views on whether patent tying can be justified on the grounds that it enhances innovation incentives. Defenders of patent tying argue that it is needed to raise patentee reward. Patent tying is a particularly desirable means to do so because it can boost patentee reward without causing consumer welfare loss. Patent tying would effectively be a magic bullet as it would avoid the long-standing trade-off between dynamic efficiency gains and static efficiency losses that underpins patent

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(2006) 06–8. Russell Pittman, 'Consumer Surplus as the Appropriate Standard for Antitrust Enforcement' (2007) 07–9. Dennis W Carlton, 'Does Antitrust Need to Be Modernized?' (2007) 21 Journal of Economic Perspectives 155.

[877] Alan Devlin, 'A Neo-Chicago Perspective on the Law of Product Tying' (2007) 44 American Business Law Journal 521, 544.

[878] Christopher R Leslie, 'Patent Tying, Price Discrimination, and Innovation' (2011) 88 Antitrust Law Journal 811, 851.

protection. This purportedly could be achieved through price discrimination, which manages to transfer consumer surplus to the patentee without creating deadweight loss.

Critics assert that patent tying is not necessary to enhance patentee reward or that it creates deadweight loss. Some resort to the familiar argument based on patent scope and contend that patent tying allows the patentee to extend the scope of her reward beyond the patent grant. Some sidestep patentee reward and directly address innovation incentives, suggesting that tying does not enhance or even suppresses innovation incentives. Tying is shown to retard innovation in the tied product market. Tying has also been said to exert a strategic effect on rivals to reduce their incentives to invest in R&D in both the tying and the tied product markets.

Ward Bowman is generally credited with originating the idea that tying as a metering device is justified to the extent that price discrimination boosts patentee reward and hence innovation incentives.[879] He distinguishes between revenue-maximizing and monopoly-creating types of patent exploitation practices and contends that practices that merely allow the patentee to maximize her profit or extract surplus from consumers should be permitted.[880] Aaron Director and Edward Levi, two of the founders of the Chicago School, believe that price discrimination is a mere instance of utilization of the inherent market power granted by patent protection rather than an unlawful extension of it.[881] To these three commentators, tying should be permitted as a profit-maximizing type of patent exploitation.

[879] Ward S Bowman, Jr., 'Tying Arrangements and the Leverage Problem' (1957) 67 Yale Law Journal 19, 26–27.
[880] ibid 19–20.
[881] Leslie (n 878) 822.

It is argued that tying merely allows the patentee to attain or at least approach the full appropriation of the social value of her invention, which is desirable because anything less than full appropriation will lead to under-investment in R&D. In that vein, tying is socially efficient to the extent that it achieves or approximates perfect price discrimination.[882] The more complete is the appropriation of surplus, the closer innovation incentives approach the optimal level. Consumers are not irreparably harmed by the extraction of consumer surplus facilitated by tying. They are compensated by the resultant boost to innovation, together with other procompetitive benefits. It is postulated that 'tying sellers will devote the additional funds they secure through price discrimination to research product improvements, as well as to other activities, such as broadening their range of products and their number of retail outlets.'[883]

Herbert and Erik Hovenkamp extend the defense of patent tying further and argue that patent tying can boost patentee reward without accelerating the extraction of consumer surplus. To the extent this is true, Leslie's objection to tying will lose its pertinence. Tying can augment 'the innovator's returns even as consumer surplus is increased as well, and for reasons additional to the economies of joint provision that most tying arrangements create.'[884] They identify three mechanisms by which this can happen. First, tying can boost the output level for both the tying and the tied products.[885] Second, by raising output level, tying can help to lower the per unit costs of production.[886] If fixed costs are significant, which is likely to be the case for a

[882] ibid 826.
[883] ibid 821.
[884] Erik Hovenkamp and Herbert J Hovenkamp, 'Tying Arrangements and Antitrust Harm' (2010) 52 Arizona Law Review 925, 953.
[885] ibid.
[886] ibid 954.

patented product which requires substantial R&D, an increased level of output means that fixed costs are spread over an expanded output base, which results in lower fixed costs on a per unit basis.[887] Hovenkamp and Hovenkamp argue that '[t]he larger upfront innovation costs are in relation to production (variable) costs, the more sensitive the final product's price will be to the output rate.'[888] A prohibition of tying will hence significantly reduce the innovator's return by artificially restricting her output level.[889] Third, tying can boost the innovator's revenue by raising prices without a concomitant loss of output.[890] If a revenue increase augments the incumbent's innovation incentives, however, the same logic should imply that tying will lessen the innovation incentives of the incumbent's competitors in the tied product market. If a tie is successful, it will reduce rivals' revenue from the sales of tied product. The overall innovation performance of the market will depend on the relative impact on the incumbent and its competitors' innovation incentives. This theme will be picked up later.

Hovenkamp and Hovenkamp believe that none of these three mechanisms entails a loss of consumer surplus. This assertion is cast in doubt upon closer scrutiny. One of the Hovenkamps' gravest oversights is their exclusive focus on the incumbent to the neglect of its competitors. Many of their conclusions may be true as far as the incumbent is concerned, but will no longer hold when considered on a market-wide basis. Regarding the first mechanism of increased output level of the tying and the tied products, a tie in fact need not increase the output level for the incumbent's tying product.[891] While the output level for the incumbent's tied product is likely to increase,

[887] ibid 955.
[888] ibid.
[889] ibid.
[890] ibid 954.
[891] Michael D Whinston, 'Tying, Foreclosure, and Exclusion' (1990) 80 The American Economic Review 837, 845.

this increase is most definitely accompanied by a drop in the incumbent's competitors output.[892] Consumer welfare will be harmed if the overall output for the tied product market falls.

Regarding the second mechanism, it should be clear that it is merely derivative of the first. Per unit production costs drop solely due to an increase in output level. A tie need not increase the output level of the incumbent's tying product, while it most probably will raise the output level of the tied product. This leads to the question of whether the fixed costs of the tying product's R&D should be imputed to the tied product. If the tied product's technology is derived from the technology for the tying product, the argument for imputation would be strong. But if the tied product is only a staple product such as salt tablets used in a canning machine or nails in a nail gun, there would be no reason for imputation. There may be difficulty in demarcating a principled boundary between cases in which imputation is justified and cases in which it is not. Yet there are clear cases in which imputation is unjustified. Tying will not lower the per unit production costs in these cases.

Regarding the third mechanism of higher prices for the tied product, Hovenkamp and Hovenkamp observe that consumer welfare is unharmed because there is no concomitant output reduction. They argue that 'tied product output may actually increase, given that consumers who were not in the market at all until the tie took hold have entered.'[893] Again, market-wide output level for the tied product need not increase, especially if there is a significant number of consumers who stop purchasing the tied product following the tie.

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[892] ibid 844. Barry Nalebuff, 'Bundling as an Entry Barrier' (2004) 119 The Quarterly Journal of Economics 159, 182.
[893] Hovenkamp & Hovenkamp 954.

Even if the focus is confined to the incumbent, consumers of the incumbent's tied product could be harmed by the higher tied product prices. Assuming that we could offset the welfare gains and losses of different consumers in a Kaldor-Hicks manner, the overall welfare calculus for the incumbent's tied product consumers depends on the proportion of new customers who enter the market after the tie is imposed and existing customers who either have always purchased from the incumbent or have been forced to switch to the incumbent's product by the tie. If the tie results in higher tied product prices for all existing customers, overall consumer welfare is unlikely to have been improved. Existing customers will in all likelihood outnumber new customers. Even if we exclude the incumbent's long-term customers, there is still no reason to assume that the welfare gains to the new customers will necessarily outweigh the welfare losses to those who have been forced to switch to the incumbent's tied product. Tying is not the magic bullet that the Hovenkamps suggest. The possibility for tying to boost patentee reward without extracting additional consumer surplus is likely to be much more limited in reality. Jerry Hausman and Jeffrey MacKie-Mason are more realistic when they observe that 'price discrimination misallocates resources among purchasers and thus causes a decrease in social welfare. Customers facing different prices will have different marginal valuations for the patented good, so that some loss in consumer welfare-relative to a first-best world- is inevitable.'[894]

Hausman and MacKie-Mason advance a somewhat different argument in defense of patent tying. They assert that tying does not entail a trade-off between static welfare and dynamic efficiency to the extent that it relies on price discrimination.[895] Price discrimination boosts producer welfare by creating substantial static efficiency

[894] Jerry A Hausman and Jeffrey K Mackie-Mason, 'Price Discrimination and Patent Policy' (1988) 19 RAND Journal of Economics 253, 253–54.
[895] ibid 254.

gains. This may at first glance sound similar to the Hovenkamps' argument. Yet there is a subtle difference between the two. Both arguments suggest that price discrimination by way of tying boosts producer welfare. The Hovenkamps, however, focus on how tying can raise patentee reward and hence innovation incentives without inflicting additional consumer welfare loss while Hausman and MacKie-Mason are concerned with how price discrimination can boost production efficiency. They observe that short-term welfare gains 'occur because price discrimination allows patent holders to open new markets and to achieve economies of scale or learning. Further, even in cases where discrimination incurs static welfare losses, it may be efficient relative to other mechanisms, such as length of patent life, for rewarding innovators with profits.'[896] They go so far as asserting that price discrimination involving a patented product 'can be Pareto-improving under some circumstances'[897], meaning that short-term welfare gains and increased innovation incentives can be simultaneously attained.

According to Hausman and MacKie-Mason, there are two main sources of production efficiency gains from patent tying. The first is scale economies, which could be especially pronounced for a patented product because 'initial production facilities may be built well below minimum efficient scale owing to uncertainty about commercial success.'[898] The second is the learning-curve effect, under which unit costs are 'a decreasing function of cumulative output over time'[899]. They argue that these two sources of efficiency gains are important for a variety of reasons. With scale economies, Pareto improvement is no longer predicated on entry into new markets.[900] Moreover, price discrimination accompanied by scale economies may facilitate market entry 'when

[896] ibid 253.
[897] ibid 254.
[898] ibid 257.
[899] ibid.
[900] ibid.

the marginal cost associated with uniform-pricing output exceeds the reservation price in potential new markets.'[901] They describe the process as follows:

> Suppose there are two markets: one is relatively inelastic and profitable under discriminatory pricing, the other is relatively elastic and not very profitable. It is intuitively clear that the optimal uniform price will be set near the monopoly price for the first, inelastic market; this sacrifices the small profits in the second market for the greater profits in the first. At that relatively high uniform price, demand in the elastic, second market is relatively low, so that total output is low and marginal cost is high. Now let the firm discriminate. The price to the elastic market is dropped substantially, and as a result it elicits a big increase in output. With scale economies marginal cost falls. To a first-order approximation the uniform price was already profit-maximizing for the inelastic market, so that with all else equal the discriminatory price will not be much higher. But the elastic market has a flywheel effect: it drives marginal cost down through a large output increase.[902]

Despite their focus on static efficiency gains, Hausman and MacKie-Mason ultimately relate their discussion back to innovation incentives. They postulate that a patentee maximizes her profit if she is allowed to pursue unconstrained third-degree price discrimination.[903] If price discrimination can generate the same amount of patentee reward at a smaller static efficiency loss, it may be wise from an optimal patent policy perspective to allow price discrimination while shortening the patent term.[904] It should be obvious to the astute observer that Hausman and MacKie-Mason's procompetitive story ultimately comes down to the rather unremarkable assertion that price discrimination by way of tying may increase output. Hovenkamp and Hovenkamp focus on the demand-side and examine how the output increase benefits consumers. Hausman and MacKie-Mason direct their attention to the supply-side productive efficiency gains from such an increase. Their procompetitive story is heavily reliant on market entry, which requires a potential market for the patentee to enter. Absent such a

[901] ibid.
[902] ibid 260.
[903] ibid 263.
[904] ibid 254.

market, what is left are productive efficiency gains from scale economies and learning-curve effect.

2. Tying Undermines Innovation Incentives

Many arguments have been made against patent tying. Some of them focus on the impact of tying on patentee reward, arguing that it is not necessary to resort to tying to enhance patentee reward or that tying generates excessive reward to the patentee. Some directly tackle the relationship between tying and innovation incentives and assert that tying does not enhance or even reduces innovation incentives. It is argued that the incentive-reducing effect is particularly pronounced in the tied product market. Joseph Farrell and Michael Katz have proposed a model that illustrates this effect. Furthermore, it has been suggested that tying has the strategic effect of reducing rivals' incentives to invest in R&D in general.

The argument that tying is beneficial because it enhances patentee reward is premised on the two alternative notions, either that the patent system currently generates insufficient reward for patentees or that more is always better as far as patentee reward is concerned. The latter notion has already been dismissed in chapter II, where it was argued that innovation can be excessive. Given resource scarcity, at some point society would be better off investing additional resources elsewhere. The former notion implies that innovations that redound net social benefits are currently being shunned because the patent system, together with other appropriation mechanisms, provides insufficient returns to innovators to cover their R&D costs. There is no persuasive evidence that the current patent system generates

insufficient innovation incentives to attain the socially optimal level of R&D.[905] Given the prohibitive information costs that an optimal patent system, which can perfectly calibrate patentee reward to match innovation costs, entails, it is unlikely that definitive evidence in support of this argument can be furnished. Leslie further asserts that to support relaxing antitrust scrutiny of patent tying, firms that would take advantage of the opportunity to tie need to be more innovative than comparable firms that would shun tying. Such evidence simply does not exist.[906]

Patent tying has been harshly treated by both U.S. patent law and antitrust law for most of the last century. There is no indication that the innovation performance of the U.S. has suffered.[907] The burden of persuasion is thus upon those who advocate a change in the status quo. Absent convincing evidence to the contrary, there are no grounds for arguing that the current treatment of patent tying be relaxed to enhance innovation incentives. Moreover, even if the current patent system needs augmentation, it cannot be presumed that permitting tying is the best way to achieve it. If one applies the ratio test propounded by Louis Kaplow, we need to compare the ratio between patentee reward and static efficiency loss for each alternative means to determine the best way to provide additional innovation incentives.[908] We need to compare Kaplow's ratio for tying versus other means of augmenting patentee reward such as lengthening the patent term to decide the optimal way to do so.

A related argument is that allowing patentees to secure her reward through tying extends her rights beyond the scope of the patent grant. This relates back to the scope of the patent test examined in chapter VI. Defenders of patent rights invoke

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[905] Leslie (n 878) 825.
[906] ibid.
[907] ibid.
[908] Louis Kaplow, 'The Patent-Antitrust Intersection: A Reappraisal' (1984) 97 Harvard Law Review 1813, 1831.

the patent scope argument and contend that a patentee should be permitted to capture the full social value of her innovation, which includes the surplus that consumers may derive from the innovation, by whatever lawful means. This is well within the scope of her patent grant. Price discrimination, which can be implemented through tying, is needed for such surplus extraction. The implication is that a patentee should be given a carte blanche to engage in price discrimination. Recall the argument that patent scope is not a self-defining concept and that its meaning is informed by a calculus of the net social benefits of an innovation. The impracticality of ascertaining the net social benefits of every innovation means that patent scope remains an elusive concept and cannot be relied upon to provide meaningful support for the patentee's unrestricted right to engage in price discrimination.

Setting aside the question of the means for surplus extraction, the notion that a patentee should be allowed to capture the full social value of her innovation and anything less than that would amount to under-compensation is also highly contentious. Any value that is unclaimed by the initial innovator will serve as either surplus to consumers or spillovers to other industry participants. Many commentators seem to believe that there is nothing wrong with full appropriation of consumer surplus by the innovator. They view this as purely a wealth transfer about which competition law should be entirely agnostic. From a static efficiency perspective, competition law should not concern itself with wealth transfer and should refrain from intervening absent clear evidence of deadweight loss. This argument would be valid if the goal of competition law was solely to pursue economic efficiency. But if one genuinely regards protection of consumer welfare as one of the most important goals, if not the only goal, of

competition law enforcement, such agnosticism would be indefensible.[909] Consumer welfare loss is all the same regardless of whether it comes in the form of wealth transfer or deadweight loss.[910]

No less important is the issue of whether the innovator should be allowed to appropriate all the technological spillovers. There is considerable intuitive appeal to the idea that an innovator should be allowed to keep the full benefits of her innovation to the exclusion of other firms. After all, the value is created by the innovator. There are, however, a number of problems with this proposition. First, as has been noted earlier, any patentee reward beyond the private costs of innovation would amount to a windfall for the innovator. While we may not always be able to calibrate the patentee reward to match exactly the private costs of innovation, if it is clear that the patentee can cover her R&D costs without resorting to tying, it would be undoubtedly excessive and unnecessary to allow her to tie.

Second, numerous economists such as William Baumol have noted the importance of technological spillovers to economic progress. Baumol postulates that we would have been condemned to pre-Industrial Revolution standard of living if innovators had been allowed to preclude spillovers of all kinds.[911] Spillovers have also been an important element in the theoretical account of economic growth. They feature prominently in the growth models proposed by Nobel Laureate Paul Romer in the late 1980s and early 1990s.[912] Allowing full appropriation of technological spillovers would severely retard economic growth, which is clearly undesirable from a social perspective.

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[909] Pittman (n 876) 5.
[910] David C Hjelmfelt and Channing D Strother, Jr., 'Antitrust Damages for Consumer Welfare Loss' (1991) 39 Cleveland State Law Review 505, 507–08.
[911] Baumol (n 47) 125.
[912] Paul M Romer, 'Increasing Returns and Long-Run Growth' (1986) 94 Journal of Political Economy 1002. Paul M Romer, 'Endogenous Technological Change' (1990) 98 Journal of Political Economy S71.

Third, as Einer Elhauge argues, providing excessive returns to innovation would spur patent race.[913] There is a whole body of economic literature which has demonstrated that these patent races are often socially wasteful.[914] As was noted earlier, the reward to winning these races is substantial from a private perspective, but the investment made by the second innovator to try to win the race is often duplicative and redounds few additional benefits to society. If two innovators pursue the same technology, one of whom will be precluded from implementing the technology once she loses the patent race. Her R&D investment in the technology will become completely redundant. Therefore, despite its intuitive appeal, the notion that the innovator should be allowed to appropriate the entire surplus created by her innovation should be rejected.

Leslie offers an alternative, more defensible position regarding a patentee's right to engage in price discrimination. He notes that

> even if patentees enjoyed an affirmative right to price discriminate, that does not translate into a right to use metered tying to effectuate such price discrimination. Patents confer the right to exclude infringers, not the right to engage without interference in any particular pricing structure.'[915]

Therefore, at most, patent rights only allow the patentee to engage in price discrimination through the sale of the patented product. The patentee crosses the line when it enlists the help of an unpatented product to implement price discrimination. In response to this line of argument, some commentators have argued that if price discrimination is permissible and lawful, which by all accounts it is under U.S. antitrust law the Robinson-Patman Act notwithstanding, a patentee should be allowed to

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[913] Einer Elhauge, 'Tying, Bundled Discounts, and the Death of the Single Monopoly Profit Theory' (2009) 123 Harvard Law Review 397, 440.
[914] Dasgupta and Stiglitz (n 62). Reinganum (n 62). Tandon (n 62).
[915] Leslie (n 878) 833.

accomplish it through whatever lawful means.[916] There is no principled basis upon which to distinguish between price discrimination accomplished with and without the help of an unpatented product.

It has never been a tenet of competition law that a lawful end justifies all lawful means to accomplish that end. Competition law regularly attaches legal significance to the means used to achieve the end. In fact, the entire body of law under monopolization or abuse of dominance is premised on the idea that market power acquired through superior product or business acumen is perfectly acceptable while such power attained or defended through exclusionary conduct is not. Merger control also draws a distinction between market power achieved through organic growth as opposed to that attained by mergers or acquisitions. The former is beyond the purview of merger control laws while the latter is subject to full regulatory scrutiny. Therefore, it is untenable to argue that because price discrimination is lawful, implementing price discrimination through patent tying should automatically be exempted from scrutiny.

Some critics of patent tying have shifted their attention away from patentee reward and directly attacked the causal link between permitting tying and generation of innovation incentives. They have made various arguments as to why increased innovation incentives cannot justify patent tying. It has been argued that the fact that proceeds from possibly unlawful conduct could be used for a procompetitive purpose has never been allowed to excuse the conduct.[917] It is easy to see the myriad problems presented by such an argument. Competition law has never entertained defenses of anticompetitive conduct on the grounds that proceeds generated by the

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[916] Dennis W Carlton and Michael Waldman, 'How Economics Can Improve Antitrust Doctrine towards Tie-In Sales: Comment on Jean Tirole's "The Analysis of Tying Cases: A Primer"' (2005) 1 Competition Policy International 27, 35.
[917] Leslie (n 878) 830.

conduct will be put to procompetitive uses. As Leslie noted, 'such a defense has no limiting principle.'[918] This defense could even be applied to justify cartel conduct, the cardinal sin of competition law. Such application would be unthinkable, yet there does not seem to be any logical basis upon which to delimit this defense.

There can be no guarantee that the proceeds from tying will indeed be used for further R&D. If increased R&D investment is the grounds upon which tying is upheld, the defendant should somehow be held to account for her commitment to increase investment. A competition authority or the courts would be loathe to compel the defendant to dedicate a certain amount of profits to R&D. The imposition of such an obligation would require ongoing close scrutiny of the defendant's operations, which most authorities and courts would shun. Absent an effective enforcement mechanism, firms that practice tying must have a greater propensity to invest their proceeds into R&D than firms that obtain their patentee reward through other means for the defense to hold. There is simply no empirical evidence for such a tendency.[919] There are no reasons why these firms would not seek out more efficient uses of their resources. Even if such evidence existed, there would still be the question of whether there are superior, less competition-distorting, means to incentivize innovation, which takes us back to an analysis under Kaplow's ratio test. If firms that are allowed to tie do not plow back their extra proceeds from tying into R&D, the proceeds will simply amount to a windfall.

Moreover, not every technological product gives rise to the opportunity for tying. The likelihood and effectiveness of tying tends to be greater between complementary products.[920] Yet not every technological product is consumed with a complimentary product. Permitting tying in the hope of incentivizing innovation would

[918] ibid.
[919] ibid.
[920] Devlin (n 877) 540.

distort R&D investments toward technology and products that are consumed with complementary products. Returns to R&D generating products that are susceptible to tying would be artificially inflated. Unless there are reasons to believe that such technology is more socially beneficial than other kinds of technology, relying on tying as an innovation incentive generation mechanism would result in considerable distortion of resource allocation.[921]

Beyond the uncertain effects of increased returns from tying on innovation incentives, some critics have gone further and argued that tying positively undermines innovation incentives, especially in the tied product market.[922] This argument would have no application if the tied product was a staple product such as salt tablets or nails, which has limited room for technical improvement.[923] It would also have little relevance for aftermarket products such as spare parts whose technology is derivative of the primary product and for which there is little need for independent R&D. But it would be a pertinent consideration if the tied product incorporates a technology that is distinct and independent from the technology in the tying product, such as web browser and operating system.

Tying is said to reduce the innovation incentives of both the incumbent and its rivals in the tied product market. Tying reduces the incumbent's innovation incentives because its offering in the tied product market no longer competes on its merit. Consumers who need the incumbent's tying product or whose surplus from the tying product more than offsets their negative surplus from choosing the incumbent's tied product will opt for the bundle. What attracts consumers to the tied product is no longer the quality of the tied product but that of the tying product. If investing in R&D

[921] Elhauge (n 913) 440.
[922] Leslie (n 878) 834.
[923] ibid 841.

for the tying product boosts the sales of both the tying and the tied products, it would be perfectly rational for the incumbent to focus on the tying product.[924] Meanwhile, tying reduces the incumbent's rivals' innovation incentives because it shrinks the size of the market from which rivals can recover their R&D investments. If the market that is left to a rival after a successful tie is insufficient to cover its fixed R&D costs, the rival will refrain from investing in R&D or exit the market altogether. This is especially likely to be the case if the tying and the tied products are perfect complements, meaning that they have no separate use without each other.[925]

This is an application of the insight developed by Michael Whinston that under certain market conditions, a monopolist tying product supplier can make use of tying to prevent a rival in the tied product market from recovering its fixed costs of entry, thereby foreclosing the rival from the market.[926] R&D costs are fixed costs that the rival will need to recoup in order to survive in the tied product market. Moreover, foreclosing rivals in the tied product market by undermining their innovation incentives may serve important strategic purposes for the incumbent. For instance, tying can help the incumbent protect its position in the tying product market.[927] Oftentimes the most likely challenger to the incumbent's position in the tying product market are rivals in the tied product market. If the incumbent is so successful in its foreclosure strategy that it has created a double-level entry requirement—where an entrant will be required to enter both the tying and the tied product markets at the same time—being required to invest in the R&D for both products means that the entrant will be able to devote fewer

[924] ibid 843.
[925] Alessandro Avenali, Anna D'Annunzio and Pierfrancesco Reverberi, 'Bundling, Competition and Quality Investment: A Welfare Analysis' (2013) 43 Review of Industrial Organization 221, 225.
[926] Whinston (n 891) 844.
[927] Dennis W Carlton and Michael Waldman, 'The Strategic Use of Tying to Preserve and Create Market Power in Evolving Industries' (2002) 33 RAND Journal of Economics 194.

resources to the tied product as compared to where the entrant can limit itself to single market entry.[928]

Apart from denying rivals market share from which to recover R&D costs, there are other ways in which the incumbent can undermine its rival's innovation incentives. Joseph Farrell and Michael Katz develop a model in which a monopolist seller of the tying product weakens or perhaps even destroys the innovation incentives of rivals through a number of strategies which they label as price squeeze, exclusionary squeeze, and investment squeeze respectively.[929] Under price squeeze, the incumbent intentionally lowers the price of its tied product below what an independent tied product supplier would charge in order to exert competitive pressure on rivals.[930] Under exclusionary squeeze, the incumbent uses interface or product incompatibility to squeeze rivals or 'demands a low price for an independently supplied [tied product] as a quid pro quo for granting access.'[931] Lastly, under investment squeeze, the incumbent 'has strategic incentives to invest in improving its variant of [the tied product] in order to drive the leading independent supplier of [the tied product] to price its (still better) product lower than it otherwise would.'[932] By forcing its rivals in the tied product market to lower their prices, the incumbent extracts surplus from that market through sales in the tying product market, thereby weakening rivals' incentives to invest in R&D in the tied product market. It is possible that in the short run, the incumbent's increased R&D more than makes up for the reduced R&D by rivals. In the long run, however, once rivals' products deteriorate to a point where they are no longer competitive against the

[928] Leslie 844.
[929] Joseph Farrell and Michael L Katz, 'Innovation, Rent Extraction, and Integration in Systems Markets' (2000) 48 The Journal of Industrial Economics 413, 415.
[930] ibid.
[931] ibid.
[932] ibid.

incumbent's product, the incumbent will lose incentives to invest further in R&D for the tied product. Innovation in the tied product market as a whole suffers.

Jay Pil Choi outlines in another theoretical model the circumstance under which tying can harm rivals' innovation incentives in the tied product market.[933] In his model, Choi demonstrates that foreclosure of rivals from the tied product market itself is not a profitable strategy and is not the source of competition harm of tying. In fact, he argues that the profitability of tying to the incumbent does not hinge on exit of rivals from the tied product market.[934] The incumbent's increased market share in the tied product market at rivals' expense itself has no independent competitive significance. What matters is that increased market share reduces rivals' innovation incentives. Choi postulates that a firm's innovation incentives are directly proportional to its market share.[935] Increased market share allows the incumbent to spread its R&D costs over a larger number of units.[936] Innovation also becomes more profitable because any cost reduction will benefit a larger output.[937] Meanwhile, tying reduces rivals' market share in the tied product market, thereby reducing their innovation incentives.[938] Therefore, it can be said that 'market foreclosure in the product market translates into foreclosure in the R&D markets'.[939] A tying arrangement gives the incumbent greater incentives to price aggressively, which inevitably will increase the incumbent's market share. An increased market share will help lower the per unit cost and the overall profitability of

[933] Jay Pil Choi, 'Tying and Innovation: A Dynamic Analysis of Tying Arrangements' (2004) 114 The Economic Journal 83, 86.
[934] ibid.
[935] ibid 92.
[936] ibid 86.
[937] ibid 93.
[938] ibid.
[939] ibid 94.

innovation. By pursuing a tie, the incumbent is effectively making a strategic commitment to more aggressive R&D.[940]

Choi argues that tying is not a profitable strategy only on account of its effect on price competition. The costs of increased price competition outweigh the benefits of increased market share. Choi believes that this 'confirms the Chicago school's central contention that tying cannot be used for the purpose of leveraging monopoly power … and highlights the importance of considering the innovation game in the analysis of tying.'[941] But once one considers the dynamic rents that can be created through R&D, 'bundling may be a profitable strategy. The change in R&D incentives through bundling enables the tying firm to capture a larger share of dynamic rents.'[942] Whether tying is ultimately profitable to the incumbent entails a balance between the harm from increased price competition and the benefits of capturing a larger share of dynamic rents.[943]

Choi concludes that 'bundling is always social welfare reducing even if it can be privately optimal.'[944] There are two main sources of reduction of social welfare. First, tying distorts the innovation incentives of both the incumbent and its rivals in the tied product market.[945] The incumbent is investing too much while rivals are investing too little. The distorted R&D results in asymmetric production costs between the incumbent and its rivals, which create allocative inefficiency.[946] Second, some consumers will be forced by the tie to forego consumption of the tying product, which

[940] ibid 93.
[941] ibid 85.
[942] ibid 93.
[943] ibid 94.
[944] ibid 96.
[945] ibid 97.
[946] ibid.

will cause a loss of consumer welfare.[947] Choi, however, cautions that his conclusions regarding social welfare are sensitive to the R&D specifications in his model.[948] Under alternative specifications, it may be more efficient for the incumbent to undertake all the R&D.[949] R&D competition can promote diversity of research approaches, which is particularly important if success in research is highly uncertain, but can also result in duplication of research efforts.[950] Ultimately the desirability of R&D competition requires a weighing of these two conflicting considerations.

The arguments on balance refute the proposition that generation of innovation incentives provides additional justification for patent tying. There is a dearth of evidence that the current patent system provides insufficient innovation incentives and needs to be supplemented by patent tying. Even if such evidence existed, it has not been proven that tying is the best way to achieve this purpose. Relying on tying to boost innovation incentives will distort R&D investments and cause potential innovators to focus on technologies that lend themselves to tying, regardless of the relative net social benefits of such innovation.

Allowing a patentee to reap patentee reward may also allow her to extend her rights beyond the scope of her patent. If Christopher Leslie's interpretation of the patent scope argument is correct, a patentee should only be allowed to practice price discrimination on the patented product. She should not be allowed to commandeer a related product to achieve a result that she could not attain solely with the patented product. There is also little support for the argument that a patentee should be allowed to appropriate the entire surplus created by her innovation. This has been shown to be

[947] ibid.
[948] ibid.
[949] ibid.
[950] ibid.

highly detrimental to social welfare and progress. Lastly, theoretical insights suggest that tying retards innovation in the tied product market. Models by Whinston, Farrell & Katz, and Choi all espouse this view. As far as tying is concerned, innovation incentive arguments do not deserve special weight. Patent tying should not be subject to preferential treatment vis-à-vis other kinds of tying arrangements.

3. Implications for Developing Countries

The relationship patent tying and innovation incentives could have significant implications for technological upgrade by developing countries. There are two main ways in which developing countries could attain technological upgrade: domestic innovation and technological adaptation from foreign sources. A developing country could improve its domestic technological capacity either by native innovation or importing technologies from other countries. The foregoing discussion focuses on innovation incentives generated by the domestic patent system and therefore should have little relevance for technological adaptation. In any case, competition rules on patent tying are unlikely to have significant impact on the incentives of foreign technology owners to export technology. Discussion in chapter III suggests that the legal rules that feature most prominently in the decision-making process of foreign technology owners are those that implicate the robustness of patent protection and those that affect the relative profitability of the various avenues for technology transfer. Rules on patent tying do not fall within either category. The extent to which patent tying is permitted by competition law, however, helps to determine the financial reward accruing to the patentee, which in turn may influence her incentives to further invest in R&D.

Innovation incentives will only be relevant to developing countries to the extent that there is domestic innovation capacity. This means that the foregoing discussion will probably have little salience to the production countries. For the technological adaptation and the proto-innovation countries, there would be a need to balance other welfare consequences of patent tying against any potential dynamic efficiency benefits if patent tying is found to promote innovation. Fortunately for our purposes, a trade-off is largely avoided because patent tying was not found to be conducive to innovation. The incentive effects of patent tying on innovation were found to be ambiguous at best. In fact, there is evidence that patent tying forecloses innovation in the tied product market, which is where a developing country firm is likely to gain a foothold on the ladder of technological advancement and innovation. If anything, innovation incentive considerations further bolsters the argument for developing country authorities to take patent tying seriously. There is no need for these authorities to treat patent tying more leniently in order to spur innovation.

C. Patent Tying in the Developing Country Context

Having addressed the relationship between patent tying and innovation incentives and established that generation of innovation incentives does not justify a more lenient treatment for patent tying, our attention is now turned to how patent tying can impact technological upgrade by developing countries. By foreclosing the tying and the tied product markets from rivals, tying can take away the incentives of a potential competitor from developing countries to acquire the technological capacity to enter a new market.

1. Enhancement of Market Power in the Tying Product Market

Even though discussion about the anticompetitive effects of tying tends to focus on foreclosure in the tied product market or the effects of price discrimination, economists have noted that tying can be deployed to protect the incumbent's market power in the tying product market. According to Elhauge, there are three ways in which this can be accomplished, which include '(1) foreclosing enough of the tied [product] market to deter or delay entry into the tying [product] market, (2) raising the costs of a partial substitute that constrains tying market power, or (3) transferring market power from a waning technology to the next-generation technology.'[951]

There are a number of alternative formulations of the first theory. Under the first formulation, as Whinston postulated, the incumbent forecloses sufficient market share in the tied product market such that rivals cannot cover their fixed costs of entry.[952] This may lead to a dearth of competitive suppliers of the tied product, which would require future entrants into the tying product market to enter the tied product market as well. This would create what is known in the literature as the double-level entry requirement.[953] To the extent that it is more difficult for a new entrant to enter two markets at the same time, perhaps due to a lack of available funding, constrained management capability to manage simultaneous entry into two markets, or, to the extent the two markets require different technology, limited R&D capability, successful foreclosure of the tied product market will raise effective entry barriers for the tying product market and help protect the incumbent's market position.

The second formulation of this theory is situations in which future entrants into the tying product market are likely to evolve from a tied product

[951] Elhauge (n 913) 417.
[952] Whinston (n 891) 840.
[953] Bowman, Jr. (n 879) 34. Devlin (n 877) 553–54.

producer.[954] This formulation was inspired by the *U.S. Microsoft* case in which the U.S. Department of Justice argued that Microsoft was trying to exclude Netscape in the browser market to prevent it from emerging as a successful middleware that will replace the Windows operating system or at least help other rival operating system developers surmount the applications barrier to entry.[955] By keeping new entrants in the tied product market at bay, tying can help the incumbent to forestall potential challengers in the tying product market.

The third formulation is based on a model developed by Dennis Carlton and Michael Waldman.[956] Theirs is a two-period model featuring two firms, one of which is monopolist in the tying product that also sells the tied product.[957] The second firm can enter the tied product market at some cost in either the first or the second period.[958] It can also enter the tying product market in the second period, but only after it has already entered the tied product market. The two firms are assumed to produce tying products of equal quality but the second firm is assumed to produce a superior tied product if it does enter the market.[959] Carlton and Waldman show that the incumbent would only have the incentive to tie if there was a threat of entry into the tying product market in the second period.[960] There are two reasons for this. The first is Whinston's standard foreclosure story that tying prevents the rival from recovering its fixed costs of entry.[961] The second is that tying eliminates the rival's incentive to enter the tying product market. They explain that

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[954] Elhauge (n 913) 417.
[955] United States v. Microsoft Corp., 253 F.3d 34, 55 (D.C. Cir. 2001).
[956] Carlton and Waldman, 'The Strategic Use of Tying to Preserve and Create Market Power in Evolving Industries' (n 927).
[957] ibid 195.
[958] ibid.
[959] ibid.
[960] ibid.
[961] ibid 196.

> since in our model the return to the alternative producer of entering the primary market is capturing more of the surplus associated with its superior complementary product, when tying stops the alternative producer from entering the complementary market, it also stops the rival from entering the primary market.[962]

The second theory is based on a scenario described by Whinston in his seminal article on tying. The idea is that the incumbent faces competition from a competitively supplied inferior substitute in the tying product market. The incumbent sells both the tying product and the tied product, which are complements[963], while the rival only offers the tying product.[964] If the incumbent sells both products separately, its pricing in the tying product market will be constrained by the inferior substitute.[965] Prices will not be brought down to a competitive level because the substitute is an imperfect one, but the incumbent will be prevented from charging the monopolist price. In that case, it would be beneficial for the incumbent to try to get rid of rivals in the tied product market through tying.[966] Upon exit of the rivals, the inferior tying product supplier will have no source of supply for the tied product and will be forced to leave the market as well. This removes the constraint on the incumbent's pricing in the tying product market. Tying 'can be viewed as raising (to infinity) the cost of the rival to produce a desirable package for the consumer.'[967]

The third theory was developed by Dennis Carlton and Michael Waldman. They develop a variant of a two-period network externalities model in which there is a monopolized tying product and a tied product that is characterized by network externalities in the first period and a new product emerging in the second period that

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[962] ibid.
[963] Whinston (n 891) 852.
[964] ibid 850.
[965] ibid 852.
[966] ibid 853.
[967] Dennis W Carlton and Michael Waldman, 'Theories of Tying and Implications for Antitrust' (Cornell University The Johnson School 2005) #24-06 18.

serves as a superior substitute for the tied product combination.[968] Carlton and Waldman show that the tying product monopolist can acquire a monopoly position in the market for the emerging product in the second period by pursuing a tie.[969] This allows the monopolist to retain its monopoly profits even after its original tying product has been rendered obsolete. They characterize the tie as allowing the monopolist to 'swing' or transfer its initial monopoly in the tying product to the market for the newly emerging product.[970]

The foregoing theories have varying degrees of applicability to developing countries depending on their technological capacity. The extent to which foreclosing entry into the tying product market shielded by patent protection should be of concern to a developing country depends on the likelihood that the country at issue will produce such an entrant. The first thing we can say is that the impact of patent tying on incentives of technology transfer is unlikely to be an important consideration. Recall that competition rules on patent exploitation practices are most relevant to technology transfer when they implicate the robustness of patent protection and when they regulate licensing, which may affect the choice of means of technology transfer. Competition rules on tying has no impact on the strength of patent protection. Nor does it have any bearing on the ease of involuntary technology transfer such as imitation or reverse engineering. These rules also do not affect the choice among trade of technological goods, foreign direct investment, and licensing as the means of technology transfer. Whether tying is permitted or not should not have a decisive impact on the

[968] Carlton and Waldman, 'The Strategic Use of Tying to Preserve and Create Market Power in Evolving Industries' (n 927) 196.
[969] ibid 197.
[970] ibid 196.

relative profitability of the three means of technology transfer. Therefore, tying overall is unlikely to be of great relevance as far as technology transfer is concerned.

As for the development of domestic technological capacity, tying would be of enforcement interest if it prevents a domestic firm from entering the tying product market and challenging the incumbent's market position by acquiring a comparable innovation. If it were possible to enter the tying product market with a low-tech substitute, then the foreclosure effect from tying may not retard technological upgrade. While there may still be static welfare consequences, they are not of particular concern for our purposes. Assuming that entry into the tying product market requires comparable technological capacity as the incumbent's, foreclosure of the tying product market will be of little pertinence to the production countries. They are unable to innovate to produce the required technology regardless of the competition rule on tying. As for the technological adaptation countries, to the extent that their technological capacity limits them to the imitation or replication of inferior technology, Whinston's account of a competitively supplied inferior substitute in the tying product market will be more relevant. A firm in a technological adaptation country will be likely to compete with a global technological leader with a technologically inferior offering. As for the proto-innovation countries, to the extent that they can produce technologies that are directly competitive with the incumbent firm's technology, all the foregoing theoretical accounts will be of interest.

2. Foreclosure in the Tied Product Market

The quintessential theory of harm for tying is foreclosure in the tied product market. It is this competitive harm that has attracted the most attention from the courts and the commentators. The majority in the U.S. *Kodak* case characterizes

elimination of competitors in the tied product market as 'facially anticompetitive and exactly the harm that antitrust laws aim to prevent.'[971] The then-Court of First Instance concentrates on foreclosure effects in the tied product market in the *EU Microsoft* case. Academic commentary on the competitive harm of tying has also been heavily tilted toward this issue.[972] The volume of literature on this issue is probably too vast to be examined thoroughly in this chapter. Instead, attention will be paid to two of the leading theoretical models of foreclosure proposed by Michael Whinston and Barry Nalebuff.

Oftentimes the tied product is a complementary product that must be used together with the tying product. Cartons for aseptic packaging machines and spare parts and repair services for photocopying machines come to mind. Therefore, the ensuing discussion is applicable to scenarios involving complementary products that were alluded to in the last chapter. Foreclosure is premised on the idea that the incumbent leverages its market power in the tying product market and extends it to the tied product market. In a way, foreclosure describes the consequence of leveraging on the incumbent's rivals. Concerns about monopoly leveraging that were raised in the last chapter will be addressed here.

Not every commentator is ready to accept that foreclosure of the tied product market is a worthy concern for competition law. Adherents to the Chicago School have long argued that leveraging of market power and the related problem of foreclosure are unrealistic. They reach this conclusion by way of a number of critical oversimplifying assumptions. These include no entry or fixed costs for tied market

[971] Eastman Kodak Co. v. Image Technical Services, Inc., 504 U.S. 451, 478 (1992).
[972] Bruce H Kobayashi, 'Does Economics Provide a Reliable Guide to Regulating Commodity Bundling by Firms? A Survey of the Economic Literature' (2005) 1 Journal of Competition Law & Economics 707, 727–37. Dennis W Carlton and Michael Waldman, 'Tying, Upgrades, and Switching Costs in Durable Goods Market' (2005). Jay Pil Choi and Christodoulos Stefanadis, 'Tying, Investment, and the Dynamic Leverage Theory' (2001) 32 RAND Journal of Economics 52.

rivals; constant marginal costs for the tied product, which requires the absence of scale economies in production; sufficient competition in the tied product market to drive prices to the marginal cost; and the existence of rivals' capacity capable of supplying the entire market on short notice.[973] It is easy to see that these are highly improbable if not unrealistic assumptions that are unlikely to hold in many real-world markets. Once these assumptions are relaxed, foreclosure of rivals in the tied product market becomes a highly pertinent concern. Tying can result in rival exit from the tied product market. It can also 'reduce rival competitiveness by impairing rival efficiency, entry, existence, aggressiveness, or expandability.'[974] Foreclosure of rivals in the tied product market, however, will not be a competitive concern if the tying and the tied products are used in fixed ratio and if the tied product has no independent use apart from with the tying product.[975]

The leading article on how tying facilitates foreclosure in the tied product market is probably Whinston's 1990 seminal article in the American Economic Review. This article can be said to be the first post-Chicago challenge to the Chicago School's stranglehold on the theoretical thinking on tying.[976] Whinston affirms that based on the assumptions adopted by the Chicago School commentators on the competitiveness of the tied product market, leveraging and foreclosure are either impossible or unrealistic concerns.[977] One of the critical changes made by Whinston to these assumptions is that scale economies exist in the production process for the tied good, which implies an oligopolistic structure for the tied product market.[978] The way tying accomplishes

[973] Elhauge (n 913) 413.
[974] ibid.
[975] ibid 416.
[976] Nalebuff (n 892) 162–63.
[977] Whinston (n 891) 838.
[978] ibid 839.

foreclosure is by reducing rivals' sales in the tied product market to a level below that which is necessary to cover the fixed costs of entry. Knowing this, potential rivals would refrain from entering the market and existing competitors would exit. Tying would be a profitable strategy for the incumbent firm in light of 'its potential for altering the market structure of the tied good market.'[979]

Whinston's model, however, would only be valid if the incumbent could make a credible pre-commitment to tie prior to market entry.[980] The significance of tying is that it 'represents a commitment to foreclose sales in the tied good market, which can drive its rival's profits below the point where remaining in the market is profitable.'[981] Whinston characterizes the exclusionary effect of tying as 'strategic foreclosure', which is predicated on a credible pre-commitment to tie.[982] The credibility of the pre-commitment is important because once entry has occurred, the rational strategy for the incumbent is always to accommodate the entrant by lowering output and abstaining from tying.[983] Once the incumbent has committed to tie, however, it can only continue to derive monopoly profits from the tying product if it also makes substantial sales of the tied product, which requires the incumbent to snatch significant market shares from rivals.[984] A pre-commitment to tie could be made through product design or adjustments to the production process, both of which entail significant sunk costs.[985]

Barry Nalebuff has proposed another influential model on foreclosure. Although his model shares some similarities with Whinston's model, one crucial

[979] ibid.
[980] ibid.
[981] ibid 840.
[982] ibid.
[983] ibid.
[984] ibid.
[985] ibid 839.

difference between them is that Nalebuff's model does not require a credible pre-commitment to tie.[986] Credibility of commitment is not an issue under Nalebuff's model because tying would still be the rational strategy for the incumbent after successful market entry. This is because regardless of the success of the foreclosure strategy, the incumbent's profits are higher with a tie than without.[987] In his numerical example, the incumbent's profits are 50% higher if the products are tied even if entry deterrence fails.[988] In his model, there is an incumbent that produces both the tying and the tied products, and a possible new entrant that can enter either market but not both.[989] The incumbent has market power in both markets.[990] Nalebuff calls such a firm a 'multigood monopolist'.[991] Tying deters market entry through two effects, which Nalebuff calls 'the pure bundling effect' and the 'bundled discount effect'.[992] The former refers to how 'the incumbent and challenger simply translate their independent pricing strategy into the bundled case without reoptimizing.'[993] The latter arises when the bundle offers a discount from the original a-la-carte prices.[994] Nalebuff summarizes the essence of the tying strategy as follows:

> A firm that has only some components of a bundle will find it hard to enter against an incumbent who sells a package solution at a discount. This will be especially true when the consumers have positively correlated values for the components of the package or when the components are complements. Bundling also softens the harm done by a one-product (or limited line) competitor. The rival takes fewer customers away, and prices do not fall as far.[995]

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[986] Ahlborn, Evans and Padilla (n 873) 327.
[987] Nalebuff (n 892) 159.
[988] ibid 183.
[989] ibid 159.
[990] ibid.
[991] ibid 183.
[992] ibid 168.
[993] ibid.
[994] ibid.
[995] ibid 183.

The crux of the foreclosure effect is that the price reduction from the bundled discounts hurts the new entrant's profitability but not the incumbent's.[996] Tying therefore gives the incumbent a relatively low-cost but powerful weapon to deter entry.

To the extent that the production of a tied product is less technologically intensive than that for the tying product, foreclosure of the tied product market will be a more serious concern to developing countries than foreclosure in the tying product market or other kinds of competitive harm of tying. This is likely to be the case in many instances. For example, a printer cartridge is likely to be much easier to produce than a laser printer and a web browser is easier to design and create than a full-fledged operating system. Oftentimes a tied product may be a stepping stone for a new entrant to acquire familiarity with part of the technology before moving on to the more technologically sophisticated tying product. Therefore, foreclosure of the tied product market could mean the loss of a precious opportunity for technological upgrade. This means that aside from all the static welfare effects from the foreclosure of the tied product market, about which Whinston and Nalebuff seem to be ambivalent[997], there are good reasons for developing countries to focus on foreclosure of the tied product market and take a particularly vigilant attitude toward tying.

D. Doctrinal Approaches

1. The United States

Tying is one area of vertical restraint law in which the U.S. courts have displayed a relatively consistent stance over time. With a number of notable exceptions

[996] ibid 170.
[997] Whinston (n 891) 845. Nalebuff (n 892) 181.

such as *Jerrold Electronics*[998] and *Fortner II*[999], the U.S. courts have regularly condemned tying arrangements where there is sufficient market power in the tying product market ever since the *Motion Picture Patents* case in 1917.[1000] As suggested earlier, judicial attitude toward tying, which often involved patented products in the early cases, was somewhat influenced by the perception that the patentee was attempting unlawfully to extend her market power from the patented product into an unpatented product market. In the *International Salt* case, the U.S. Supreme Court declared that 'it is unreasonable, per se, to foreclose competitors from any substantial market.'[1001] This rule was reaffirmed in the *Northern Pacific Railway* case, in which the Court compared tying to price fixing, market allocation, and group boycotts and reiterated that tying is subject to the per se rule.[1002] In *Fortner I*, the Court reiterated its animosity toward tying, asserting that tying arrangements 'generally serve no legitimate business purpose that cannot be achieved in some less restrictive way.'[1003]

With the Chicago School's growing influence on U.S. antitrust law, some began to question the suitability of the per se rule for tying. Advocacy for reconsideration of the per se rule culminated in Justice Sandra Day O'Connor's concurrence in *Jefferson Parish*, in which she contended that '[t]he time has therefore come to abandon the "*per se*" label and refocus the inquiry on the adverse economic effects, and the potential economic benefits, that the tie may have.'[1004] She proceeded to call for the abandonment of the per se rule in favor of the Rule of Reason for tying

[998] United States v. Jerrold Electronics Corp., 187 F. Supp. 545 (E.D. Pa. 1960), aff'd per curiam, 365 U.S. 567 (1961).
[999] United States Steep Corp. v. Fortner Enterprises, 429 U.S. 610 (1977).
[1000] Motion Picture Patents Co. v. Universal Film Mfg. Co., 243 U.S. 502, 516 (1917).
[1001] International Salt Co. v. United States, 332 U.S. 392, 395 (1947).
[1002] Northern Pacific Railway Co. v. United States, 356 U.S. 1, 5 (1958).
[1003] United States Steel Corp. v. Fortner Enterprises, 394 U.S. 495, 503 (1969).
[1004] Jefferson Parish Hospital District No. 2 v. Hyde, 466 U.S. 2, 35 (1984).

arrangements. Justice O'Connor failed to carry the day. Her call for the abandonment of the per se rule was met by Justice Stevens' pronouncement that it is far too late to question the proposition that at least certain tying arrangements are illegal per se.[1005] *Jefferson Parish* reaffirmed the qualified per se rule from earlier cases, under which, to prevail in a tying claim, the plaintiff is required to prove that: (1) there must be separate tying and tied products; (2) there must be evidence of coercion on the part of the seller to force buyers to accept the tie; (3) the seller must possess sufficient market power to coerce buyers to accept the tie; (4) there must be foreclosure of a not insubstantial amount of commerce in the tied product market.[1006]

The majority in that case, however, did make a concession to Justice O'Connor. It held that the per se rule should only apply when the defendant's market power passes a sufficient threshold such that it can effectively coerce customers to accept the tie. This continues the trend that had begun in *Fortner II* in which the Court insisted on serious proof of market power before condemning a tie.[1007] Prior to that, the Court had been quick to assume market power on the part of the defendant. In *International Salt*, the Court inferred market power from the fact that the defendant's machines were patented.[1008] In *Northern Pacific*, the Court based its finding of market power on the considerable size and strategic location of the defendant's land holding.[1009] *Jefferson Parish* heightened the standard for market power. It has been understood to stand for the notion that the defendant must possess at least a 30% market share in the tying product market to benefit from the qualified per se rule.[1010]

[1005] Jefferson Parish, 446 U.S. at 9.
[1006] Hovenkamp, *Federal Antitrust Policy: The Law of Competition and Its Practice* (n 390) s 10.1.
[1007] Fortner Enterprises, 429 U.S. at 620-22.
[1008] International Salt, 332 U.S. at 395.
[1009] Northern Pacific, 356 U.S. at 7-8.
[1010] Hovenkamp, *Federal Antitrust Policy: The Law of Competition and Its Practice* (n 390) s 10.3a.

Hylton and Salinger believe that the Court's tightening of the requirement of market power reflected the Chicago School's influence, even though there was no formal alteration in the doctrine.[1011] The federal district courts in the U.S. dismissed significantly more tying cases in the two decades following *Jefferson Parish* than in the preceding two decades.[1012] Justice O'Connor might have lost the battle, but probably won the war in the end.

2. The European Union

While tying is mostly addressed as a restrictive agreement under Section 1 of the Sherman Act and Section 3 of the Clayton Act, bundling, as it is called in the EU, belongs to the province of abuse of dominance under Article 102 of the Treaty on the Functioning of the European Union ('TFEU').[1013] This largely reflects the fact that the market power requirement under Article 102 TFEU is lower than that under Section 2 of the Sherman Act. The amount of market power sufficient to trigger concerns for tying in the U.S. roughly corresponds with that connoted by a dominant position under EU law.[1014] Yet the reliance of different legal provisions cannot obscure the considerable similarity in the substantive legal standards across the Atlantic. Given the general tendency of the EU competition law to take a stricter approach, it perhaps should come as no surprise that it has adopted a standard akin to the qualified per se rule under U.S. antitrust law for bundling. The anomaly here is probably the strict approach in the U.S. EU law has demonstrated greater flexibility for technical bundling than contractual

[1011] Keith N Hylton and Michael Salinger, 'Tying Law and Policy: A Decision-Theoretic Approach' (2001) 69 Antitrust Law Journal 469, 476.
[1012] David S Evans, 'Tying: The Poster Child for Antitrust Modernization' in Robert W Hahn (ed), *Antitrust Policy and Vertical Restraints* (Brookings Institution 2006) 85.
[1013] Ahlborn, Evans and Padilla (n 873) 306.
[1014] ibid.

tying, as can be seen in the EU *Microsoft* case, in which the-then Court of First Instance was more demanding in terms of evidence for foreclosure effects than in past bundling cases.

EU stance on contractual tying is largely informed by two cases, *Hilti* and *Tetra Pak II*. Hilti concerned nail guns used in the construction industry. At the time of the case, Hilti was the largest manufacturer of nail guns in the EU, with a slightly over 50% market share.[1015] Nail guns are used with cartridge strips and nails, which were all subject to patent protection.[1016] Hilti's competitors produced compatible nails which can be used on Hilti's nail guns. Hilti then resorted to business practices and legal measures to prevent customers from using competitor-manufactured nails on its nail guns. These include tied sale of nails and cartridge strips to end customers[1017], the refusal to honor guarantees if a customer uses competitor-manufactured nails on Hilti nail guns[1018], and refusal to supply cartridges which might be resold[1019]. These practices gave rise to the tying claim.

The European Commission condemned Hilti's practices on the grounds that 'independent producers of Hilti-compatible nails have been severely restricted in their penetration of the market' and that 'customers have been obliged to rely on Hilti for both cartridges and nails for their Hilti nail guns.'[1020] Although the European Commission did not formally adopt the analytical structure of the qualified per se rule, elements of the rule were clearly present in its reasoning. There were separate tying and tied products of nail guns and cartridges on the one hand and nails on the other

[1015] *Eurofix-Bauco v. Hilti* [1988] OJ L65/19, para. 14.
[1016] *Hilti*, para. 12.
[1017] *Hilti*, para. 30-31.
[1018] *Hilti*, para. 44.
[1019] *Hilti*, para. 41.
[1020] *Hilti*, para. 74.

hand. There was examination of Hilti's market power in the market for the tying products of nail guns and Hilti-compatible cartridge strips.[1021] The reference to customers being obliged to rely on Hilti's cartridge and nails indicated coercion. Lastly, the Commission probably went further than what was required under the qualified per se rule in *Jefferson Parish* to refer to the foreclosure of independent producers in the market for Hilti-compatible nails.

Nonetheless, the Commission's condemnation of Hilti's business practices on the grounds that they 'leave the consumer with no choice over the source of his nail and as such abusively exploit him'[1022] suggests that the Commission did not rely on foreclosure effects to find tying practices abusive. If deprivation of consumer choice suffices to prohibit a tie, the rule is probably tantamount to per se illegality.[1023] The only way out for the defendant would be to offer justifications. On appeal, the-then Court of First Instance rejected Hilti's argument that there was no tie because the nail gun, the cartridge strip, and the nails constituted one product system and that its tying practices were justified by safety concerns.[1024]

Tetra Pak II was another leading case in which Tetra Pak, the world leading manufacturer of liquid packaging machines, was accused of tying the supply of non-aseptic packing machines to the sale of non-aseptic cartons, purchase of maintenance services, and the supply of spare parts. Tetra Pak produced both aseptic and non-aseptic packaging machines and the cartons that were used with them. Tetra Pak defended the tie on the grounds that the machines and the cartons formed integrated packaging systems and that the tie was objectively justified based on

[1021] *Hilti*, para. 74.
[1022] *Hilti*, para. 75.
[1023] Ahlborn, Evans and Padilla (n 873) 314.
[1024] Case T-30/89, *Hilti v. Commission* [1991] ECR II-1439, para. 66, 118.

technical reasons, product liability concerns, public health, and the protection of goodwill.[1025] These arguments were rejected by the Commission, the-then Court of First Instance, and Court of Justice. The Court of First Instance also rejected Tetra Pak's objective justifications[1026], which was affirmed by the Court of Justice[1027].

There was much discussion as to whether the machines and the cartons could be treated as an integrated system based on a natural or commercial link between them. Although the discussion was phrased in the specific language of Article 102(d), it is clear what was being argued was whether the machines and the cartons should be treated as two separate products. The Court of First Instance and the Court of Justice both rejected the argument that machines and cartons constitute an integrated packaging system on the grounds that there were independent producers specializing in the production of non-aseptic cartons to be used with third-party machines.[1028]

Yet in an observation that suggests that there is still some difference between the inquiry into commercial usage and natural link under Article 102 and the determination of separate products under U.S. law, the Court of Justice noted that the list under Article 102 is not exhaustive and that a tie between two products can still be deemed abusive even if the 'tied sales of the two products are in accordance with commercial usage or there is a natural link between the two products in question'.[1029] If two products cannot be deemed distinct in light of commercial usage or the natural link between them, a tie would be impossible as there are no two separate products to tie the sale of. This shows that the Court of Justice sees the inquiry into commercial usage or natural link more in terms of justifications for the tie than product definition.

[1025] Case T-83/91, *Tetra Pak v. Commission* [1994] ECR II-755, para. 79.
[1026] ibid, para. 138.
[1027] Case C-333/94 P, *Tetra Pak International SA v. Commission* [1996] ECR I-5951, para. 36.
[1028] *Tetra Pak (CFI)*, para. 82; *Tetra Pak (CJ)*, para. 36.
[1029] *Tetra Pak (CJ)*, para. 37.

In the EU *Microsoft* case, the Court of First Instance was confronted with Microsoft's tying of the Windows operating system with Window Media Player. Moving beyond its rather stringent approach to tying from the previous cases, the Court did not presume the existence of foreclosure effects or overlook the issue completely.[1030] Instead, the Court spent much effort in ascertaining how the foreclosure of competitors harmed consumers.[1031] The determination of the legality of a technical tie required the Court to consider both anticompetitive effects from the tie and possible objective justifications for it. The *Microsoft* court seemed to require the following four elements to establish a successful technical tying claim:

> the existence of a dominant position in a distinct product market that can be tied, the practice of forcing an undertaking to buy two products at the same time, the existence of the limited competition in the market for the tied good and the lack of objective justification for the tying practice by the dominant partner.[1032]

One last case to mention is the *Google Android* case, in which Google has been accused of tying its Google Search app with its Play Store and tying Google Chrome, its web browser, with its Play Store and the Google Search app.[1033] The Commission reiterates the four elements of a tying claim: that there are two separate products, that the undertaking is dominant in the tying product market, that customers are coerced to accept the tie, and that the tie is capable of restricting competition.[1034] In particular, the Commission notes that even though under the classic tying cases of *Hilti* and *Tetra Pak*, one can 'assume that the tying of a specific product has by its very nature a foreclosure effect',[1035] the General Court modified this anticompetitive effect

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[1030] Case T-201/04, *Microsoft v. Commission* [2007] ECR II-3601, para. 857.
[1031] *EU Microsoft*, para. 1054-58, 1088.
[1032] Aleksander Maziarz, 'Tying and Bundling: Applying EU Competition Rules for Best Practices' International Journal of Public Law and Policy 268.
[1033] *Google Android* [2018] OJ L149/22, [2018] ____ CMLR ____.
[1034] *Google Android*, para. 741.
[1035] *Google Android*, para. 749.

requirement in *Microsoft* to require a showing that the conduct is capable of restricting competition. The Commission proceeds to enumerate three criteria upon which restriction of competition is to be evaluated:

> (i) reduces the incentives of users to choose a product from among those of other suppliers than the dominant undertaking; (ii) creates disincentives for customers of the dominant undertaking to offer the products of other suppliers of the product that is tied; or (iii) encourages third parties to develop products that implement only the underlying technology on which is based the product that is tied.[1036]

The Commission concludes the alleged ties are capable of restricting competition as they give the Google Search app and Google Chrome a significant competitive advantage.[1037]

E. Conclusion

On account of the uncertain welfare effects of theoretical models which have demonstrated the competitive harm of tying[1038], the apparent ubiquity of tying[1039], and the many procompetitive justifications for the practice[1040], some commentators have advocated permissive treatment for tying, going so far as to argue for per se legality. What this chapter seeks to illustrate is that solely based on innovation incentive considerations raised by patent protection for the tying product, there are no persuasive reasons to alter the prevailing rule for tying in developing countries, whatever the rule may be. These considerations do not call for a more lenient treatment of patent tying in the hope of boosting patentee reward and hence innovation performance. If anything, the balance of the argument seems to point in the opposite

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[1036] *Google Android*, para. 750.
[1037] *Google Android*, paras. 773-76, 896-99.
[1038] Kobayashi (n 972) 736.
[1039] Hylton and Salinger (n 1011) 500–02.
[1040] Jean Tirole, 'The Analysis of Tying Cases: A Primer' (2005) 1 Competition Policy International 1, 14–17.

direction. There is no reason for developing countries to give much weight to innovation incentive concerns in tackling patent tying. No special adjustment to the prevailing analytical framework for tying is necessary in light of dynamic efficiency considerations. Meanwhile, it has been illustrated that the various theories of harm of tying predicated on foreclosure of the tying and the tied product markets would have implications for the technological upgrade of developing countries. Foreclosure of developing country rivals in the tying and the tied product markets may retard the acquisition of technological capacity by those firms.

Therefore, developing countries could do well to adopt for patent tying the prevailing approach to tying in advanced economies. One possibility would be the qualified per se rule promulgated by the U.S. Supreme Court in *Jefferson Parish*, under which, to prevail in a tying claim, the plaintiff is required to prove: (1) there must be separate tying and tied products; (2) there must be evidence of coercion on the part of the seller to force buyers to accept the tie; (3) the seller must possess sufficient market power to coerce buyers to accept the tie; (4) there must be foreclosure of a not insubstantial amount of commerce in the tied product market.[1041]

[1041] Hovenkamp, *Federal Antitrust Policy: The Law of Competition and Its Practice* (n 390) s 10.1.

VIII. CONCLUSION

This thesis has proposed a developmental approach to the patent-competition interface that takes into account an individual country's technological capacity. It argues that innovation incentives matter less for most developing countries for a variety of reasons. These include the tendency of the patent system to overcompensate innovators, the availability of other appropriation mechanisms such as lead time that allow the innovator to monetize her innovation, and the lack of potential innovators with the appropriate technological capacity in most developing countries to take advantage of the incentives generated by the patent system. The patent system in these countries of course are not only geared toward domestic innovators. Foreign innovators such as multinational corporations may take into account the patentee reward generated by the patent system in developing countries. This, however, is mostly only true for developing countries with a large domestic market. For the numerous developing countries that only possess a small domestic market, it is highly unlikely that the patentee reward provided by their patent system will feature prominently in foreign innovators' investment decisions. These countries can by and large ignore the innovation incentive externalities generated by their domestic patent systems. The conclusion is thus that for most developing countries, innovation incentives deserve little weight in calibrating an appropriate approach for the patent-competition interface. This conclusion may well lead to increased intervention and possible negative externalities on the innovation incentives of foreign innovators. Yet it may be justifiable from the perspective of a developing country jurisdiction seeking to protect the welfare of its downtrodden consumers.

Developing countries differ in their technological capacities and can be roughly classified into production countries, technology adaptation countries, and

proto-innovation countries. The production countries are only capable of production and implementation of basic technology. The technology adaptation countries are in a position to adapt and implement sophisticated imported technology or perhaps to imitate or reverse engineer such technology. Proto-innovation countries, of which there are only a few, possess the capacity to innovate in at least some industries. For the vast majority of developing countries bereft of genuine innovation capacity, the main vehicle for technological progress is technology transfer from foreign innovators. Therefore, for these countries, dynamic efficiency considerations are concerned with incentives of foreign innovators to transfer technology and not innovation incentives as such. Technology transfer can be divided into voluntary and involuntary technology transfer. Voluntary technology transfer can be undertaken in three mains ways: importation of technological goods, FDI, and licensing. Involuntary technology transfer consists of outright copying and reverse engineering.

Competition law regulation of patent exploitation practices interacts with the three means of technology transfer in myriad and complex ways. Impact on the three means of voluntary technology transfer also varies depending on the type of patent exploitation practice at issue. For practices that implicate the robustness of patent protection, a permissive attitude toward these practices may increase the country's attractiveness as a destination of technology transfer and may skew the mode of technology transfer to FDI and licensing, which tend to produce greater benefits in terms of enhancement of technological capacity. This is especially true for licensing. The relationship between competition law regulation of patent exploitation practices and FDI tends to be industry- and activity-specific. The positive impact seems to be much more pronounced in countries that are otherwise viable FDI destinations. The impact also tends to be stronger for research-related activities as opposed to non-research-

related ones such as sales and marketing. The actual amount of technology transfer through FDI is dependent on the bargaining power of the host country at issue. It is possible for FDI to take place without significant technology transfer. Host countries often need to put pressure on the foreign investor to undertake meaningful technology transfer.

The thesis thus proposes a framework for approaching the patent-competition interface that takes into account the technological capacity of individual countries. For production countries without meaningful innovation capacity, the primary consideration when approaching the patent-competition interface would be static efficiency and consumer welfare. The technology adaptation countries will need to take into account how their approach to the patent-competition interface affects the incentives of foreign technology owners to transfer their technology. This means that patent exploitation practices that implicate robustness of patent protection, such as unilateral refusal to license, deserve special attention. Relaxed regulation of licensing restrictions may steer potential licensors toward licensing. Proto-innovation countries will require an industry-specific approach to the patent-competition interface as their technological capacity varies across industries. For industries in which the country at issue possesses some innovation capacity, the patent-competition interface will require a balancing of the interests of consumers, imitators, and innovators. This presents the thorniest policy dilemma for developing countries. The thesis proceeds to illustrate this complex framework for the patent-competition interface with reference to two patent exploitation practices, unilateral refusal to license and patent tying.

Underlying this thesis is the belief that one size does not fit all in competition law. The approaches developed in the leading jurisdictions of the U.S. and EU, which are continental-sized industrialized economies, could be ill-suited for

developing countries, especially those with a small economy. Developing countries face policy considerations that have little relevance for industrialized economies, such as the need to prioritize economic growth, the need to alleviate abject poverty, and the need to promote technology transfer. By putting forward a developmental approach to the patent-competition interface, this thesis implicitly challenges the drive for convergence that has dominated the global competition law community over the last two decades and puts forward a case for informed divergence. The drive for convergence may serve the interests of the industrialized economies but neglect the different policy considerations facing developing nations. The international mainstream approach to the patent-competition interface may only reflect the policy choices of the leading jurisdictions with scant regard for the development needs and market realities of the developing countries. There is a risk that the drive for convergence will repeat the debacle for developing countries that was inflicted upon them by the TRIPS Agreement in the realm of intellectual property. It is hoped that it has presented a cogent case for that.

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