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COMMENTARY

Patent disclosure requirements and benefit sharing: A counterfactual case of Morocco's argan oil

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ARTICLE INFO

Article history:
Received 5 February 2007
Received in revised form
2 May 2007
Accepted 17 June 2007
Available online 23 July 2007

Keywords:
Biodiversity
Patents
Benefit sharing
Disclosure requirements
Argan oil
Morocco

ABSTRACT

This article uses the seemingly promising case of Morocco's argan oil to assess the value of patent disclosure requirements (PDRs) as a policy instrument aimed at improving the sharing of biodiversity benefits. After introducing the disclosure requirements debate and discussing relevant features of the argan oil case, I construct a simple counterfactual by asking: "How would PDRs have changed benefit sharing in the argan oil case?" From this case, three practical considerations emerge that shed a realistic, if cautious, light on the marginal value of PDRs as a benefit sharing mechanism: (1) PDRs require an accompanying national biodiversity regime but their relative value is inversely proportional to regime strength (2) PDRs should be assessed based on the additional compliance incentives they provide and median, not blockbuster, patent values and (3) the alternative to no PDRs and no regime is not zero benefits. While these considerations are inherently country-specific, PDRs should generally be assessed at the margin rather than in vague conceptual and aggregate ways.

1. The debate on patent disclosure requirements

As the substantive achievement of the 1992 Rio Earth Summit, the Convention on Biodiversity (CBD) has three objectives:

> "[1] the conservation of biological diversity, [2] the sustainable use of its components, and [3] the fair and equitable sharing of the benefits arising out of the utilization of genetic resources, including by appropriate access to genetic resources and by appropriate transfer of relevant technologies, taking into account all rights over those resources and to technologies, and by appropriate funding." (CBD, Art. 1)

The third benefit sharing objective continues to generate serious debate, especially regarding the implementation and logistics of feasible benefit sharing arrangements. The CBD commits Contracting Parties to take "all practicable measures" (Art. 19.2), including "legislative, administrative or policy measures" (Art. 19.1) to support this objective. It also repeatedly emphasizes that access and benefit sharing should be based on "mutually agreed terms" (Art. 15.4, 15.7, 19.2), suggesting the need for private contracts and negotiation. Of the more than 50 countries that have adopted measures on biodiversity access and benefit sharing, however, only half have established sufficient administrative capacity and regulations to govern negotiations

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doi:10.1016/j.ecolecon.2007.06.017

effectively (Louafi and Tobin, 2005). The dialogue on the role of legislation in achieving the access and benefit sharing objective remain relevant and lively (see Rosendal, 2006; Tvedt, 2006).

In 1999, work began to operationalize the benefit sharing objective of the CBD. The process ultimately yielded the detailed and concrete *Bonn Guidelines* (Secretariat of the Convention on Biological Diversity, 2002), which *inter alia* encourage countries to require patent applicants to disclose the country of origin of any genetic resources or traditional knowledge used in the invention. While there are ongoing negotiations to make these guidelines legally-binding, there remain misgivings and debate about the feasibility of benefit sharing arrangements given the broader multilateral policy context. One common perception is that the Agreement on Trade Related Aspects of Intellectual Property (TRIPS) at the WTO directly impedes progress towards the CBD benefit sharing objective and should be amended accordingly (see Sarnoff and Correa, 2006). Indeed, widespread concerns about conflicts between the TRIPS Agreement and the CBD shaped the 2001 Doha Declaration, which instructed the Council for TRIPS to examine the relationship between the TRIPS Agreement and the CBD in order to "take fully into account the development dimension" (Paragraph 19).

The Council for TRIPS has in response discussed and debated (i) whether or not there is any conflict between the TRIPS Agreement and the CBD, and (ii) whether or not the TRIPS Agreement needs to be modified to ensure greater mutual supportiveness between the two (see WTO Secretariat, 2006 for an overview of these discussions). Developed country members such as the U.S., Canada, Japan, and Australia see little or no conflict between the TRIPS Agreement and the CBD. They argue that these agreements have different objectives and deal with different subject matter and support a tailored national approach to achieve the benefit sharing objective of the CBD. This approach involves the creation of a national regime in the source country to administer access permits, benefit sharing contracts, and penalties for non-compliance. In their view, far from impeding the CBD, functional and effective patent systems outside the source country play a critical role in facilitating the negotiation of private contracts and generating monetary benefits to share.

In contrast, most developing country WTO members are concerned about possible conflicts between the national sovereignty over biodiversity mandated by the CBD and the granting of private rights over inventions based on biodiversity offered under the TRIPS Agreement (through national patent legislation). In their view, a national approach alone would fail to capture complex transboundary uses of biodiversity, put administratively weak developing countries as well as indigenous and local communities at a clear disadvantage in negotiations, and create an idiosyncratic nation-by-nation system with high transaction costs. Inspired by the *Bonn Guidelines*, they advocate patent disclosure requirements (PDRs) as a substantial supplement to national regimes. Specifically, they propose an amendment to the TRIPS Agreement that would require patent applications for inventions based on biological resources and/or traditional knowledge to disclose (i) the source country, the specific source within this country and the country of origin; (ii) evidence of prior informed consent where required by the source country; and (iii) evidence of fair and equitable benefit sharing where required by the source country. In this proposal, failure to disclose this information would delay examination of the application and render unenforceable any granted patent rights.[2]

Discussion of this PDRs proposal in the TRIPS Council and other fora has been quite heated. While the debate has a North–South flavor, the line drawn between developed and developing countries is often somewhat blurred (see, for example, Rosendal, 2006; Tvedt, 2006). Opponents argue that PDRs would contribute very little to CBD objectives and introduce additional and unnecessary uncertainty into the patenting process. This might encourage inventors to seek other means of protecting biodiversity-based inventions such as trade secrets or, worse, discourage such research altogether. Proponents retort that the PDRs amendment would set a uniform international requirement and would thereby reduce uncertainty and improve transparency relative to an idiosyncratic national system. To this broad and conceptual debate about PDRs, this paper aims to add concrete insights from the specific, and in many ways representative, case of Morocco's argan oil.

2. Argan background

The argan tree (*Argania spinosa* (L) Skeels) is endemic to Morocco, where it is second in coverage only to the cork oak tree and is ecologically indispensable. Its deep roots are the most important stabilizing element in the arid ecosystem, providing the final barrier against the encroaching deserts (see Morton and Voss, 1987). The tree resists domestication and remains extremely difficult to transplant or establish on any meaningful scale outside Morocco. In southwest Morocco, argan forests are invaluable to the indigenous Berber tribes who rely on the peculiar tree for firewood and charcoal for heating and cooking; wood for carpentry and construction; fodder for livestock; and oil for culinary, cosmetic and medicinal purposes. Indeed, nearly 90% of the rural economy in the region depends on argan-based agroforestry (Benchekroun, 1990). This heavy local dependence on the argan tree has shaped clear and well-established, albeit complex, tenure arrangements that grant usufruct rights to the fruit of sections of the forest to specific villages and households (see Lybbert et al., 2002). In recognition of its ecological value and local economic importance, the argan forest region was declared a UNESCO Biosphere Reserve in 1998.

The oil extracted from the argan tree's fruit exhibits notable cosmetic and nutritive properties. Growing appreciation for these properties over the 1990s sparked some fundamental changes in argan oil markets with implications for both conservation and development in the region (Lybbert et al., 2003, 2002). This expanding interest in the oil attracted external cooperation and funding, eventually leading to the creation of dozens of dedicated argan oil cooperatives (*e.g.*,www.targanine.com). Presently, after roughly a decade of argan oil market expansion and differentiation, there are two broad argan oil markets, one culinary and the other cosmetic. Culinary argan oil, historically available only in or near the argan forest region, is now marketed in relatively limited quantities across Morocco, Europe, the Middle East, and North America. Since this market spans dusty village souks and upscale restaurants in New York

[2] This proposal is available as document IP/C/W/474 through the document search facility at www.wto.org.

and Paris, retail prices range widely from $7/l to twenty or thirty times this much, making it one of the most expensive edible oil in the world. Because global oil production is somewhere in the neighborhood of two million liters per year (El Yousfi, 1988; M'Hirit et al., 1998) and most never leaves the argan region, however, the total annual value of the culinary oil market outside the argan region is probably only in the $2 million to $3 million range.

The market for cosmetic argan oil as a natural moisturizer and as an active ingredient in other cosmetic treatments has likewise expanded over the past decade, albeit at a slower rate. The extensive traditional knowledge of the Berbers of the argan forest region, who have used argan oil cosmetically for centuries, has always intrigued travelers (see M'Hirit et al., 1998) and began attracting attention from researchers decades ago. Introducing cosmetic argan oil into high value international markets has required research into both the chemical properties of the oil and potential extraction and processing technologies. By the late 1990s a few European cosmetic firms, including Yves–Roche and Colgate–Palmolive, were experimenting with argan-based moisturizers. Presently, two distinct segments of this cosmetic market have emerged. The first consists of pure argan oil marketed as a natural moisturizer or added directly to a moisturizer or other cosmetic product. Vendors of culinary argan oil typically also have a line of such cosmetic products (*e.g.*, ABSIM, Targanine Cooperatives, Zamouri Spices, *etc.*). Several other firms specialize exclusively in these argan-based cosmetic products (*e.g.*, Naturelle d'Argan, Cool Essentials, *etc.*).

The second segment of the cosmetic argan market is more research-intensive and consists of extracts from argan oil, leaves, fruit, and seeds that are marketed as active ingredients in cosmetic treatments. This research began in the 1980s with the French cosmetic firm Pierre Fabre Dermo-Cosmétique and Moroccan chemists such as Zoubida Charrouf. Pierre Fabre launched its first line of anti-aging moisturizers called Argane™ in 1986. It currently markets seven argan-based products under its Galénic brand, including enriched argan oil with argan peptides and nutritive masks and creams, which retail primarily in Europe for $47 per 30 ml. In 2005, the Galénic brand had worldwide sales of $88 million, but if internet offerings of Galénic products are any indication of product sale shares, the Argane™ product line constitutes only a tiny slice of its sales, perhaps a couple million dollars. The other major player in this research-based cosmetic argan market is Cognis Care Chemicals, a specialty chemicals company focused on skin and beauty care additives and ingredients that works with Zoubida Charrouf to develop argan-based treatments. In contrast to Pierre Fabre, Cognis has developed a range of argan-based active ingredients for cosmetics, which it is currently testing clinically and plans to sell to cosmetic companies for use in retail products.

Both Pierre Fabre and Cognis have sought patents for various argan-based inventions. Table 1 displays all patent applications and grants with argan-related claims and provides a paper trail of this argan related research activity. Pierre Fabre submitted the first argan patent application in France in 1983 and currently holds three active patents that appear to cover their current Argane™ product line. Cognis began its argan research around 2000 and also has three active patents worldwide, with six more patent applications under examination. There has been only one argan-related patent application that is not from either of these two firms and little or no patentable research activity beyond this. Furthermore, the argan patents in Table 1 are likely the most valuable patents based on Moroccan biological resources. Thus, the value of PDRs to Morocco is not likely to be much more than the value of PDRs in the argan case.

Table 1 – Argan-related patent grants and applications in the U.S. and Europe

Patent assignee	Patent grants and *applications* [app. date/grant date]	Argan-related claims
Pierre Fabre	FR 2,553,788 [1983/85]*	Stable lipid extract of argan fruit
Dermo-Cosmétique	US 5,376,379 [1993/94]	Composition of liposomes with argan oil as active ingredient
	FR 2,724,663 [1994/96]	Enriched argan oil
	FR 2,756,183 [1996/98]	Composition of argan oil and argan peptides
Cognis S.A.	US 7,105,184 [2001/06]	Skin or hair treatment with composition containing an argan leaf extract
	EP 1,347,768 [2003/?]	
	EP 1,339,421 [2003/05]	Preparation containing native proteins from the argan plant
	US 2004042996 [2001/?]	
	EP 1,276,460 [2003/06]	Saponins from an argan plant extract
	US 2003138394 [2002/?]	
	W 2005039610 [2004/?]	Extract of pulp of argan fruit
	EP 1,572,222 [2005/?]	Acne, seborrhea, and unwanted hair treatment containing an argan plant extract
	US 2006083794 [2003/?]	
Ekomaat OOD	*BG 108,720* [2004/ ?]	Acne and inflamed skin treatment containing argan oil (~67%) and other oils

FR = France, EP = European Patent, W = PCT Application, BG = Belgium. Expired patents denoted by *.

3. Disclosure requirements counterfactual

Consider a few features of the argan case that make it a useful case for a counterfactual assessment of PDRs. First, the argan case involves biodiversity in a developing country with demonstrated potential in high value markets. While the market value of biodiversity in other cases may be substantially greater (*e.g.*, rosy periwinkle in Madagascar), these widely-cited blockbuster stories are clearly the exception and seem to overly-influence the current PDRs discussion. Argan oil has not and may not ever enjoy this kind of blockbuster success, but this only makes the case more broadly representative. Second, the patenting activity in cosmetic argan research makes PDRs relevant in this case, an obvious precondition for any useful counterfactual exercise. These patents used both biological materials and traditional knowledge from the argan forest region and would have clearly triggered PDRs. Third, customary tenurial arrangements in the argan region create clear and secure usufruct rights to trees in the argan forest. These established harvesting rights would have facilitated the process of identifying

stakeholders and negotiating benefit sharing agreements had PDRs been in force. Lastly and importantly, the argan tree is endemic to Morocco. Because it remains difficult to domesticate and propagate in Morocco, let alone elsewhere, this case dodges one potentially prickly problem with PDRs: the distinction between source and origin and the related specification of who should benefit and how. During recent discussions at the Council for TRIPS at the WTO, this confusion about source and origin was frequently raised as a concern with a PDRs (*e.g.*, see WTO Secretariat, 2006 p.41). To appreciate this promising aspect of the argan case, suppose that the opposite were true and that the argan tree was originally native only to Morocco but had since been established *in situ* in several other countries as is very common. How should beneficiaries then be defined? How should any associated benefit stream be partitioned between them? In the argan case, we can safely ignore these tough questions. The persistent endemism of the argan tree also limits annual production and eases related concerns about widespread *ex situ* supplies of argan source material.

How would PDRs have altered the argan case? Suppose that PDRs conforming to the current proposal had been added to U.S. and European patent laws in the 1980s. Consider the counterfactual effects of the three disclosure requirements: (i) country of source and origin, (ii) prior informed consent, and (iii) fair and equitable benefit sharing.

3.1. *Country of source and origin*

The first requirement is easily satisfied in the case of any of the argan patent applications shown in Table 1: Source = Morocco, Origin = Morocco. Although there may be a day in the future when *ex situ* stocks of argan trees or fruit add some complexity, with near certainty all of the inventions in Table 1 used biological materials from Morocco. With complete certainty, these materials and any traditional knowledge is of Moroccan origin. The marginal value of PDRs in this case must therefore rest on the second and, especially, the third requirements.

3.2. *Prior informed consent*

Under the current PDRs proposal, prior informed consent and benefit sharing are only required if the country of source or origin has established a national regime for governing biodiversity access and benefit sharing. Morocco lacks such a regime, so Pierre Fabre and Cognis would have had no obligation under PDRs to seek consent or share benefits. To avoid this rather uninteresting counterfactual, we must assume that Morocco had in place a functional national regime, including necessary consent and benefit sharing legislation.[3] In order to focus on the value of PDRs as a supplement to this regime, assume that Morocco's biodiversity legislation applied to all uses of biological resources (as it should) rather than just those that yield patent applications. Assume further that this biodiversity legislation and regime embodied the recommendations of the *Bonn Guidelines* (Secretariat of the Convention on Biological Diversity, 2002), including the use of Material Transfer Agreements (MTA) to proscribe permitted uses, grant prior consent, and specify the (negotiated) terms of benefit sharing.

Under these assumptions and in a world of imperfect compliance, PDRs could have changed the argan case by affecting incentives to comply with this prior consent requirement. *Ex ante*, the existence of PDRs and the threat of examination delays and patent revocation could have provided additional incentives to Pierre Fabre and Cognis researchers to seek prior consent through an MTA. With the assumption that Morocco had established a national regime that covered all uses of biological resources, the size of these *additional* incentives would have hinged on (i) the capacity of this regime – in the absence of PDRs – to incite users to seek consent and (ii) researchers' *ex ante* plans for ultimately filing patent applications. With a strong regime and limited patent expectations, the additional incentives provided by PDRs would have been trivial. Instead of speculating on the strength of our hypothetical Moroccan regime, consider researchers' upfront patent plans. Both Pierre Fabre himself and Zoubida Charrouf, a co-author on the Cognis patents, took somewhat circuitous routes to their respective argan research programs. Like most researchers, their's was not a linear path with foreseeable and patentable inventions. Combined with a possible lack of awareness or concern about these distant patent complications, this would have reduced the perceived expected penalty of patent threats. Unless the Moroccan regime was too weak to provide any incentives on its own, PDRs would have likely provided only weak additional incentives to sign an MTA *ex ante*. While in theory these added incentives would have affected users other than Pierre Fabre and Cognis who initially hoped to file argan patents, it is unclear whether there were any other aspiring argan patent holders in this case. If any did exist, they would have likely been too small to change the substance of this counterfactual, so we remain focused on these two.

Although PDRs mandate prior informed consent, in practice they would have also created incentives for *ex post* compliance. If Pierre Fabre and Cognis had initially neglected to seek an MTA that granted prior consent, PDRs would have provided significant incentives for them to cooperate with the Moroccan regime in negotiating an *ex post* MTA (even with possible fines or other penalties) as their research progressed. These incentives would have become substantial as the value and patentability of their argan inventions became clearer, not least because preparing these applications would have involved lawyers with a clear awareness of such legal technicalities. Since they would have only been relevant if the researchers had initially failed to comply, the magnitude of these additional *ex post* incentives would have decreased as the homegrown incentives for initial compliance provided by the Moroccan regime increased. If the regime was weak and required time to mature and build capacity, these *ex post* incentives may have been particularly important.

3.3. *Fair and equitable benefit sharing*

Perhaps the greatest practical challenges facing a hypothetical Moroccan national regime relate to benefit sharing, including identifying and involving relevant stakeholders and beneficiaries, establishing an appropriate sharing mechanism, and negotiating with users of biological materials a structure of

[3] A weaker form of this assumption, that there was legislation but no functional regime, is entirely likely and would raise practical and important considerations that are outside the scope of this counterfactual.

benefits that is fair and equitable (see Secretariat of the Convention on Biological Diversity, 2002 for related guidelines). The objective of our counterfactual, however, is not to explore these challenges but to assess the value of PDRs within a Moroccan national regime relative to the same regime without PDRs. Thus, we can ignore many of these challenges as they pertain to benefit sharing in general, independent of PDRs. The marginal value of PDRs ultimately depends on how the additional incentives provided by PDRs change the probability of complying by negotiating benefit sharing terms in an MTA and on the benefits generated thereby. In particular, the marginal value of PDRs based on argan benefits in year τ is given by:

$$MV_{\tau}^{PDRs} = \sum_j [\Pr(\text{Compliance}_j|\text{PDRs}) - \Pr(\text{Compliance}_j|\text{noPDRs})]\text{Benefits}_{j\tau}$$

where j indexes users of biological materials – in the present case, Pierre Fabre and Cognis – and the term in square brackets is simply the change in the probability of compliance due to PDRs. This annual expected benefit equation structures our PDRs counterfactual.

Consider first the compliance incentives PDRs would have provided for Pierre Fabre and Cognis. These incentives would have turned on these users' *ex ante* expectation of ultimately filing a patent application and on the compliance incentives provided by the Moroccan regime independent of PDRs *via* penalties, enforcement and monitoring. Again, there are good reasons to expect the perceived expected penalty of patent threats from PDRs to be quite low. And again, there is an important temporal dimension to these additional incentives in practice. If overall incentives were too weak initially to compel compliance, these PDRs incentives would have grown stronger for Pierre Fabre and Cognis (and weaker for any who gradually abandoned their patent aspirations) the longer an MTA was postponed. While their lawyers would have recognized that the longer they waited the worse their bargaining position would become and would have preferred to sign an MTA early in the process, they may have become involved only when preparations for a patent application began. At this late stage, patent threats, along with the examination and ultimate publication of the "evidence of … fair and equitable benefit sharing" they would have to provide in their patent application, could have shaped the benefit sharing terms distinctly in Morocco's favor. As before, the marginal value of PDRs is likely higher in countries with initially weak regimes that provide weak compliance incentives. If Morocco's regime started weak and matured slowly, the marginal value of PDRs could have therefore been relatively high.

Next, consider the benefits in Eq. (1). Benefit sharing terms normally stipulate a royalty rate on sales and often include fixed upfront and periodic maintenance payments. These terms may also specify non-monetary benefits such as capacity building, training and technology transfer. These non-monetary benefits could have been important in the argan case, but quantifying them is beyond the scope of this paper. Whatever their value to Morocco would have been, note simply that the portion attributable to PDRs is some fraction of this amount depending on the first term in Eq. (1). As for monetary benefits, I assume that any fixed payments primarily cover administrative costs within the Moroccan regime and focus on monetary benefits in the form of royalties on annual sales.

Currently, total annual sales in argan markets are probably in the range of $5 million to $7 million. Half or more of these sales occur in the booming culinary oil market and cosmetic market for pure argan oil products, both of which are out of the jurisdiction of PDRs since they use no patents. The relevant benefit stream for PDRs must come from sales by Cognis and Pierre Fabre. Cognis' argan ingredients with patents or patents pending are under development or clinical trial. Without trying to assess potential royalties that Cognis might ultimately generate, we can at least note that any such benefits are both unrealized and uncertain.

The remaining annual argan sales are generated by Pierre Fabre's Galénic Argane products. Since each of these products appears to be covered by at least one patent, royalties on these sales would have been partly attributable to PDRs. These products have been on the market for nearly 20 years in France, but appear to be almost trivial to Galénic's sales in Europe, much less worldwide. Currently, annual Argane™ sales are likely in the $1 million to $3 million range. Suppose that the negotiated royalty rate on these sales was somewhere between the 1.1% rate contained in the standard MTA for plant genetic resources established under the FAO's International Treaty on Plant Genetic Resources and the 2% rate used in the acclaimed Tropical Botanic Garden and Research Institute and Kani Tribe agreement in the Western Ghat region of south India.[4] Argane™ sales would have generated an annual royalty stream for the Moroccan regime roughly in the range of $15,000 to $45,000 in 2005. This royalty stream would have been much smaller when Argane™ was launched during the 1980s and 1990s. Finally, recall that the annual marginal value of PDRs is a fraction of this royalty stream, as given by the change in the probability of compliance induced by PDRs in Eq. (1). Even if the incentives provided by the Moroccan regime were weak and PDRs dramatically increased this probability by say 0.5, the annual value of PDRs in the argan case would have only been in the $7500 to $22,500 range. While the value of PDRs at the margin could have been much less than this if the regime provided strong incentives on its own, Morocco would have been much more likely to reap benefits from the $3 million to $4 million argan oil market that is not patent-based and therefore untouched by PDRs.

4. Discussion

How does this counterfactual assessment of PDRs in the argan case compare to reality? In the absence of PDRs, Pierre Fabre and Cognis differed in their approaches to benefit sharing. Pierre Fabre began argan research before biodiversity and sustainable development became high profile issues. In these early years, it had little market incentive to seek consent or share benefits and seems to have done neither. Widespread sensitivity to these issues in the late 1990s led Pierre Fabre to

[4] See www.biodiv.org/doc/case-studies/abs/cs-abs-tbgri-in-en.pdf (accessed October 27, 2006).

leverage the argan story in its marketing of Argane™ and to consider partnering with the then-nascent argan oil cooperatives, but it continued to procure at least some of its argan materials in a more clandestine manner (see Lybbert, 2000 p.77). More recently, Pierre Fabre has actively supported the work of the *Foundation Mohamed IV Pour La Protection De L'Environnement* in the argan forest *via* several donations — one in 2004 for €30,000, roughly equivalent to 2% of annual Argane™ sales.

Cognis' argan research is more recent, and their approach has therefore been shaped heavily by biodiversity and benefit sharing considerations. Cognis has collaborated closely with Zoubida Charrouf not only in developing their argan research program but also in nurturing linkages to the argan region through the Targanine Cooperative that she organized in the late 1990s. Instead of paying royalties, Cognis has agreed to source all of its argan materials at a premium through this cooperative, which has dozens of branches throughout the region. While it is difficult to quantify prospective benefits from this arrangement, it is effectively a royalty rate that Cognis initiated as an integral part of its business model.

The firms in the argan case that would have been subject to PDRs have in reality been quite proactive recently in sharing benefits of their own accord. Moreover, the same is likely to be true in many cases around the world for one simple reason: the same growing awareness of sustainable development and biodiversity that is responsible for the CBD and for the PDRs proposal has simultaneously sensitized consumers and changed how firms market their products and conduct business. It may be impossible to compare precisely these market-induced benefits with benefits from PDRs, but recognize at least that the alternative to PDRs is not zero benefits.

One seemingly irresistible feature of PDRs is that they give poor biodiverse countries a stake in potential blockbuster patents. Though not always explicit, the appeal of blockbuster success scenarios – or, analogously, the threat of blockbuster biopiracy cases – is often implicit in the PDRs debate and betrays either a misunderstanding of the distribution of the value of patents, most of which are worth little or nothing, or "skewness seeking" tendencies akin to bettors at the horse track (Scherer, 2001). Argan products, including those based on patents, have been reasonably successful as niche products, but they have certainly not been blockbusters. This moderate success makes the argan case promising, but still representative of most cases where PDRs would be relevant. This distinction between niche and blockbuster products has other implications for the marginal value of PDRs. Niche retailers often rely on quaint stories about biodiversity, poverty, gender, *etc.* to market their products and therefore have clear market incentives to share benefits. In contrast, blockbuster successes rarely need such stories, and the additional incentives provided by PDRs to share benefits may be particularly valuable in such cases. Hence, the marginal value of PDRs may be even more skewed than the distribution of patent values.

While this commentary has assessed the marginal value of PDRs based on the benefits shared, they may bring other less tangible benefits as well. In addition to non-monetary benefits negotiated as part of an agreement, PDRs may help countries without a regime to track at least some users of its biological resources and their commercial success. PDRs may also act as a quasi-insurance policy for countries with weak regimes by ensuring that they benefit from successful and patented uses of their biodiversity, if there are any. The premium for this policy is the cost of establishing and maintaining a national regime, which is nontrivial for biodiverse developing countries with resource-strapped bureaucracies. In Morocco, the Ministry of the Environment has charged its *Centre d'Echange d'Information Sur La Biodiversité* with handing CBD issues — on top of several other responsibilities. When asked about the prospects for creating such an administrative regime, officials in this division pointed to a lack of awareness of the need and a lack of the political will to divert resources for such a regime away from other basic (probably more pressing) administrative and policy priorities. The existence of PDRs would create greater incentives for establishing a national regime, even if it is weak, but it is also possible that overoptimistic or "skewness seeking" bureaucrats may shuffle administrative priorities in a way that actually reduces net social welfare.

In conclusion, PDRs may ultimately play a valuable role in implementing the objectives of the CBD, but the current debate should be informed by three practical considerations highlighted in this counterfactual case study. All three are based on the notion that the potential contribution of PDRs should be assessed at the margin, rather than in vague conceptual or aggregate ways.

First, PDRs are only valuable to countries with regimes in place to govern biodiversity access and benefit sharing, but the time lags inherent in research programs create an important tradeoff between regime strength and the marginal value of PDRs. Strong regimes stand to benefit broadly from biodiversity uses, whether patent-based or not, and may have little need for PDRs. Weak regimes lack this broad benefit and stand to benefit more from PDRs, albeit based on a very narrow, patent-based subset of biodiversity uses. The broad benefits reaped by a stronger biodiversity regime will often far outweigh the narrow patent-based benefits garnered by PDRs. They may incite the creation of biodiversity regimes where none previously existed, but PDRs alone may not improve benefit sharing much at the margin (see Tvedt, 2006).

Second, assessments of PDRs should not be wooed by blockbuster success scenarios. The value of PDRs *ex ante* should instead reflect the median market value of patents, which is generally quite low. Furthermore, since countries must have national regimes in order to benefit from PDRs at all, the relevant value of PDRs is actually some fraction of these modest patent benefits as dictated by the additional compliance incentives provided by PDRs.

Third, in the absence of PDRs and national biodiversity regimes – the present situation in many countries – many biodiversity users face compelling market incentives to share benefits and involve locals. Changing consumer preferences and information campaigns *via* the internet have reduced the returns to biopiracy. In short, the alternative to no PDRs and no national regime is not zero benefits.

The aim of this article is not to make sweeping generalizations about the benefit sharing value of PDRs. Instead, it offers these three considerations, which are inherently country-specific, as a reasonable starting point for assessing the potential value of PDRs in a given national context.

Although the argan oil case, with its demonstrated but modest success, seems representative of other cases involving innovative and transnational uses of genetic resources, the overall effectiveness of PDRs in remedying access and benefit sharing concerns will hinge importantly on differences across industries (see Laird and Wynberg, 2005) and countries. Morocco is hardly representative of other developing countries facing access and benefit sharing issues, and the value of PDRs based on these three considerations may be substantial for very different, mega-biodiverse countries such as India and Brazil. Yet, carefully assessing PDRs at the margin – rather than in broad conceptual and aggregate ways – is no less important.

Acknowledgements

Jayashree Watal provided very helpful insights throughout the process of this research. Zoubida Charrouf and Hassan Falaki offered valuable input from Moroccan perspectives. Participants at the 2006 WIPO–WTO Colloquium contributed to the formative stages of this work. Two anonymous referees offered helpful suggestions. All remaining errors are mine.

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