POLICY BRIEF NUMBER 5, OCTOBER 2009

The Bayh–Dole Model in Developing Countries: Reflections on the Indian Bill on Publicly Funded Intellectual Property

UNCTAD – ICTSD Project on IPRs and Sustainable Development

Bhaven N. Sampat
Department of Health Policy and Management
Columbia University

Introduction

Cross-national policy emulation is common, but challenging. It is difficult to determine whether and why specific policies worked, and even harder to assess if they would work in different contexts. Evaluation of innovation policies is particularly difficult, given unique challenges in measuring and tracking their outputs and outcomes (Jaffe 1998). However, with the growing recognition that science and technology are important for economic growth and development, developing countries are currently considering a range of policies to promote innovation; many of these import or adapt policies from other countries.

Multilateral discussions also stress innovation policies: The World Intellectual Property Organization's (WIPO's) Development Agenda, for example, emphasizes the need to promote creativity and innovation in developing countries (Recommendation 19), and to consider intellectual property (IP) policies that serve this end (Recommendation 25).

In this vein, several countries, including India, Brazil, South Africa, Malaysia, and Jordan, are debating or have recently passed legislation modeled on the U.S. Bayh-Dole Act (Graff 2007). Bayh-Dole (passed in 1980 and implemented in 1981) facilitated patenting by American research universities. Before Bayh-Dole American universities could and did patent. Indeed, several of the most lucrative patents in the post- Bayh-Dole era were filed before Bayh-Dole (Mowery et al., 2004). But there was variation in rules and procedures for doing so across the numerous government agencies funding university research. Bayh-Dole created a standard set of rules across funders. It also provided government endorsement for more active university involvement in patenting and licensing. Many American universities had previously avoided these activities, reflecting concerns that they might compromise their missions to advance and widely diffuse science and technology (Sampat 2006).

As has been well documented by the proponents of Bayh-Dole type initiatives, since 1981 university patenting and licensing have increased dramatically, as has licensing income from university research. These data provide a main impetus for initiatives to emulate Bayh-Dole in developing countries.

This Policy Brief provides an assessment of one such bill, the Indian Bayh-Dole Act. It focuses on India because legislation is currently under consideration there; however, many of the issues considered are relevant for other developing country emulators as well.

The next section provides details on the Indian act. Section 2 examines the theory and evidence in support of its main goals. Section 3 concludes with policy recommendations.

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1. The Indian Bayh–Dole Act

"The Protection and Utilization of Publicly Funded Intellectual Property Bill, 2008," the Indian Bayh-Dole act, was introduced in Parliament late last year, and is currently being reviewed by the Parliamentary Standing Committee on Science, Technology, Environment and Forests.The proposed legislation has many stated motivations, including:

- "to provide incentives for creativity and innovation"
- "to ensure access to such innovation by all stakeholders for public good,"
- "to encourage innovation in small and medium enterprises"
- to promote "collaboration between Government, private enterprises and non-Governmental Organisations"
- to facilitate "commercialisation of intellectual property created out of public funded research and development,"
- to promote the "culture of innovation" in India,
- to "increase the responsibility of universities, academic and research institutions to encourage students, faculty and scientists to innovate, to raise royalty income"... and thus:
- "promote self- reliance" and "minimise dependence of universities, academic and research institutions and other recipient organisations for Government funding"...and finally:
- "enhance awareness about intellectual property issues, especially in universities, academic and research institutions."

Like Bayh-Dole, the Indian act applies to all research resulting from government grants. As a condition of accepting government funds, institutions would face new obligations. First, they would have to disclose "intellectual property" to the government, and to notify the government of their desire to retain title. Second, institutions receiving government grants are required to create an intellectual property management committee. Institutions affected by the act are also obliged not to disclose or publish research results until IP has disclosed. Royalty sharing with inventors is required.

The bill creates a presumption that the research institution, rather than the government, retains title to disclosed inventions. There are some exceptions to this, under which the government could refuse to license. These include three low frequency situations–when the grant recipient is not located in India, when the intellectual property relates to atomic energy, or when it is necessary for the government to retain title for reasons of nwational security. Another exception is for cases where "in the public interest and in exceptional circumstances the Government deems it expedient to do so."[1]

It is similar to Bayh-Dole in several ways. It creates clarity and uniformity in processes for ownership of intellectual property from publicly funded research. Like Bayh-Dole, it codifies the process through which institutions must disclose and report publicly funded IP. But it goes beyond Bayh-Dole. It defines "intellectual property" broadly, to include not only patents, the focus of Bayh-Dole, but also trademarks and copyrights. Taking this expansive view of IP, the Indian bill creates strong penalties for grantee institutions and inventors that do not comply, including revocation of past and future grants, as well as various fines and penalties, otherwise. It also includes a number of "India-first" provisions, including that any licensees of government funded IP taken out in India must substantially manufacture any resulting products in India.

Other analysts (Lin et al, 2008) have commented on potential negative unintended impacts of the Indian legislation. So et al. (2008) explore potential risks of Bayh-Dole type legislation in developing countries; these observations apply specifically to the Indian situation as well.

This Policy Brief focuses on the narrower question of whether the Indian act will achieve its intended goals. Given its large set of aims, it would be difficult to assess them each specifically. Instead, this brief focuses on three main goals, and examines the logic and evidence for them. While recognizing, indeed highlighting, that India today is very different from the United States in the post-Bayh-Dole era, much of this data is from the U.S. A close examination of U.S. evidence is important because the Indian legislation is modeled on the U.S. Act, and the proponents of the legislation appeal to these data for support.

2. An Overview of the Evidence from the US experience

2.1 Licensing Income

One motivation for the Indian legislation is to generate licensing revenues for Indian universities and public-sector research institutions, based on the belief that if universities are allowed and encouraged to patent and license their inventions, they will generate substantial licensing revenues which in turn can be re-invested into research.

Is this a reasonable expectation? While it is difficult to predict what will happen in India, the aggregate numbers from the U.S. provide some support. Data from the AUTM Licensing Survey suggests income from licensing increased dramatically even over the 1991 to 2005 period, rising to 1.6 billion by 2005 (AUTM, 2007).

But this income is a minuscule share of the total research base. In 2006, academic research expenditures in the U.S. were $48 billion, meaning licensing revenues account for only slightly more than 3 percent for total academic research and development funds. "Net licensing revenues" subtracting unreimbursed legal fees and licensing revenues paid to other institutions, are even lower. U.S. academic licensing income is also highly concentrated: most institutions earn little or no gross revenues, and the aggregate trends are driven by a handful of universities. Moreover, for the three top revenue earners in the post-Bayh-Dole era (Columbia University, University of California, and Stanford University) the bulk of revenues are driven by a small number of inventions (Mowery et al. 2001). Licensing income is also scale- dependent: universities with a limited research base, including the vast majority of public sector research institutions in India, cannot expect to earn meaningful royalties.[2]

Moreover, these data from the U.S. do not account for the high costs of licensing patents. While these figures do subtract legal fees, they don't account for operating or salary costs of technology transfer offices. Recent research that models these costs suggests that, over a quarter century after the implementation of Bayh-Dole in the U.S., "net returns from patenting and licensing by U.S. universities, are, on average, quite modest" and that "universities should form a more realistic perspective of the possible economic returns from patenting and licensing activities" (Bulut and Moschini 2006). These quantitative data find support in the qualitative impressions from Lita Nelsen, director of the technology licensing office at the Massachusetts Institute of Technology (MIT), who observed: "the direct economic impact of technology licensing has been relatively small - a surprise to many who believe that royalties could compensate for declining federal support of research. Because of the high costs of patenting, most university licensing offices barely break even" (Nelsen 1998).

Overall, data from the U.S. experience suggest it is unlikely that Indian institutions will earn much money, or even cover costs, from these activities. If income is the goal of the new legislation, the game is probably not worth the candle.

2.2 Technology Transfer

Another motivation for the Indian Bayh-Dole act is to facilitate technology transfer- commercialization of ideas and inventions developed in India's public sector and publicly funded research laboratories. Much like the U.S. Act (Mowery et al 2004), this is not based on any systematic data that there is currently a problem with technology transfer that reflects difficulties in patenting, but rather selective anecdotal accounts of inventions that are "languishing on the shelf" (Bhattacharjee 2008). Indeed, Indian academic institutions currently can and do take out patents, much as U.S. institutions could and did before Bayh-Dole (Mowery and Sampat 2001). The Indian legislation appears to be motivated by the assumption that the rules and incentives it would establish would increase awareness of IP (see below), and that the resulting increase in patenting and licensing would facilitate technology transfer and commercialization.

Since the impetus for this claim is the notion that Bayh-Dole promoted these activities in the United States, this section summarizes evidence on the impact of Bayh-Dole on U.S. technology transfer.

A familiar argument is that before Bayh-Dole there was very little university-industry technology transfer. The most commonly cited figure in arguments for the Indian Bayh-Dole legislation, and by proponents of Bayh-Dole type legislation worldwide, is that very few government owned inventions were commercialized in the U.S. before 1981. For example, in a letter to the Prime Minister arguing for an Indian Bayh-Dole act, the National Knowledge Commission recites the figure:

> In the United States, before the Bayh-Dole Act was enacted, the country's federal agencies owned about 28,000 patents, out of which only 5 % were licensed to industry to develop commercial products (Pitroda, 2007).

The 28,000 figure has also been cited in journalistic accounts supporting the India Act (Unnikrishnan and Nayak 2008). This

statistic, which provided the main quantitative argument for Bayh-Dole, and now for its emulation, is misleading. It is based on a particular subset of government owned patents that were unlikely to have been commercialized in the first place (Eisenberg 1996). It is also of limited relevance to debates about universities and public sector research institutes, since the 28,000 patents emanated primarily from government-funded R&D carried out by firms, not universities. During the passage of Bayh-Dole in the U.S., little evidence was summoned to show that difficulties in patenting and licensing were hindering U.S. university-industry technology transfer (Mowery et al. 2004), and no such evidence has been produced since.

Another striking feature of the Bayh-Dole debates in the U.S., contemporary evaluations of Bayh-Dole, and current movements to emulate the legislation in India and elsewhere (Mowery and Sampat 2005), is their omission of attention to other, non-patent, channels of university-industry technology transfer. Both historically and today, academic ideas and technologies have been transferred to industry through a range of channels, including through disclosure via publications and conferences, through consulting, and through hiring of students. Recent survey work in the U.S. suggests that patenting and licensing of inventions are a relatively unimportant channel in most industries (Cohen et al 2002; Agrawal and Henderson 2002). Even in pharmaceuticals, where firms view academic patents and licenses as more important sources of ideas than do other industries, these other channels dominate (Cohen et al. 2002).

As discussed in the Introduction, the Indian emulation initiative also invokes post-Bayh- Dole data, typically from AUTM and other sources, in support of the argument that Bayh-Dole, by facilitating university patenting and exclusive licensing, accelerated university-to-industry technology transfer, i.e. the development and commercialization of academic inventions by firms.

Certainly, technology transfer activity, patents, licenses, and licensing revenues have increased since Bayh-Dole's passage. However, this does not speak to whether technology transfer outcomes have improved. Increased patenting and licensing per se was not the aim of Bayh-Dole: these were seen as a means to facilitate technology transfer and commercialization of technologies that otherwise would have remained on the shelf. Patenting and licensing trends are not useful indicators of technology transfer success, since a trivial share of patented and licensed inventions result in commercially useful products. More importantly, at least part of the overall growth reflects patenting and licensing of inventions and knowledge that would have been commercialized via traditional channels. In such cases, university patents facilitate rent- extraction-though as discussed in the previous section these rents are generally small-but did not facilitate technology transfer.

Whether Bayh-Dole was successful at stimulating technology transfer is an admittedly difficult question, as Thursby and Thursby's (2007) review of the theoretical and empirical evidence suggests. But the evidence marshaled by proponents of the Indian legislation does not address this question. Moreover, there is little evidence that a problem currently exists in India, i.e. that there are a significant number of valuable inventions in Indian public sector laboratories currently lying fallow because of lack of patent protection. In this context, promotion of technology transfer is not itself a compelling rationale for Indian emulation of Bayh-Dole.

2.3 Awareness

A third goal of the Indian legislation is to improve "awareness" of IP issues among Indian universities and public research institutes.

Here too, U.S. data provide mixed support. There is, first, a "chicken and egg" problem: It is difficult to disentangle whether Bayh-Dole enhanced awareness of patent issues among U.S. universities, or whether this increased awareness was itself a motivation for passage of Bayh-Dole (Mowery and Sampat 2001.) Moreover, it is unclear whether simply setting up technology transfer offices and royalty-sharing incentives is sufficient to create the broad cultural change the architects of the legislation imagine. The European context, where a number of countries recently passed legislation modeled on Bayh-Dole (some of which explicitly aimed to stimulate the formation of technology transfer offices), may be instructive (OECD 2003; Mowery and Sampat 2005). At least thus far, there is little evidence that these initiatives have succeeded in stimulating patenting and licensing, let alone in changing the ethos of public research institutions in Europe (Montobio, 2009).

Moreover, a hyper-awareness of intellectual property rights (IPRs) among academic institutions could have costs. In the U.S., there is at least widespread concern--if not strong evidence--that a focus on IP may be leading universities to be so aggressive in their pursuit and defense of patents that these activities hinder the progress of research (Heller and Eisenberg 1998) and serve as obstacles rather than aids to

university-industry technology transfer and collaborative research (Litan et al., 2007).

To be sure, awareness of patents (like institutions and laws that reduce costs of obtaining patents) may be useful where patents are needed for technology transfer, and their absence would limit benefits from publicly funded research. A danger with the Indian act is that, like Bayh-Dole, it puts no bounds on the sorts of inventions where patents should be obtained, and those where academic practice as usual would suffice. But the Indian act actually goes further than Bayh-Dole, by creating strong penalties, in the form of revocation of public funding, for academics who fail to disclose intellectual property.

Absent any definition of what does and what does not constitute potential "intellectual property," it is unclear if any academic researchers (or research) would be immune from the requirement to report. India's focus on patent awareness appears to be aimed at limiting costs of sins of omission: failure to patent when patents are needed. But strong penalties for not reporting IP, broad definitions of IP, and lack of distinction between when patents would or would not be desirable, may interact to create costly sins of commission: patenting when patents are unnecessary. This would not only have negative social costs, but could also be costly to individual academic institutions, since few patents are likely to return revenues.

3. Questions for Consideration by Developing Countries

The myriad goals of the Indian legislation make it difficult to evaluate as a whole. While a strong case for the legislation cannot be made based on the three objectives discussed above, it is possible that a thorough review of evidence on the other objectives (e.g. that it will stimulate small business growth, or promote creativity) would provide more compelling justification. But none of these claims should be taken on faith.[3]

Bayh-Dole was passed in a climate of economic crisis in the U.S., when there was fear of loss of economic and technological leadership to Japan. This atmosphere contributed to the passage of Bayh-Dole despite little evidence it was needed, and minimal discussion of its potential costs (Mowery et al 2004). India, and other countries considering similar legislation, need not go down the same path. At the very least, supporters of Bayh-Dole in other countries should consider the following three questions:

1. What specific problems does it aim to address?
2. What features of the legislation address these problems?
3. What evidence is there that these policy interventions, if adopted, would achieve these ends? How strong is this evidence?

Better country-specific data may also be useful. Surveys illuminating the roles the universities and public laboratories currently play in developing country innovation systems, such as those recently administered in Brazil (Rapini et al. 2006; Povoa, 2007) would be particularly helpful in assessing the costs and benefits of Bayh-Dole type legislation in developing countries.

Unlike the apparently widespread view among some emulators that Bayh-Dole was an unambiguous success, there is some rethinking of the legislation even in the U.S. For example, Boettiger and Bennett (2006)-- in their article "Bayh-Dole: If We Knew Then What We Knew Now"— suggest that "the Act inadvertently created a misalignment between the private interests of university technology transfer offices and public interests that benefit the innovation system at large" (323). A main set of concerns is that privatization of academic research can (in some contexts) hinder research and commercialization. In response to these, government and philanthropic funders of research are increasingly exploring alternatives to the Bayh-Dole model (Lee 2009).

The business community has voiced similar concerns. The vice-president of the Kaufmann Foundation, the largest funder of entrepreneurship research in the U.S., recently suggested "We are now at a critical point in which the incentives of some universities may lead to the codification of a system that will inhibit rather than promote commercialization of technological breakthroughs,"[4] and recently co-authored a paper proposing alternatives to the Bayh-Dole model (Litan et al. 2008). The Vice-President of university relations at Hewlett-Packard, in testimony before the U.S. Congress, notes that the post-Bayh-Dole focus on IP by universities has hindered university-industry research relations: "It has fueled mistrust, escalated frustration, and created a misplaced goal of revenue generation, which has moved the universities and industry further apart than they've ever been" (Johnson 2007, 5). He also suggests that this frustration with U.S. universities has led HP to instead seek out academic partners in China, Russia, and India.

Finally, note that the European Union's most recent recommendations about how to stimulate commercial and social benefits from publicly funded research is much more holistic than Bayh-Dole, recognizing the variety of channels,

through which knowledge diffuses or is transferred from universities to industry, including open source approaches (European Commission, 2007).

This and the others models discussed above are reactions to difficulties associated with Bayh-Dole. They also recognize that science, technology, and intellectual property environments have changed in the three decades since Bayh-Dole was drafted. Rather than import bills modeled on Bayh-Dole, it would seem prudent for India and other developing countries to consider elements from these alternative models being discussed.

Beyond these general suggestions, India (and other countries considering legislation governing dissemination of publicly funded research) might consider one specific one.

The "ultimate objective" of Indian legislation is to "ensure access to [university technologies] by all stakeholders for public good," as indicated in the Statement of Objects and Reasons accompanying the Bill. But, like its namesake, the Indian Bayh-Dole Act makes no distinction between the characteristics of inventions that should be patented, and those that would be more effectively produce social benefits via placement in the public domain. Indeed, it goes further, by creating strong penalties for non-patenting. This has the danger of leading universities to patent willy-nilly, without regard to whether patents are actually needed. This concern about what should be patented is particularly salient given that much more can be patented today, given the expansion of patent eligible subject matter and growing constraints on patent offices in the post-TRIPS era.

Conclusion

Work by economic historians on developed nations (Rosenberg and Nelson 1994) and developing and emerging countries (Mazzoleni and Nelson 2007) emphasizes that one of the main ways in which publicly funded universities and laboratories contribute to domestic innovation and productivity is by getting knowledge and technology into the public domain.[5]

A policy that made patenting the default option—and indeed penalized placing information in the public domain—would seem counter-productive, if the goal of such legislation is to promote the public good. If nothing else, India—and other countries considering legislation of this sort--should provide specific guidance about what sorts of publicly funded research outputs ought to be patented, and what should instead be placed in the public domain.[6]

KEY CONCLUSIONS AND RECOMMENDATIONS

Will the Indian Bayh–Dole legislation achieve its main aims?

- It seems unlikely that it will generate significant licensing income.
- Its effects on technology transfer and commercialization are unclear, but the data cited by proponents of the initiative are misleading.
- It is unclear whether it will promote "awareness" of IP; such awareness also has risks.
- The legislation defines IP broadly, and creates strong penalties for not disclosing such IP.
- This risks inducing institutions to seek IP even when it is not necessary.

Recommendations:

- Policymakers should ask proponents to be more specific on what problems the legislation aims to solve, and what evidence there is that it will do so.
- Look before you leap: evaluate the positive and negative impact of Bayh-Dole type legislation.
- Consider the range of other models and approaches that have evolved in the post-Bayh-Dole era, in response to these concerns.
- *At the very least*: provide guidelines about when it is appropriate to take out IP, and when outputs of public research should instead be placed in the public domain.

Endnotes

1. This is analogous to the "march in" provision built into the U.S. Act. Several scholars (e.g., Rai and Eisenberg 2003) suggest that this provision is too vague and too cumbersome to be useful.
2. In what may be an attempt to overcome these hurdles, several Indian institutions have contracted with a centralized patent licensing firm, Intellectual Ventures (Koshy 2008). This U.S. entity has been accused of being a "patent troll": asserting patents to extract rents rather than to promote development. While many commentators view these activities unfavorably in the U.S context, the welfare consequences would be very complicated in a global context. Putting those aside, it is unclear whether centralized management of academic patent portfolios is efficient, or can succeed in generating licensing revenues for clients. The history of the Research Corporation, which managed patents for most major U.S. Universities during the post-World War Two, pre-Bayh-Dole era, provides reasons for skepticism (Mowery and Sampat 2001).
3. While not among the articulated goals of the Indian legislation, an interesting issue is that patents on publicly funded research could help to assure that Indian taxpayers get a share of the benefits when an invention is commercialized by a non-Indian firm. This distributional issue was not prominent in the Bayh-Dole debates in the U.S. (see however, Mowery and Sampat 2001b); most of the likely commercializers of U.S. university research were based in the U.S. To the extent that this were a motivation for the Indian legislation, it could be achieved by allowing publicly sector patenting but requiring liberal non-exclusive licensing to domestic firms.
4. http://www.kauffman.org/Details.aspx?id=878
5. Econometric and survey research in the U.S. provides similar results (Cohen et al. 2002; Agrawal and Henderson 2002).
6. At the time of this writing, South Africa has released draft regulations to implement its recently passed Bayh-Dole Act, "the Intellectual Property from Publicly Funded Research and Development Act 2008." It is in ways very different from the Indian Act; it includes, for example, a presumption of non-exclusive licensing and various provisions to ensure access to end products. But, like the Indian legislation, the regulations appear to make taking intellectual property rights the default, rather than the exception, and create bureaucratic hurdles to placing knowledge and technology in the public domain.

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About the author

Bhaven N. Sampat is Assistant Professor, Department of Health Policy and Management, Columbia University.

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ISSN 1684 9825