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Patents

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addition, older adults in larger households report better health status with limitations in ADLs than do other older adults. These results are consistent with a model in which money (in the form of a pension) brings help (purchased or volunteered) when respondents cannot dress or bathe by themselves.

¹ A. S. Deaton, "Policy Implications of the Gradient of Health and Wealth," *Health Affairs*, 21 (March/April 2002), pp. 13-30.

² A. S. Deaton and C. Paxson, "Mortality, Education, Income and Inequality among American Cohorts," NBER Working Paper No. 7140, May 1999, and in D. A. Wise, *Themes in the Economics of Aging*, Chicago: University of Chicago Press, 2001, pp. 129-65.

³ A. S. Deaton, "Inequalities in Income and Inequalities in Health," NBER Working Paper No. 7141, May 1999, and in F. Welch, *The Causes and Consequences of Increasing Inequality*, Chicago: University of Chicago Press, 2001, pp.

285-313.

⁴ C. J. Ruhm, "Are Recessions Good for your Health?" NBER Working Paper No. 5570, May 1996, and in *Quarterly Journal of Economics*, 115 (2000), pp. 617-50.

⁵ U. Gerdtham and C. J. Ruhm, "Deaths Rise in Good Economic Times: Evidence from the OECD," NBER Working Paper No. 9357, December 2002.

⁶ A. S. Deaton and C. Paxson, "Mortality, Income, and Income Inequality among British and American Cohorts," NBER Working Paper No. 8534, October 2001, and forthcoming in D. A. Wise, ed., *Perspectives on the Economics of Aging*, Chicago: University of Chicago Press, forthcoming.

⁷ A. S. Deaton and D. Lubotsky, "Mortality, Inequality and Race in American Cities and States," NBER Working Paper No. 8370, July 2001, and *Social Science and Medicine*, forthcoming.

⁸ A. S. Deaton, "Relative Deprivation, Inequality, and Mortality," NBER Working Paper No. 8099, January 2001.

⁹ V. R. Fuchs, M. McClellan, and J.

Skinner, "Area Differences in Utilization of Medical Care and Mortality among U.S. Elderly," NBER Working Paper No. 8628, December 2001.

¹⁰ A. S. Deaton, "Health, Inequality, and Economic Development," NBER Working Paper No. 8318, June 2001, and in *Journal of Economic Literature*, (41) (March 2003), pp. 113-58.

¹¹ D. M. Cutler and E. Meara, "Changes in the Age Distribution of Mortality over the 20th Century," NBER Working Paper No. 8556, October 2001.

¹² A. Case, D. Lubotsky, and C. Paxson, "Economic Status and Health in Childhood: the Origins of the Gradient," NBER Working Paper No. 8344, June 2001, and *American Economic Review*, 92 (5) (2002), pp. 1308-34.

¹³ A. Case, "Does Money Protect Health Status? Evidence from South African Pensions," NBER Working Paper No. 8495, October 2001, and in D. A. Wise, ed., *Perspectives on the Economics of Aging*, Chicago: University of Chicago Press, forthcoming.

Patents

Jean O. Lanjouw*

The past twenty years have seen very significant changes in U.S. patent law and policy, strengthening the rights of inventors and significantly expanding those rights across the globe. The United States has broadened areas in which patents can be received, notably software, genetic information, and business methods; has instituted a new unified Court of Appeals for the Federal Circuit to hear appeals on patent cases from all district courts;

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and has given universities and government laboratories the right to patent and license the output of publicly-funded research. Bilateral negotiations and, more recently, international treaties also have led other countries to revise their patent systems. In particular, NAFTA and the intellectual property component of the treaty establishing the World Trade Organization - WTO - (known as TRIPS) extensively harmonized and extended patent rights internationally. Jaffe discusses these changes and surveys related empirical studies.¹

The domestic patent reforms have been driven by the emergence of new areas of research and commerce, and by the view that a healthy knowledge-

based economy requires strong protection of intellectual property (IP). At the same time, however, serious concerns have arisen. My work on the patent system as an institution has focused on two such areas of concern. The first is the large and growing costs associated with litigating patent rights. The second is the extension of patent rights on pharmaceuticals to countries in the developing world where drug access is already limited by extreme poverty.

Patent Enforcement

Dealing with patent disputes is part of business life for most firms, but it is

not a phenomenon well understood by economists. Josh Lerner and I² have provided a survey of the small body of empirical research on patent litigation that was available in the mid-1990s³. In a set of papers⁴ Mark Schankerman and I provide an empirical basis for evaluating what has happened in patent litigation and its implications for R and D incentives and patent policy. We study the determinants of patent suits and settlements during 1978-99 by linking detailed information from the U.S. patent office, the federal courts, and industry sources. In order to characterize litigation risk, we start from a set of almost 10,000 litigated patents and then draw a matching random set from the universe of patents, controlling for technology and year of application. This very comprehensive database reveals that, contrary to popular perception, the incidence of patent suits has *not* been rising once one controls for the rapid increase in patenting itself and a shift toward more litigious technology areas. However, we also show that litigation is concentrated and primarily involves firms and patents with particular characteristics. For example, the risk that a given patent is subject to a suit is much higher if it is owned by an individual or a small firm than if it is owned by a corporation. Patentees with a large portfolio of patents to trade, or other characteristics that facilitate “cooperative” resolution of disputes, are less likely to litigate. At the same time, post-suit outcomes — such as whether a case goes to trial and who wins — do not depend on these characteristics. Thus, small patentees appear to be at a disadvantage in enforcing their patent rights in that their greater litigation risk is not offset by a more rapid resolution of their suits. Both the benefits of patent portfolio and company size in settling disputes, and the heterogeneity in litigation risk, point to the potential value of patent litigation insurance. Currently there are a number of providers of litigation insurance in the United States and Europe. However, demand has been severely limited by high prices while, at the same time, profitability of insuring companies has been undermined by the widespread use of pooled prices. Our empirical

analysis could be used to develop insurance pricing schemes that recognize the heterogeneity of litigation risk.

One piece of evidence from our studies⁵ suggests that there is a threat value associated with having control over many patents in an area: firms with portfolios that are large *relative* to the disputants they are likely to encounter are significantly less likely to use the courts. In a paper with Josh Lerner, I explore a particular avenue for strategic use of litigation.⁶ A plaintiff may request, and be granted by the court, a preliminary injunction preventing an accused infringer from using the patented innovation during the time that a case is being decided. It is claimed that requests for preliminary injunctions requests are used strategically by financially secure plaintiffs to go beyond the avoidance of “irreparable harm” and to extract even greater profit by raising the cost of legal disputes. In an earlier paper⁷, Lerner and I develop a model in which differences in financing costs drive the use of preliminary injunctions, and we explore the implications for efficiency and incentives. Detailed data compiled on 250 patent suits and the financial status of the litigants indicates that larger corporate plaintiffs with high levels of cash and equivalents are significantly more likely to request preliminary injunctions.

One of the difficulties faced understanding the effect of enforcement costs on the value of patent protection is that much of the impact of those costs may not be in the form of direct expenditures on litigation. Most obviously, 95 percent of suits settle without a trial, three-quarters before even a pre-trial hearing.⁸ Thus even when a suit is filed, legal costs will have most of their effect on returns by altering threat points and thus settlement terms. More subtly, enforcement costs may induce indirect changes in behavior. I develop and estimate a model of patentee decisions to pay annual renewal fees that incorporates the cost of enforcement as part of the decision, in addition to the renewal fees themselves.⁹ The basic premise of the model is that patents lose their value when they would not be

enforced, irrespective of whether one observes a suit. With the model estimates it is possible to simulate renewal behavior, and thus patent value, with different menus of legal costs and cost allocation rules.¹⁰

The Global Patent System for Pharmaceuticals

The global system of patent rights also is undergoing an unusually dramatic period of evolution. One of the most important institutional changes has been bringing intellectual property within the system of rules governing the world trading system. While in the past the United States and other rich country governments have used bilateral pressure to influence others’ intellectual property (IP) laws and enforcement, now the standards setting and the process for resolving international disputes over IP policies have moved, at least in part, to the WTO.

The inclusion of IP within the Uruguay Round of the GATT negotiations, and the current standards required for membership in the WTO, have been extremely controversial. The main issue has been the treatment of pharmaceutical patents, including the allowed uses of compulsory licensing to deal with public health. Historically, many countries have limited the protection of drug products. Concerned with the prospect of higher prices, the developing countries and their advocates have resisted the expansion of rights over pharmaceutical innovations. On the other side, firms, together with rich country governments, have insisted on the importance of the worldwide availability of patents to support R and D. The controversy over TRIPS began as a rather limited, though bitter, fight among experts at the trade round. With growing awareness of HIV/AIDS and the discovery of expensive new treatments, the question of the appropriate form of global pharmaceutical patents has moved onto the editorial pages and into the public eye.

In this polarized debate, there is an important role for economists in understanding the implications of

global patents (or their restriction) and in using information about pricing and incentives to develop economically well-grounded policies. For some years I have pursued these twin objectives. In an initial period of information gathering, I spent half a year in India interviewing firms, non-governmental organizations, and government officials about their views of the country's commitment to introducing pharmaceutical patents and what it would mean for local industry and consumers. I then outlined the possible costs and benefits of introducing protection for drug products there,¹¹ and pulled together available statistics and interview data to consider what could be said about their magnitudes. The resulting paper highlights just how little empirical evidence supports *any* position in this debate.

My on-going research attempts to fill in some of the gaps. In a recent paper, Iain Cockburn and I¹² do the groundwork for a future assessment of whether newly-available patent protection in the developing world increases private R and D on diseases concentrated in those countries. These include diseases such as malaria, schistosomiasis, and Chagas disease. This subclass of products is rarely broken out in accounts or statistical sources. We put together tables on disease-specific patenting, bibliometric citations, and NIH funding, and survey Indian pharmaceutical firms to determine their current focus on products specific to developing country markets. The paper gives a baseline picture of private investment in products treating tropical diseases before TRIPS; it will be updated periodically to track changes as new patent laws are implemented. There are, of course, other constraints on investments for poor markets besides weak patent protection, and the paper relates some insights on these problems drawn from interviews with U.S.-based pharmaceutical executives. (An empirical assessment of the response of innovation to policy and price changes in the environmental area is in Lanjouw and Mody, 1996.)¹³

Currently I am examining the relationship between IP protection for pharmaceuticals and related policies

on the speed of new product launches in a country. In another current project I am estimating differentiated product demand models for India in order to estimate the effect on local consumer welfare of introducing patent protection.

Part of my recent work has been directed at using a basic understanding of the tradeoffs implicit in the patent system and some basic facts about global drug markets to devise an economically rational global patent system. I discuss various aspects of this in a series of papers.¹⁴ The main factual point is that global drug markets differ enormously by disease. Some diseases are concentrated almost exclusively in poor countries. For these, any market will largely only serve patients there. At the same time, there are many "global" diseases which are just as important in the poor countries but which have worldwide markets. For these, spending is heavily concentrated in rich countries. For example, I estimate that almost half of the world's population — some 3 billion people — live in countries that together represent less than 2 percent of global spending on cardiovascular drugs.

Because the global markets are so very different for these two types of diseases, the tradeoffs between pricing and incentives when adding protection in new countries also differ. The optimal global patent system would reflect this fact. It is not obvious, however, how to differentiate protection in a feasible way. In the work cited, I have developed an unusual mechanism for differentiating protection across diseases. It uses the fact that inventors must request permission to file for a patent overseas (a foreign filing license). This requirement already exists in the U.S. patent code and also in a number of other countries. The mechanism works by requiring inventors to make a particular "Declaration" to obtain permission to file overseas.

The system the mechanism would allow is one in which patent protection in poor countries differed across diseases depending on the importance of those countries' markets as a potential source of research incentives. No one, for example, would argue that African nations are an important source of

incentives for doing cancer research. The search for a cure for cancer is driven by demand from the big western markets. However, patent protection in Africa — together with increased funding — might be an important spur to malaria research. Thus, the mechanism would give a system with minimal patent protection in the poorest countries, allowing them to benefit from generic production. As a country developed, protection would broaden gradually to cover more diseases, starting with those, like malaria, of particular importance there. The result would be a patent system tailored to both development levels *and* to the characteristics of different drug markets.

¹ A. B. Jaffe, "The U.S. Patent System in Transition: Policy Innovation and the Innovative Process," NBER Working Paper No. 7280, August 1999, and in *Research Policy*, 2000.

² J. O. Lanjouw and J. Lerner, "The Enforcement of Intellectual Property Rights: A Survey of the Empirical Literature," NBER Working Paper No. 6296, December 1997, and in the *Annales d'Economie et de Statistique*, (49/50) (July 1998), pp. 223-46.

³ More recent work involving NBER researchers includes, for example, *Graham et al*, 2002, and *Hall and Ziedonis*, 2001. See S. J. H. Graham, B. H. Hall, D. Harhoff, and D. C. Mowery, "Patent Quality Control: A Comparison of U.S. Patent Re-examinations and European Patent Opposition," NBER Working Paper No. 8807, February 2002; and B. H. Hall and R. H. Ziedonis, "The Patent Paradox Revisited: An Empirical Study of Patenting in the Semiconductor Industry, 1979-1999," NBER Working Paper No. 7062, March 1999, and in *RAND Journal of Economics*, (32) (1) (2001), pp. 101-28.

⁴ J. O. Lanjouw and M. Schankerman, "An Empirical Analysis of the Enforcement of Patent Rights in the United States," in W. M. Coben and S. Merrill, eds., *Patents in the Knowledge-Based Economy*, Washington, D.C.: National Academy Press, 2003; J. O. Lanjouw and M. Schankerman, "Enforcing Intellectual Property," NBER Working Paper No. 8656, December 2001; and J. O. Lanjouw and M. Schankerman, "Characteristics of Patent Litigation: A

Window on Competition," NBER Working Paper No. 6297, December 1997, and in *The Rand Journal of Economics*, (32) (1) (2001), pp. 129-51.

⁵ See J. O. Lanjouw and M. Schankerman, "An Empirical Analysis of the Enforcement of Patent Rights in the United States."

⁶ J. O. Lanjouw and J. Lerner, "Tilting the Table? The Predatory Use of Preliminary Injunctions," NBER Working Paper No. 5689, July 1996, and in *The Journal of Law and Economics*, (XLIV) (2) (2001), pp. 573-603.

⁷ See J. O. Lanjouw and J. Lerner, "The Enforcement of Intellectual Property Rights: A Survey of the Empirical Literature."

⁸ See also J. O. Lanjouw and M. Schankerman, "An Empirical Analysis of the Enforcement of Patent Rights in the United States."

⁹ J. O. Lanjouw, "Patent Protection in the Shadow of Infringement: Simulation Estimations of Patent Value," NBER Working Paper No. 4475, September 1993,

and in *The Review of Economic Studies*, (65) (1998), pp. 671-710.

¹⁰ J. O. Lanjouw, "Beyond Lawyers' Fees: Economic Consequences of a Changing Litigation Environment," NBER Working Paper No. 4835, August 1994. Revised version available. See also J. O. Lanjouw, A. Pakes, and J. Putnam, "How to Count Patents and Value Intellectual Property: Uses of Patent Renewal and Application Data," NBER Working Paper No. 5741, September 1996, and in *The Journal of Industrial Economics*, (XLVI) (4) (December 1998), pp. 405-33.

¹¹ J. O. Lanjouw, "The Introduction of Product Patents in India: 'Heartless Exploitation of the Poor and Suffering?'" NBER Working Paper No. 6366, January 1998.

¹² J. O. Lanjouw and I. Cockburn, "New Pills for Poor People? Empirical Evidence After GATT," NBER Working Paper No. 7495, January 2000, and in *World Development*, (29) (2) (2001), pp. 265-

89.

¹³ J. O. Lanjouw and A. Mody, "Innovation and the International Diffusion of Environmentally Responsive Technology," *Research Policy*, (25) (1996), pp. 549-71.

¹⁴ J. O. Lanjouw, "Beyond TRIPS: A New Global Patent Regime," Policy Brief No. 3, The Center for Global Development, July 2002, at <http://www.cgdev.org/fellows/lanjouw.html>; J. O. Lanjouw, "A Patent Policy for Global Diseases: U.S. and International Legal Issues," *Harvard Journal of Law & Technology*, (16) (1) (Fall 2002); J. O. Lanjouw, "A Patent Proposal for Global Diseases," Policy Brief No. 84, The Brookings Institution, June 2001; and J. O. Lanjouw, "Intellectual Property and the Availability of Pharmaceuticals in Poor Countries," Center for Global Development Working Paper No. 5, April 2002, and forthcoming in *Innovation Policy and the Economy*, (3).

NBER Profile: Menzie Chinn

Menzie Chinn is a Research Associate in the NBER's International Finance and Macroeconomics Program and is a National Fellow at the NBER during the 2002-3 academic year. He is also Professor of Economics at the University of California at Santa Cruz. During 2000-1, Chinn served as senior staff economist for international finance on the Council of Economic Advisers during the Clinton and Bush Administrations. His responsibilities included research on Japanese macroeconomic policy issues and assessing the implications of energy market developments. He also has been a visiting scholar at the IMF, the Federal Reserve Board, and Humboldt University, Berlin.

Chinn received his A.B. in economics from Harvard University in 1984 and his M.A. and Ph.D. in Economics from the

University of California, Berkeley. He began teaching at UC Santa Cruz in 1991. His research focuses on the macroeconomic interaction between countries, using econometric methods. His earlier work examined the determinants of exchange rate behavior among developed countries, with an emphasis on the role of productivity differentials. His later research examines the empirical factors underlying currency crises. Recently, he has examined the interaction between capital controls, institutional characteristics of economies, and the financial development of credit and equity markets.

Chinn resides in Santa Cruz, California, and is married to Laura Schwendinger, a composer at the University of Illinois, Chicago.

