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Does Compulsory Licensing Hurt Innovation?

By Petra Moser and Alessandra Voena

Representatives of Pharmaceutical Research and Manufacturers of America are planning a series of meetings with key government officials in Delhi toward the end of October 2010. These meetings are in response to an announcement by India's Department of Industrial Policy and Promotion that it will explore compulsory licensing as a means to make generic versions of drugs that U.S. companies have patented in India available to Indian consumers. Compulsory licensing allows firms in developing countries to produce foreign inventions without the consent of foreign patent owners. Put bluntly, this amounts to stealing patents of foreign firms and licensing these patents to domestic firms.

Perhaps surprisingly, compulsory licensing is permissible under international trade agreements. Article 31 of the Trade-Related Aspects of Intellectual Property Rights (TRIPS) agreement allows developing country governments to issue compulsory

licenses after negotiations for a voluntary license have failed. In cases of emergency, developing countries can issue compulsory licenses without first trying to negotiate. National governments have substantial leeway in deciding what constitutes an emergency. The World Trade Organization (WTO) Doha Declaration of 2001 emphasized the right to issue compulsory licenses: "Each member has the right to grant compulsory licenses and the freedom to determine the grounds upon which such licenses are granted" (WT/MIN(01)/DEC/1, Art. 5.b).

Why is compulsory licensing permissible under international law? For one, compulsory licensing can save millions of lives. Thailand and Brazil, for example, have used compulsory licenses to procure antiretrovirals against HIV/AIDS for patients who could not afford these drugs; India has used the threat of compulsory licensing to

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About The Authors

Petra Moser is an Assistant Professor in Economics at Stanford and a Fellow at SIEPR. She earned an M.A. in International Relations at Yale and a Ph.D. in Economics at Berkeley. Her research centers on the effects of patent policy on innovation. Representative publications include "How do Patent Laws Influence Innovation" in the *American Economic Review* 2005, and "Do Patent Pools Encourage Innovation?" (with Ryan Lampe) in the *Journal of Economic History*, forthcoming.



Alessandra Voena is a PhD candidate in the Department of Economics at Stanford University, who will graduate this year. Her primary research interests are labor economics and applied econometrics. In her job market paper, Alessandra examines the effects of legal changes in divorce laws on the savings decisions of married men and women.



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procure vaccines for swine flu. Even the U.S. government suggested in 2009 that it may use compulsory licenses to increase the supply of *tamiflu* in case of a swine flu epidemic (Galvão 2002, Gostin 2006, Kremer 2002, Steinbrook 2007).

Opponents of compulsory licensing argue that it weakens incentives to invent and discourages technology transfers into developing countries. The U.S. pharmaceutical company Merck, for example, criticized Brazil's licensing of its HIV drug *efavirenz* as an "expropriation of intellectual property" that will "hurt patients who require new life-saving therapies" (<http://www.ip-watch.org/>, May 7, 2007). Contrary to these claims, there is little evidence that compulsory licensing has any effect on the patenting activity of pharmaceutical firms (Chien 2003). This policy brief examines empirically the impact of compulsory licensing on domestic innovation to understand whether the ability to expropriate other firms' innovation reduces innovative activity or increases through learning-by-doing effects.

Does Compulsory Licensing Encourage Domestic Invention?

Policy debates have also neglected an important aspect of compulsory licensing: Does it discourage *domestic* invention? Intuitively, the ability to steal foreign inventions may destroy

incentives for domestic firms to invest in R&D. But it is also possible that the ability to produce foreign inventions may help to jump-start a domestic industry and thereby increase incentives to invent. In the end, theoretical predictions on the effects of compulsory licensing on invention are ambiguous, so that answers have to come from an empirical test. In an empirical test, however, it is difficult to establish the direction of causality: Compulsory licensing is most likely to occur when an invention is urgently needed and domestic firms are unable to produce it. These factors by themselves have an ambiguous effect on invention, which makes it difficult to measure the effects of compulsory licensing.

My paper "Compulsory Licensing: Evidence of the *Trading with the Enemy Act*" with Alessandra Voena addresses this problem by taking advantage of an exogenous episode of compulsory licensing as a result of World War I. The United States Congress passed the Trading with the Enemy Act (TWEA) on October 6, 1917. Section 10 of the TWEA permitted U.S. firms to violate enemy-owned patents if they contributed to the war effort.¹ As the war dragged on, the TWEA became more and more punitive (Steen 2001, 99), and the primary goal of the TWEA became to weaken the war enemy, to "dislodge the hostile Hun within our gates" (Alien

Property Custodian 1919, 17). In March 28, 1918, the TWEA was amended to give the custodian the power to sell enemy property, including all enemy-owned patents "as though he were the owner thereof" (Alien Property Custodian 1919, 22). By February 22, 1919, Mitchell Palmer, the Alien Property Custodian and president of the Bureau of Investigation (today's FBI), felt comfortable to say that "practically all known enemy property in the United States has been taken over by me and is administered according to the provisions of the trading with the enemy act" (Alien Property Custodian 1919, 7); 35,400 reports of alien property had been received, and 27,274 trusts had been created, with a total value exceeding \$500 million in 1919, equivalent to \$4.7 billion in 2008.

Our study focuses on the U.S. organic chemical industry, which shares many of the characteristics of contemporary settings. Most importantly, foreign patentees dominated the U.S. market for synthetic organic chemicals. For example, 70 percent of all U.S. patents for synthetic organic compounds between 1900 and 1910 were granted to German firms (Haynes 1945, 214; Steen 2001). World War I temporarily suspended German competition, but German firms swiftly returned to U.S. markets and resumed patenting in the 1920s.

1 12 U.S.C. § 95a. Today, Cuba is the only country still affected by the TWEA.

Did Domestic Invention Increase in Response to Licensing under the TWEA?

To measure the effects of compulsory licensing on domestic invention, we compare increases in patents by domestic inventors in technologies where domestic firms were able to use foreign-owned patents with areas where domestic firms could not use foreign-owned patents.

This approach allows us to control for factors other than compulsory licensing that may have encouraged domestic invention at the same time. For example, domestic invention in chemicals may have increased independent of compulsory licensing as a result of improvements in education and scientific training, but only invention in chemical technologies that included German patents were able to benefit from compulsory licensing.

Our data include 128,953 U.S. patents by domestic and foreign inventors between 1875 and 1939. They reveal a significant increase in technologies that were affected by compulsory licensing relative to other technologies: Domestic inventors produced on average 0.15 additional patents per year in technology (measured as U.S. Patent Office subclasses) that were able to benefit from compulsory licensing relative to other technologies. This implies an increase in domestic invention of more than 20 percent.

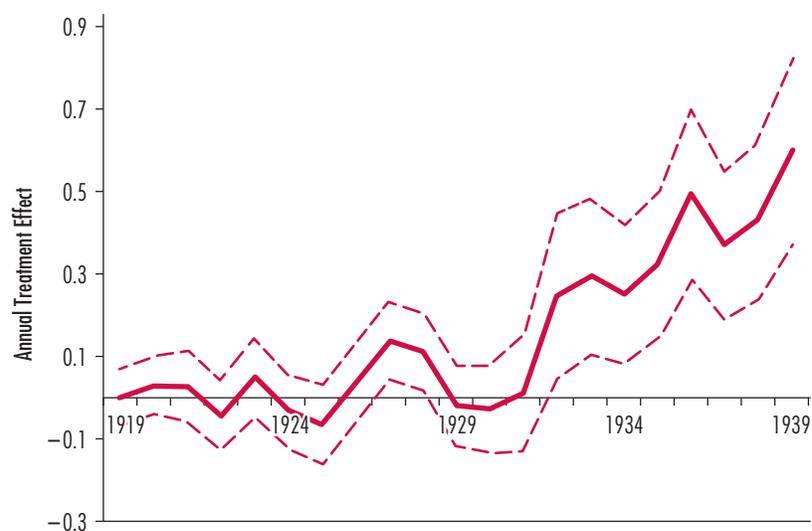
Domestic Invention Increases after a Prolonged Period of Catching-Up

The historical nature of the data allows us to examine the timing of effects and to shed some light on the mechanisms by which licensing encourages domestic invention. If licensing increases domestic invention through learning by doing, effects may take several years to materialize, as domestic firms learn to produce foreign inventions and build their own production capacities. This process might be especially slow if domestic inventors need “time to learn,” as Arora and Rosenberg (1998, 79) suggest to have been the case for organic chemicals in the United States. In

1923, for example, chemical trials during a court case established that a skilled U.S. chemist could not reproduce synthetic organic chemicals based on confiscated German patents: Louis Freedman, who had earned degrees from Yale and Columbia, proved unable to produce cincophen, a drug to treat gout (Steen 2001, 91-92, 114-115).

Additional delays may result from incomplete information in patent documents. The German firm BASF, for example, withheld critical information about the Haber-Bosch process from its patent application and U.S. firms took nearly a decade to replicate its process (Haynes 1945, 86-87). Consistent with this idea, our data on U.S. patents suggest that pre-TWEA levels of domestic

Figure 1
Effects Of Compulsory Licensing On Domestic Invention



Notes: For a 95-percent confidence interval of the regression $Patents\ by\ U.S.\ inventors_{ct} = \alpha_0 + \beta_1 \cdot TREAT_t \cdot YEARpostTWEA_t + \gamma \cdot Z_{ct} + \delta_t + f_c + \epsilon_{ct}$, where $TREAT = 1$ if a subclass received at least one license under the TWEA. Data include all 165,400 patents between 1875 and 1939 in 21 USPTO classes that received at least one license. These 21 classes cover 8,422 subclasses, 335 of which are treated.

invention were especially low in treated subclasses.

Our estimates suggest that the full impact of compulsory licensing occurred with a lag of eight to nine years. Enemy-owned patents were licensed from 1919 to 1926 with most licenses being granted from 1919 to 1922 (Steen 2001, 100). Although effects become significant as early as 1927, the strongest effects occur for patents that were granted after 1931 (Figure 1). Given that patent grants occur two to three years after applications in our data, this implies that the largest effects on applications began in 1928 — six to nine years after most patents had been licensed. Effects remained large and statistically significant at nearly 60 percent additional patents per subclass

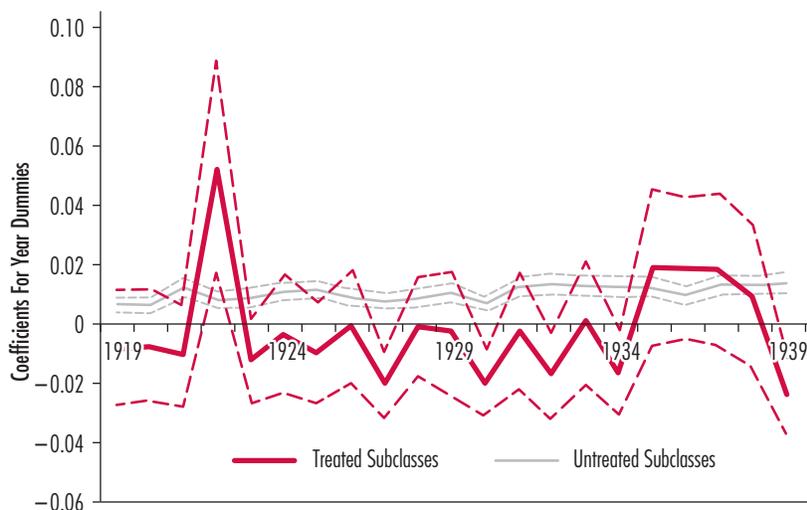
and year throughout the 1930s.

To control for the potential influence of alternative factors we subject the data to a series of additional tests. Specifically, we want to test whether unobservable factors, such as brief absence of German competitors during the war, may have encouraged invention by any non-German firms (domestic U.S. but also other non-German) in the United States regardless of compulsory licensing. To this end, we compare changes in patenting by domestic inventors with changes in patenting by other non-German inventors before and after the TWEA. This test confirms that licensing encouraged patenting by domestic U.S. inventors, even relative to other non-German

inventors. We also perform a placebo test, which artificially treats French inventors in the United States, who could not license enemy patents under the TWEA to compulsory licensing. In this placebo test, compulsory licensing has no effect (Figure 2).

Thus, the U.S. experience with compulsory licensing as a result of the TWEA suggests that compulsory licensing supports domestic invention. From the point of view of India's government, this is good news, because it means that compulsory licensing will help to create access to more new drugs that are specifically targeted to the needs of domestic patients. For U.S. pharmaceutical firms, who can expect to face stronger Indian competitors, the outlook is less rosy.

Figure 2
Annual Treatment Effects: Placebo on French Inventors



Notes: For a 95-percent confidence interval of the regression $Patents\ by\ French\ inventors_{c,t} = \alpha_0 + \beta_1 \cdot TREAT_c \cdot YEAR_{postTWEA_t} + \gamma \cdot Z_{c,t} + \delta_t + f_c + \epsilon_{c,t}$, where $TREAT =$ for subclasses where U.S. firms received at least one license under the TWEA. Data include all 3,000 U.S. patents in treated subclasses between 1875 and 1939 that were granted to French inventors

References

Aftalion, Fred. 2001. *A History of the International Chemical Industry*, trans. O. Benfey. Philadelphia: University of Pennsylvania Press.

Alien Property Custodian. 1919. *A detailed report by the Alien Property Custodian of all proceedings had by him under the Trading with the Enemy Act during the calendar year 1918 and to the close of business on February 15, 1919*. Washington: Government Printing Office.

Arora, Ashish, and Nathan Rosenberg. 1998. "Chemicals: A U.S. Success Story." In *Chemicals and Long-Term Economic Growth*, ed. Ashish

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Arora, Ralph Landau, and Nathan Rosenberg, 71-102. New York: John Wiley and Sons.

Arrow, Kenneth. 1962.

"The Economic Implications of Learning by Doing." *Review of Economic Studies*, 29(3): 155-173.

Baten, Jörg, and Rainer Schulz.

2005. "Making Profits in War-Time: Corporate Profits, Inequality, and GDP in Germany During WWI." *Economic History Review*, vol. 58-1 (2005), pp. 34-56.

Chien, Colleen. 2003.

"Cheap Drugs at What Price to Innovation: Does the Compulsory Licensing of Pharmaceuticals Hurt Innovation?" *Berkeley Technology Law Journal*.

Davenport, A. Neil. 1979. *The United Kingdom Patent System*. Homewell, UK: Kenneth Mason.

Eichengreen, Barry. 1989.

"The Political Economy of the Smoot-Hawley Tariff." *Research in Economic History*, 12: 1-43.

Field, Alexander. 2003. "The Most Technologically Progressive Decade of the Twentieth Century." *American Economic Review*, 93(4): 1399-1413.

Galvão, J. 2002. "Access to Antiretroviral Drugs in Brazil." *The Lancet*, 360(9348): 1862-1865.

Gilbert, Richard, and Carl Shapiro. 1990. "Optimal Patent Length and Breadth." *RAND Journal of Economics*, 21(1): 106-112.

Gostin, Lawrence O. 2006. "Medical Countermeasures for Pandemic Influenza: Ethics and the Law." *Journal of the American Medical Association*, 295(5): 554-556.

Haber, Ludwig Fritz. 1971. *The Chemical Industry, 1900-1930: International Growth and Technological Change*. Oxford: Clarendon Press.

Haynes, Williams. 1945. *American Chemical Industry — The World War I Period 1912-1922*, vol. 3. New York: D. Van Nostrand Company.

Irwin, Douglas. 1998. "The Smoot-Hawley Tariff: A Quantitative Assessment." *Review of Economics and Statistics*, 80(2): 326-334.

Irwin, Douglas A., and Peter J. Klenow. 1994. "Learning-by-Doing Spillovers in the Semiconductor Industry." *Journal of Political Economy*, 102(6): 1200-1227.

Kremer, Michael. 2002. "Pharmaceuticals and the Developing World." *Journal of Economic Perspectives*, 16(4): 67-90.

Landau, Ralph, and Nathan Rosenberg. 1992. "Successful Commercialization in the Chemical Process Industries." In *Technology and the Wealth of Nations*, ed. N. Rosenberg, R. Landau, and D.C. Mowery, 73-120. Stanford: Stanford

University Press.

Lexis Nexis Chronological Patent Files, 1790-1970. Available at www.lexisnexus.com.

Mowery, David C., and Nathan Rosenberg. 1998. *Paths of Innovation. Technological Change in 20th-Century America*. Cambridge: University Press.

Scherer, Frederic M. 1977. "The economic effects of compulsory patent licensing." New York University Monograph, Center for the Study of Financial Institutions.

Steen, Kathryn. 2001. "Patents, Patriotism, and 'Skilled in the Art' USA v. The Chemical Foundation, Inc., 1923-1926." *Isis*, 92(1): 91-122.

Steinbrook, Robert. 2007. "Thailand and the Compulsory Licensing of Efavirenz." *New England Journal of Medicine*, 356(7): 544-546.

Tandon, Pankaj. 1982. "Optimal Patents with Compulsory Licensing." *Journal of Political Economy* 90(3): 470-486.

Williamson, Samuel H. 2008. "Five Ways to Compute the Relative Value of a U.S. Dollar Amount, 1790 to Present." *Measuring Worth*.

World Trade Organization. 2001. *Ministerial Declaration*, November, 20, WT/MIN(01)/DEC/1.

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