

Science Policy Research Report: The Effects of Patents on Innovation

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Some Proposals for Improving the Patent System

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FOREWORD

The following research study was prepared by Dr. Vannevar Bush at the request of the Subcommittee on Patents, Trademarks, and Copyrights as part of the study of the United States patent system it is conducting pursuant to Senate Resolutions 92 and 167 of the 84th Congress. Dr. Bush's study is one of a number of special studies undertaken for the subcommittee under its mandate "to conduct a * * * complete examination and review of the statutes relating to patents * * * ." The authors of these studies have been selected on the basis of their understanding, experience, and vision in dealing with the patent system.

competition. But the rights granted under patents have remained substantially unchanged. It is the patent monopoly with which we are here primarily concerned. Our forebears made the latter a temporary monopoly and imposed upon it practically no further governmental control.

It worked well. This country has prospered beyond all others in the wide application of new techniques and in advanced industrial processes. Undoubtedly much of this was due to the width of the land in which great homogeneous markets were developed, and to the pioneering spirit of the people which could be applied as well to industrial as to geographic frontiers. Yet the patent system was largely responsible for the vigor of our small enterprises and for the effectiveness with which new things were promptly brought into use.⁶ **Life was made more comfortable, healthy, and worth living for large numbers of our citizens.**

guesses about the extent to which reality corresponds to these assumptions.

If one does not know whether a system "as a whole" (in contrast to certain features of it) is good or bad, the safest "policy conclusion" is to "muddle through"—either with it, if one has long lived with it, or without it, if one has lived without it. If we did not have a patent system, it would be irresponsible, on the basis of our present knowledge of its economic consequences, to recommend instituting one. But since we have had a patent system for a long time, it would be irresponsible, on the basis of our present knowledge, to recommend abolishing it. This last statement refers to a country such as the United States of America—not to a small country and not a predominantly nonindustrial country, where a different weight of argument might well suggest another conclusion.

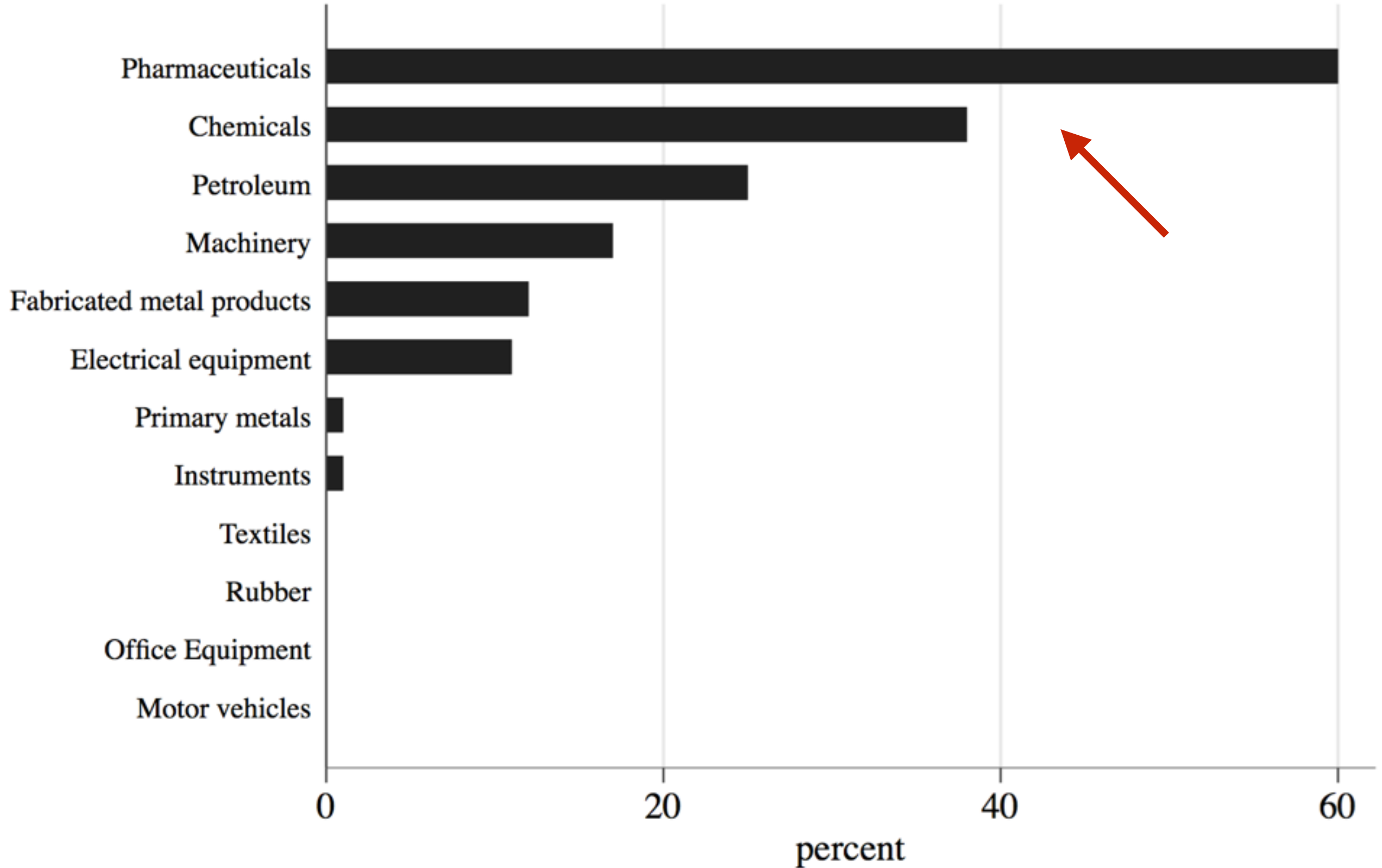
While the student of the economics of the patent system must, provisionally, disqualify himself on the question of the effects of the system *as a whole* on a large industrial economy, he need not disqualify himself as a judge of proposed *changes* in the existing system. While economic analysis does not yet provide a basis for choosing between "all or nothing," it does provide a sufficiently firm basis for decisions about "a little more or a little less" of various ingredients of the patent system. Factual data of various kinds may be needed even before some of these decisions can be made with confidence. But a team of well-trained economic researchers and analysts should be able to obtain enough information to reach competent conclusions on questions of patent reform. The kind of analysis that could form the framework for such research has been indicated in the present study.

Scope

1. Patents create incentives for R&D
2. Patents disclose information that enables technology diffusion and subsequent innovation
3. In contexts of cumulative innovation, strong upstream patents can hinder downstream innovation

How important are patents
as incentives for innovation?

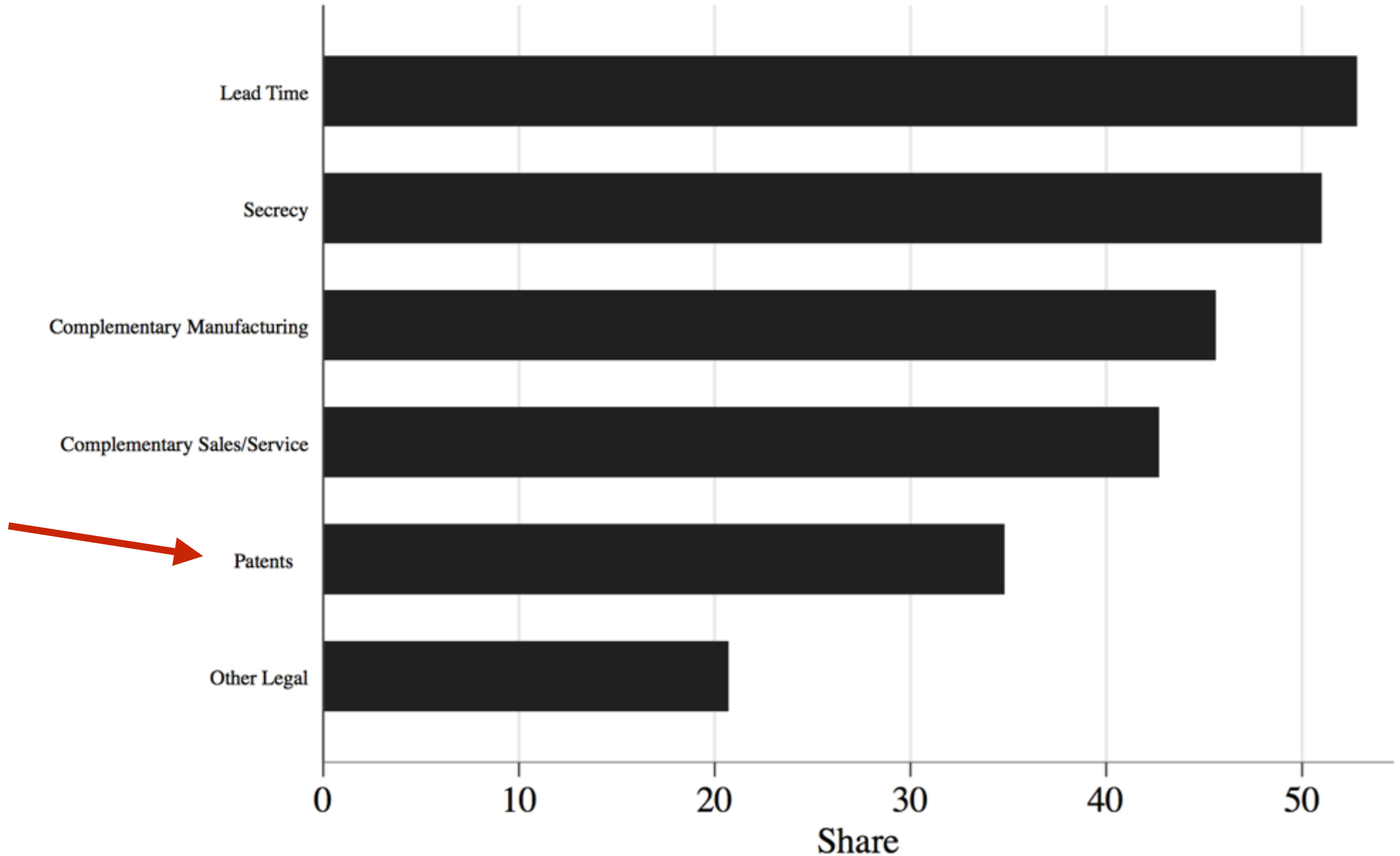
Percent of inventions that would not have been developed absent patent protection
Twelve industries, 1981-1983



Adapted from Mansfield (1986)

Effectiveness of Appropriability Mechanisms for Product Innovations

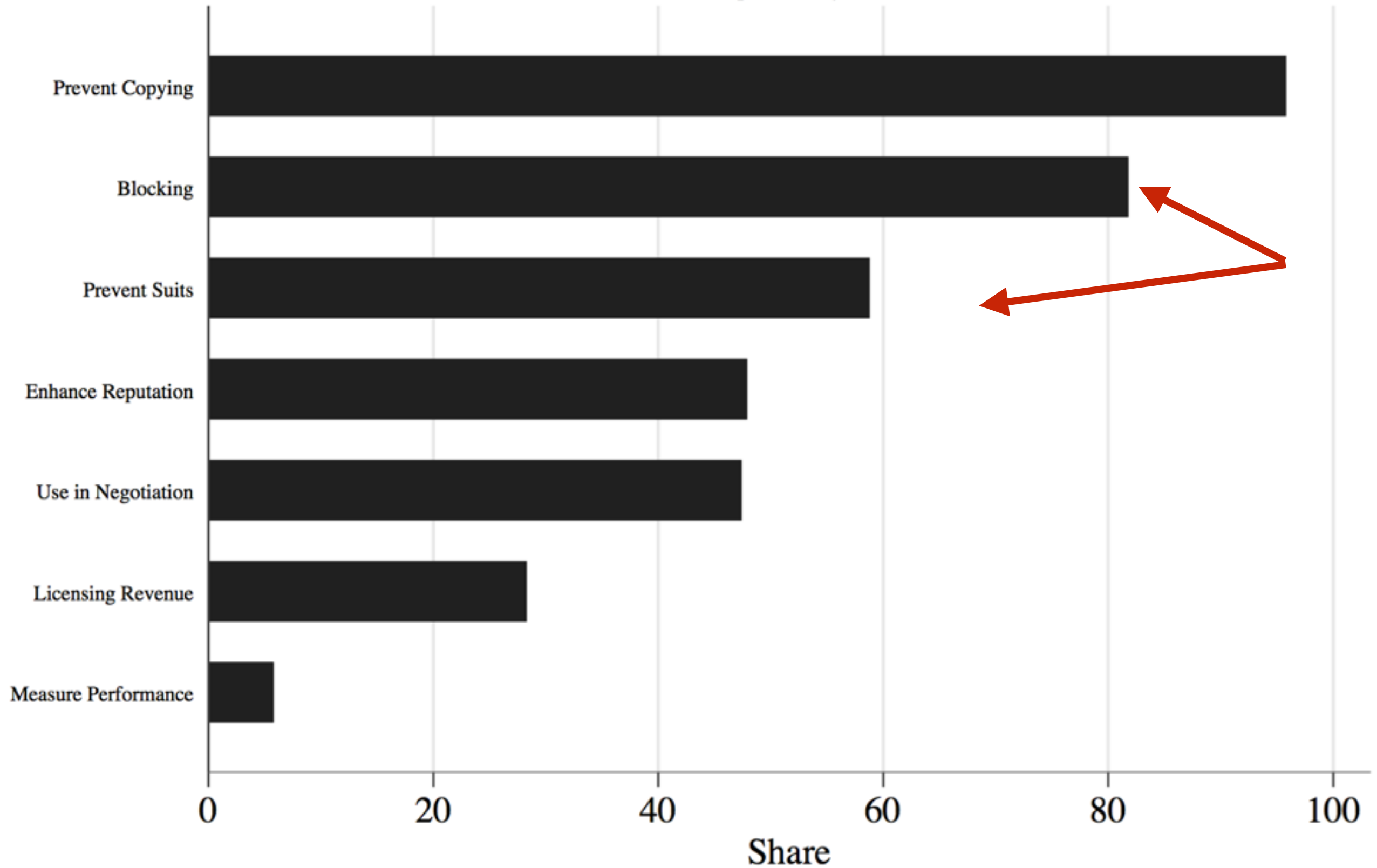
Mean % of Innovations for Which Mechanism Considered Effective



Adapted from Cohen et al (2000) Figure 1

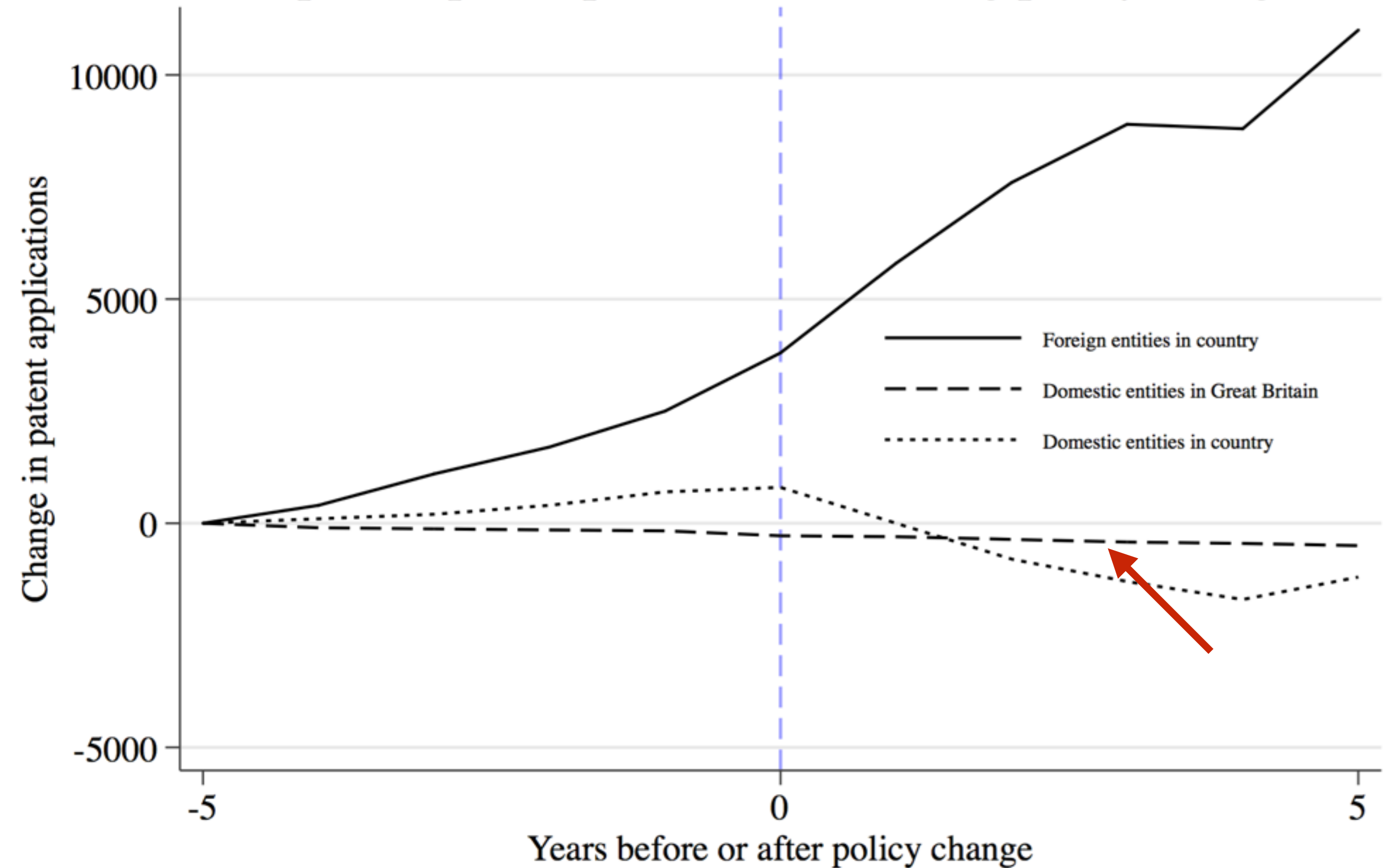
Reasons to Patent Product Innovations

% of Repondents By Reason



Adapted from Cohen et al (2000) Figure 7.

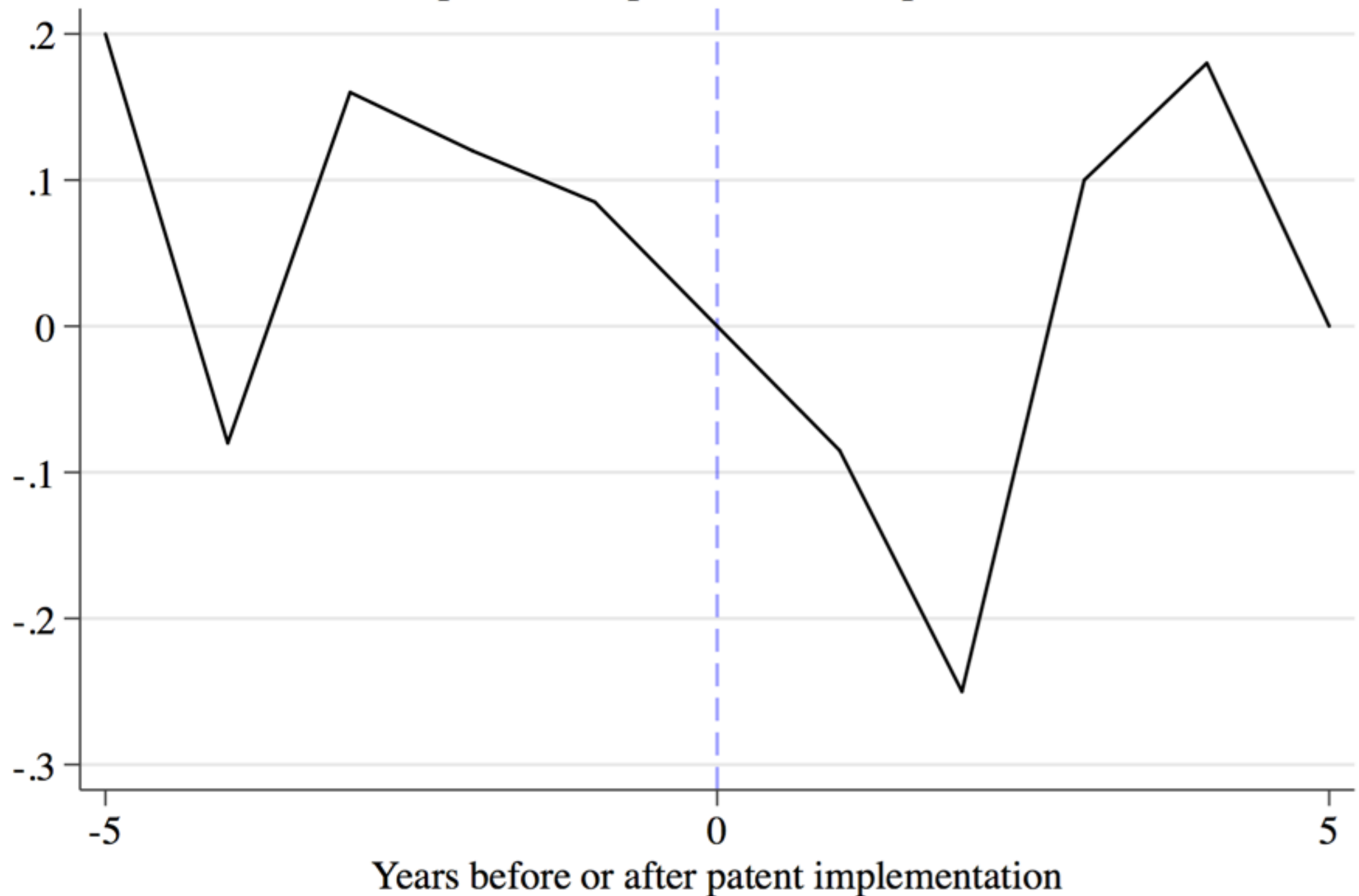
Impact of patent protection enhancing policy changes



Adapted from Lerner (2009)

Time trend of log citation-weighted pharmaceutical patents

Countries that implemented pharmaceutical patent laws 1978-1999

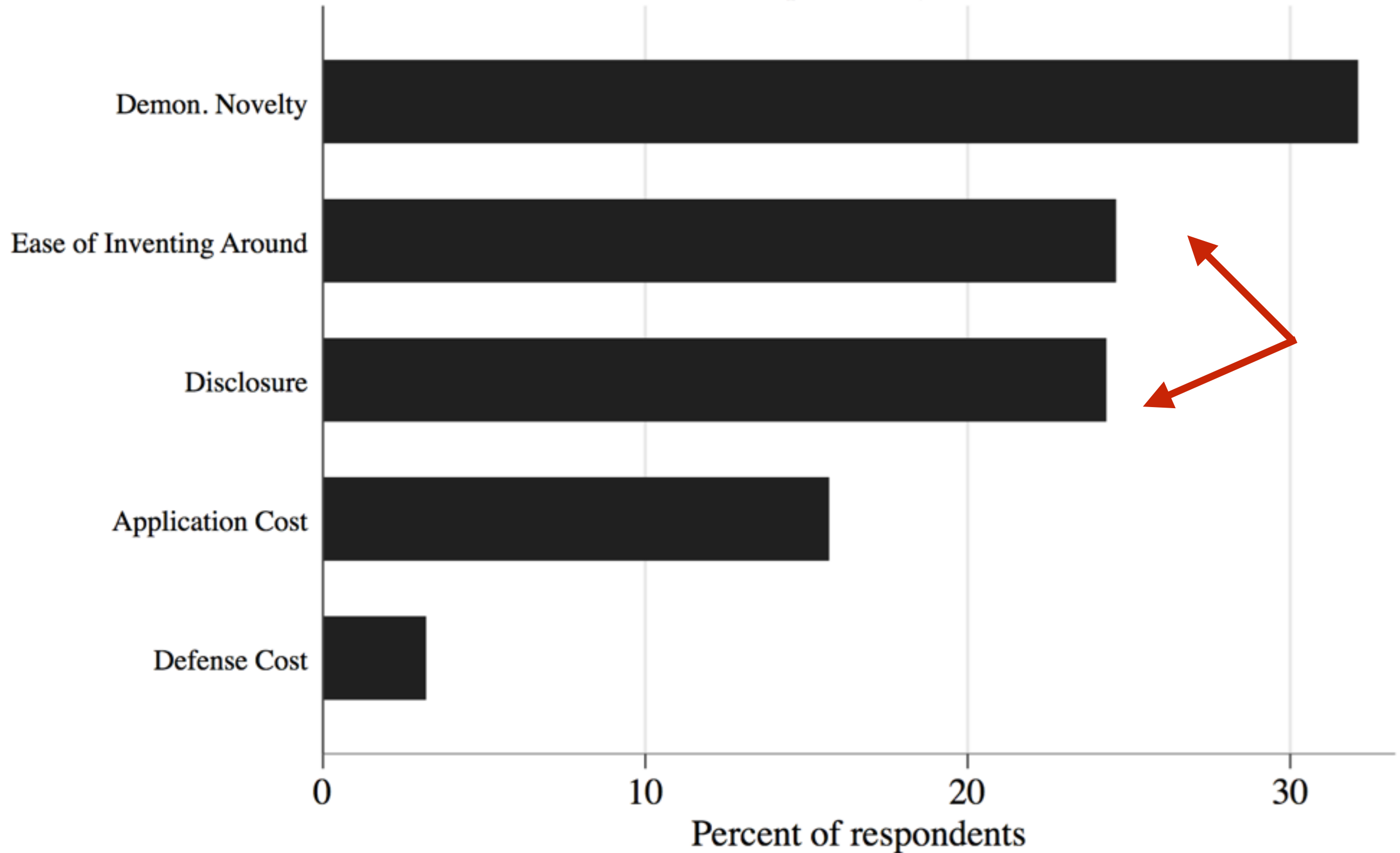


Adapted from Qian(2007)

Patents and diffusion: Do patents disclose information that enables subsequent innovation?

For Unpatented Innovations Most Important Reasons Not to Patent

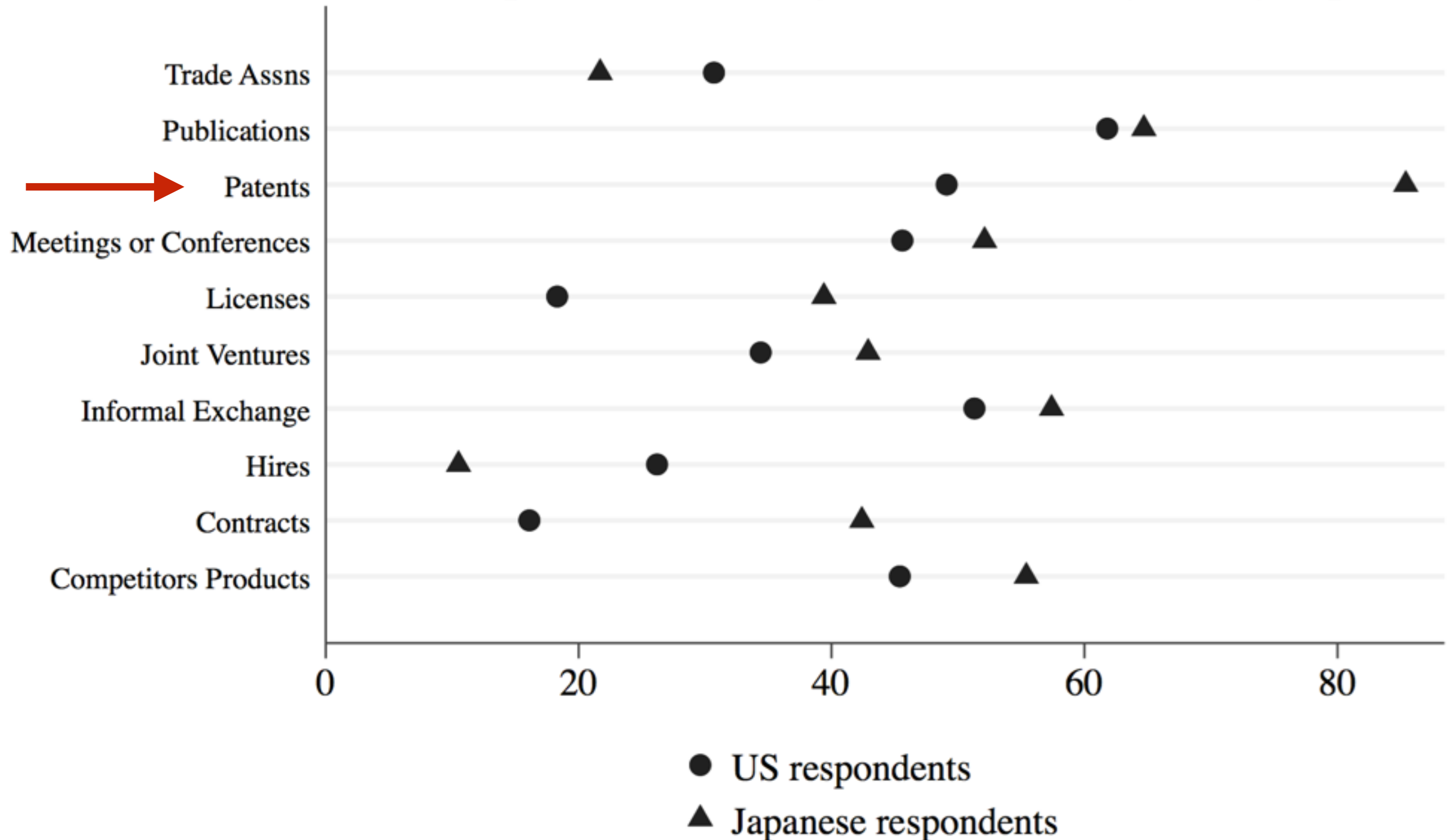
% of Repondents By Reason



Adapted from Cohen et al (2000) Figure 6.

Importance of sources of information on rivals' R&D

Percent respondents indicating source moderately or very important

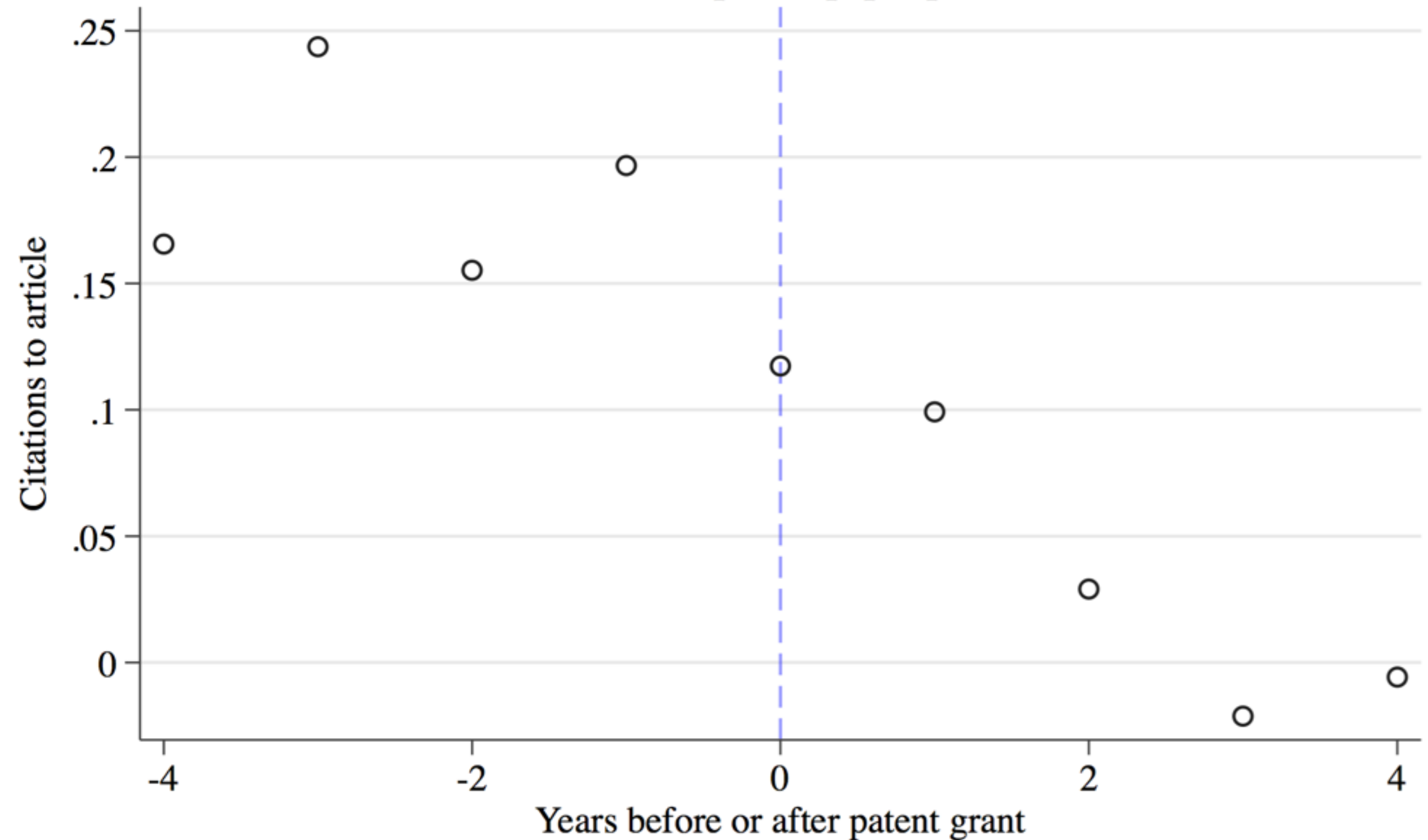


Adapted from Cohen et al (2012) Figure 6

Do upstream patents hinder
follow on innovation?

Citations to article vs timing of patent grant

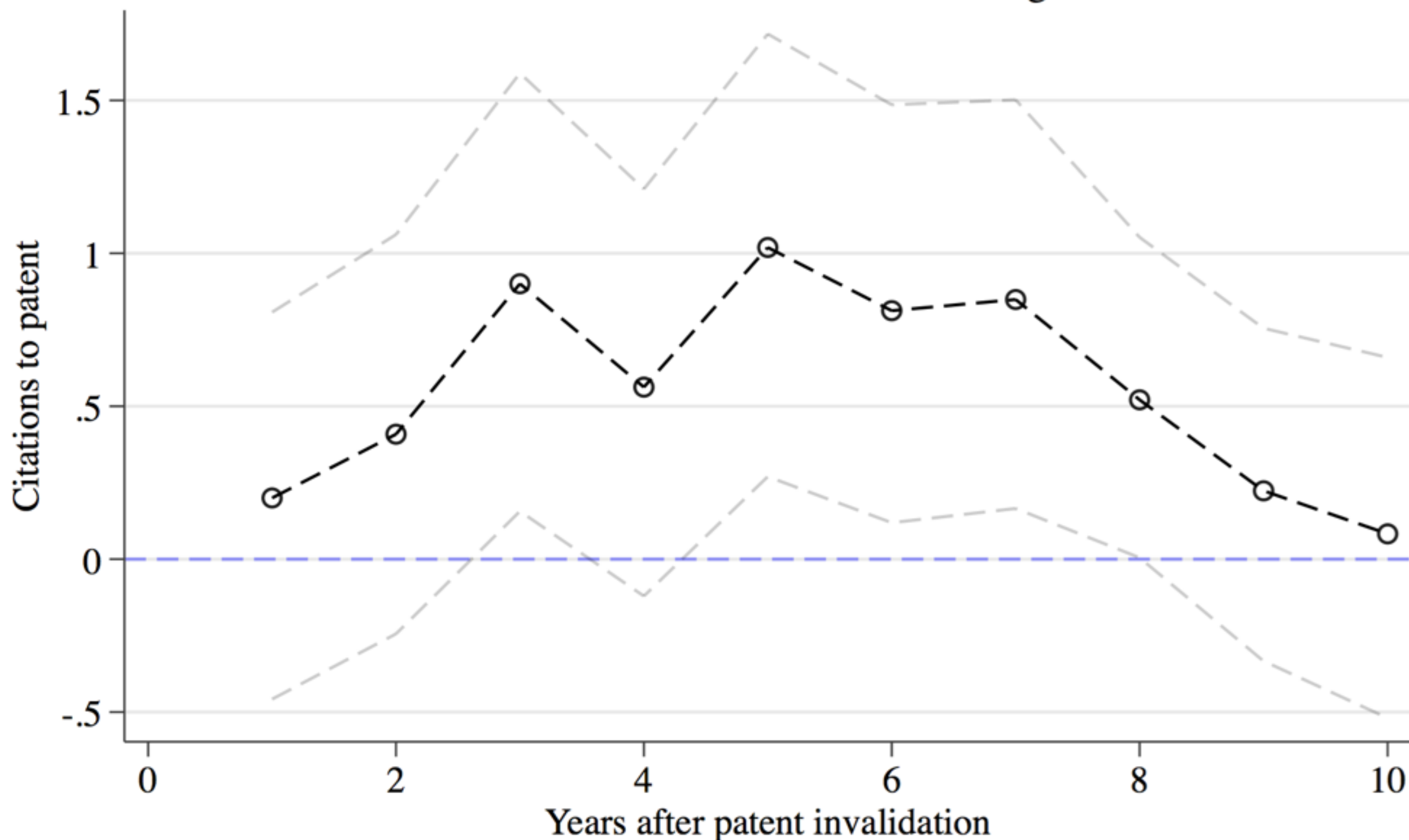
Based on patent-paper pairs



Estimated coefficients from negative binomial models; Adapted from Murray and Stern (2007)

Citations to patent vs timing of patent invalidation

Estimates from instrumental variables regression



Dashed lines indicate 90 percent confidence intervals. Adapted from Galasso and Schankerman (2014)

Conclusions

- **The effects of patents on innovation incentives are stronger in some sectors (pharmaceuticals, chemicals) than others. An optimal patent policy would be sector specific.**
- A considerable amount of innovation occurs outside the patent system. Strengthening of patent protection leads to changes in patenting and patent propensity, but this is not necessarily correlated with more innovation.
- In a global environment, strengthening national patent laws outside the U.S. doesn't seem to matter much for domestic R&D or innovation.
- Stronger patent protection does not appear to generate R&D for “tropical diseases.” For high social value investments without significant markets, patents are unlikely to have a strong effect. Other mechanisms, including prizes or public funding, may be needed.
- Firms do seem to read patents for information and learn from them. But the design of patent systems and publication rules may affect the extent of disclosure of useful information in patent documents.

Research gaps

- More work needed on static costs of patent protection, overall and relative to other S&T policy instruments (prizes, public funding) to generate innovations
- Continued work on patents and follow on innovation needed; better understanding of differences across fields
- Quasi-experimental evidence needed on disclosure function
- Better non-patent measures of innovation would help in evaluating the effects of patents on innovation
- More nuanced understanding of patent law implementation needed to understand results from patent law changes
- Much work on patents focused on their average importance: evaluations of marginal changes (extending to a new type of product, extending by 6 months, etc.) would be useful

Thanks!

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