

# Markets outperform patents in promoting intellectual discovery, say economists

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When it comes to intellectual curiosity and creativity, a market economy in which inventors can buy and sell shares of the key components of their discoveries actually beats out the winner-takes-all world of patent rights as a motivating force, according to a California Institute of Technology (Caltech)-led team of researchers.

In a paper published in this week's issue of the journal *Science*, an international team of researchers led by Peter Bossaerts, the William D. Hacker Professor of Economics and Management and professor of finance at Caltech, and Swiss Finance Institute Professor at the Ecole Polytechnique Federale Lausanne in Switzerland, describes a series of experiments designed to quantify the different ways patent systems and market forces might influence a person's drive to invent, to solve intellectual problems.

Over the last hundred-plus years, the patent system has been the gold standard by which we've protected and tried to incentivize intellectual discovery. But Bossaerts and his team--which includes Debrah Meloso from Bocconi University in Milan, Italy, and Jernej Copic from the University of California, Los Angeles--now say there's a new game in town. Or, rather, an old game--the same free-market forces that drive so much of our economy.

The problem with patents, Bossaerts explains, is that they "give the prize to the winner only. Whoever comes in second or third walks away empty." This means that, for the patent system to work well, "a large

number of people need to think they're the absolute best." The economic theory that motivated patent regulation even assumes that all people have an equal chance of being the best, he adds.

In reality, Bossaerts says, that's not how people think. Very few of us think we're the person most likely to come up with a unique solution to a problem before anyone else--and so very few of us are likely to even try to solve a difficult problem. We just assume that someone else will beat us to the patent punch.

On the other hand, Bossaerts notes, studies have shown that more than 50 percent of people think they're better than the median--a statistical impossibility, but one that can be exploited in the marketplace to generate trade.

The researchers were able to provide concrete evidence for these ideas by running a series of experiments in which participants were asked to solve what is known as "the knapsack problem." In the knapsack problem, participants are given a large number of items to pack into a knapsack that cannot possibly hold all of the items; their job is to try to figure out how to maximize the number of "valuable" items they can fit into the knapsack.

"These aren't always the most expensive items," says Bossaerts. "For instance, if you're packing the knapsack to go on a trip, one of the items you would consider most valuable would probably be a toothbrush."

Participants in Bossaerts's knapsack experiment had to solve one set of problems under a regime that worked in much the same way as a traditional patent system, with a \$66 reward for whoever figured out the solution first.

The second set of problems was to be solved in a kind of free-trading

market regime. Each item that could go into the knapsack was given a different price, and each participant was given five securities per item at the beginning of the experiment. They were then encouraged to buy and sell their securities for the various items, stocking up on shares of items they believed were likely to be included in the problem's solution, and getting rid of shares of items they thought would be left out of the knapsack.

Once the solution was revealed, the securities of the left-behind items became worthless, while the participants who had bought up shares of the included items were allowed to keep their earnings of \$1 a share. While nobody won the full \$66 as in the patent groups, several people in the market groups were able to benefit financially from coming up with a workable solution to the problem.

That solution didn't even have to be the optimal one, Bossaerts notes. "They didn't have to fully solve the problem to benefit financially," he explains. "They could solve only part of the problem--figure out a few items they believed would be in the solution, or those they thought wouldn't be there--and focus buying and selling those."

This resulted in a large number of different people trying different ideas each time the game was played. Allowing people to benefit even if they only tackle a part of a problem might well lead to more collaboration, and to the faster development of a final solution to the whole problem, Bossaerts adds. "This is important, because the nature of knapsack problems is such that one can only be sure that the optimal solution has been found after one has tried everything," he says.

To 'win' in the patent group, on the other hand, required coming up with the right answer first, which seemed to remove the incentive for the large majority of participants to even attempt solving the problem. "In one example, there was a woman who won a couple of times in a row,"

Bossaerts recalls. "She had over \$120, and everyone else had nothing. They just gave up trying, saying, 'Why bother? She'll just figure it out before us anyway.'"

How would these sorts of market forces work in the "real world"? Bossaerts uses the concept of scientists working to invent a fuel-cell catalyst.

"If a scientist is really convinced that platinum, for instance, is the best catalyst for his fuel cell, the best way to go, he would go out and buy a bunch of platinum futures, knowing that once his invention got into the public domain, the items that go into that invention--in this case, platinum--will go up in price."

Without a patent on the invention, other people would also be free to create platinum-based fuel cells. But there would still be a benefit to being the first: That inventor would be the one able to buy up platinum futures when the prices were at their lowest. "In the market system, if you're first, you still have the advantage," Bossaerts explains. "But you also give the second and third person a chance to profit from their work as well."

Bossaerts's next step is to try to collect data to explain why the market system works. "Our conjecture is that it's due to this idea of overconfidence, that most people think they are better than most other people. But this study wasn't able to test that idea specifically, so we're hoping to do that in future studies."

Bossaerts is well aware that his ideas--even with solid data to back them up--are controversial. People are very protective of their patents, and of the system that guards them, he says. But in reality, says Bossaerts, his team's findings should be seen as reassuring, rather than threatening.

"The take-home message from this study is that one should not be too nervous about protecting intellectual property," he explains. "There are other ways you can benefit from your efforts as well, as long as you have a functioning free market economy in place. Even if you get rid of most patent laws, people will still innovate."

More information: The study described in this paper, "Promoting Intellectual Discovery: Patents vs. Markets," journal *Science*.

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