A Toolkit of Policies to Promote Innovation

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***Japan SPOTLIGHT* Introduction**

In pursuing Evidence-Based Policy Making (EBPM), it is useful to take advantage of the academic knowledge from research outcomes in the past. However, it is practically difficult for policy makers working on EBPM to examine a variety of recent research papers and digest them to find lessons for their work due to the constraints of skills and time. Instead, they can learn a lot from papers on recent research surveys written in language without many technical terms that is easier for them to understand. They can understand roughly what has been clarified so far and what has not been made clear yet by academic research, as well as finding researchers' consensus on certain issues of analysis.

Nicholas Bloom summarizes below a key article in this literature, Bloom, Van Reenen and Williams (2019[1]).

Governments often make interventions to increase innovation and encourage economic growth. Such interventions are in general justified by economic theory, since in the case of innovation knowledge spillovers are the central market failure that economists consider it crucial to correct by public policies.

Such innovation promotion policies like tax incentives, patent boxes, government research grants, human capital supply, intellectual property and product market competition and international trade are examined below based on research surveys of recent academic achievements and suggest which policies would be most effective in promoting innovation.

Tax Incentives for Research & Development

The tax code automatically treats research and development expenditures by firms more generously than tangible capital investment. In particular, because most R&D expenses are current costs – like scientists' wages and lab materials – they can be written off in the year in which they occur. By contrast, investments in long-lasting assets such as plants, equipment, and buildings must be written off over a multiyear period; this allows a firm to reduce its tax liabilities only at some point in the future.

But over and above this tax structure advantage, many countries provide additional fiscal incentives for R&D, such as allowing an additional deduction to be made against tax liabilities. For example, if firms treat 100% of their R&D as a current expense, and the corporate income tax rate is 20%, then every $1 of R&D expenditure reduces corporate taxes by $0.20. However, if a government allows a 150% rate of super deduction, again assuming a corporate tax rate of 20%, then $1 of R&D spending would reduce corporate taxes by $0.30. President Ronald Reagan introduced the first Research and Experimentation Tax Credit in the United States in 1981. This policy currently costs the US federal government about $11 billion a year in forgone tax revenue (National Science Board 2018), with an additional $2 billion a year of lost tax revenue from state-level R&D tax credits (which started in Minnesota in 1982).

The OECD reported in 2018 that 33 of the 42 countries it examined provide some material level of tax generosity toward R&D. The US federal R&D tax credit is in the bottom one-third of OECD nations in terms of generosity, reducing the cost of US R&D spending by about 5%. This is mainly because the US tax credit is based on the incremental increase in a firm's R&D over a historically defined base level, rather than being a subsidy based on the total amount of R&D spending. In countries with the most generous provisions, such as France, Portugal, and Chile, the corresponding tax incentives reduce the cost of R&D by more than 30%.

Do such tax credits actually work to raise R&D spending? The answer seems to be "yes". One narrow approach to the question asks whether the quantity of R&D increases when its tax price falls. This question is of interest in part because most people (and many expert surveys) suggest that R&D is driven by advances in basic science and perhaps by market demand, rather than by tax incentives. There are now a large number of studies that examine changes in the rules determining the generosity of tax incentives by using a variety of data and methodologies. Many early studies used cross-country panel data, or US cross-state data (Wilson, 2009[2]) and related changes in R&D to changes in tax rules. Some more recent studies have used firm-level data and exploited differential effects of tax rules across firms before a surprise policy change. For example, firms below a size threshold may receive a more generous tax treatment, so one can compare firms just below and just above the threshold after (and before) the policy change by using a regression discontinuity design (Dechezleprêtre et al., 2016[3]). Taking the macro and micro studies together, a reasonable overall conclusion would be that a 10% fall in the tax price of R&D results in at least a 10% increase in R&D in the long run; that is, the absolute elasticity of R&D capital with respect to its tax-adjusted user cost is unity or greater.

One concern for both research and policy is that firms may relabel existing expenditures as "research and development" to take advantage of the more generous tax breaks. Chen et al., (2019[4]), for example, found substantial relabeling following a change in Chinese corporate tax rules. A direct way to assess the success of the R&D tax credit is to look at other outcomes such as patenting, productivity, or jobs. Encouragingly, these more direct measures also seem to increase (with a lag) following tax changes (for US evidence, see Lucking 2019[5] and Akcigit et al., 2018[6] for the United Kingdom, see Dechezleprêtre et al. 2016[3]; for China, see Chen et al. 2019[4]; and for Norway, see Bøler, Moxnes, and Ulltveit-Moe, 2015[7]).

Another concern is that tax credits may not raise aggregate R&D but rather may simply cause a relocation toward geographical areas with more generous fiscal incentives and away from geographical areas with less generous incentives. US policymakers may not care so much if tax credits shift activity from, say, Europe to the US, but I expect them to care if state-specific credits simply shift around activity from one state to another. There are a wide variety of local policies explicitly trying to relocate innovative activity across places within the US by offering increasingly generous subsidies. For example, Amazon's second headquarters generated fierce competition, with some cities offering subsidies up to $5 billion. This is likely to cause some distortions, as the areas that bid the most are not always the places where the research will be most socially valuable.

There is some evidence of relocation in response to tax incentives. In the context of individual inventor mobility and personal tax rates, Moretti and Wilson (2017[8]) find cross-state relocation within the US, and Akcigit, Baslandze, and Stantcheva (2016[9]) document a similar relocation pattern in an international dimension. Wilson (2009[2]) and Bloom and Griffith (2001[10]) also document some evidence of relocation in response to R&D tax credits. However, relocation alone does not appear to account for all of the observed changes in innovation-related outcomes. Akcigit et al. (2018[11]) test explicitly for relocation and estimate effects of tax incentive changes on nonrelocating incumbents. Overall, the conclusion from this literature is that despite some relocation across place, the aggregate effect of R&D tax credits at the national level both on the volume of R&D and on productivity is substantial.

Patent Boxes

"Patent boxes" – first introduced by Ireland in the 1970s – are special tax regimes that apply a lower tax rate to revenues linked to patents relative to other commercial revenues. By the end of 2015, patent boxes (or similarly structured tax incentives related to intellectual property) were used in 16 OECD countries (Guenther, 2017[12]). Although patent box schemes purport to be a way of incentivizing research and development, in practice they induce tax competition by encouraging firms to shift their intellectual property royalties into different tax jurisdictions. Patent boxes provide a system through which firms can manipulate stated revenues from patents to minimize their global tax burden (Griffith, Miller, and O'Connell, 2014[13]) because firms – particularly multinational firms – have considerable leeway in deciding where they will book their taxable income from intellectual property. Although it may be attractive for governments to use patent box policies to collect footloose tax revenues (Choi, 2019[14]), such policies do not have much effect on the real location or the quantity of either R&D or innovation. Gaessler, Hall, and Harhoff (2018[15]) find a small effect of the introduction of patent boxes in several EU countries on transfers of the ownership of patents, but zero effect on real invention.

My take is that patent boxes are an example of a harmful form of tax competition that distorts the tax system under the guise of being a pro-innovation policy. In contrast to well-designed research and development tax credits – for which it is hard to manipulate the stated location of research labs – patent boxes should be discouraged.

Government Research Grants

A disadvantage of tax-based support for research and development is that tax policies are difficult to target at the R&D that creates the most knowledge spillovers and avoids business-stealing. In contrast, government-directed grants can more naturally do this type of targeting by focusing on, for example, basic R&D, such as that performed in universities, rather than more applied R&D that occurs in an industry setting. A variety of government programs seek to encourage innovation by providing grant funding, either to academic researchers – such as through the US National Institutes of Health (NIH) – or to private firms, such as through the Small Business Innovation Research (SBIR) program. How effective are these programs?

Evaluating the effectiveness of grant funding for R&D is challenging. Public research grants usually (and understandably) attempt to target the most promising researchers, the most promising projects, or the most socially important problems. As a result, it is difficult to construct a counterfactual for what would otherwise have happened to the researchers, firms, or projects that receive public R&D funds. If $1 of public R&D simply crowds out $1 of private R&D that would otherwise have been invested in the same project, then public R&D could have no real effect on overall R&D allocations (much less on productivity or growth). However, it is also possible that public R&D grants add to private R&D spending, or even that public R&D "crowds in" and attracts additional private R&D spending.

Jacob and Lefgren (2011[16]) use administrative data on US grant applications to the NIH and effectively compare academic applicants who just barely received and just missed receiving large NIH grants. They document that these grants produce positive but small effects on research output, leading to about one additional publication over five years (an increase of 7%). One explanation for this modest effect is that marginal unsuccessful NIH grant applicants often obtain other sources of funding to continue their research. Consistent with that story, productivity effects are larger among researchers who are likely to be more reliant on NIH funding (for whom alternative funding sources may be less likely to be available).

Looking beyond academic output, public research and development grants may affect private firms in several ways. First, public R&D grants to academics can generate spillovers to private firms. Azoulay, Graff Zivin, et al. (2019[17]) exploit quasi-experimental variation in funding from the NIH across research areas to show that a $10 million increase in NIH funding to academics leads to 2.7 additional patents filed by private firms. Second, private firms themselves sometimes conduct publicly funded R&D. Moretti et al. (2019[18]) use changes in military R&D spending, which is frequently driven by exogenous political changes, to look at the effect of public subsidies for military R&D. They document that a 10% increase in publicly funded R&D to private firms results in a 3% increase in private R&D, suggesting that public R&D crowds in private R&D (and also, they document, raises productivity growth). Third, private firms can directly receive public subsidies. Howell (2017[19]) examines outcomes for Small Business Innovation Research grant applicants, comparing marginal winners and losers. She estimates that early-stage SBIR grants roughly double the probability that a firm receives subsequent venture capital funding, and that receipt of an SBIR grant has positive impacts on firm revenue and patenting.

Two other important aspects of public grant support for R&D are worth mentioning. First, a substantial share of public R&D subsidies goes to universities, which makes sense from a policy perspective, as spillovers from basic academic research are likely to be much larger than those from near-market applied research. There certainly appears to be a correlation between areas with strong science-based universities and private sector innovation (for example, Silicon Valley in California, Route 128 in Massachusetts, and the Research Triangle in North Carolina). Jaffe (1989[20]) pioneered research in this area by documenting important effects of academic R&D on corporate patenting, a finding corroborated by Belenzon and Schankerman (2013[21]) and Hausman (2018[22]).

Governments can also fund their own research and development labs – for example, the SLAC National Accelerator Laboratory at Stanford University. These labs can generate more research activity and employment in the technological and geographical area in which the lab specializes. For example, the United Kingdom's Diamond Light Source synchrotron appeared to do this (Helmers and Overman, 2016[23]), but in that case the increase seems to have occurred mainly through relocation of research activity within the UK rather than an overall increase in aggregate research.

There has also been controversy over how to design complementary policies that enable the resulting discoveries – when made at universities – to be translated into technologies that benefit consumers. The 1980 Bayh-Dole Act in the US made some key changes in the ownership of inventions developed with public research and development support. In part because of Bayh–Dole, universities have an ownership share in the intellectual property developed by those working at their institutions, and many universities set up "technology transfer offices" to provide additional support for the commercialization of research. Lach and Schankerman (2008[24]) provide evidence consistent with greater ownership of innovations by scientists being associated with more innovation. In addition, evidence from Norway presented in Hvide and Jones (2018[25]) suggests that when university researchers enjoy the full rights to their innovations, they are more likely to patent inventions as well as launch start-ups. That is, ideas that might have remained in the "ivory tower" appear more likely to be turned into real products because of changes in the financial returns to academic researchers.

Human Capital Supply

So far, I have focused attention on policies that increase the demand for R&D by reducing its cost via the tax system or via direct grant funding. However, consider an example in which I assume that scientists carry out all R&D and that the total number of scientists is fixed. If the government increases demand for R&D, the result will simply be higher wages for scientists, with zero effect on the quantity of R&D or innovation. Of course, this example is extreme. There is likely to be some ability to substitute away from other factors into R&D. Similarly, there is likely some elasticity of scientist supply in the long run as wages rise and, through immigration from other countries, in the short run. However, the underlying message is that increasing the quantity of innovative activity requires increasing the supply of workers with the human capital needed to carry out research, as emphasized by Romer (2001[26]). This rise in supply increases the volume of innovation directly as well as boosting R&D indirectly by reducing the equilibrium price of R&D workers. In addition, since these workers are highly paid, increasing the supply of scientific human capital will also tend to decrease wage inequality.

Many policy tools are available that can increase the supply of scientific human capital. In terms of frontier innovation, perhaps the most direct policy is to increase the quantity and quality of inventors. There have been many attempts to increase the number of individuals with training in science, technology, engineering, and mathematics (commonly known as STEM). Evaluating the success of such policies is difficult given that these policies tend to be economy-wide, with effects that will play out only in the long run.

One strand of this literature has focused on the location, expansion, and regulation of universities as key suppliers of workers in science, technology, engineering, and mathematics. For example, Toivanen and Väänänen (2016[27]) document that individuals growing up around a technical university (such institutions rapidly expanded in the 1960s and 1970s in Finland) were more likely to become engineers and inventors. Of course, such policies could increase the supply of workers with qualifications in STEM fields, but research and innovation by university faculty could also directly affect local area outcomes.

Bianchi and Giorcelli (2018[28]) present results from a more direct test of the former explanation by exploiting a change in the enrollment requirements for Italian majors in science, technology, engineering, and mathematics, which expanded the number of graduates. They document that this exogenous increase in STEM majors led to more innovation in general, with effects concentrated in particular in chemistry, medicine, and information technology. They also document a general "leakage" problem that may accompany efforts to simply increase the STEM pipeline: many STEM-trained graduates may choose to work in sectors that are not especially focused on R&D or innovation, such as finance.

Migration offers an alternative lens into the effects of human capital on innovation. Historically, the US has had a relatively open immigration policy that helped to make the nation a magnet for talent. Immigrants make up 18% of the US labor force aged 25 and over but constitute 26% of the science, technology, engineering, and mathematics workforce. Immigrants also own 28% of higher-quality patents (as measured by those filed in patent offices of at least two countries) and hold 31% of all Ph.Ds (Shambaugh, Nunn, and Portman, 2017[29]). A considerable body of research supports the idea that US immigrants, especially high-skilled immigrants, have boosted innovation. For example, Kerr and Lincoln (2010[30]) exploit policy changes affecting the number of H1-B visas and argue that the positive effects come solely through the new migrants' own innovation. Using state panel data from 1940 to 2000, Hunt and Gauthier-Loiselle (2010[31]) document that a 1 percentage point increase in immigrant college graduates' population share increases patents per capita by 9-18%, and they argue for a spillover effect to the rest of the population. Bernstein et al. (2018[32]) use the death of an inventor as an exogenous shock to team productivity and argue for large spillover effects of immigrants on native innovation.

The US federal government's introduction of immigration quotas with varying degrees of strictness in the early 1920s – for example, Southern Europeans such as Italians were more strongly affected than Northern Europeans such as Swedes – has been used to document how exogenous reductions in immigration damaged innovation. Moser and San (2019[33]) use rich biographical data to show that these quotas discouraged Eastern and Southern European scientists from coming to the US and that this reduced aggregate invention. Doran and Yoon (2018[34]) also find negative effects of these quotas. Moser, Voena, and Waldinger (2014[35]) show that American innovation in chemistry was boosted by the arrival of Jewish scientists who were expelled by the German Nazi regime in the 1930s.

Overall, most of the available evidence suggests that increasing the supply of human capital through expanded university programs and/or relaxed immigration rules is likely to be an effective innovation policy.

A final way to increase the quantity supplied of R&D is to reduce the barriers to talented people becoming inventors in the first place. Children born in low-income families, women, and minorities are much less likely to become successful inventors. Bell et al. (2019[36]), for example, document that US children born into the top 1% of the parental income distribution are 10 times more likely to grow up to be inventors than are those born in the bottom half of the distribution. The authors show that relatively little of this difference is related to innate ability. A more important cause of the lower invention rate for disadvantaged groups appears to be differential exposure rates to inventors in childhood. This implies that improved neighborhoods, better school quality, and greater exposure to inventor role models and mentoring could arguably raise long-term innovation.

Intellectual Property

The phrase "intellectual property" is often used to refer to a suite of policies including patents, copyrights, and other instruments such as trademarks. Although these policies have some broad similarities, they differ in meaningful ways. For example, a patent grants – in exchange for disclosure of an invention – a limited-term property right to an inventor, during which time the inventor has the right to exclude others from making, using, or selling their invention. A copyright, in contrast, provides a limited term of protection to original literary, dramatic, musical, and artistic works, during which time the author has the right to determine whether, and under what conditions, others can use their work. The legal rules governing patents and copyrights are distinct, and the practical details of their implementation are quite different; for example, copyright exists from the moment a work is created (although as a practical matter it can be difficult to bring a lawsuit for infringement if you do not register the copyright), whereas an inventor must actively choose to file a patent application, and patent applications are reviewed by patent examiners. Nonetheless, patents and copyrights have many similarities from an economic perspective, and economists – to the chagrin of some lawyers – often lump the two types of policies together.

Boldrin and Levine (2013[37]) have argued that the patent system should be completely abolished, based on the view that there is no evidence that patents serve to increase innovation and productivity. Although the patent system has many problems, outright abolition is – in my view – an excessive response. However, many different elements of patents could be strengthened or loosened. I focus here on two specific areas currently under active policy debate.

First, what types of technologies should be patent eligible? The US Patent and Trademark Office is tasked with awarding patent rights to inventions that are novel, non-obvious, and useful and whose application satisfies the public disclosure requirement. The US Supreme Court has long interpreted Section 101 of Title 35 of the US Code as implying that abstract ideas, natural phenomena, and laws of nature are patent-ineligible. Several recent court rulings have relied on Section 101 to argue that various types of inventions should no longer be patent eligible: business methods (Bilski vs *Kappos*, 561 US 593 [2010]), medical diagnostic tests (*Mayo Collaborative Services vs Prometheus Laboratories, Inc.*, 566 US 66 [2012]), human genes (*Association for Molecular Pathology vs Myriad Genetics, Inc.*, 569 US 576 [2013]), and software (*Alice Corp. vs CLS Bank International*, 573 US 208 [2014]). A reasonable interpretation of these legal rulings is that the court is "carving out" certain areas where the perceived social costs of patents outweigh the perceived social benefits. For example, in the 2012 *Mayo vs Prometheus* case, the court argued that the patenting of abstract ideas such as medical diagnostic tests might impede, more than encourage, innovation. This question is fundamentally empirical, but the available empirical evidence provides only rather inconclusive hints at the answer to that question, rather than a systematic basis for policy guidance (Williams 2013[38], 2017[39]; Sampat and Williams, 2019[40]).

Second, many current debates about patent reform center on "patent trolls", a pejorative term that refers to certain "nonpracticing entities", or patent owners who do not manufacture or use a patented invention but instead buy patents and then seek to enforce patent rights against accused infringers. The key question here is whether litigation by so-called patent trolls is frivolous. On the one hand, Haber and Levine (2014[41]) argue that the recent uptick in patent litigation generally associated with the rise of patent trolls may in fact not be evidence of a problem. They argue that, historically, spikes in litigation have coincided with the introduction of disruptive technologies (such as the telegraph and the automobile) and that there is no evidence that the current patent system either harms product quality or increases prices. On the other hand, Cohen, Gurun, and Kominers (2016[42]) find that nonpracticing entities (unlike practicing entities) sue firms that experience increases in their cash holdings. They interpret this interesting connection as evidence that, on average, nonpracticing entities act as patent trolls, but this evidence provides little information about the importance of these types of incentives in explaining the broader observed trends in patenting or innovation. While several other author teams have investigated various aspects of patent trolling (Abrams, Akcigit, and Grennan, 2018[43]; Lemley and Simcoe, 2018[44]; Feng and Jaravel, forthcoming[45]), the past literature has struggled to establish clear evidence that many or most nonpracticing entities are associated with welfare-reducing behavior.

Product Market Competition & International Trade

The impact of competition on innovation is theoretically ambiguous. On the negative side, Schumpeter (1942[46]) argued that the desired reward for innovation is monopoly profits, and increasing competition tends to reduce those incentives. More broadly, settings with high competition may tend to imply lower future profits, which in turn will limit the internal funds available to finance research and development, which may be important given the financial frictions discussed above.

But there are also ways in which competition may encourage innovation. First, monopolists who benefit from high barriers to entry have little incentive to innovate and replace the stream of supernormal profits they already enjoy, in contrast to a new entrant who has no rents to lose (this is the "replacement effect" described in Arrow, 1962[47]). Second, tougher competition can induce managers to work harder and innovate more. Finally, capital and labor are often "trapped" within firms (for example, restricted by the costs of hiring employees or moving capital). If competition removes the market for a firm's product, it will be forced to innovate to redeploy these factors (Bloom et al., 2019[48]). In some models, the impact of competition on innovation is plotted as an inverted U: when competition is low, the impact of greater competition on innovation first is positive, then becomes negative at higher levels of competition (see, for example, Aghion et al., 2005[49]).

The bottom line is that the net impact of competition on innovation remains an open empirical question. However, existing empirical evidence suggests that competition typically increases innovation, especially in markets that initially have low levels of competition. Much of this literature focuses on import shocks that increase competition, such as China's integration in the global market following accession to the World Trade Organization in 2001. Shu and Steinwender (2019[50]) summarize over 40 papers on trade and competition, arguing that in South America, Asia, and Europe, competition mostly drives increases in innovation (also see Blundell, Griffith, and Van Reenen 1999[51]; Bloom, Draca, and Van Reenen, 2016[52]). In North America, the impact of import competition is more mixed; for example, Autor et al. (2016[53]) argue that Chinese import competition reduced innovation in US manufacturing, although Xu and Gong (2017[54]) argue these research and development employees displaced from manufacturing were re-employed in services, generating an ambiguous overall impact.

In addition to its effect on competition, trade openness can increase innovation by increasing market size, thus spreading the cost of innovation over a larger market (for example, Grossman and Helpman, 1991[55]). Moreover, trade leads to improved inputs and a faster diffusion of knowledge (for example, Diamond 1997[56]; Keller, 2004[57]). Aghion et al. (2018[58]) use shocks to a firm's export markets to demonstrate large positive effects on innovation in French firms. Atkin et al. (2017[59]) implemented a randomized controlled trial to stimulate exports in small apparel firms in Egypt and found that exporting increases firms' productivity and quality. The benefits of superior imported inputs have been shown in a number of papers (including Goldberg et al[60]., 2010; Fieler and Harrison, 2018[61]).

In my view, the policy prescription from this literature seems reasonably clear: greater competition and trade openness typically increase innovation. The financial costs of these policies are relatively low, given that there are additional positive impacts associated with policies that lower prices and increase choice. The downside is that such globalization shocks may increase inequality among people and places.

Conclusions

Market economies are likely to underprovide innovation, primarily due to knowledge spillovers between firms. This article has discussed the evidence on policy tools that aim to increase innovation.

I condense my (admittedly subjective) judgements into a *Table*, which could be used as a toolkit for innovation policymakers. Column 1 summarizes my reading of the quality of the currently available empirical evidence in terms of both the quantity of papers and the credibility of the evidence provided by those studies. Column 2 summarizes the conclusiveness of the evidence for policy. Column 3 scores the overall benefits minus costs (that is, the net benefit), in terms of a light bulb ranking where three is the highest. This ranking is meant to represent a composite of the strength of the evidence and the magnitude of average effects. Columns 4 and 5 are two other criteria: first, whether the main effects would be short term (say, within the next three to four years), medium term, or long term (approximately 10 years or more), and second, the likely effects on inequality. Different policymakers (and citizens) will assign different weights to these criteria.

In the short run, R&D tax credits and direct public funding seem the most effective, whereas increasing the supply of human capital (for example, through expanding university admissions in the areas of science, technology, engineering, and mathematics) is more effective in the long run. Encouraging skilled immigration has big effects even in the short run. Competition and open trade policies probably have benefits that are more modest for innovation, but they are cheap in financial terms and so also score highly. One difference is that R&D subsidies and open trade policies are likely to increase inequality, partly by increasing the demand for highly skilled labor and partly, in the case of trade, because some communities will endure the pain of trade adjustment and job loss. In contrast, increasing the supply of highly skilled labor is likely to reduce inequality by easing competition for scarce human capital.

Of course, others will undoubtedly take different views on the policies listed in the *Table*. Nevertheless, I hope that this framework at least prompts additional debate over what needs to be done to restore equitable growth in the modern economy.

TABLE

Innovation policy toolkit

	Quality of evidence	Conclusiveness of evidence	Net benefit	Time frame	Effect on inequality
Policy	(1)	(2)	(3)	(4)	(5)
Direct R&D grants	Medium	Medium	💡💡	Medium run	↑
R&D tax credits	High	High	💡💡💡	Short run	↑
Patent box	Medium	Medium	Negative	NA	↑
Skilled immigration	High	High	💡💡💡	Short to medium run	↓
Universities: incentives	Medium	Low	💡	Medium run	↑
Universities: STEM supply	Medium	Medium	💡💡	Long run	↓
Trade and competition	High	Medium	💡💡💡	Medium run	↑
Intellectual property reform	Medium	Low	Unknown	Medium run	Unknown
Mission-oriented policies	Low	Low	💡	Medium run	Unknown

Notes: This is my highly subjective reading of the evidence. Column 1 reflects a mixture of the number of studies and the quality of the research design. Column 2 indicates whether the existing evidence delivers any firm policy conclusions. Column 3 is my assessment of the magnitude of the benefits minus the costs (assuming these are positive). Column 4 delineates whether the main benefits (if there are any) are likely to be seen in the short run (roughly, the next three to four years) or in the longer run (roughly 10 years or more); NA means not applicable. Column 5 lists the likely effect on inequality.

Source: Nicholas Bloom

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