# Working Paper

## Is Intellectual Property the Root of All Evil? Patents, Copyrights, and Inequality

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# Introduction

This paper raises three issues on the relationship between intellectual property and inequality. The first is a simple logical point. Patents, copyrights, and other forms of intellectual property are public policy. They are not facts given to us by the world or the structure of technology somehow. While this point should be self-evident, it is rarely noted in discussions of inequality or ways to address it.

The second issue is that there is an enormous amount of money at stake with intellectual property rules. Many items that sell at high prices as a result of patent or copyright protection would be free or nearly free in the absence of these government granted monopolies. Perhaps the most notable example is prescription drugs where we will spend over $420 billion in 2018 in the United States for drugs that would almost certainly cost less than $105 billion in a free market. The difference is $315 billion annually or 1.6 percent of GDP. If we add in software, medical equipment, pesticides, fertilizer, and other areas where these protections account for a large percentage of the cost, the gap between protected prices and free market prices likely approaches $1 trillion annually, a sum that is more than 60 percent of after-tax corporate profits.

The third issue is that the effect of these protections is to redistribute income upward. This can be seen most easily in looking at the origins of the fortunes of some of the country's richest people, starting with Bill Gates. It also is apparent from looking at the leading companies in terms of market capitalization and profits, starting with Apple.

In addition, the demand for people with advanced skills in computer science, biotechnology, and other technical areas is highly dependent on the patent and copyright monopolies which ultimately pay for their work. With a different set of rules for promoting innovation and creative work, there could be far less demand for their work. While it can be debated whether or not that situation is desirable, the point is that this is a policy decision, not anything that is determined by technology or the natural development of the economy.

Instead of being a sidebar pursued by a small clique of economists and people concerned about access to medicines, rules on intellectual property should play a central role in debates on inequality. There is a huge amount at stake in setting these rules and those concerned about inequality should be paying attention.

# Section I: The Logic of Creating Intellectual Property

Grants of intellectual property are explicitly designed as a mechanism by which the government provides incentives for certain types of activity. The wording in the Constitution could not be clearer on this point. In listing the powers of Congress in Section 8, the eighth item listed is:

> *"To promote the Progress of Science and useful Arts, by securing for limited Times to Authors and Inventors the exclusive Right to their respective Writings and Discoveries."* [1]

This is very clearly describing the monopolies granted by patents and copyrights as policy tools to promote innovation and creative work. Somehow this basic fact — that patent and copyright monopolies are tools of public policy — seems to have largely disappeared in public debate. The point matters because everything about these monopolies is determined by government policy, not facts of nature or the course of technology.

At the most basic level, the duration of the monopoly is the result of an explicit decision as to how much incentive to provide. The duration of both patents and copyrights have been lengthened in the last four decades. In the case of patents, the duration had varied by type but ranged from 14 to 17 years from the date of issuance. It is now 20 years from the date of application. There have been efforts to make it even longer. Copyright duration had been 55 years until the mid-1970s. Since then it has been raised three times and now stands at 105 years. It had been just 28 years from 1790 until 1831.

In addition to setting the length of patent and copyright protection, the government also decides what items are subject to these protections. In the last four decades, the realm of items potentially subject to patent protection has been expanded to include biological organisms, software, and business methods. This has vastly expanded the range of potential patents.

Beyond the question of whether an item should be subject to patent protection, there is also a question of how broadly a patent should be applied. Apple famously claimed a patent on its mouse/menu system of computer operation. It tried to block the introduction of Microsoft's Windows system, claiming it had the same "touch and feel" as Apple's system, although Apple ultimately lost the case.

1 *US Constitution.* Art. I, Sec. 8.

Amazon attempted to patent one-click shopping in the early days of the commercial Internet. It also lost its case.

While most people would probably agree that honoring these incredibly broad claims is unreasonable, both companies presumably thought they had a serious legal argument or they would not have bothered with the expense of pursuing their cases. This means it is possible that courts would have decided that any company using menu-based computing or one-click shopping had to pay royalties to Apple or Amazon for the privilege.

There is also a question of what inventions meet the novelty requirement for a patent. Under India's patent system this requirement imposes a high standard, especially in the case of prescription drugs. Typically, to get a patent, India requires that a drug involve a new molecule. This has prevented many drugs that are patented elsewhere from getting patent protection in India. For example, the cancer drug Glivec, which sells for tens of thousands of dollars for a year's treatment, was denied a patent in India because its courts ruled that it did not involve a novel innovation.[2]

The US patent office is notoriously lax in the standards it applies to patents. It famously issued a patent on a peanut butter and jelly sandwich in 1997.[3] Many companies, especially in the pharmaceutical industry, have taken advantage of this laxness to get frivolous patents. Even a patent of dubious validity may allow a company to extend the duration of its monopoly for several years.[4]

This brings up another important aspect of policy, the rules on enforcement. In the United States, the rules are very friendly to those claiming patent or copyright protection. Infringers can be assessed punitive damages if they lose a case. This acts as a powerful deterrence to competitors from entering a market where they are potentially infringing until a case has been decided. This again is especially important in the case of pharmaceuticals. If a pharmaceutical company claims a dubious patent on some aspect of a drug that is about to lose protection from its main patent, a generic competitor would take a considerable risk in entering the market.[5] It is also important to recognize the fundamental asymmetry in this sort of contest: the brand producer is fighting to be able to continue to sell the drug at the monopoly price, the generic competitor is trying to get the right to sell it at the free market price.

2 Kulkarni and Mohanty (2013).
3 Kretchman and Geske (1997).
4 On this topic, it is worth noting the America Invents Act of 2011, which created an extra-judicial process whereby patents could be challenged post-approval. This set up a less costly process through which dubious patents could be contested (see Leahy–Smith America Invents Act 2011).
5 Collier (2013).

The situation in the case of copyrights is even more friendly to the copyright holder. In many cases, the actual losses from even large-scale infringement would be trivial. For example, Spotify pays between 0.006 and 0.0084 cents per play to the holders of the copyright on a song.[6] This means that someone who had circulated 10,000 unauthorized copies of a song would have cost the copyright holder between 60 cents and 84 cents in lost royalty payments. It is unlikely anyone would pursue this sort of case in courts.

However, the law provides for punitive damages, which could mean that this sort of violation could lead to thousands or even tens of thousands of dollars in damages. The government has also taken upon itself to prosecute these cases criminally, making an otherwise trivial economic loss into a major criminal offense.

The Digital Millennial Copyright Act of 1998 also makes third parties potentially liable for infringement. In order to protect themselves from liability, a web intermediary has the responsibility for promptly taking down allegedly infringing material after being notified. This effectively requires an intermediary to take the side of the person alleging infringement against their customer or friend. By contrast, the law in Canada simply requires that the intermediary notify the person posting the alleged infringing material, after which point they have ended their potential liability.

The point is that the value of patents and copyrights, and if they even exist at all, is directly determined by public policy. We can write laws in ways that make these property claims quite valuable, as we have done in the United States, or we can structure patents and copyrights so that they provide little return to their owner. If we think that technology is somehow redistributing income upward, then the problem is that patent and copyright protection have been made too long and strong, not that technology somehow has a bias towards a particular type of worker.

The often-expressed concern — that robots will replace workers and lead to a redistribution from people who work for a living to the people who "own robots" — is not actually a concern about an outcome of technology, but rather a possible result of our intellectual property rules. "Owning robots" is not a technical relationship, it is a legal one. And, in order for there to be any plausibility to this redistributional concern, there really must be an issue of patent and/or copyright monopolies.

Robots will almost certainly be relatively cheap to manufacture in terms of the physical materials, capital requirements, and labor needed. If they are sold in a free market with no patent or copyright protections, people with even a middle-class living standard would likely be able to buy robots that

6 Plaugic (2015).

would cook their food, clean their house, wash their clothes, and mow their lawn. This could mean a large improvement in living standards. And, while robot manufacturers would make a normal profit, no one would stand to get especially rich from robots any more than people get especially rich manufacturing washing machines or paper clips.

The story of robots and inequality is one in which robots are expensive, and this is really a story whereby patent and/or copyright monopolies make them expensive. In that case, it is possible that the people who own these claims to intellectual property may become very rich, and most workers are not in a position to benefit from the gains from productivity growth. But it is important that we clearly identify the problem in this case. Inequality is not coming from technology; it is coming from our laws on the ownership of technology. And, as noted earlier, these laws have become considerably stronger in the last four decades.[7]

The impact of changes in laws on ownership can perhaps be seen most clearly with the Bayh–Dole Act that was signed into law in December of 1980. The main thrust of the law was to allow researchers on government contracts to gain ownership rights to their research. This meant they could get patents or other types of protection on work for which the government incurred much or all of the cost.

While Bayh–Dole applied to all types of research supported by the government it had the largest impact on the market for prescription drugs. The government had been funding bio-medical research through the National Institutes of Health (NIH) since the 19th century. (The 2018 budget is $37 billion.) While much of this research did result in important medical breakthroughs, the pharmaceutical industry was not allowed to get patents on the direct products of the research.

Bayh–Dole changed this, effectively giving the industry the opportunity to get patent monopolies or other types of exclusivity on research that was largely funded by the government. While this undoubtedly did lead to more industry funding for research, it also led to an enormous increase in the amount the country spends on prescription drugs as shown in **Figure 1**.

**Figure 1**

Prior to the Bayh–Dole Act, there was no clear trend in spending on prescription drugs relative to GDP. It had been just under 0.4 percent of GDP in the 1960s, rising to slightly over 0.4 percent in

7 The argument that technology generates inequality is the explicit theme of Goldin and Katz (2010): *The Race Between Education and Technology*. Interestingly, the link between technology and inequality is not disputed even by those who question whether bias in technology is responsible for increasing inequality. Mishel and Bernstein (1998) don't deny that technology increases the returns to skilled labor, they only dispute whether an increase in this bias can explain the growth in inequality since 1980.

the early 1970s, before falling back under 0.4 percent of GDP by the late 1970s. After Bayh–Dole, spending began to rise sharply, doubling to 0.8 percent of GDP by 1993 and then doubling again to 1.6 percent of GDP by 2002. It currently stands at 2.1 percent of GDP.

Undoubtedly, the incentives created by Bayh–Dole increased private research spending on developing prescription drugs. It presumably also led to better health outcomes as some drugs that would not have otherwise been developed had large health benefits. But there can be little doubt that this change in the law governing control of government research hugely increased our spending on prescription drugs.

The rationale for the Bayh–Dole Act and other measures strengthening intellectual property claims is that the dynamic gains from more innovation, outweigh the deadweight losses associated with these government-granted monopolies. In fact, the evidence on this is far from clear. A cross-country analysis assessing the impact of stronger protections on productivity growth found no evidence of a positive relationship.[8] In fact, most of the regressions found a negative relationship between patent strength and productivity growth. Similarly, an analysis that looked at multi-factor productivity growth across industries found no relationship between the number of patents issued and the rate of productivity growth.[9]

But even if there was solid evidence that the dynamic gains associated with stronger patent and copyright protection outweighed the deadweight losses, it is still important to recognize that this policy is increasing inequality. The question is not just whether the dynamic gains exceed the static losses, but whether this difference is large enough to offset whether undesirable impact the policy has on inequality. This last point has been completely invisible in policy discussions on patent and copyright policy.[10]

It is also important to note that there are alternative mechanisms for supporting innovation and creative work. For example, as noted earlier, the US government is currently spending more than $37 billion a year on biomedical research through the National Institutes of Health. (There is additional public funding through the Centers for Disease Control and other agencies.) The government could,

8 Baker (2016).

9 Boldrin et al. (2011).

10 This should be a big issue in trade policy where a major focus of US policy over the last three decades has been to impose stronger and longer intellectual property protections on our trading partners. There is an obvious upward redistributional aspect to this policy. The more money that our trading partners have to pay holders of intellectual property claims in the United States, the less money they have to spend on other goods and services produced in the United States. In effect, this means a larger trade deficit on items excluding intellectual property, such as agricultural and manufactured goods. While it is possible that the greater inducement to innovation and incentive for creative work offsets this redistributional effect, that seems a dubious claim and there is certainly no research supporting this position.

in principle, increase this funding by enough to partially or fully replace the patent-financed research undertaken by the industry. The National Science Foundation puts the US industry's worldwide research spending at $62.3 billion in 2013, the last year for which data are available.[11] Not all of this spending is dependent on patents. For example, the industry has to spend money researching manufacturing techniques, which would be necessary even if the drugs it was producing were not patent protected.

If the government directly funded research then all the new drugs developed could be sold at their free market price from the day they were approved by the Food and Drug Administration, eliminating the patent rents in the sector.[12] (The same would be true for medical equipment and supplies, which also have hugely inflated prices as a result of patent monopolies.) If all prescription drugs were sold at their free market price it would not only reduce the income for the owners of the patents, but it would also eliminate a massive industry that has grown up as a result of the high price of patented drugs. This includes the pharmacy benefit managers, the advertisers and marketers, and the intellectual property lawyers who contest patents in court.[13]

The same set of issues arise in other areas as well, even if the immediate consequences may not be as dire as in the case of unaffordable medicines. The government decides not only the strength and length of intellectual property protections but also the availability of public financing that can either support or compete with patent/copyright financed research.[14] As a matter of policy, in recent decades government supported research through various agencies has generally been done with the explicit intent of supporting rather than competing with patent financed research.

This is also explicitly the case with the tax credit for research and development. This is designed as a supplement for patent support, not a replacement. It is a 15 percent marginal tax credit, based on prior years of research spending. It could instead be designed as a replacement and cover all research

11 Shackelford and Wolfe (2017).

12 There are a variety of forms that direct public funding could take. Several papers have advocated a prize buyout system, where the government buys up patents and places them in the public domain (e.g. Kremer 1998). It could also take the form of direct funding where NIH or a new government agency issues long-term contracts to drug companies to undertake research with the requirement that all research findings and patents are placed in the public domain (see Baker 2016, Chapter 5). An advantage of the latter approach is that all research findings would be available for both clinicians and other researchers. Baker, Jayadev, and Stiglitz (2017) reviews the relative merits of these and other approaches.

13 There is an especially compelling argument for publicly funded research as opposed to patent-supported research in the case of prescription drugs. First, and most importantly, these drugs are developed to advance public health and save lives. We generally recognize the government's responsibility for the public's health and even in the United States most health care spending is done by the government. This is not just a moral issue, there is also the very practical point that there is generally a third-party payer, either the government or an insurer. This means that the typical story of consumers being best able to determine a product's value to them does not apply, since they are attempting to get a third-party payer to pick up the cost. Also, there is an enormous issue of asymmetric information, where the patient, and even their doctor, are unlikely to know anywhere near as much about the benefits and risks of a drug as the company that is marketing it.

14 It is worth noting that the pharmaceutical industry is probably the biggest lobbyist for NIH funding. As it stands, this funding is largely a direct subsidy to the industry.

spending since 15 percent is roughly equal to estimates of the research subsidy provided by patent monopolies.[15]

It is worth mentioning an area of government support for creative work that is generally overlooked: the tax deduction for charitable contributions. For high-income taxpayers, the government effectively pays 37 cents of every dollar they choose to contribute to a qualified non-profit organization. (For inheritances the implicit subsidy is 40 percent, the estate tax rate.) While these contributions go to a wide variety of organizations, at least some of them go to support art museums, symphonies, operas, playhouses and other entities that support cultural output of various forms.

This support is not intended to compete with copyright support for cultural work, but it does suggest a possible alternative route that does not involve a government agency deciding on the relative merits of different types of work. As it is, the deduction for charitable contributions benefits overwhelmingly higher income individuals, but it is possible to design a comparable mechanism of individual credits and/or subsidies which would be more egalitarian.[16]

The point of describing alternatives to patent and copyright monopolies for supporting innovation and creative work is that we could, in principle, have mechanisms that allow for the same or perhaps even greater progress in developing technology and creative work, without producing the same degree of inequality. The alternatives mentioned here and proposed by others would have to be examined closely, but the point is that this is an important public debate which is not taking place.

## Digression: Intellectual Property and Budget Deficits

There has been an enormous amount of debate in policy circles on reducing the size of the budget deficit over the last four decades. The cost associated with intellectual property claims has almost never been raised in this context. That is an inexcusable omission.

As noted above, patent and copyright monopolies are government policies designed to achieve public purposes. The government grants their holders monopolies, allowing them to charge prices that vastly exceed the free market price, in exchange for carrying through research or creative work. The higher prices from these monopolies can be thought of as equivalent to a privately collected tax, but for some

15 See e.g. Jaffe (2000), Schankerman and Pakes (1986), Lanjouw (1998), and Schankerman (1998).

16 Baker (2006), Chapter 5, outlines a system of individual tax credits that could be used as an alternative to copyright monopolies for supporting creative work. A condition of receiving money through this system would be giving up the right to copyright protection for a substantial period of time (e.g. 3–5 years).

reason, they are never included in any measure of the deficit accrued in a given year or the debt accumulated over time.

To be more concrete, if patent and related monopolies allow drug companies to charge $315 billion annually in excess of the free market price for drugs, this is equivalent in terms of its impact on living standards and economic distortions to the government imposing an excess tax of $315 billion a year on prescription drugs. In effect, the government is paying for the research undertaken by the drug companies by allowing them to collect this tax.

It is completely inconsistent for those concerned about government deficits and debt to be troubled by the idea that the government would finance research by borrowing, which will then be supported by future taxes, but not be at all troubled by the government granting patent and copyright monopolies that will allow private companies to charge prices that vastly exceed free market prices.[17] The cost of the latter is quite large, as is shown in the next section. If anyone is actually concerned about the cost imposed by government borrowing on future generations then they cannot honestly ignore the costs associated with the patent and copyright monopolies granted by the government.

# Section II: The Cost of Patent and Copyright Monopolies

In addition to the argument that patent and copyright monopolies are both inefficient and increase inequality, it is important to recognize that these monopolies direct a substantial amount of money in the US economy. There is an enormous gap between the monopoly price and potential free market price for a wide range of items. This is perhaps most clear in the case of prescription drugs, where we have data both on the price in the period after patent protection has been removed and also on the price of generics in countries where patent protection is not available. Recent research puts the price decline for the branded drug at 90 percent in the years after they have lost exclusivity.[18] Even this drop may understate the impact of patents and related protections since often there are subsidiary patents that may still apply even after a drug's key patents have expired. In the case of some of the most

17 In some cases, the trade-off between direct government spending (and therefore increased deficits) and patent monopolies is very explicit. The FDA will give drug companies an extra six months of patent monopoly or other forms of exclusivity if they do pediatric trials on their drugs. The government could simply pay for these trials directly, but the grant of monopoly does not require any direct government spending. (It may actually require considerable indirect expenditures, since the extra six months of exclusivity could mean the government is paying considerably more for the drug through Medicare, Medicaid, and other public sector programs.)

18 IMS Institute for Healthcare Informatics (2016).

expensive drugs, generic versions are available for less than 1.0 percent of the price of the branded drug in the United States.[19]

In many other areas, patent or copyright monopolies account for a large portion or majority of the price. The case of medical equipment is similar to prescription drugs. In most cases, the cost of manufacturing the equipment itself would not be very high, but equipment like MRIs and dialysis machines are expensive because of the patents held by the manufacturers. The same is true of a wide range of computers and other information processing equipment. The cost of pesticides and fertilizers is to a large extent attributable to patent monopolies. The same is true of the cost of many non-prescription drugs and medical supplies.

Copyright monopolies also lead items to cost far more than the free market price. This is most apparent with recorded music and video material, which would be available over the Internet at essentially zero cost in the absence of copyright protection. However, this monopoly protection also raises the price of cable and satellite television and radio services, since these would be available for essentially the cost of making home hookups and the electricity needed if it was not necessary to make royalty payments. The cost of all forms of printed material, such as newspapers, magazines, books, and textbooks is hugely inflated due to copyright monopolies.

**Table 1** gives a set of calculations of the money that is being directed to industries in which patents and copyrights are most important to the price. Column 1 shows 2018 levels of spending in each industry. Column 2 shows the assumed percentage reduction in price if there were no patent or copyright protection. Column 3 shows the implied savings.

**Table 1**

It is important to be clear what the meaning of the assumed savings in Table 1 is. The numbers are an approximation of the savings if we were to eliminate all patents, copyrights, and related protections and allow any producer to sell the items without restrictions. The savings would include not only the lost profits to the sellers, but also a wide range of costs associated with these protections, such as legal fees, marketing to maximize the profit of an item on which the company has a monopoly, and also payments for the actual innovation or creative work. This last category, payments to researchers and creative workers, would be necessary if we wanted to continue to have innovation and new creative work in the future, but this category is included in the table because the amount that we choose to pay

19 Collins (2016).

and how we choose to pay it is a matter of public policy. At present, we make these payments by having the government grant patent and copyright monopolies.

The numbers shown for prescription drugs are probably the most solid in the table and provide a useful point of reference. We have a good idea of how much patent monopolies add to the cost of drugs because we can compare the price to generic drugs. According to data from the Association for Accessible Medicines (AAM), the trade group for the generic industry, brand drugs accounted for 74 percent of spending even though they were only 11 percent of the prescriptions sold. By contrast, generic drugs accounted for just 26 percent of spending even though they were 89 percent of sales.[20] This implies that the average generic prescription cost just 3.6 percent of the price of the average brand prescription, or $29.70 per prescription. This figure would mean that we could save 96.4 percent of the money spent on brand drugs if we immediately got rid of protections and allowed them to be sold as generics.

But even this figure understates the true potential savings from eliminating patents and related protections. The AAM's data is based on averages, but these numbers are skewed by the fact that many generics sell for high prices in the period immediately after they are introduced. This is due to the fact that they have limited competition, in part by design. The first generic to enter a market is granted six months of exclusivity, a period in which they enjoy an effective duopoly with the brand drug. For example, a recent analysis found that price declines averaged just over 50 percent in the first year after a generic is introduced.[21] This means that the average cost of generic drugs in the AAM analysis is inflated by the generic drugs that are sold at high prices in the first years after they come onto the market. Also, the price of generics is inflated due to the fact that the generic industry must incur legal costs to contest patent battles with the brand industry. In addition, generic drugs may also be paying royalties on secondary patents that are still in force even after the key patent for a drug expired.

In a world with no patents or related protections, it is likely that generics would cost close to half as much as we now spend since the market would be more fully competitive and the industry would face far lower legal expenses. The table assumes an 80 percent reduction in spending, which is likely a conservative figure. If the average price of a generic drug in a patent-free world was 50 percent of the current price and all drugs were sold as generics, the savings would be more than 85 percent of current spending.

20 Association for Accessible Medicines (2017).
21 IMS Institute for Healthcare Informatics (2016).

The other figures shown in Table 1 are more speculative. But in most instances, the numbers are likely conservative. The assumed savings on other medical products, which are primarily non-prescription drugs, is 50 percent. The next line is computers and other peripheral equipment. The assumed savings if there were no patent or copyright monopolies on these items is 60 percent. For recorded music and video material, as well as recreational books, it is assumed that the savings would be 80 percent in a copyright-free world. This would be simply the cost of physically transferring the material, which at least over the web, would be close to zero.

The savings on educational books is assumed to be 70 percent under the assumption that the bulk of the textbooks used by students would be produced through apublicly funded system. It is assumed that the savings in newspapers and periodicals, motion pictures, and cable television would each be 80 percent of total spending, with the assumption that there would be a large amount of free material available so again the cost is simply transferring the material. (With cable, many people may opt to rely on material received over the Internet and cancel cable subscriptions.) The cumulative figure for savings is $827.4 billion.

While in some areas the assumptions on savings might be too high, this calculation also leaves out important areas. For example, it does not include software investment which was $382.2 billion in the second quarter of 2018. This is left out to avoid double-counting since this is a direct input in many of the other items included in Table 1. In addition, much of the spending on software is for company specific software, most of which would occur even without patent or copyright protection. The table also does not include spending on items like fertilizers, pesticides, and genetically engineered seeds, the prices of which are also hugely inflated due to patent protections.[22]

This figure is large by almost any measure. It is just under 54.0 percent of after-tax corporate profits in the second quarter of 2018. It comes to more than $6,000 per household. The amount of money that is directed by patent and copyright protection dwarfs the sums that are typically the basis for policy debates in Washington.

22 As a check on this figure, the Bureau of Economic Analysis gives the value of the capital stock in intellectual products at $2,720 billion in 2016 (Bureau of Economic Analysis 2018, NIPA Table 2.1, Line 76.) Given its growth rate, the capital stock is likely $2.9 trillion. If we assume a 10 percent before-tax profit rate, this implies annual profits of $290 billion. Assuming that the expenses associated with this profit are three to four times the actual profit (they are more than five times in the case of prescription drugs), it would imply $870 billion to $1,160 billion in annual spending associated with these protections.

# Section III: Patent and Copyright Monopolies and Upward Redistribution

Patent and copyright protections not only involve large sums of money; they also redistribute income upward. At the most basic level, there are not many low-income households who receive royalties from patents or copyrights. These forms of protection provide the basis for the fortunes of many of the richest people in the country.

**Table 2** shows the hundred richest people in the United States from the Forbes 400.[23] The table indicates whether a person's fortune comes from an industry where patent or copyright protections are a major factor in their wealth. While in some cases there is ambiguity about the importance of intellectual property to the person's fortune, in many cases the situation is quite clear.

**Table 2**

Starting at the top, there is little doubt that Bill Gates would not have anywhere near his current fortune if Microsoft did not have copyright and/or patent protection on its software and other products. While Microsoft has also benefited from near-monopoly status in the operating system market, this would not be worth very much if anyone could copy the system and manufacture millions of Windows-based computers without paying a licensing fee. There is a similar story with other software billions like Larry Ellison or Steve Ballmer.

I have also included the media-based billionaires as owing their fortunes to intellectual property rules. It would be difficult to envision a television network or movie production company being hugely profitable if it was entirely legal for anyone to immediately duplicate a broadcast or to distribute copies of a movie, without paying any royalties to the copyright holder. These businesses exist in their current form because of our rules on intellectual property.

I have put wealth from Amazon, Facebook, and Google in the ambiguous category. These companies, especially the latter two, depend to a large extent on near monopolies in their market segments. On the other hand, they all have made a point of developing cutting-edge technologies on which they enjoy patent and/or copyright protection. It would require a much closer examination of the development of these businesses to assess the centrality of the role of these intellectual property claims.

23 It actually includes the richest 103, due to a tie for the last place.

There are other people in this top 100 whose fortunes may depend to a substantial extent on intellectual property. There are 15 people among this top 100 who are listed as getting their fortune from some type of finance. It is possible that much of their wealth stemmed from making a good bet on Apple or Microsoft or some other high-flying tech company whose profits depend on intellectual property. There are also three owners of sports teams on the list. Would Robert Kraft's stake in the New England Patriots be worth as much if anyone could freely and instantaneously rebroadcast Patriots games without paying him a penny for the rights?

**Table 3** shows the total wealth attributed to IP and the share all Forbes 100 wealth. The cumulative wealth of the people placed into the IP category is $490.6 billion or 27 percent of the total for this group. The people in the mixed category summed to $298.9 or 16.5 percent of the total. If these two are summed, it comes to $789.5 or 43.5 percent of the total wealth of the Forbes 100. This figure would certainly suggest a much lower concentration of wealth without the intellectual property rules now in place. While it is possible that a broader look at very high wealth individuals would change the picture somewhat, there clearly are many people in the Silicon Valley, Seattle, and other tech centers who have accumulated tens or hundreds of millions from software, pharmaceuticals, and other industries heavily dependent on intellectual property.

**Table 3**

The fact that we can, as a matter of policy, decide to weaken IP protections or alter the form of the incentive that the government provides for innovation and creative work, means that the demand for the highly skilled individuals that are disproportionately employed in the industries that are heavily dependent on these protections is very directly a policy choice. The government could, for example, weaken or alter these protections in ways that reduce demand for highly skilled individuals by 10 to 20 percent. This would lead to radically lower pay for a wide range of highly skilled individuals from software engineers to PhDs in biotechnology. Such a reduction in demand may not be desirable, but it is important to recognize it is a policy choice.

# Conclusion: Technology Does Not Have to Lead to Inequality

The main point of this discussion is to point out that the flows of income associated with new technology is very directly a policy choice. We have adopted a set of rules, centered on patent and copyright monopolies, which have the effect of significantly increasing inequality. We could weaken these rules, or alternatively, make use of different mechanisms to provide incentives for innovation and creative work.

In deciding whether to strengthen or weaken patents, copyrights, and related protections we need to consider whether they are the most efficient mechanisms for supporting innovation and creative work. As the paper notes, there is good reason for believing that this often is not the case.

Furthermore, we should also consider their impact on inequality. Even if weaker protections had some net negative effect on growth (e.g. the dynamic losses exceeded the static gains), we may still choose to go this route if there were enough benefits in reducing inequality. Most tax and transfer policies will have some negative effect on growth, so we should also be prepared to tolerate some negative effect from altering IP rules if the distributional benefits are large enough.

This paper has just outlined some of the issues to show how much income and wealth is potentially at stake, but the key point is to bring IP policy into the inequality debate. Bill Gates has become incredibly wealthy because we structured our IP rules in ways that allowed him to become incredibly wealthy. This was a policy choice, not an outcome of technology.

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*US Constitution*. Art. I, Sec. 8.

**TABLE 1**

**Total Savings from Patent/Copyright Alternatives**

(billions of 2018 dollars)

| | Current Spending | Potential Savings |
|---|---|---|
| Prescription drugs (2.4.5U Line 121) | $426.6 | $315.5 |
| Other medical products (2.4.5U Line 119) | $78.1 | $39.1 |
| Computers and other information processing equipment (2.4.5U Line 46) | $139.1 | $83.5 |
| | | |
| Recorded music and video material (2.4.5U Line 42) | $16.6 | $13.3 |
| Educational Books (2.4.5U Line 67) | $11.4 | $8.0 |
| Recreational books (part of 90) (2.4.5U Line 58) | $21.9 | $11.0 |
| Newspapers and periodicals (2.4.5U Line 141) | $50.0 | $40.0 |
| Motion pictures (2.4.5U Line 210) | $17.6 | $14.1 |
| Cable and satellite television and radio services (Line 215) | $97.1 | $77.7 |
| | | |
| Computers and peripheral equipment (5.5.5U Line 4) | $121.2 | $72.7 |
| Communication equipment (5.5.5U Line 5) | $133.7 | $80.2 |
| | | |
| Nonmedical instruments (5.5.5U Line 9) | $42.4 | $25.4 |
| Medical equipment and instruments (5.5.5U Line 6) | $94.0 | $47.0 |
| | | |
| **Total** | | **$827.4** |

Source and notes: Bureau of Economic Analysis (2018), NIPA Tables 2.4.5U, 5.5.5U and author's calculations, see text.

**TABLE 2**

**The World's Billionaires**

(billions of 2017 dollars)

| US Rank | World Rank | Name | Net Worth | Age | Source | IP Dependent? |
|---|---|---|---|---|---|---|
| 1 | 1 | Jeff Bezos | $112 B | 54 | Amazon | ? |
| 2 | 2 | Bill Gates | $90 B | 62 | Microsoft | Y |
| 3 | 3 | Warren Buffett | $84 B | 88 | Berkshire Hathaway | N |
| 4 | 5 | Mark Zuckerberg | $71 B | 34 | Facebook | Y |
| 5 | 8 | Charles Koch | $60 B | 82 | Koch Industries | N |
| 5 | 8 | David Koch | $60 B | 78 | Koch Industries | N |
| 7 | 10 | Larry Ellison | $58.5 B | 74 | software | Y |
| 8 | 11 | Michael Bloomberg | $50 B | 76 | Bloomberg LP | Y |
| 9 | 12 | Larry Page | $48.8 B | 45 | Google | ? |
| 10 | 13 | Sergey Brin | $47.5 B | 45 | Google | ? |
| 11 | 14 | Jim Walton | $46.4 B | 70 | Walmart | N |
| 12 | 15 | S. Robson Walton | $46.2 B | 73 | Walmart | N |
| 13 | 16 | Alice Walton | $46 B | 68 | Walmart | N |
| 14 | 21 | Sheldon Adelson | $38.5 B | 85 | casinos | N |
| 15 | 22 | Steve Ballmer | $38.4 B | 62 | Microsoft | Y |
| 16 | 28 | Phil Knight | $29.6 B | 80 | Nike | N |
| 17 | 34 | Jacqueline Mars | $23.6 B | 78 | candy, pet food | N |
| 17 | 34 | John Mars | $23.6 B | 82 | candy, pet food | N |
| 19 | 39 | Michael Dell | $22.7 B | 53 | Dell computers | Y |
| 20 | 44 | Paul Allen | $21.7 B | 65 | Microsoft, investments | Y |
| 21 | 47 | Thomas Peterffy | $20.3 B | 73 | discount brokerage | N |
| 22 | 48 | Len Blavatnik | $20.2 B | 61 | diversified | N |
| 23 | 52 | James Simons | $20 B | 80 | hedge funds | N |
| 24 | 54 | Elon Musk | $19.9 B | 47 | Tesla Motors | N |
| 25 | 58 | Laurene Powell Jobs | $18.8 B | 54 | Apple, Disney | Y |
| 26 | 67 | Ray Dalio | $17.7 B | 69 | hedge funds | N |
| 27 | 73 | Carl Icahn | $16.8 B | 82 | investments | N |
| 28 | 80 | Donald Bren | $16.3 B | 86 | real estate | N |
| 29 | 83 | Abigail Johnson | $15.9 B | 56 | money management | N |
| 30 | 83 | Lukas Walton | $15.9 B | 31 | Walmart | N |
| 31 | 94 | Rupert Murdoch | $15 B | 87 | newspapers, TV network | Y |
| 32 | 100 | Harold Hamm | $14.1 B | 72 | oil & gas | N |
| 33 | 102 | Steve Cohen | $14 B | 62 | hedge funds | N |
| 33 | 102 | Dustin Moskovitz | $14 B | 34 | Facebook | Y |
| 35 | 106 | Charles Ergen | $13.4 B | 65 | satellite TV | ? |
| 35 | 106 | Eric Schmidt | $13.4 B | 63 | Google | Y |
| 37 | 108 | Philip Anschutz | $13 B | 78 | investments | N |
| 37 | 108 | Jim Kennedy | $13 B | 70 | media | Y |
| 37 | 108 | Blair Parry-Okeden | $13 B | 68 | media | Y |
| 40 | 113 | Leonard Lauder | $12.9 B | 81 | Estee Lauder | N |
| 41 | 117 | Stephen Schwarzman | $12.6 B | 71 | investments | N |
| 42 | 121 | Donald Newhouse | $12.3 B | 89 | media | Y |
| 43 | 132 | Andrew Beal | $11.6 B | 65 | banks, real estate | N |
| 44 | 134 | John Menard, Jr. | $11.5 B | 78 | home improvement stores | N |
| 45 | 138 | David Tepper | $11 B | 60 | hedge funds | N |
| 46 | 145 | Pierre Omidyar | $10.5 B | 51 | eBay | N |
| 47 | 152 | Ronald Perelman | $9.8 B | 75 | leveraged buyouts | N |
| 48 | 154 | Micky Arison | $9.7 B | 69 | Carnival Cruises | N |
| 49 | 158 | Thomas Frist, Jr. | $9.6 B | 80 | health care | N |
| 50 | 162 | Charles Schwab | $9.4 B | 81 | discount brokerage | N |
| 51 | 164 | Herbert Kohler, Jr. | $9.3 B | 79 | plumbing fixtures | N |
| 52 | 170 | Jan Koum | $9.1 B | 42 | WhatsApp | Y |
| 53 | 172 | James Goodnight | $9 B | 75 | software | Y |

**TABLE 2**

**The World's Billionaires**

(billions of 2017 dollars)

| US Rank | World Rank | Name | Net Worth | Age | Source | IP Dependent? |
|---|---|---|---|---|---|---|
| 53 | 172 | Ken Griffin | $9 B | 49 | hedge funds | N |
| 55 | 178 | James Chambers | $8.7 B | 61 | media | Y |
| 55 | 178 | Katharine Rayner | $8.7 B | 73 | media | Y |
| 55 | 178 | Margaretta Taylor | $8.7 B | 76 | media | Y |
| 58 | 181 | Gordon Moore | $8.5 B | 89 | Intel | Y |
| 59 | 183 | Stanley Kroenke | $8.3 B | 71 | sports, real estate | N |
| 60 | 186 | John Malone | $8.1 B | 77 | cable television | Y |
| 61 | 190 | Carl Cook | $8 B | 56 | medical devices | Y |
| 61 | 190 | David Geffen | $8 B | 75 | movies, record labels | Y |
| 61 | 190 | George Soros | $8 B | 88 | hedge funds | N |
| 61 | 196 | Edward Johnson, III. | $7.9 B | 88 | money management | N |
| 65 | 198 | David Duffield | $7.8 B | 77 | business software | Y |
| 65 | 198 | George Kaiser | $7.8 B | 76 | oil & gas, banking | N |
| 65 | 198 | Patrick Soon-Shiong | $7.8 B | 66 | pharmaceuticals | Y |
| 68 | 205 | Stephen Ross | $7.6 B | 78 | real estate | N |
| 69 | 207 | Pauline MacMillan Keinath | $7.4 B | 84 | Cargill | N |
| 70 | 211 | Eli Broad | $7.3 B | 85 | investments | N |
| 70 | 211 | Sun Hongbin | $7.3 B | 55 | real estate | N |
| 70 | 211 | Christy Walton | $7.3 B | 69 | Walmart | N |
| 73 | 217 | Shahid Khan | $7.2 B | 68 | auto parts | N |
| 74 | 222 | John Doerr | $7.1 B | 67 | venture capital | N |
| 75 | 242 | David Green | $6.8 B | 76 | retail | N |
| 75 | 242 | Hank & Doug Meijer | $6.8 B | - | supermarkets | N |
| 76 | 251 | Brian Acton | $6.6 B | 46 | WhatsApp | Y |
| 76 | 251 | Ann Walton Kroenke | $6.6 B | 69 | Walmart | N |
| 78 | 261 | Leon Black | $6.5 B | 67 | private equity | N |
| 78 | 261 | John Paulson | $6.5 B | 62 | hedge funds | N |
| 80 | 265 | David Shaw | $6.4 B | 67 | hedge funds | N |
| 80 | 265 | John A. Sobrato | $6.4 B | 79 | real estate | N |
| 82 | 274 | Daniel Gilbert | $6.3 B | 56 | Quicken Loans | N |
| 83 | 281 | Richard Kinder | $6.2 B | 73 | pipelines | N |
| 83 | 281 | Robert Kraft | $6.2 B | 77 | New England Patriots | N |
| 83 | 281 | Ralph Lauren | $6.2 B | 78 | Ralph Lauren | N |
| 86 | 287 | Les Wexner | $6.1 B | 80 | retail | N |
| 87 | 289 | Whitney MacMillan | $6 B | 88 | Cargill | N |
| 88 | 296 | Marijke Mars | $5.9 B | 54 | candy, pet food | N |
| 88 | 296 | Pamela Mars | $5.9 B | 58 | candy, pet food | N |
| 88 | 296 | Valerie Mars | $5.9 B | 59 | candy, pet food | N |
| 88 | 296 | Victoria Mars | $5.9 B | 61 | candy, pet food | N |
| 92 | 305 | Nancy Walton Laurie | $5.8 B | 67 | Walmart | N |
| 92 | 305 | Tom & Judy Love | $5.8 B | 81 | retail & gas stations | N |
| 92 | 305 | Robert Rowling | $5.8 B | 64 | investments | N |
| 92 | 305 | Dennis Washington | $5.8 B | 84 | construction, mining | N |
| 96 | 315 | David Sun | $5.7 B | 66 | computer hardware | Y |
| 96 | 315 | John Tu | $5.7 B | 77 | computer hardware | Y |
| 98 | 321 | Jen-Hsun Huang | $5.6 B | 55 | semiconductors | ? |
| 98 | 321 | Charles Johnson | $5.6 B | 85 | money management | N |
| 98 | 321 | Jerry Jones | $5.6 B | 75 | Dallas Cowboys | N |
| 98 | 321 | Richard LeFrak | $5.6 B | 73 | real estate | N |
| 98 | 321 | Steven Rales | $5.6 B | 67 | manufacturing | N |

Source and notes: Dolan and Kroll (2018).

**TABLE 3**

**Intellectual Property Based Wealth as a Share of Forbes 400 Wealth**

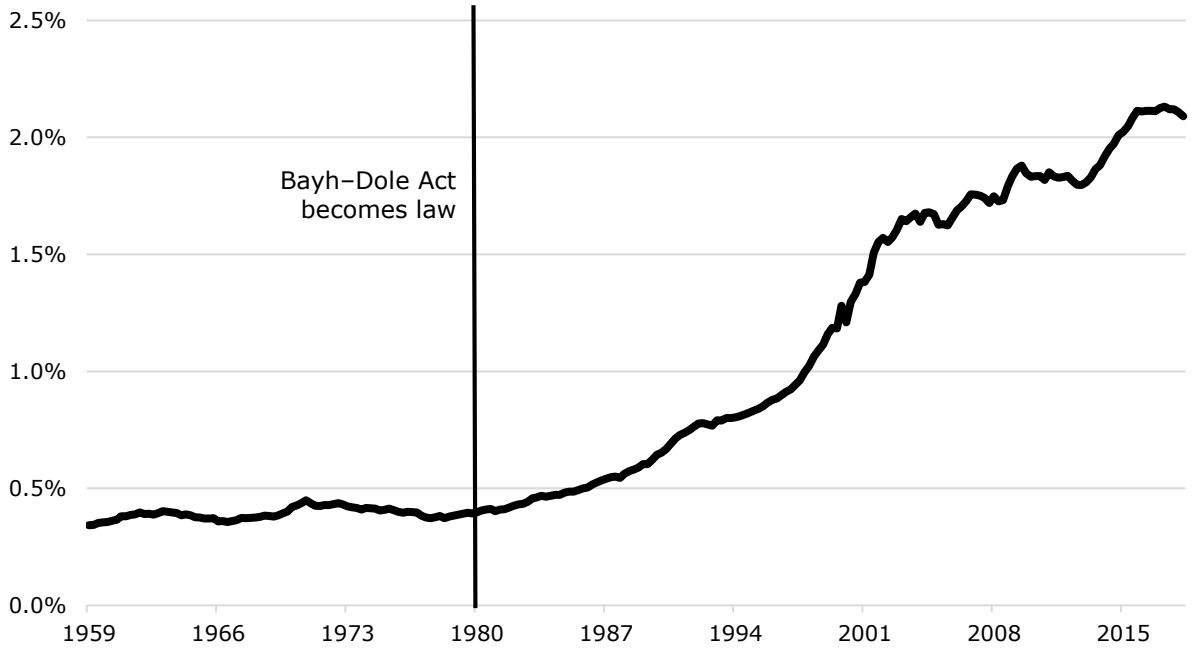
(billions of 2017 dollars)

| | 1<br>All | 2<br>Pure IP | 3<br>Mixed | 4 |
|---|---|---|---|---|
| Total | $1,813.8 | $490.6 | $298.9 | $789.5 |
| Percent | 100.0% | 27.0% | 16.5% | 43.5% |

Source and notes: Author's calculations, see text.

**FIGURE 1**

**Spending on Prescription Drugs as a Percent of GDP, 1959–2018**




Source and notes: Bureau of Economic Analysis (2018), NIPA Table 2.4.5U.