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Intellectual Property Rights and Economic Inequality: Theory and Evidence[1]

By Professor Keith E. Maskus

1 INTRODUCTION

I am pleased to be able to contribute to the special issue honoring Professor Marianne Levin. Marianne has long been a global leader in the legal analysis of intellectual property (IP) policy and has particularly been concerned with various socioeconomic ramifications of IP rights (IPRs). In that spirit, I offer this piece on a deeply important yet understudied aspect of IPRs: how do such rights interact with economic inequality, within and across nations? This complex question only recently has begun attracting attention by economists, despite massive concerns over growing inequality and its potential effects. In this paper I review the limited, yet substantive, theoretical and empirical studies of this issue. My objective is to explain how economists think about it, noting, for example, that there could be two-way causal impacts between IPRs and inequality.

There are several powerful and interrelated sources of growing income and wealth inequality, which operate to differing degrees in nearly all countries. Most impactful is the ongoing "skill-biased technical change" arising from rapidly improving information technologies, such as automation, robotics, and artificial intelligence, which may supplant the jobs of even medium-skilled workers.[2] Also important have been the falling transportation costs and trade and investment liberalization, supporting the offshoring of lower-skilled jobs from high-wage to low-wage countries, captured in the public imagination by the so-called "China Shock."[3] Other key factors include the declining power of labor unions, increasing market concentration that shifts income toward highly skilled and productive workers and managers, and the inadequacy of educational systems at equipping workers with needed technical skills.[4]

Economists have largely ignored the possible roles played by IP protection in expanding inequality. Intuitive claims are readily made. For example, a sensible argument is that the exclusivity of IPRs raises returns to invention, innovation, and creativity, which are skill intensive. Relatedly, patents, copyrights, and other rights can establish temporary but strong pricing power in specific products and services, which correlates with rising market concentration, profits, and managerial compensation. Accordingly, stronger IP rights could help explain growing inequality. However, other influences push in the opposite direction. For example, IPRs raise product innovation and facilitate the diffusion of new goods and technologies, expanding consumer gains from more varieties and lower prices. Moreover, these processes are linked to other policies, such as market opening and research and development (R&D) supports. Whether these outcomes increase or decrease inequality is an empirical question about which we have little clear evidence. Neither is much known about how growing inequality may change innovation incentives. In sum, the essential question of how inequality interacts with IPRs requires extensive economic research going forward.

2 BRIEF DATA OVERVIEW

The idea that inequality and IP rights are linked is intuitively plausible, in part because recent decades have seen notable increases in both on a global scale. For example, on a population-weighted basis, the Gini coefficient measuring the distribution of disposable income within countries rose between 1990 and 2015 by 10.2 percent among a group of 28 high-income countries (HICs), by 17.7 percent among 35 lower-middle-income countries (LMICs), and by 18.8 percent among 22 low-income countries (LICs).[5] It actually fell slightly for a group of 12 upper-middle-income countries (UMICs), though these had among the highest levels of inequality overall in the period. The weighted-average coefficient across all 97 countries in the sample rose by 14.6 percent. Marked increases in inequality were registered by the United States, with the Gini coefficient rising by 10.4 percent, and China, whose coefficient went up by 27.6 percent, among the highest of all nations. These are exceptionally large increases for a 25-year period.

Another measure, the share of gross national income (GNI) earned by the top 10 percent of households, tells a similar story.[6] Among the HICs, this top group increased its share of GNI from 31 percent to 35 percent, while among LMICs the share rose from 36 percent to 41 percent. This may seem small but, in fact, a five-point shift in the share of GNI is a large change by normal standards. Standing out again were the United States, with the top decile income share rising from 38.9 to 47.3, and China, with corresponding figures of 30.4 and 41.4. Indeed, this period saw a massive increase in inequality for China, India, and other middle-income countries.

Contemporaneous with this trend was a global expansion of the scope of IPRs, according to available metrics. For example, the celebrated Ginarte-Park (GP) index, a measure of the scope of legal protection of patent rights

across countries, rose on average by 91 percent among LICs, 182 percent among LMICs, and 103 percent among UMICs from 1990-2015.[7] Other indexes of IP rights followed a similar trend. These increases are due to the combined impacts of the TRIPS Agreement at the World Trade Organization, several preferential trade agreements with elevated requirements for IP protection, and other factors. As has been widely discussed,[8] even accounting for measurement errors and the lack of adequate enforcement mechanisms, this era saw the greatest and most globalized deepening of IPRs in history.

The fact that both inequality and the strength of IPRs have grown sharply begs the obvious question: Did countries with relatively stronger increases in the patent index see greater increases in inequality, at least as measured by the Gini coefficients? In fact, the answer is that the two measures bear little in common. Over this period, there was effectively no correlation between the GP index and the Gini coefficients on disposable incomes in the HICs, UMICs, and LMICs.[9] There was a positive and significant correlation in the lower-income economies, but it remained stable over time at around 0.2. In brief, simple correlations offer little evidence of any relationship between changes in measured patent rights and household income inequality, despite the remarkable changes in each variable individually.

3 ECONOMETRIC ANALYSIS OF WITHIN-COUNTRY INEQUALITY

3 A Macroeconomic data

Simple correlations do nothing to identify potential causal impacts of IP protection on inequality, or the reverse. International databases of Gini coefficients offer some room for statistical work on this issue, however. Two recent studies have used that data or similar figures to estimate the cross-country effects of IP protection on inequality, finding largely consistent results.

Adams (2008) was the first to incorporate IPRs empirically into a study of the determinants of international inequality. He assembled Gini coefficients compiled by the World Bank intermittently between 1985 and 2001 in a sample of 62 emerging and developing countries (EDCs). This data was regressed on various lagged independent variables that were argued to be important contributors to inequality. These variables included certain national globalization and policy variables, including trade openness, incoming foreign direct investment (FDI), secondary education rates, government consumption, an index of institutional quality, and GDP per capita. The scope of IPRs was measured by the GP patents index. The regressions found a consistently positive and significant effect of the GP index on subsequent inequality, with the main coefficient indicating that a one-unit increase in the patent index (on a five-point scale) would increase the average Gini coefficient by around 1.2 points (on a scale between zero and 100, though typically the relevant Gini range is between 30 and 60). Putting that in rough economic terms, a 20-percent strengthening of patent rights in the average EDC would raise income inequality by just over one percent. As for other key variables, a stronger institutional environment tends to reduce inequality significantly. One suggestion from these estimates is that if a country's policymakers planned to strengthen its patent laws and were worried about possible impacts on income distribution, they might wish to accompany the IP reforms with more certainty about contract security, the rule of law, and related elements of institutional quality.

1 This paper draws on Maskus (2022).
2 See Brynjolfsson and MacAfee (2011) for a strong statement of this thesis.
3 The phrase comes from Autor, Dorn, and Hanson (2013), who document these and other effects, kicking off a large literature on the labor-market impacts of low-wage imports.
4 See Goldin and Katz (2008), Piketty (2014), and Acemoglu (2002) for seminal pieces on the sources of growing inequality.
5 The Gini coefficient is an index of household income distribution, with values running from zero (all households have the same incomes) and 100 (one household has all the income). This data is from the Standardized World Income Inequality Database, described in Solt (2019). The computations mentioned here are from Maskus (2022), Table 1. The income groupings are those of the World Bank as of 1999.
6 See Maskus (2022), Table 2.
7 I am grateful to Walter Park for providing the data underlying the index. For these calculations, see Maskus (2022), Table 3.
8 See, for example, Maskus (2012) and Deere (2009).
9 See Maskus (2022), Table 4.

More recently, Saini and Mehra (2018) asked whether strengthened IP rights in the post-TRIPS era had affected income inequality, using a sample of 65 EDCs and developed economies over the period 1995–2009. These authors used the post-transfer Gini coefficients from the Standardized World Income Inequality Database (mentioned above) as the dependent variable in an econometric model similar to that in Adams (2008). Specifically, they regressed the post-transfer Gini coefficients on five-year averages of the GP index, openness to imports, inward FDI, GDP per capita, a measure of schooling, and indexes of political rights. They interacted the patent index with per-capita GDP to study whether the IPRs-inequality relationship was different for countries at different levels of economic development.

Remarkably, the findings were completely at odds with those of Adams (2008). In particular, the authors estimated that increases in the GP index tended to reduce the average Gini coefficient in developing countries, suggesting that stronger patent protection reduced income inequality. The authors speculated that this outcome reflected the fact that stronger IPRs tend to attract more inward technology transfer, which could raise the relative wages of lower-skilled workers in labor-abundant countries.[10] The coefficient on the interaction term of the patent index and GDP per capita was significantly positive, however, implying that the reduction in inequality was lower in rich nations. Indeed, for countries above a threshold income level the relationship could be positive, implying higher inequality with strengthened patent rights in developed economies. They interpreted this outcome to suggest that stronger patent laws may induce innovation in the latter group of countries, with rents to that activity favoring those with more technical and managerial skills. Unfortunately, the authors made no attempt to subject these broad conclusions to further empirical testing.

The results of these studies are intriguing if only because, for now, they stand as the only cross-country estimates available of the potential impacts of IP protection on internal income distribution. However, they find distinctly opposite impacts, suggesting that the correlation between the legal determinants of patent scope and inequality, as measured by Gini coefficients, is ambiguous, and its estimation may depend on the data used and the specifications set out. Moreover, it is important to note that cross-country studies using aggregated macroeconomic data are notoriously fragile, making it difficult to place much confidence in such estimates.[11] At this point, the conclusion must be that no clear evidence has been unearthed about this basic question and much more work is necessary.

3 B Microeconomic Data

As noted earlier, economists have scrutinized a large set of hypotheses about the sources of within-country income and wealth inequality. Perhaps surprisingly, IP protection has been virtually ignored in this arena, except through intuitive claims about the role of IPRs in increasing the returns to R&D investments, which result ultimately in higher wages for skilled and technical workers. In this view, IPRs are another conduit for skill-biased technical change, which expands the gap between technically proficient engineers, entrepreneurs, and manager, at one end, and lower-skilled workers, at the other. Furthermore, patents, copyrights, trademarks, and trade secrets often are viewed as means of generating and protecting monopoly rents, which go disproportionately to these favored classes and shareholders.

Such claims are intuitively reasonable and find theoretical justification in various forms in the recent theoretical literature.[12] Rather than devote scarce space to reviewing these somewhat esoteric models, the primary point here is that fruitful empirical searches for inequality effects of intellectual-property protection should use microeconomic data involving innovative firms and agents at different parts of the income distribution. This approach is natural because patents exist at the firm level in specific locations, suggesting that carefully specified analysis could trace the impacts of private patenting on wage inequality within enterprises.

Two notable recent papers adopted this approach. First, Aghion et al. (2019) studied how firm-level innovation and patenting affects "top income inequality," or increases in the income shares of the top one percent of US households. The paper modeled endogenous innovation decisions by firms that already own patents and earn monopoly profits versus new firms that innovate to own patents. In the model, innovation by either group raises the income shares of entrepreneurs and generates more income inequality. But only R&D investments by new firms increase social mobility, or the ability of entrants to enter the top income level. Such entry may be blocked by high innovation costs, including enforcement of existing patents, which reduces mobility. Although the model does not explicitly consider the role of stronger patent scope, presumably it would have offsetting effects. First,

[10] This point is taken up in more detail in the following section.

[11] See Levine and Renelt (1992) for an early critique, among many.

[12] See, for example, Chu (2010), and Pan, et al. (2015). Kiedaisch (2021) makes the interesting point that, in theory, the impact of IPRs on economic growth could depend on the degree of income inequality.

[13] See Maskus (2022), Table 5. Baldwin (2016) cogently analyzes the sources of this relative change in incomes.

broader patents should raise the returns on innovation and increase top income shares. Second, blocking entry should reduce the increases in inequality associated with more rapid entrepreneurship.

These ideas were tested empirically using state-level innovation data from 1975 to 2010. The authors accumulated data on the top one percent and top ten percent of income shares in all fifty states plus Washington DC. In that period, these high-income shares rose in every state, from an unweighted average of eight percent in 1975 to a maximum of 21 percent in 2007, before declining during the financial crisis. Additional data implied that income from entrepreneurship was largest in the top income groups in states with the highest patenting profiles. The income figures were combined with patenting data, including patent citations to construct quality measures. The authors regressed these top income shares across states on lagged patents and patent quality, controlling for business conditions, the importance of the financial sector, state GDP, and population, plus state and year fixed effects. In the regressions they found consistently positive and significant effects of patents and patent quality on the top one percent of incomes.

An obvious problem is that patenting may be driven by high incomes, which could be high for other reasons. To control for this potential endogeneity, the authors included each state's representation on Congressional Appropriations Committees and other factors as instrumental variables. These specifications found similar impacts of patents on top income shares. In the best econometric specification, they found that a one-percent rise in patents per capita raised a state's top income share by 0.17 percent. That is, patenting alone could explain 17 percent of the rise in the top-level income proportion across states. This effect was even larger in high-patent states, such as California. To understand the magnitude of this effect, the coefficients implied that if a state was to move from the bottom 25 percent of patents granted to the top 25 percent in the year 2000, there would be an increase in its top income share of about 1.5 percentage points, a substantial increase. Indeed, this effect could be underestimated because it did not account for the possibility that a successful inventor in a low-patent state would likely move to a high-patent state, among other factors.

A second study of note is by Bhattacharya et al. (2022). To summarize, these authors took advantage of a new Indian patent law, implemented between 2002 and 2005, to determine if the gap between manager wages and other wages within firms differed by whether those firms owned patents before and after the legal change. They found consistently strong evidence of an increase in these wage gaps, which was more pronounced in high-technology industries. This evidence strongly indicates that firms transfer patent-based profits disproportionately to skilled and managerial workers within firms, raising wage inequality.

Such studies using microeconomic data are considerably more robust in econometric terms than the earlier macro-based analyses. They suggest that both patent reforms and patenting itself may increase income and wage inequality through intuitively familiar mechanisms. Many more such analyses, using other databases across countries, industries, and firms, would enrich this literature. It is also important to quantify how patents and patent laws contribute to growing within-industry market concentration and monopoly power across countries and how those rents have been distributed between worker types, managers, and shareholders.

4 EVIDENCE ON CROSS-COUNTRY INCOME CONVERGENCE

The prior sections considered the limited and contradictory findings about IPRs and economic inequality within countries, emphasizing the difficulties in estimating such impacts. There is, however, a second important dimension to consider. As noted above, the period since 1995 has seen a considerable expansion and globalization of IPRs around the world. At the same time, many EDCs have experienced relatively faster real GDP growth than have the developed economies. For example, using purchasing power parity exchange rates, with prices stated in 2017 US dollars, both LMICs and UMICs have experienced rapid growth in real GDP per capita between 1990 and 2015. On a GDP-weighted basis, the former group saw average annual growth of 3.9 percent and the latter registered 5.8 percent, compared with 1.9 percent in the HICs and 1.6 percent in the LICs.[13] An important stylized fact, therefore, is that income convergence between the LMICs and UMICs, on the one hand, and the HICs, on the other, has corresponded with relatively larger IPRs reforms in the former groups.

Have stronger IPRs played a role in this convergence? Again, it would be difficult to demonstrate with macroeconomic data that the former caused the latter, because many other factors could have driven both upward, making the correlation spurious. Examples include trade and FDI liberalization in the EDCs, increased opportunities for offshoring with vertical supply chains, and improved education and governance institutions. However, while largely correct, that point is misleading in at least one important context. Economic theory and empirical analysis find that, as a matter of microeconomic decision making, IP reforms in EDCs have attracted more technology flows, raising local productivity. The balance of this paper develops that argument. Note carefully, however, that higher real incomes from enhanced technology transfer do not necessarily imply more equal internal income distributions in EDCs, as the gains may have been acquired largely by the already well-off.

4 A Technology Transfer and IPRs

There are three fundamental economic arguments for why effective IPRs, especially patent rights, may play a positive role in encouraging inward technology transfer, leading potentially to income convergence.[14] In this section I summarize these ideas, then turn to empirical evidence.

The first is the result of so-called product-cycle dynamics, referring to a continuous process of innovation in the advanced countries (the "North") and knowledge transfer necessary to shift production in later stages to lower-wage EDCs (the "South").[15] In the basic conception the stream of Northern innovation is exogenous, as is the rate at which Southern firms imitate new technologies. Ultimately, the South exports mature versions of new products to the North, where yet newer goods have been innovated, generating a cycle of new knowledge and diffusion.

These relative rates of innovation and diffusion drive changes in the global income distribution. An increase in the rate of innovation produces more Northern monopoly rents, which are paid to workers as higher wages. In contrast, a rise in the rate of imitation ends those monopolies and transfers production more rapidly to the South, raising wages there. The key income metric, the ratio of Northern to Southern wages, rises with innovation and falls with imitation. If innovation is sufficiently slow and imitation sufficiently fast, this ratio could approach unity, implying full income convergence. IPRs play a specific role in this process: stronger IP in the North expands innovation and protects wages there, while enhanced IP in the South raises imitation costs or forces firms to pay license fees, reducing wages there. Thus, stronger global IPRs worsen international income inequality in the basic model.

This simple proposition is the basis for concerns in developing countries about the potential impacts of IP reforms associated with TRIPS at the WTO. It featured in the first formal theory translating the product-cycle dynamics into an endogenous growth framework through purposeful innovation and technology transfer.[16] In a "quality ladders" framework, stronger patent protection in the South would support longer Northern monopolies, leading to reduced rates of both imitation and innovation, thereby limiting economic growth. In this view, the global policy harmonization demanded by TRIPS would be a serious mistake.

This result inspired an extensive literature extending the product-cycle model and IPRs in important directions. For example, subsequent models[17] posited that there are two forms of technology diffusion: imitation by Southern firms and information transfers through FDI and licensing by Northern multinational enterprises (MNEs). Foreign investment is responsive to Southern IPRs, especially in high-technology manufacturing and services, because MNEs feel more confident that they can transfer advanced information and know-how without losing them to local imitation. Licensing should expand with IP reforms for similar reasons and because patent

rights can reduce the costs of contracting. In consequence, FDI and licensing accelerate technology diffusion, raising Southern wages and reducing the North-South wage gap. Further, this process moves Northern labor from production to innovation, raising the latter. In this context, stronger IP protection in the South has offsetting effects: it slows down uncompensated imitation but enhances market-oriented technology transfer through FDI and licensing. The impact on the North-South income gap depends on circumstances.

Thus, whether IP reforms lead to income divergence or convergence is an empirical question. To date, there are no solid econometric studies of this issue for reasons already explained. However, there is consistent evidence that broader patent scope in EDCs tends to attract more FDI, licensing, and offshoring to those countries with affiliates and local firms that can incorporate technical information into domestic production.[18] The implication is that stronger IP protection likely has accelerated technology transfer and encouraged income convergence by shifting employment abroad from HICs to EDCs. In turn, the extensive international upgrading since TRIPS almost surely has reduced relative wages between workers in rich countries and the emerging countries through enhanced technology diffusion.

A second channel through which stronger IPRs may induce more technology transfer is its role in supporting the formation of international supply chains. The so-called "property rights" approach to the organization of firms argues that MNEs and local network partners operate as principals (multinational firms) and agents (local contractors).[19] The MNE and the input contractors bargain over how they will share the profits from production within the network. The contractor pays lower wages than the parent firm, which is the incentive for offshoring. However, once the contract is signed, the input supplier might save costs through shirking, which is more likely if the MNE cannot enforce its contract. Among other forms, shirking could involve stealing know-how or diluting the parent firm's trademark and reputation. It follows that stronger IP rights in the contractor's nation would raise the costs of shirking, making offshoring more likely.

The empirical prediction is that firms that potentially can produce high-quality inputs are more likely to be invited into a production network if their governments offer enforceable contract rights, including in the IPRs realm. Again, available evidence suggests that this is the case, for outsourcing locations at different stages of production, other things equal, are sensitive to local IP rights.[20] This logic applies as well to the recent emergence of R&D networks across countries within MNEs. Again, the implication is that EDCs with transparent IP rights are more likely to integrate with vertical production networks, a force for international wage convergence.

The third channel within which IPRs may lead to North-South income convergence may be labeled trade-induced innovation, or the possibility that trade and investment liberalization can push domestic firms to become more innovative and productive. Modern international trade theory emphasizes that market opening pushes resources into the most efficient enterprises, which raises labor productivity and wages in general, though with a bias toward those with greater skills. More fundamentally, when a country cuts its trade barriers, local firms must adopt globally efficient techniques to enter export markets. This tends to raise the relative wages of workers in such firms. Indeed, exporting firms and affiliates of MNEs typically pay significantly higher wages in EDCs than local firms.

[14] Hoekman, et al. (2005) offer further perspective.

[15] The product-cycle model was first explicated by Vernon (1966) and is a workhorse model in trade and global business studies.

[16] Helpman (1993).

[17] See, among others, Lai (1998), Glass and Saggi (2002), and Yang and Maskus (2001).

[18] A full review of this evidence is excluded for reasons of space. See Maskus (2012, 2022) and Park (2008) for more discussion.

[19] The property-rights analysis of principal-agent problems was pioneered by Hart and Moore (1990) and Williamson (1985). It is a fundamental theory of the boundaries of a firm, analyzing conditions under which a firm would produce inputs in-house or outsource them to a contractor. It was extended to international outsourcing and IPRs by Antras (2003, 2005).

[20] For example, Canals and Sener (2014) found that US multinational firms in patent-intensive sectors significantly expanded their offshoring within their primary industries to emerging countries following substantial IPRs reforms.

[21] Bustos (2011).

[22] Aghion, et al. (2018).

Trade liberalization through tariff cuts and joining free trade agreements may also force more innovation on the part of domestic firms. As suggested above, such firms must lower costs to compete with more efficient imports or develop new products to enter export markets. Both processes require investments in R&D, new capital goods, and better management techniques. Argentina offered initial evidence for this spur to innovation in the wake of trade opening by a middle-income economy.[21] The author found that higher-productivity Argentine firms facing larger cuts in Brazilian tariffs after the implementation of MERCOSUR invested more in improved technologies. A second study[22] featured a theoretical model in which greater access to export markets increased the incentives of certain domestic firms to innovate. Specifically, high-productivity firms have the resources to invest more in R&D and develop new products, while low-productivity enterprises reduce their innovation spending. These predictions were borne out of using exporting and patenting data of French firms from 1994 to 2012.

The relationships between market opening and innovation are considerably more complex than suggested here, and much depends on local circumstances in each country. The preponderance of evidence, however, finds that increasing global integration has encouraged more innovation, at least in developed and higher-income emerging economies. These innovation responses, concentrated in high-productivity enterprises, likely have contributed to higher wage inequality across skill classes within reforming countries. At the same time, they are a powerful force toward international income convergence as defined here.

While these effects seem robust at this stage, available studies have not yet linked trade liberalization and IPRs in a serious study of induced innovation and global inequality. In principle, trade liberalizers with stronger IPRs may experience greater innovation impacts, at least as measured by formal metrics. This is an important area that remains open for research. Overall, however, these various channels support the view that IPRs reforms have contributed to international convergence, even as they may have exacerbated internal inequality within reforming economies.

5 CONCLUDING REMARKS

It seems intuitive and evident that IP protection is likely a force for rising economic inequality for a variety of reasons. However, a primary lesson from this paper is that establishing that causality is challenging, and systematic evidence is scarce. Cross-country macroeconomic regressions of Gini coefficients on available measures of IP protection find opposing evidence across specifications, which is not informative. At the same time, emerging econometric evidence using detailed microeconomic data suggests that firms engaged in more global patenting tend to have more unequal internal wages, even within occupational categories. These findings are suggestive but a long way from establishing a firm and generalizable relationship. To be sure, far more analysis is needed.

Another point made here is that IP reforms may accompany trade and investment liberalization, contributing to internal inequality, especially in EDCs. However, while the channels through which trade, FDI, and outsourcing through production networks can affect internal and external inequality. are reasonably well understood, there has been almost no empirical study of how IPRs may contribute. This also is a yawning hole in our understanding and needs to be rectified with additional study.

Finally, there is clear evidence that IP reforms have contributed significantly to increased flows of market-oriented technology transfer from technologically advanced countries to certain EDCs. Because these flows embody knowledge that can raise local productivity and transform the global structure of production, IPRs likely have had an indirect but substantially positive effect on raising average incomes in recipient EDCs relative to those in rich countries. This process of income convergence is a critical outcome of the globalized IP system but remains underappreciated and deserves far more analysis. Unfortunately, however, such flows have not materialized in poorer countries, whose incomes continue to stagnate in relative terms, despite their own reformations of intellectual property policy.

I hope that this chapter opens avenues for further research that will help sort out the underlying explanations for both these stylized outcomes and impacts on other, heretofore largely ignored, socioeconomic outcomes. I am sure that Professor Marianne Levin would agree that we have moved forward in our understanding but there are many hills left to climb.

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