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Towards Better Balanced IPRs: Improving Access to Health through Better Access to Education

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ABSTRACT

This is an excerpt from a larger work on biotechnology patents and access to healthcare looking to provide an alternative, rather indirect solution that might improve the whole IPRs environment and ease the longstanding strife between access to health and patent protection.

This paper argues that increase of the overall standard in developing and least developed countries through provision of better education, in turn, supported by IPRs resources, can contribute to better access to healthcare and novel patented medicines.

For this purpose, an analytical method is used going through various approaches to IPRs ranging from public-private interests, information and patents, individualism and IPRs as well as looking into the concept of knowledge economy. Human rights, albeit the common battleground, deserve their rightful place in this paper, however, they are not directly addressed to leave room for the other aspects mentioned. It concludes with the findings that IPRs contribution to education might be beneficial for both IPRs holders and the general society.

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Keywords: access to health, individualism, information, IPRs, knowledge economy, patents, public-private interests.

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I. Instead Of Introduction: The Balance Of Private-Public Interests

It can be argued that balance is not anachronic but fluid and diachronic since things rebalance as they change. Alternatively, today's balance might be tomorrow's disarray. This is especially true in contemporary society driven by constant change and development. However, with societal changes, the already established balances need looking into and making sure that mechanisms placed to keep such balances are still working properly. The balancing of private and public interests in intellectual property rights, especially patent rights, is no different, nor neglected. For example, Menell, *et al*. (2021), find that '[t]he keys to economic efficiency lies in balancing the social benefits of providing economic incentives for creation and the social costs of limiting the diffusion of knowledge.'

Discussed and researched both by opponents and advocates of patent rights, the balance of rights in patent law is a simple transaction seen through the prism of contractual justice theory. In the words of Robinson, (1890):

> "A patent is a contract between the inventor and the public, by which the inventor, in consideration that the exclusive use of his invention is secured to him for a limited period of time, confers upon the public the knowledge of the invention during that period and an unrestricted right to use it after that period has expired […]. The specification is the instrument in which the terms of these mutual considerations and promises are declared, and on its completeness and accuracy depends on the validity and the value of the contract itself."

In other words, the inventor discloses their invention in detail, and society grants them an exclusive right to dispose of the disclosed invention as they please. A recent paper by Mario Biagioli (2019) concludes that such balance does not really exist outside patents themselves. The more productive the patent is, the more exclusive power it gets (Biagioli, 2019, pp. 160–161). He also argues that an invention which is not provided patent protection falls in the public domain and has got almost no market power since there is nothing to prevent others from producing the products underlined by such invention (Biagioli, 2019, p.

150). This would mean that the market itself is the driver of development, not the inventiveness of products placed on the market (Mgbeoji, 2006). The success of an invention could be estimated by considering its actual production, whether it takes place or not, and how many people such invention has reached. If the invention is released into the public domain as soon as it is invented, it does not allow anyone to produce it exclusively. If it is successful when placed on the market, it would be copied by competitors and as such it is not a profitable investment. And, yet Biagioli argues that 'progress is ultimately accomplished when inventions and works of authorship are released into the public domain at the expiration of their term or protection, thus becoming free for everybody to use (Biagioli, 2019, p. 142).'

As patented products are sometimes very expensive and time consuming to produce and, yet, very easy and cheap to copy, they are found to have an unusual nature since they require different approaches so as to generate profits for the deserving parties. The patent system allows creators or patent holders the deserved gratification, but the cost society pays to access patented products is rather high, especially when it comes to biotechnological inventions which have the potential to save many lives. And these are exactly those that require time and large investments. Efforts to strike that balance between the needs of the patent holders and the needs of society are numerous. One recent example to achieve this is the COVID-19 Patent Waiver, which resulted in only a partial waiver of IPRs (WTO, WT/MIN(22)/30, WT/L/1141). From this one example only, it can be argued that the strive to achieve the said balance has so far been a patch work. Competition driven economy further emphasizes this as 'limited islands of monopoly (Machlup, 1958),' that is patents, are not only tolerated by also encouraged. On the other hand, given the time-limited duration of patents, commentators refuse to refer to them as monopolies but exclusive rights since they argue patents stimulate competition by motivating others to find different solutions for the same problem (Fox, 1946, pp. 328–34). However, the fact that patents impede access to medicines is irrefutable as they breed largely unaffordable products.

Many alternatives to patents have been proposed and discussed, including possible industry-specific length of protection based on the different development costs and incentives in different fields of invention (software, pharmaceuticals, etc.) (Kahin, 2006), alternative systems providing the necessary incentive for innovation while enabling access to essential medicine to populations inflicted with poverty, like the Health Impact Fund (Hollis & Pogge, 2010; Pogge & Thomas, 2012, p. 13), or localizing the process of patent grant by transferring the granting powers to the society rather than the examiners (Biagioli, 2019, p. 162). Private-public partnership is also one of the alleys to increase public access (see more in Zhou, 2022; Oguamanam, 2010). The establishment of public-private partnerships is considered as one of the solutions to maintain or re-establish the balance between IPRs and society as such partnerships have proven to be beneficial for societies since they prevent complete privatization of public enterprises and still enable private companies to work profitably within this partnership. On the other hand, what public-private partnerships seem to have also encouraged is the rise of nationalism. It is also argued that exclusive or proprietary rights are used to leverage access, to promote dissemination, and to safeguard downstream use rights through the shaping of license policies (Van Overwalle, 2012, pp.71–114). IP license management in an imaginative and solid manner can be a powerful tool for advancing both private and public interest (Dryden, in his foreword to Krattiger *et al*., 2007).

The balance requiring assessment is the cost (giving up market power) and benefit (overall societal development by means of innovation) of patents. However, since innovative products are priced way above the purchasing power of general society (Bluhm, 2019; Radelli, 2021; I-MAK, 2022), and way beyond the cost of production of such innovative products, the balance should be sought so as to re-establish the equilibrium foreseen by the patent system. Namely, innovation in the 19th century was possible for gifted individuals only. Today, innovation is in the hands of highly educated individuals since genetic issues cannot be solved by naturally gifted individuals only. They would also have to acquire a lot of knowledge in a given field of study in order to solve a problem in an innovative manner and obtain a patent for their trouble.

Consequently, what society needs to demand in return for the monopolies it confers is return in the form of education. That is, it is the society which actually produces these highly educated individuals, not the companies which rip the benefits of their work. So not only does society grant market monopolies, in return for the previously mentioned patent disclosure, but also empowers the individuals who are drivers of such innovation for which patents are granted. In the same vein, Oguamanam finds that the society is short-changed twice when considering how gene patents lock up information, thereby denying public access while public funds are poured in university research, which results in patents of inventions exploited by the private sector by way of exclusive licensing of university inventions (Oguamanam, 2008). Effectively, the public gets almost no reward for its contribution. Oguamanam would see this in a way of fair pricing and access mechanism to the resulting research products or other benefits, which Part VI. a below seeks to bring around (Oguamanam, 2008; see Higher Education IP Contribution below).

Measuring the value of patents is not a straightforward task since intangibles do not really have a mass which can be weighed on a scale. None-exclusive objects come under exclusive control provided for by IP

laws (May, 1998, pp. 59–78). Intellectual properties are non-exclusive as they are abstract objects, information and ideas, with no particular location in time and space (Black's Law Dictionary, 1999). The legal term "intangible" is similar to the philosophical term "abstract." An intangible property is a property that lacks a physical or corporeal existence, such as stock options or mechanical designs. In philosophy, an abstract object is an object that does not have physical properties, such as a number or geometric figure. However, although all intangible properties are abstract objects, not all abstract objects are intangible properties: the number 4 is an abstract object, but no one can claim ownership of that number. Hence, we could either consider weighing patent features, or profits they generate from the granted monopoly. The specific features of an invention could be great but without commercialization of that invention, its value from market perspective could be very small and insignificant compared to a widely commercialized and marketed not-so-feature-specific invention. Hence, the value of the invention, that is of the patent, should be sought in the market power it provides and the plenitude of people who uses it as a solution to the problem it is intended to solve. To achieve this goal, several other aspects are considered below.

II. Patents and Information

As inventions subject to patent protection are conditioned on the provision of detailed discloser, patents are not only of inventive, but also of informative value to society. Development relies on inventiveness as much as it does on information, however, the latter has also come to enjoy proprietary protection, which contradicts the previously mention *quid quo pro*. Information derived from patented inventions, beyond those disclosed for marketing authorization, does not become public upon patent expirations but is afforded unlimited legal protection as it is deemed to provide holders with competitive advantage. When this is applied to information pertaining to life science products (Nealey *et al*., 2015), generic drug manufacturers, which are meant to have access to previously patented products and produce them at affordable prices, might find themselves lacking the information to do so. In a time when competitive means possessing superior information, as argued by Oguamanam (2008), in terms of content and timing, the question of restricting access to life-advancing biotechnological solutions, which could provide further information only if massively used seems counterintuitive. Oguamanam (2008, p. 131) argues that 'the generation, ownership, and management, including the manipulation of information, are considered as pivotal in the 'contemporary global economic order which services, and is in turn, also serviced by the information (or post-industrial) society.'

At the same time, providing patent protection for the purpose of obtaining information is still an argument pro patent protection, counteracting the possibility of not obtaining any information at all. However, the experience with the patented product would be limited to those who can afford to pay for such a product. The limited access is not only detrimental for all the people who will not receive the medicine for their condition, but it is also crippling for the process of obtaining further information of a given product. As biomedical products are improved based on data gathered in post-marketing periods from users reporting side effects, the wider the use of the product, the more information on its post-marketing effects can be acquired.

Drahos (2016) in his 'Philosophy of Intellectual Property' claims information to be a 'primary good,' which, according to Rawls (2020), can be natural or social and is presumed to be something that every rational person wants. Considering the access to information and data flow to be an invaluable asset to have in possession, the limited information provided by the disclosure of inventions in patent applications not only restricts the access to the invention itself, in terms of unhampered further study and development, but also limits the access to data concerning the said invention due to its restricted use by only a minority who can afford it (Drahos, 2016, p. 201). John Stuart Mill finds that injustice occurs when one is deprived of his 'personal liberty, his property, or any other thing which belongs to him by law' (Mill, 1863) and that secondly injustice consists in 'taking or withholding from any person that to which he has a moral right (Mill, 1863, p. 44).' Access to affordable medicine would definitely fall in the category of not only moral rights, but human rights.

As economic development is a crucial aim of governments throughout the world and economic advantages are achieved by countries, or individuals, in possession of more information, the gap between the developed and the developing is bound to widen, rendering the developing countries underdeveloped and the developed countries overdeveloped in this equation. Little, McGivern and Kerins (2016, p. 165) find that 'Social classes are divided by access to education, since without technical and communication skills, people in an information society lack the means for success.' In addition, in his pluralistic account of intellectual property, Resnik (2003, p. 320) gives succinct description of how property rights developed throughout the centuries as well as the underlining causes for such a development. As IP rights received more attention with the scientific and industrial revolutions, corresponding IP laws were adopted at the time to support the contemporary political economy, which had come to depend more on information and ideas.

From a different perspective, Resnik suggests that private information should be treated as intellectual property since every individual possesses such information and is entitled to monetize it in exchange for sharing it. If private information is to be treated as IP, also argued by Samuelson (2000), then the term 'intellectual' would not be appropriate as private information has nothing to do with 'intellectual' abilities as everyone has information which are considered private in the eyes of the law. This is further supported by Resnik's (2020, p. 321) argument that access to private information can be bargained over if confidential information is treated as IP, thus enabling individuals to enforce 'their privacy rights by suing violators for property-related torts, such as theft, trespass and conversion.' Perhaps 'intangible property' would be the more suitable term for such information so as to distinguish it from the actual intellectual property. Perhaps trademarks should also be moved in this category as they are indeed intangible, but it is arguable how 'intellectual' they are. Furthermore, it can also be argued that only patents, copyrights and industrial designs are deserving of the 'intellectual' attribute, while all other currently recognized intellectual property rights as well as rights to private information, albeit intangible, are not intellectual. On the other hand, there have been arguments that the basis for intellectual property are not fundamental metaphysical distinctions but only reflect pragmatic concerns (Drahos, 2016), and the very terminology used in this context suggests the veracity of the argument. John Lock's relation of labor and property supports the argument that not all intellectual property is of the same nature:

> "Whatsoever then he removes out of the state that nature hath provided, and left it in, he hath mixed his labour with, and joined it to something that is his own, and thereby makes it his property (Locke, 2015, p. 27)."

This goes in line with Hegel's (1821) self-expression in patents, which is disputed as it is considered that it is not required given that the majority of the work is done by machines replacing people, such machines being used in biochemistry, molecular biology, electrical engineering alike (Resnik, 2003, p. 327). This can be challenged on the fact that the person using these machines directs the process of how and what they do to realize his or her goals, that is to produce the patentable invention deriving from her or his personal imagination, experience and knowledge. Thus, any invention, indeed, would have a tight relation with one's own self-expression, albeit this not being the concern of current IP laws. In Resnik's (2003, pp. 74–75) words"

> "Learning is not merely the treasuring up of words in the memory; it is through thinking that the thoughts of others are seized, and this after-thinking is real learning. Now that which is learned becomes in turn something which can be disposed of; and the external expression of this material may easily assume a form different from the form into which the original thinker threw his work."

The world might be better off without any IP rights (Martin, 1995); however, it might serve a better purpose if those IP right are utilized for more public-oriented goals rather than keep the original form of strictly private and alienating purposes of these rights.

III. Individualism and Patents

As the Industrial Revolution brought about major industrial changes, so did stronger patent protection for inventions which coincided with the overall social development. Jones and Vollrath (2013) find that 'in the last century (or two), the world economy has witnessed sustained, rapid growth in population, technology and per capita income never seen before in history' justifying patents and copyrights as enablers of 'inventors to earn profits to cover the initial costs of developing new ideas.' However, the phenomenon of individualism began to grow at about the same time, even though traces of individualism can be found already in classical antiquity (Lee, 2017), and although it emerged as a systematic theory only in the nineteenth century (Akhtar Khan, 1987). Swart (1962) finds that the term 'individualism' as invented at the time was used to denote at least three different groups of ideas, that is, 'the idealistic doctrine with equalitarian implications of the rights of man' or political liberalism, 'the anti-statist, largely utilitarian doctrine of *laissez faire*, or economic liberalism' and 'the aristocratic cult of individuality, or Romantic individualism.'

Current research shows that these past few decades have shown a marked increase in individualism in the world (Zengrui *et al*., 2017). Santos *et al*., (2017) conducted a study examining 51 years of data on individualistic practices and values across 78 countries confirming rise in individualism in most of the tested societies. Previous research in the connection between individualism and intellectual property protection confirms their concomitant rise and interdependency (Gorodnichenko & Roland, 2011). This is justified on the premise that individualist cultures attach social status rewards to personal achievements,

that is, the incentive for innovation is not only monetary but also socially rewarded, which leads to higher rates of innovation and economic growth (Gorodnichenko & Roland, 2011, p. 1). The intensity of innovation is measured by patents per million population, as authors find that it is the most suitable available measure for innovation outputs, as well as the innovation performance index from the Economist Intelligence Unit (EIU) (Gorodnichenko & Roland, 2011, p. 2), which combined with Hofstede's index of individualism (Hofstede, 2001), results in higher individualism in cultures with higher number of patents filed by resident population. They also find that GDP per capita is higher in cultures with foster stronger individualism (Santos *et al*., 2017, p. 2). Similarly, Grossman and Na (2014) find that independence is prioritized in individualist cultures while in collectivist cultures, family relations and conformity are emphasized.

It is this independence and allowance of nonconformism that enables individuals to change and improve the existing settings. When such changes and improvements are technological, they become eligible for patent protection. Having in mind the above-mentioned findings, it is safe to conclude that the grant of privileges for original developments boosts individualism in societies making more individuals to stive towards creativity and invention, thus further developing the society. Only learning from the existing and changing it to fit the new challenges which come with the social and technological changes could lead to such development. This goes in line with the very often quoted metaphor 'standing on the shoulders of giants' emphasizing that intellectual progress is made by using the gained wisdom and understanding of previous thinkers.

On the other hand, Van Overwalle (2012, pp. 111–112) considers individualism, collectiveness, and patents through the licensing perspective of gene patents, thus addressing not only access to health, but also access to knowledge. She finds that individual (exclusive) licenses have as negative effect on innovation as collective (multiple ownership) licenses since the former have blocking effect while the latter may lead to hindering patent tickets (Von Graevenitz *et al*., 2013). Approaching individualism and collectiveness from biotechnology standpoint, specifically, the 'open biotechnology' concept (Joly, 2010), the positive effects of collaborative/collective models of sharing knowledge are more than evident as exemplified by the many open projects as open journals (for e.g., Public Library of Science), new bioinformatic tools (BioMoby), databases (NIH db GaP), big science projects (HapMap), projects to facilitate access to biotech research tools (Cambia BiOS Initiative, see Jefferson, 2006) or a combination of these.

This leads to the conclusion that although socio-economic and technological progress and development depend on specific individuals and their ability to think and act differently from their community, the collaborative activities between these individuals for the purpose of sharing acquired knowledge and ideas is the necessary ingredient for the benefit of the whole society. Thus, perhaps with a collective of individualists, society can achieve a better balance between the exclusive and the private.

IV. KNOWLEDGE, EDUCATION, AND INNOVATION

Arguments pro patent protection highlight the importance of monopolies for furthering development. This is supported by the reward and incentive theory as the most prominent theoretical postulate of intellectual property (Oddi, 1995) further discussed by Oguamanam (2008, p. 117). He argues against the existent belief that reward for creativity is vital for cultivating further creativity while maintaining rich public domain, which is the condition under which this theory offers the proper balance. However, the origin of development is not in the invention *per se* but in the knowledge and ingenuity underlying that invention (Oguamanam, 2008, p. 142). Under the patent system, knowledge is not a subject to monopolist rights, as it should not be, however, nowadays it is fundamentally needed to obtain patent protectable products. Such products bring large monetary returns to their holders, thus investments in intellectual property development have become common place (EPO and EUIPO Munich, Germany, and Alicante, Spain, 2019; Seip *et al*., 2022). However, as these products are essentially dependent on the knowledge their inventors acquire before using that knowledge to innovative solutions, it is only reasonable that investments should also be directed towards the ingredient essential for the development of such inventions. Notwithstanding, in pharmaceutical and biotechnology settings, with the protection of regulatory and test data provided to this sector, interests of generic drug manufacturers are undermined as access to the knowledge necessary for the manufacturing of the generic medicines is denied beyond the patent term initially afforded (Correa, 2002). This does not only effectively prevent affordable medicines to enter the market, cutting off access to these medicines indefinitely, or at least while the 'evergreening' period lasts (Collier, 2013), but consequently knowledge gets 'proprietarized' (Oguamanam, 2008, p. 142) and out of the public domain where it is ought to be.

The education industry, which actually deals with knowledge, tends to get least funding worldwide (See COE-Education Expenditures by Country). Unlike the developed countries which arguably allocate sufficient funds for education, as they can afford it, education in less developed countries is not so fortunate.

In its press release from 2021, the World Bank reports that two-thirds of the poorer countries are cutting education budgets due to the COVID-19 pandemic (World Bank press release, February 2021). This is in accordance with the joint World Bank–UNESCO Education Finance Watch (EFW), which finds that prior to the COVID-19 pandemic, in 2018-19, high-income countries were spending annually the equivalent of US$8,501 for every child or youth's education compared to US$48 in low-income countries (Al-Samarrai, 2021). The report also finds that 'the gap in spending per capita between low- and upper-middle-income countries increased from US$ 813 to US$ 1,045 in real terms between 2010–11 and 2018–19 (Al-Samarrai, 2021, p. 5).

This leads to the conclusion that although education is the basic driving force of knowledge, and consequently, should be the most funded societal segment in order to achieve the development the society is so eager to obtain, exclusive control over knowledge, not development, is the driver behind strong patent protection. Insight into the concept of Global Knowledge Economy relating to the role of intellectual property can be found in Drahos & Braithwaite (2017). However, it seems counterintuitive to allocate investments only in the 'middleman', which is the research, while circumventing investment in the primary diver, education, as those research scientists, which created profit-generating patented inventions, primarily require vast amount of education, especially in life-sciences.

As science has become the driver of inventions subject to patent protection, it is reasonable to conclude that what society needs to further develop is knowledge and better access to it. Knowledge transforms into inventions that solve problems; Inventions are subject to exclusive rights which generate profits; Profits are based on the unwritten agreement of society to grant exclusivity to a portion of the market (monopoly) in exchange for knowledge, although within traditional philosophy, there is a choice to be made between contractarian approaches to justice and utilitarian or consequentialist accounts of justice (Drahos (2008), p. 200). However, this circle is missing a link, which is the distribution of that knowledge underlying patented inventions. And it is exactly that link that could possibly provide the balance between private and public interests.

The balance of rights is usually weighted in terms of IP rights and human rights as human rights deal with access while IPRs with restrictions. The debate is deep and ongoing with no middle ground in sight. This has become especially true with the rise of pharmaceutical patents since such innovation effectively started touching the lives of individuals and there is a scientific agreement that the disconnection between the pharmaceutical research agenda and the global health crises is substantial (Shah, 2010). When a patented product in any industry comes to the market, it is a privilege rather than necessity to use it. A simple comparison would be the advance in information technologies development, also due to the increase of knowledge in the sector, with the development of biotechnology. The latter produces often necessary products, the former, products which people can live without. In this light, perhaps a different balance is ought to be considered. Instead of the classical approach of balancing IPRs and human rights in terms of access to medicine, the above 'full circle' concerning knowledge should be considered in more depth.

The core argument to grant patents is the incentive to invent, innovate and disclose in return for a patent. However, this is undermined by the investment incentive as companies are willing to invest in R&D which is most likely to result in a patent grant, thus promising return of investment and capitalization (Elster, 1989, pp. 33–34). Patent rights are only worthy if large returns are guaranteed, and the exclusive rights granted under the current IP regime are very much profitable. What needs weighing is the benefit society rips from such disclosure against the privilege it grants. Patent holders exercise their rights over the entirety of the population within a jurisdiction under which the patent is granted. Every single individual in this jurisdiction is subject to the granted patent as none of them have the right to the patented invention otherwise than allowed by the patent holder. On the other hand, the benefit for every single individual from the disclosure provided by the patent holder is again limited, if any. The disclosure would benefit science, surely, but not the child who needs treatment with a patented medical technology. If every single individual is subject to the monopoly, shouldn't every single individual benefit from the disclosure? If the balance should not be individual, then the agreement is flawed, or asymmetrical at best. Furthermore, intellectual property's emphasis on profit and reward has yielded a pharmaceutical research agenda that aims at a "cosmetic society," ignoring the sick and needy and targeting wealthy and healthy who can afford expensive cosmetic drugs and procedure, in turn, generating investment return (Karmel, 2003, pp. 16–17). So, individual balance for the wealthy, not so much for the less well off. This leads to the need for balancing the very essence of patent granting, but from within, rather than from without.

To evaluate such balancing, perhaps it is necessary to find a way for this disclosed knowledge to be more accessible to the general public, rather than just to a certain minority that can actually benefit from it. The only disposable tool society has got to achieve this goal is education, which leads back to the monopolization of knowledge especially targeted by life sciences (Corea 2002).

A. Global Knowledge Economy

The terms 'knowledge economy' or 'knowledge society' have been used to describe a fundamental shift in how economic resources, value production and the bases of political, social, and cultural life are viewed by modern societies (Zapp, 2022). Beginning in the late 1960s, this economy is characterized by innovation, research, development, stronger premium on skills and university knowledge (Drucker, 2017; Craig, 1974; Stehr, 2012; Välimaa & Hoffman, 2008; Frank, & Meyer, 2007), which are indispensable tools for patented inventions. Consequently, the expanse of education leads to reshaping of the economic system and labor market, where non-material and creative skills become resources of critical importance (Baker, 2014; Goldin & Katz, 2010; Wyatt & Hecker, 2006, p. 21). A study conducted by Zapp (2022) indicates that OECD countries more than tripled their R&D personnel since the 1980s, while the number of professional knowledge workers in non-OECD countries doubled since the mid-1990s but the global growth of a knowledge-intensive occupational field is conditioned by strong state support (Zapp, 2022, p. 3).

On the other hand, technological breakthroughs in digitalization and the growth of biotechnologies exact strong intellectual property regimes centered around an aggressive attempt to create artificial scarcity over information, thus 'propertizing' knowledge (Drahos & Braithwaite, 2004). Drahos and Braithwaite (2004, p. 204) describe this as 'hegemony based on knowledge' further elaborating that 'the logic of hegemonic power based on knowledge is to lock up knowledge, to deal with ignorance selectively, to create a morality that judges knowledge to be a private good and to punish through the criminal apparatus of the state those who steal knowledge.' Evidently, intellectual property generates knowledge, on the one hand, and locks it up on the other. This is further emphasized by the imposition of strong intellectual property rights enforcement via the TRIPs Agreement, also known as TRIPs-Plus Agreements, as well as the US bilateral trade agreements, before and after TRIPs alike, conditioning other countries with weaker economies to defer from using the TRIPs flexibilities (Drahos & Braithwaite, 2004, p. 214). Such hegemony has been felt at diverse intersections, including health and access to essential drugs; human rights, biodiversity conservation, bioprospecting and biopiracy; market access and balance of trade; and technology transfer and questions about indigenous knowledge (Kongolo & Shyllon, 2004). Research itself is not unaffected by the said hegemony. Mgbeoji and Allen (2003) report on a survey of approximately 2100 life science researchers of which 18% reported delaying the publication of research results for intellectual property reasons for over six months.

Fagerberg (2006, March) finds that knowledge has always been important for economic development. However, the operation of knowledge today is comparably different from its operation a century ago. Innovation is found as the primary factor for this difference combined with R&D infrastructure, also known as 'systems of innovation' (Edquist, 2004) as well as massification of higher (tertiary) education and the advance of ICT (Fagerberg, 2006, p. 21). The extent to which countries benefit from this process, however, is not linear, which is evident from the increase in the difference in GDP per capita between the dynamic (mostly rich) and less dynamic (mostly poor) parts of the world (Fagerberg, 2006, p. 21). It is interesting that this divergence is not along the classical line of developed versus developing countries, but evidence suggest that the European Union is behind the US and some Asian parts in this regard and has adopted a policy to raise R&D investments to address this concern (Fagerberg, 2006, p. 21). However, R&D alone cannot change much without changing anything else. What Fagerberg is suggesting is to transform the public sectors, such as education, health, communication, etc., into powerhouses for innovation and to do so, he suggests 'transition to an experimental economy; in which experiments with new solutions/technologies would be the normal state of affairs, not the exception (Fagerberg, 2006, p. 21).' The following part discusses one such 'experimentation'.

B. Higher Education IP Contribution

The academic pursuit of striking a balance between patents and society is justified only if it is true. Historically, people with inventive capacities were recognized by wealthy rulers in power to adopt laws in favour of these scarce, talented people (see for example, David, 2004). Today, thanks to those rights granted, these people can make a living without giving up on their abilities but exploit them. Were the end here, this would have been a success story worthy of being an architype of how diversity, not uniformity, enables society to prosper. Instead, there is a demand seduced by marketing powers fueled by mass psychology guaranteeing mass demand for innovation of life exploited by, not the inventors, but the ever-vigilant investors in high-demand products.

As the incentive to invest in innovations is the monopoly to be granted, perhaps the profits from the monopoly, which are justified as being used for investment in further innovation, could be redirected to the financing of the higher knowledge distribution system as a form of mandatory contribution or, rather, an early investment in future innovation.

In his revisit of the knowledge economy, Zapp (2022, p. 187) discusses the social advantages people with higher education bring about as they possess the analytical and creative skills found to be the core of the knowledge economy, hence arguing that infrastructure capacity for academic training can be seen as

essential for the increase of knowledge-intensive personnel. Furthermore, in its most prevalent interpretation, intellectual property rights are justified on the utilitarian premises that economic growth is driven by R&D, which uses science 'as a national, systemically planned and economically viable tool to foster progress (Drori, 2003).' As such, science and education as drivers of social and economic development require further nourishment.

Investment in education produces higher quality graduates who become part of the labor market equipped with better skills and faced with more opportunities to find better paying jobs because of it. The more educated individuals are generated, the more scientists who will develop future inventions on the market. Today, investment in higher education mainly originates from national funding, which is rarely enough. Even patenting universities, which have their own research and development leading to patented inventions, and in turn are being licensed to private companies, get additional income that amounts to about 10% of their research budget (OECD, 2004).

Financing education is a long-term investment in future scientists and individuals with bigger purchasing power, which can later afford to buy the patented products placed on their market. The more inventions on the market, the higher the profits of the patent holders, which nowadays are mostly large corporations employing scientists who usually only hold the moral rights in patents, that is, there name is written on the patent application, and they get the moral credit for the invention, otherwise receiving a salary just like everyone else. At the end of the 20th and beginning of the 21st century, many European countries extended the employers' rights to employee inventions to the university area. Nowadays universities as employers may have a right to inventions made by professors and other academic staff researching at universities (see von Falck, & Schmaltz, 2005; Stallberg, 2007). Investing in the education of low- and middle-income countries opens new markets for the patent holders where they can place their patented products and where the purchasing power of the new markets' population should gradually increase as they acquire better skills and get better paying jobs.

Education solves many problems, some of which include higher awareness of more global problems like, climate change issues, better ability to discriminate between fake and true new, a step forward to eradicating poverty as well.

Such a contribution would balance the scales between the private and public interests and even ennoble the role of intellectual property in the society, perhaps allow it to gain a function of enlightenment, perhaps similar to the enlightenment and vast changes brought about by the French revolution of 1789 when 'Freedom of press' was declared and literary privileges abrogated (Hesse, 2002). At the time of the revolution, authors were widely celebrated as civic heroes, servants of public enlightenment (Hesse, 1991). With mandatory higher education contribution for intellectual property holders the whole IP system obtains a social role and could, indeed, ascribe itself the attribute 'driver of development.'

Overdiek, Rausch and Gramke (2020), assessing world-class patents based on the approach by Ernst and Omland (2011), find that some patents have more meaningful contribution in society than others. Namely, their study shows that only 10% of the most important patents ('world-class patents') have contributory role in society. If only 10% of the patents bear meaning and importance, and yet, raise market barriers just as meaningful patents do, demanding a contribution from such patent holders for educational purposes seems only fair so as to restore the public-private balance. If anything, the finding just strengthens the argument that patents impede knowledge dissemination while having a hegemony over them.

C. University Patents

Universities, like companies, are entitled to patent rights over inventions stemming from their research work. This practice originates in the US with the enactment of the Bayh-Dole Act in 1980 (PUBLIC LAW 96-517-DEC. 12, 1980. Public Law 96-517. 94 STAT. 3015. 96th Congress). The act encourages utilization of inventions produced under U.S. federal funding, promotes participation of universities and small businesses in the development and commercialization process and allows exclusive licensing by transferring inventions to the marketplace for the public good while the US government enjoys royalty-free, nonexclusive licenses to use such inventions for government purposes (Bayh-Dole Act, § 202(c)(4)), including use by government contractors (Bayh-Dole Act, § 200; Krattiger *et al*., 2007). As a result, the last 40 years have been marked by a considerable increase in university interest in commercializing new technologies (Siegel *et al*., 2003). The Bayh-Dole Act is considered to have given a new role to universities aside from the classical role of contributing to society by providing education and performing basic research (Rosenberg & Nelson, 1994; Henderson, R. *et al*., 1998), thus shifting the aim of universities towards a more direct contribution to economic development, also referred to as a pursuit of a 'third mission', by engaging in activities of technology transfer from universities to industry (Etzkowitz & Leydesdorff, 2000). Such activities involve marked growth in filing university patent applications (Geuna & Nesta, 2006).

As the practice of transfer of technologies from universities to industry proved successful in the US, the European counties started to adopt legislation similar to the Bayh-Dole Act in order to achieve greater social and economic benefits from research, as placing the outputs of publicly funded research in the public

domain proved insufficient to fulfil that role (Baldini, 2009). The trend did not stop with the western economies but took a worldwide effect, evidenced by the research done on university patents in Asia (Hu & Mathews, 2005), and especially China (Fisch & Sandner, 2016). Wong and Singh (2010) also researched the relationship between patenting and publishing, finding a positive correlation despite the evidence that researchers refrain from publishing before patenting. Trends in university patenting activities have been largely studied and generated a growing academic literature on university transfer of technology Mowery *et al*. (2001). A study conducted in 2015 comparing university technology transfer of 300 top universities worldwide found that European universities file fewer patent applications than do US and Asian universities (Fisch *et al*., 2015). More importantly, the correlation of university size and patenting activities was found to be also positive (Fisch *et al*., 2015, p. 322), confirming previous studies of the same characteristic. Based on a survey of 1554 researchers in Canada. Landry *et al*. (2007) found that university-industry knowledge exchange is significantly determined by the size of the university. Also supportive of the same finding is the work of Hewitt-Dundas, N. (2012). The positive correlation between university size and technology transfer was also found by Carlsson & Fridh (2002). This is ascribed to the larger fundings and availability of more resources (Fisch *et al*., 2015, p. 322) to universities of greater size, however it begs the question of how smaller sized universities, especially those in developing regions, could receive more funding and resources in order to catch up with the already well funded and patenting universities in the developed world.

While the above confirms it is true that universities like companies own patents and some of them are even major patent holders, unlike universities, private companies innovate to obtain market position. Inventions invented at universities would end up in the public domain anyways since published research does not leave space for a monopoly, hence does not allow for high return of innovative products (Biagioli, 2019, p. 156). However, this is not true for inventions developed by private companies. Universities tend to innovate for innovation's sake, unlike companies which innovate for the post-inventive competitive and market benefits. It is exactly these benefits that patent law implies when it grants monopoly right to patent holders.

In their seminal Triple Helix model, Etzkowitz and Leydesdorff (2000) compare two modes of research, that is Mode 1 based on research dealing with issues in separate disciplines and Mode 2 based on collaborative intradisciplinary research addressing practical issues. They find it paradoxical that Mode 2 currently derives from Mode 1 as the former was the format of science in the 17th century. However, they justify the development of Mode 1 as a defense mechanism against the undermining of university autonomy by holders of great industrial fortunes, who at the time donated funds for the foundation of new universities (Etzkowitz & Leydesdorff, 2000, p. 142). Nevertheless, with the strong government intervention in education, science and research, such consequences did not come to pass, which might again arise if IP holders are obliged to contribute to education once again. On the other hand, the triple helix of university-industry-government can form stronger ties and enable the development of a more compact and balanced society.

V. Conclusion

By applying the proposed IP education contribution and linking patent-generated company funds to universities, a measurable value could be created. That is, the number of students educated by funds generated from the monopolies as part of the public grant to companies which own the rights to such monopolies could be a measurable value. The rationale would be that these graduates themselves would become part of the innovation generating population at best or become global citizens who can utilize their university skills in other parts of the market. In other words, instead of constantly attacking a system that seems to be impervious to attacks, the said system could be reutilized. Conditioning patent holders to invest specific funds in universities, thus ensuring higher quality education and opening the way to cheaper or even free education for the general population could possibly return the much sought-after balance between patents and society.

The slight change in investment practices has a lot to contribute. The industry prides itself on its investment in research and development, thus justifying its strong advocacy of intellectual property protection. However, the current practice leaves a dark stain on its reputation as it effectively protects its profits while its opposition advocates human rights.

Industry advantages:

1) Early investment of just a fraction
2) Inevitable market expansion
3) Guaranteed human resources of intellectual value.
4) Power to dictate societal changes and directions.

Societal advantages:

1) Better access to education
2) Improved chances of employment due to increased skillset
3) Incremental but progressive departure from poverty
4) Mid-term and long-term improved access to medicines

To achieve such balancing, the general framework of patent law should undergo certain changes. Given that worldwide minimum requirements are governed by the TRIPS agreement, it is exactly through this mechanism that these changes should be put through. Amending TRIPS would provide for worldwide implementation of the said conditioning thus achieving effects on the largest scale. Gervais (2004) succinctly sums this up when arguing that 'modifying one component may require adjustment of others if the components are to continue to work effectively.' The introduction of a compulsory financing of universities by patent holding companies could disturb the balance which allows the system to work effectively. Such changes inevitably require further research to assess all economic, social, political, legal, and developmental aspects and impacts it might have.

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