

Documentation of Group Modeling Design and Research Executive Summary of Technical Report

APPENDIX A Variable dictionary

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Variable	Description	Measurement Unit
Accessibility of Knowledge	This measures whether knowledge can be easily attained from its source by third parties who need to utilize the knowledge.	Low / medium / high (Number of internet hosts per 1000 inhabitants).
Adoption of technology	Availability of knowledge for firms/industry. MFP as a proxy for disembodied technological progress, since it is the increase in GDP that is not embodied in either labour or capital. MFP comes from more efficient management of the processes of production through better ways of using labour and capital, through better ways of combining them, or through reducing the amount of intermediate goods and services needed to produce a given amount of output.	MFP annual growth rate in percentage.
Aggregated regulation	Regulations assuring the safety and diversity of agricultural products (e.g. controlling propagating materials and the marketing of agricultural products, and protecting breeders' rights) and regulations protecting and improving the quality of the environment (e.g. regulations controlling pollution levels, prohibiting or restricting the setting up of and/or operation of any industrial facility on environmental grounds).	Scale \rightarrow 1 (Aggregated of environmental regulation scale and agricultural regulation scale ; with scale of agricultural regulation = (none, weak, mitigated, permissive, restrictive) and scale of environmental regulation estimated through PAC expenditure as a percentage of GDP).
Average patent value	This is the commercial value that a patent represents to an owner.	Scale (1 to 5).
Average protection for pharma	The relative protection of pharma products in comparison of patents inventions (patent term extension, automatic injunction, data protection)	N.A.
Basic and applied research\$	Public and private funds for research up to & including prototypes	GERD as a percentage of gross domestic product (GDP)
Benefit sharing flows	Article 15 of the Convention on Biological Diversity defines access/benefit sharing as the sharing of the benefits arising out of the utilization of genetic resources with the providers of these resources and/or the holders of traditional knowledge relate	Low / medium / high.
Bilateral IP agreements	The importance of bilateral agreements.	None / low / medium / high (High being the most restrictive treaty to which a country is party).
Business capabilities	All corporate business capabilities. It could relate, for example, to the human resources management, security law management or also business organization strategy. Qualitative	N.A.
Competition regulation	Ability of competition law to alter IP practices.	An index/score (\rightarrow =1) of scope of antitrust/competition law that takes into account scope, remedies, private enforcement, merger notification and defenses, dominance and restrictive practice (The higher, the broader in scope the law is).
Compulsory Licensing	The actual practice of providing compulsory licensing.	Low / medium / high.
Concentration of competition	Concentration of product market competition limited number of actors in the product market	N.A.
Consortia	Association of societies, institutions, or innovators that accumulate knowledge for the purpose of engaging in a joint venture.	N.A.
Copyright value	This is the commercial value that copyright represents to an owner.	Scale (1 to 5).

Cost of patent application	The cost of drafting, filing, and prosecuting an application is indicated to be either high or low. High cost affects choice to protect through trade secret instead of patent	Low / medium / high (The cost of patent registration is compared to the population minimum wage together with the rate of unemployment in a country. This forms the basis criteria for the assignment of the comparative level of cost).
Cost of registration (Trademark)	The cost of drafting, filing, and internal review of an application is indicated to be either high or low.	Low / medium / high (The cost of trademark registration is compared to the population minimum wage together with the rate of unemployment in a country. This forms the basis criteria for the assignment of the comparative level of cost)
Court procedure	How many court cases got at least discovered as a percentage of total number of valid patents	N.A.
Democratization	Democratic society or not.	Not free / partly free / free (The index of political Rights and Civil Liberties from FreedomHouse).
Description	The breadth of the description provided in the patent application is indicated as significant or minimal. This is a representation of what is claimed, but also takes into account the scope of the general description included within the patent application.	No description / description with no guideline / description with guideline.
Economic integration	Increasing relationships of economic interdependence between states in a regional or international context.	Trade % of GDP (where trade is the sum of exports and imports of goods and services measured as a share of gross domestic product).
Education, training, degree	The human resources involved have to be educated and trained. And their skills depend on degrees.	The percentage distribution of the adult population (25 to 64 years of age) who have attained tertiary level of education.
Exclusionary value	The monetary value of the right to exclude through patent or regulatory market value.	Scale (1 to 10).
Exemption Exists	National patent or copyright legislation or jurisprudence may provide for an exemption to patent or copyright protection.	No / yes.
Expected profit	This represents the potential market value that the owner of an innovation is expected to earn. (not at intervals as a look forward projection)	N.A.
Experimental development \$	\$ public / private from prototype to break even pt	GERD as a percentage of gross domestic product (GDP)
Feasibility of scientific infrastructure	Feasibility, including the cost of setting up an infrastructure (labs, equipment) and operating an R&D center in a country.	Scale (1 to 6) (The cost of setting up and operating an R&D centre in a country expressed as a rank [1 to 6]. Rankings are provided following decreasing business costs according to the indication of a comparative cost index comparing 6 countries. A country with a high value corresponds to a highly feasibility or a low cost).
Foreign direct investment	Capital extended from an international source to promote innovation in a nation. May be applied through a joint venture or technology transfer or through commercialization within a nation (Creation of an industry or trade).	FDI inward stock (GDP%).

Foreign investment (R&D)	Acquisition, construction, or expansion of physical capital, such as a plant, by a firm from one (source) country in another (host) country.	GERD (gross domestic expenditure on R&D) financed by abroad as a percentage of GDP.
Formal diffusion of knowledge	Publications, journal articles and conferences.	Scale [0 to 2] : Average relative citations in health biotechnology. A score above 1 indicates that the country's papers are cited more often than the average paper in health biotechnology.
Genericization	This occurs when a trade name becomes a household word rather than descriptive and can render a trade name/trademark ineffective and worthless (e.g. when all photocopies, not just those photocopies produced by a Xerox machine, are referred to as Xeroxes).	N.A.
Genetic resources conservation	Practical effort to conserve genetic resources.	Low / medium / high.
Genetic resources protection	Legal measure to control access to genetic resource.	None / low / medium / high (A nation party to the Convention on biological diversity treaty is given a weight of 1; a nation party to the International treaty on plant genetic resources for food and agriculture is given a weight of 2. When a nation is party to both treaties, it is given a weight of 3).
Genetic resources richness	Diversity of in situ genetic resources, i.e. any material of plant, animal, microbial or other origin containing functional units of heredity and existing within ecosystems and natural habitats.	Low / medium / high (Based on national biodiversity indices developed by the United Nations Environment Programme's World Conservation Monitoring Centre).
Gov. spending on R&D	Amount available for R&D of government spending in all government agency (direct & indirect).	GERD (gross domestic expenditure on R&D) financed by government as a percentage of GDP.
Government emphasis on technology transfer	Qualitative measure of government policy encouraging technology transfer, mixture of factors including government reports, programs, encouraging matching funds, science grant evaluation criteria, etc.	Total GBOARD US\$ millions current PPP (Total government budget appropriations or outlays for R&D).
Government Use	A government may have an automatic right at law to utilize a patented invention.	None / low / medium / high (The intensity of government's automatic right at law to utilize a patented invention).
Imitation	Products put on the market that do not include invention or improvement.	% of products.
Implementation of indigenous rights	Quality of national implementation of internationally recognized rights of indigenous people.	Non applicable / low / medium / high (Indigenous people are recognized or protected by the country's constitution, politics are implemented, acceptance of the UN declaration of rights of indigenous people, etc.).
Industry registered lobbyists	Indiv. exerting influence on governments to increase funding for applied research/regulatory and to increase IP protection/funded for specific industries, etc.	Scale [1 to 10] (A proxy index assessing the amount of time senior management spends dealing with government bureaucracy. On a scale from 1 to 10 where 1 represents the least time spent and 10 the high time spent).

Infringement Parameter	This parameter indicates whether a national court is likely to uphold a patent infringement challenge, based upon national statistics.	N.A.
Injunction Availability	A court may have the option to order an injunction as a remedy. This is a valuable remedy for owners as it acts as a wall barring utilization.	Does not exist / low / significant.
Innovation	Innovation in this context concerns both new products and processes in the health and agriculture sector of the biotechnology industry (invention or improvement).	Quantity of biopharmaceutical products and transgenic plant products and processes at different phases of the development. These quantities are calculated based on the following indicators: new R&D innovation, R&D innovation, and R&D commercialized innovation.
Innovation magnitude	Aggregated relative value of new technology compared to old. How much more someone willing to pay.	N.A.
International exhaustion doctrine	A qualitative measure of the degree to which the country's patent laws follow the rule of international exhaustion. Under a system of international exhaustion, once a product has been sold somewhere in the world with the authorization of the IP holder, the rights in respect of this specific product are exhausted, authorizing its parallel importation without the consent of the IP holder.	N.A.
International human rights	Major human rights treaties are those 7 core treaties taking into account by the Office of United Nations High Commissioner for Human Rights.	Scale (0 to 7).
Invalidity Parameter	This parameter indicates whether a national court is likely or unlikely to find that a challenged patent is invalid, based upon national statistics.	N.A.
Inventions	Potentially commercializable publicly funded inventions (e.g. universities)	N.A.
Know-How Value	This is the commercial value that know-how represents to an owner.	Scale (1 to 5).
Late \$	Public & private \$ beyond break even pt for a given product	N.A.
Legal sovereignty	The condition of a state being free from any higher legal authority. It is related to but distinct from the condition of a government being free from any external constraints. Pursuant to international law, all states have an absolute territorial sovereignty. However, sovereign states can limit their legal sovereignty through international law.	Scale [-2.5 to +2.5] (The dimensions of the "Regulatory quality index" measure the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development. Positive scores indicate better governance and 99% of the values fall between -2.5 and 2.5).
Level of economic development	Economic development is the development of economic wealth of countries for the material well-being of their inhabitants.	Low / lower middle / upper middle / high (Income of a country classified using the World Bank scale of low, lower middle, upper middle or high based on GNI).
Media activity	Coverage of issues related to IP in biotech innovations.	An aggregation of the number of articles published broken down according to the following classes i) Biotech and agricult* or farm* or seed* or crop*, ii) Biotech and aquaculture, iii) Biotech and health or pharma* or medicine or disease, iiiii) Nutrigenomic, and v) Stem Cell.

Moral rights under copyright law	This is a residual right of an author of a work which can be invoked if the author's integrity is impugned.	Does not exist / exists.
Multilateral IP agreements	Number of multilateral trade treaties ratified or adopted.	Low / medium / high (TRIPS, the Doha, the PCT, or the UPOV treaties).
Non tariff barrier to trade	State measures other than tariffs that are barrier to trade. It includes traditional NTB, such as standards, quotas, licensing, as well as de facto trade barriers, such as procedural delays, excessive documentation, domestic legislation, requirements, and lack of transparency and predictability in the application of government rules.	Scale (1 to 10) [A proxy: the hidden import barrier to trade (other than publish tariff and quota) ; 1 signify a low level of use of non tariff barriers, 10 signify a high level of use].
Non-Obviousness	Whether the legislated patentability criteria of non-obviousness is met and indicated.	Does not exist / exists / high.
Novelty	Whether there is a legislated patentability criteria of novelty and the strength of this requirement.	Does not exists / exists / high (absolute novelty).
Number of (I) NGO	International non-governmental organizations with membership is the number of international non-governmental organizations that have either member organizations or individuals in each country.	Number of INGOs with membership per million population (Density).
Number of biotech issued patents	The number of patents granted in the biotechnology sector within a state.	The total number of patent granted in the biotechnology sector to a country by the national office. USPTO data is used to estimate the number of patents granted at the national office.
Number of biotech patent applications filed	The number of patent applications in the biotechnology sector that filed in the country.	Patent count. USPTO are used to estimate the number of patent applications at the national office.
Number of claims permitted / applications	The number of claims that may be included in a patent application without the applicant incurring additional charges.	No limit of claims / moderate number of claims (ie. 5 to 10) / additional fee charges for each claim.
Number of patent agents	The number of patent agents per thousand population within a state.	The number of patent agents per thousand population within a state.
Number of patent examiners	The number of patent examiners per thousand population within a state.	The number of patent examiners per thousand population within a state.
Number of public fora	Participation of non-state agents (industry, NGO, etc.) in public consultative processes	N.A.
Number of spin-offs	Number of spin-offs initiated/formed per country.	Number of spin-offs (start-up) initiated/formed.
Patent eligible invention	Inventions that fall within the class of inventions that can be patented.	Low / medium / high.
Patent exam qualification	The level of qualifications that must be obtained in order to become a patent examiner	N.A.
Patent Grant rate	The rate at which patents are granted within a state.	%
Patent maintenance fees	The level of the fees that must be paid in order to maintain a patent (prevent the patent rights from terminating before the patent term is completed).	Low / medium / high.
Patent pool	This variable concerns the grouping of many patents: it's a mean to accumulate knowledge.	N.A.
Patent related obligation to reveal origins	Does failure to disclose origin of generic ressources result in either non patentability or invalidity.	Does not exist / exists.
Patent term	The level of the length of the patent term granted within a state.	Number of years.
PCT	Contracting parties (countries) to the PCT (Patent Cooperation Treaty)	N.A.

Pharma/health regulation	Strength (both of the legislation and its enforcement) of the major policies and regulations related to medicine aimed at assuring their safety and efficacy (i.e. National medicine policies, access to essential medicines, rational use of medicines, medicine regulations).	Scale \rightarrow 0 (The accumulated yearly value of the major policies and regulations related to medicine in each country since 1990).
Plant varieties eligible for sui generis protection	The plant variety falls within the class of plant varieties that are eligible for protection under plant variety protection.	Number of registrations for plant protection.
Post-Grant opposition	Existence of a post-grant opposition procedure.	Does not exist / exists.
Pre-Grant opposition	Existence of a pre-grant opposition procedure.	Does not exist / exists.
Price of technology	Price of the end product for the user.	Biopharmaceutical : PMPRB index (Canada=100) (Average Foreign-to-price ratios, patented drug products, bilateral comparison) ; Agbiotech : price of the technology US(\$)/ha, based on GM IR cotton.
Production capability	The set of production inputs needed to achieve production scale that is economically viable and competitive (HR, capital, know-how, capability to execute).	Scale (1 to 100) (The productive capacity index (from Georgia Tech) with 100 is the highest capacity).
Production costs	Aggregated expenses associated with generating output of the final good that is made using the new technology.	Wholesale Price Index (WPI).
Public exclusive license parameter	Percentage of public licenses in technology that are exclusive in a given country.	The ratio defined by the number of public exclusive licenses on the total number of (exclusive and non exclusive) public licenses in technology.
Public exclusive licenses	Number of public exclusive licenses in technology in the country.	The number technology exclusive licenses executed in not-for-profit institutions (academia research hospitals and public research centers).
Public non-exclusive licenses	Number of public non exclusive licenses in technology in the country.	The number technology non exclusive licenses executed in not-for-profit institutions (academia research hospitals and public research centers)
Public opinion attitude	The public opinion towards biotechnology and more specifically towards genetically modified organisms (food and animals) for health and agricultural applications.	Scale (-4 to +4) (with -4 being more negative, 0 being neutral and +4 being the more positive).
Quality of risk analysis	How sophisticated is the scientific/technological capacity analysis in the sector, mostly in regard of biosafety for human and the environment.	Low / medium / high.
Recognition of customary laws of indigenous people	Extend to which indigenous people are granted sovereignty and control over genetic resources and TK within the country	N.A.
Recognition of indigenous people rights	Number of major international treaties that ratified by the country that recognize the rights of indigenous peoples, including rights over TK and ABS, eg. CBD, Draft Declaration of Rights of Indigenous	N.A.
Regional IP agreements	Member of regional patent filing system.	Not member / member.
Remedy (Copyright)	This represents the total value of all remedies granted to an owner of copyright, less the cost of the action.	N.A.
Remedy (TradeMark)	This represents the total value of all remedies to an owner of a trademark, less the cost of the action.	N.A.
Remedy (TradeSecret)	This represents the total value of all remedies granted to an owner of a trade secret less the cost of the action.	N.A.

Respect for human rights	Consistency of state practices to human right norms.	Scale (1 to 5) (Using the Purdue political scale).
Restrictions on research for protection of integrity of living things and biodiversity	Restrictions placed on conduct of biotechnological research involving higher life forms, including, but not limited to, conditions for funding, limitations of professional conduct, legislation, etc.	Low / medium / high (Criteria = i) subject matter exclusions for higher life forms from patentability, ii) ordre public considerations and iii) national stem cell regulation).
Revenues	This variable concerns the monetary incomes generated by an innovative or imitative product.	GDP %
Risk of Dissemination	This indicates whether there is a high or a low risk that know-how will be disseminated.	N.A.
Risk of infringement (Copyright)	This indicates the percentage of likelihood that an infringement challenge will be upheld by a local court.	N.A.
Risk of infringement (TradeMark)	This indicates the percentage of likelihood that an infringement challenge will be upheld by a local court.	N.A.
Risk of Invalidity (Trademark)	This indicates the risk that a technology component may be challenged and found invalid.	Low / medium / high.
Sales	Total number of innovative product sold for health biotech and agbio products.	Total sales for health biotech and agbiotech products in million (US\$ PPP).
Scientific and technical knowledge	The store of tacit scientific and technical knowledge including know-how.	Scale (1-10).
Scientific infrastructure	The level of access and use of information and communication technologies and the capability for research (number of researchers).	Scale (1 to 10) (A combined measure of two indicators: a) the number of researchers (FTE) per million inhabitants and b) the relative level of access and use of information and communication technologies of a country based on the ICT-Opportunity Index).
Spending on post-secondary education	Expenditure on educational institutions at the tertiary level of education from all sources of public and private funds.	Total expenditure from all sources of funds on educational institutions at the tertiary level as a percentage of GDP.
Stability of political infrastructure	Likelihood that the government in power will be destabilized or overthrown by possibly unconstitutional and/or violent means (incl. Terrorism, weather, natural disaster).	Scale (1 to 6) (The ratio of two indicators: 1) the number of persons killed and affected in a natural disaster per thousand people and 2) the Political Stability and Absence of Violence index).
State bargaining power	The relative control of the state over bargaining outcome	N.A.
Tax regulation and policies	Fiscal incentives aimed at promoting R&D in industry and also at encouraging the utilization of locally available R&D options for industrial development.	Rate of governmental tax reduction for 1 unit (1\$) of R&D spending for large firms and SMEs (1minus B-index).
Technology transfer organizations	Public/private unit for the transfer of technology.	Number of FTE persons employed in technology transfer offices per thousand of full time equivalent (FTE) researchers in a country.
TK as prior art	Is the traditional knowledge taken into account as prior art?	N.A.
TK richness	Diversity of knowledge, innovations and practices of indigenous and local communities. Developed from experience gained over the centuries and adapted to the local culture and environment, traditional knowledge is	N.A.

	transmitted from generation to generation	
Trade Secret Value	This is the commercial value that a trade secret represents to an owner and is representative of the quantity of inventions protected by trade secret owned by an entity.	Scale (1 to 5).
TradeMark/Trade Name Value	This is the commercial value that a trademark represents to an owner.	Scale (1 to 5).
Treaty on generic plant resource	Country that has ratified the treaty	N.A.
University/owned university IP policy	Percentage of universities with university owned IP policy	N.A.
University-industry links	Cooperation among business and higher education actors estimated by direct financial flows.	HERD %.
Utility	Whether there is a legislated patentability criteria of utility and the strength of this requirement.	Does not exist / exists / high.
Value of IP	This is the commercial value that IP rights in a technology represent to an owner including any regulation advantage or disadvantage.	Scale (1 to 10).
Wealth	Accumulated income.	GDP per capita per person in constant US\$ (Y 2000).
Wealth distribution	The degree of distribution of wealth within the society between the richest and the poorest.	Scale (0 to 100) (The Gini index value with 0 represents perfect inequality, while 100 implies perfect equality).