The Future of Healthcare around the World: Four indices integrating Technology, Productivity, Anti-Corruption, Healthcare and Market Financialization[1]

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The COVID-19 crisis has tested healthcare systems worldwide. A global response must integrate technological advancement and economic productivity to both combat the pandemic and sustain essential services. Anti-corruption is key to equitable public healthcare access. Market financialization mobilizes private sector funding for research and market-oriented implementation, fostering efficient responses to health crises. Innovation, tech-driven growth, and transparency are essential for future healthcare resilience, though their presence varies globally. This paper introduces four indices to synthesize these dynamics. Index 1 connects Artificial Intelligence, proxied by internet connectivity, with economic output (GDP). Index 2 examines anti-corruption and its link to strong public healthcare. Index 3 integrates digital access, transparency, and healthcare potential. Index 4 adds market capitalization and innovation to the mix, spotlighting regions best poised for medical breakthroughs. These indices reveal global disparities and synergies across public and private sectors, offering insight into where future pandemic solutions may flourish. Mapping these ingredients provides strategic direction for a more unified and digitally empowered global healthcare response.

Keywords: access to healthcare, advancements, AI-GDP index, apps, artificial intelligence (AI), coronavirus, corruption-free maximization of excellence and precision, corruption perception (CPI)-global connectivity (GCI) index, corruption perception (CPI)-global connectivity (GCI)-healthcare index, corruption perception (CPI)-global connectivity (GCI)-healthcare-market innovation financialization index, covid-19, decentralized grids, economic growth, healthcare, innovation, market disruption, market entrance, pandemic, rational precision, social stratification, supremacy, targeted aid, telemedicine

INTRODUCTION

Artificial Intelligence (AI)

AI is "a broad set of methods, algorithms, and technologies that make software 'smart' in a way that may seem human-like" (Noyes, 2016). The Oxford Dictionary defines AI as "the theory and development of computer systems able to perform tasks normally requiring human intelligence, such as visual perception, speech recognition, decision-making, and translation between languages." AI describes the capacity of a computer to perform like human beings including the ability to review, discern meaning, generalize, learn from past experience and find patterns and relations to respond dynamically to changing situations.[2] AI is perceived as the sum of different technological advancements with currently developing regulation (Dowell, 2018). Machine learning are computational algorithms that learn from data in order to derive inferences.

Artificial Intelligence International Leadership

AI leadership appears to develop foremost in Asia, Europe and North America. Together, the United States, China and the European Union represent over 93 percent of total AI private equity investment from 2011 to mid-2018. Of those investments, 8 percent occurred in Europe, 30 percent in China and about 70 percent in the United States. Start-ups in Israel (3 percent), Japan and Canada (1.6 percent) also played a role (OECD, 2019Puaschunder, Mantl & Plank, 2020). Recently AI has also grown in qualitative terms, with widespread applications in healthcare transportation, agriculture, finance, marketing and advertising, science, criminal justice, security and virtual reality (OECD, 2019; Puaschunder, Mantl & Plank, 2020).

Artificial Intelligence in Healthcare

No other scientific field grants as much hope in the determination of life and death and fastest-pace innovation potential with economically highest profit margin prospects as does medical care (Puaschunder, 2019e). Digitalization nowadays opened unprecedented opportunities and potentials in healthcare (Puaschunder, 2019e). Artificial Intelligence (AI), Robotics and Big Data revolutionized the world (Puaschunder, 2019a). The currently ongoing digital disruption enabled big data-driven tailored personal medical care (Puaschunder, 2019d).

As early as November 2019, experts identified new technologies such as robots, AI, algorithms and large data-generated insights as helpful innovations in the medical sector (Puaschunder 2019e, f). Tailor-made data-driven preventive medicine was praised as one of the most groundbreaking achievements in modern medicine (Puaschunder 2019f). Efficiency, precision and better quality work were highlighted as advantages of artificial intelligence, robots and big data in healthcare. Decentralized preventive medicine and telemedicine enable personalized preventive care that makes health more accessible to large sections of the population (Puaschunder 2019d, f). The power of big data enables understanding of group behavior and trend predictions as well as preventive health care – such as through genetic predisposition and origin tests in the USA and hand-picked genetic material selection.

AI-supported scientific discovery and medical assistance have increased steadily in the last decade. In recent years, the range of medical information collected has grown tremendously. Every day, healthcare professionals, biomedical researchers and patients produce vast amounts of data from an array of devices, including clinical, genetic, behavioral and environmental cues. With the medical literature doubling every three years, also the pharmaceutical industry now has access to unprecedented amounts of scientific data.

As never before in the long history of medicine, improvements in data generation, storage and analysis coupled with unprecedented computational power and statistical means have resulted in large-scale data processing on healthcare. Through machine learning, algorithms and unprecedented data storage and computational optimal control, AI technologies gain information, process it and give a well-defined output to the end-user.

Growth of genomic sequencing databases but also widespread awareness and implementation of electronic health recording have improved the nature and quality of accessible preventive medicine. Daily monitoring creates big data to relate behavioral patterns' to health status in order to predict global health trends. Online App-administered tracking provides a complete view of the patient journey over time – covering the spectrum from prevention efforts, early disease state to management of therapeutic choices and therapy-specific outcomes as well as recommendations for future health goals (Puaschunder, 2019a, b).

Healthcare has never been as individually-targeted and accessible as today. User self-reporting allows instant information generation and in-depth knowledge retrieval. Digital consultant Apps enable medical consultation based on personalized medical history records and common medical knowledge derived from big data inferences.

Artificial Intelligence in Healthcare during COVID-19

The 2019 Coronavirus crisis (COVID-19) stemmed from an infectious disease that was first diagnosed in Wuhan, China, in December 2019. The majority of those infected only develops mild symptoms such as fever, cough, difficulty breathing and tiredness as well as loss of smell and taste, but also rashes and other diffuse symptoms. Depending on age and prevalence, COVID-19 can also lead to acute complications such as organ failure, cytokine loads, blood clots and septic shock. Pre-existing conditions, such as obesity and diabetes, but also the general status of the immune system, are crucial determinants whether the new coronavirus is of danger to the individual. Prevention and holistic medicine play an important role whether the disease turns out to follow a trajectory of severe or only mild symptoms.

In January 2020, the World Health Organization declared a state of emergency with international relevance over COVID-19, and in March 2020 a global pandemic. As of July 2020, around 15 million infected cases are known and almost one million deaths have been recorded in over 200 countries in all six World Health Organization territories (The Lancet COVID-19 Commission, July 10, 2020). Exponentially growing numbers of infections and no complete cure so far project that the virus will become endemic and herd immunity may prevail (United Nations, 2020).

The COVID-19 crisis increased attention to the potential of AI in healthcare as a pandemic prevention means around the globe. COVID-19 unleashed the online healthcare tech world. On a flat globe, data traffic exploded. A multi-tasking online workforce[3] gained global outreach and flexibility in digitalization cutting red tape.[4] Health Apps target at tracking human contact and preventing COVID. Bluetooth-tracking[5] of medical devices[6] helps overcome bottlenecks and fraud while protecting privacy. Telemedicine detects COVID-19 symptoms and cures remotely.

The COVID-19 pandemic outlined vast differences in the use of the internet and AI as well as algorithms for medical purposes. Digitalization's international differences accentuated during the pandemic – in China online COVID whistleblowers disappeared.[7] Strategically-internet-controlling Asia and the former Soviet world trumped on mobile crowd control[8] and social monitoring compliance (Ackermann, 2020).[9] US S&P 500 leaders partnered[10] to pool health data[11] while freedom-of-speech-fueled-information-overload deadlocked relevant communication.[12] Europe emphasized privacy protection[13] in envisioning[14] a 5th freedom of data[15] to harvest network effects of exponentially-growing marginal utility of information (Puaschunder & Gelter, 2019).

The COVID-19 crisis triggered efforts to create an effective big data-driven crisis response ecosystem in public health pandemic early warning and disease transmission monitoring systems. The wealth of electronic health records has also excelled digitalized diagnosis and prevention of diseases and their outbreak control (Puaschunder, 2019e). With the growth of scientific evidence derived from big data, AI also helps to analyze health trends to guide on global pandemic alleviation.[16] For instance, health risk early warning systems function through data constantly collected via mobile Apps. Once tagged and compiled, AI tools that employ natural language processing help mine the data for community health status monitoring and pandemic outbreak tracking. Pandemic spreads visualized via google search mapping analytics are the most recent advancements based on big data, large-scale mapping sophistication and computation control. All these AI-led opportunities to gather actionable insights lead to strategic data-driven interventions on medical prevention and health crisis management excellence.

Integration of fragmented diagnosis and treatment results coupled with self-monitoring devices collecting data on a constant basis are viewed as future medical necessities. An as such integrated diagnostic process fosters personalized treatment. Targeted aid can form a grid of medical specialists to work concurrently on patient diagnosis. Data integration can combat fragmentation of different help groups and foster information flow between field workers responding to crises. A recently-started Bluetooth-enabled cartography of the medical device distribution helps overcome bottlenecks and fraud while protecting patient privacy (Puaschunder, 2019a, e). [17]

The COVID-19 crisis increased the necessity to share medical care data. International development crisis management has profited from data-driven prevention. Technological development of information and communication technologies open unprecedented opportunities in sharing insights and resources on a global level. Telehealth enables instant monitoring and preventive control. Emergency outreach and remote diagnosis based on large-scale data-driven knowledge generation decentralize healthcare. Network connectivity thereby grants affordable healthcare around the globe in a cost-effective way. Health-related data from personal self-diagnosis devices enhanced by low-cost generation of big data and patient-led monitoring but also information technology advancements make data-driven quality care more accessible in remote areas and developing nations than ever before.

Decentralized information collection and information storage grids as well as technological diversified data collection means are expected to revolutionize the healthcare sector in the future. Information share among neighbors helps overcome shortages and enables fast-paced aid cheaper and more democratically-distributed scarce resources. Geopolitically the individual becomes more independent from centralized medical structures. Remote communities thereby benefit from equal, easy and cheap access to medical aid. Decentralized grids also open novel opportunities of monitoring and measuring information constantly and closely where health or diseases occur. Information can be tracked and linked directly to the scientific and patient impact they are having. Instant messaging has opened the gates for remote access to affordable diagnostics. Networking data sharing capacities have reached unprecedented density and sophistication. Novel mapping tools can display local search results and crowd media use into visible alert systems so it becomes more accessible in a broader way. Decentralized crisis management applications of AI and machine learning are key in data-driven assistance in pandemic outbreak.

In the near future, advances in 3D printers may soon make it possible to substitute healthcare provision closer to the consumer, where the manufacturing process is simplified thanks to the reproduction of models. Outsourcing monitoring to patients and electronic recording devices but also tapping into the wealth of expert knowledge generated through big data helps classical human medical doctors and healthcare agents, who benefit from freed capacities for creative decision making and expert advice giving.

With the COVID-19 pandemic, the issue of the relationship between preventive medicine, general health and prevalence through a weakened immune system has become of paramount importance for emergency medicine and general health. The entry of AI, algorithms and large data sets in the medical field raises hope in prevention through self-monitoring but also safety through mobile tracking of infected as a means of crowd control.

In the future, self-led monitoring and remote diagnosis fostered by machine learning mining of big data and algorithmic decision making are continuously meant to grant access to affordable and excellent healthcare around the globe. Clinical decision support systems are expected to advance in the near future with 5G technologies arising, which will boost prognostic capacities. Virtual nursing assistants are predicted to become more common to perform targeted patient aid that can run 24/7 at most efficient levels.

Artificial Medical Care and Economic Growth around the World

Capturing differences in digitalization in the healthcare sector around the globe allows to derive inferences on opportunities to establish a leadership in digitalized, tailored healthcare solutions for individual well-being. Knowing about key strengths of countries to provide novel technologies, seed funding and non-corrupt healthcare solutions offers pandemic panaceas for current and future public and private sector medical endeavors. Integrating different components of technology-driven healthcare innovations concurrently will enable to find interaction effects of the different ingredients and success factors of contemporary medical care. Highlighting the international differences in the access and quality of healthcare provision will serve to depict resource bundling strategies in order to alleviate global health pandemics and prevent future healthcare risks in the international compound.

The healthcare AI market is expected to increase by a compound annual growth rate of 50.2 percent until 2025.[18] A 2017 Accenture Research and Frontier Economics report of economic growth rates of 16 industries concluded that AI has the potential to boost profitability on average by 38% by 2035.[19]

The use of AI is predicted to improve the prevention of diseases, accuracy of diagnoses and predictions on treatment plan outcomes. AI innovations offer benefits of rational precision and human resemblance, targeted aid and corruption-free maximization of excellence. Utilizing the predictive power of big data has perpetuated the effectiveness and efficiency in the healthcare sector (Puaschunder, 2019d).

Machine learning's ability to collect and handle big data, and its increasing adoption by hospitals, research centers, pharmaceutical companies and other healthcare institutions, are expected to fuel economic growth in healthcare.[20] Hospitals and healthcare provider segments are prospected to hold the largest size of AI in healthcare market due to a large number of applications of AI solutions across provider settings, the ability of AI systems to improve care delivery and patient experience while bringing down costs as well as the growing adoption of electronic health records by healthcare organizations. Moreover, AI-based tools, such as voice recognition software and clinical decision support systems, help streamline workflow processes in hospitals at lower cost with improved care delivery and enhanced patient experience.[21] Today advanced hospitals are looking into AI solutions to support and perform operational initiatives that increase precision and cost effectiveness. Medical decision making become enhanced by predictive analytics and general healthcare management technology. Big data insights support drug development and global health monitoring.

Advanced computing power and the declining cost of hardware are other key factors in the projected market growth.[22] The rising adoption of applications – such as patient-data and risk analysis, lifestyle management and monitoring – is further propelling technology in the healthcare market (Puaschunder, 2019b).[23] Electronic health records used by healthcare organizations and the outsourcing of health monitoring by novel personal care products – such as routine check-up medical tools and wearable devices – are further believed to better service quality and eventually bring down costs. Higher frequency of self-monitoring checks at lower costs are expected to improve preventive medicine sustainably.

Technology plays an important role in helping analyze and identify actionable insights derived from a multitude of accessible data sources. The medical profession shifts towards precision medicine using a variety of complex datasets such as a patient's health records, physiological reactions and genomic data (OECD, 2019). While data collection is easier than ever, proper usage of linked data is and will be a key factor for productivity, quality and accessibility of AI-driven applications. The core promise of data-driven solutions is to collect data at a density that is not feasible for humans and identify patterns humans cannot detect. Since AI in healthcare is currently utilized mainly to aggregate and organize data – looking for trends and patterns and making recommendations – a human component that is creative, cognitively highly flexible and compatible with AI sources is still needed (Puaschunder, 2019d, e).[24]

Rather than replacing human medical doctors and staff, AI is therefore believed to support medical doctors and nurses with excellence and precision on decision making predicaments and cognitive capacity constraints (Puaschunder, 2019d, e; Puaschunder & Gelter, 2019). Radiology is an example why technology often will not replace humans, instead giving human better tools (Hosny, Parmar, Quackenbush, Schwartz & Aerts, 2018; Pakdemirli, 2019).

Intriguing, yet less described and hardly researched, appears that AI, robots and algorithms differ from human healthcare providers by holding the potential to be less susceptible to materialistic vices and less prone to be corrupt in comparison to human counterparts. If programmed to follow an ethical imperative, AI and robots being without self-enhancing profit-maximizing goals promise to grant healthcare free from any corruption, bribery or monopolistic price margins.

Corruption

Corruption has many faces such as organized crime, illegal business, bribery, non-meritocratic placements and nepotism, tax havens and voting to name a few (Alt & Lassen, 2012; Charron, Fazekas & Lapuente, 2016; Gordon, 2009; Holmes, 2007; Johannesen & Zucman, 2014; Klumpp, Mialon & Williams, 2016).[25] Breeding in collective experiences in the pertaining societal networks, national conduct and social norms; corruption determines economic development and the state of democracy in countries around the world (Bardhan, 2016; Davis & Trebilcock, 2008; Fisman & Miguel, 2007; Rose-Ackerman & Palifka, 2016).

Corruption is prevalent in territories with missing accountability and rule of law (Agerberg, 2019).[26] Governmental revenues derailed through corruption weaken public financial management and fiscal space for the establishment, procurement and maintenance of collective goods (Campos & Pradhan, 2007).[27] Corrupt institutional structures have been associated with poverty and hindered international development (Human Development Report, 2019).[28] Corruption erodes the regulatory impact and the provision of public services ranging from medical care, education, energy, transportation and environmental protection (Campos & Pradhan, 2007; Rose-Ackerman & Palifka, 2016; Rose-Ackerman & Tan, 2014).

International efforts to combat corruption include international treaties, governmental accountability and whistleblower protection,[29] transparency, national laws against foreign-induced corruption, security and peace-building (Boucher et al., 2007; Hite-Rubin, 2015; Le Billon, 2003; McLean, 2012; Rose-Ackerman & Lagunes, 2015; Vlasic & Atlee, 2012).[30] Anti-corruption reform is likely to stem from the international community fostering corruption prevention,[31]corporate watch,[32] consumer action,[33] social, ethical,[34] and humanitarian accountability,[35] international development[36] as well as integrity action and training[37] (Davis, 2019; Cooley & Sharman, 2015; Engel, Ferreira Rubio, Kaufmann, Lara Yaffar, Londoño Saldarriaga, Noveck, Pieth & Rose-Ackerman, 2018; Rose-Ackerman & Carrington, 2013).[38]

Corruption in the digital age is underexplored. First attempts have been made to capture digital corruption in the political domain (Ackermann, 2020). A quantification of the relation of AI-led growth and corruption is – to this day – missing; yet highly relevant during this unprecedented time of IT governance and the search for AI-driven healthcare solutions against global pandemics (Puaschunder, 2020).

Empirical Validation

The empirical part presents four indices that highlight the influence of AI, economic growth and market capitalization, corruption and healthcare for a country's potential to hold future healthcare solutions:

(1) The first index is based on internet connectivity – as a proxy for digitalization and AI advancement – as well as Gross Domestic Product (GDP) – as indicator for economic productivity. This AI-GDP Index is first calculated to outline global AI innovation hubs with economic impetus around the world. This index establishes a basis of countries that are prone to have vital economic conditions to host technology innovations.

(2) Second, a novel anti-corruption artificial healthcare index is created called Corruption Perception (CPI)-Global Connectivity (GCI) Index, which outlines countries in the world that have vital AI growth in a non-corrupt environment. This index highlights the role of anti-corruption for establishing a functioning healthcare sector. In the public domain, a corruption-free democracy leaves the fiscal space to build essential public health capacities and grant democratic access to affordable general healthcare.

(3) Third, a so-called Corruption Perception (CPI)-Global Connectivity (GCI)-Healthcare Index integrates internet connectivity, anti-corruption as well as healthcare access and quality to determine the potential to have AI-led healthcare solutions. This index integrates the current access to and quality of a functioning healthcare system with technology-affinity and anti-corruption.

(4) Lastly, an index titled Corruption Perception (CPI)-Global Connectivity (GCI)-Healthcare-Market Innovation Financialization Index combines public and private sector forces to establish AI-technology leading countries with public and private sector favorable conditions for future healthcare innovations in the age of digitalization.[39] This index in contrast to the preceding indices outlines the importance of

financial market capitalization and access to private sector capital driving innovations. The index phases in a market-driven financialization of AI and big data firms angle by adding a Nasdaq-rated index that targets corporations with excellence in AI and big data derived revenues.

In its entirety, the integration of different components allows highlighting concurrent effects and complementary nuances of diverse public and private sector input. The stepwise addition of the components outlines continent-specificities in the provision of capital, innovation, anti-corruption and healthcare. Outlining vast international differences in health crises remedy strengths to establish medical excellence offers insights for a favorable diversification of diverse forces, bundling of complementary strengths opportunities but also the implicit hope of strategic technology-transfers to grant universal access to healthcare around the globe where and when it is needed to serve the greater good.

Operationalization

AI-GDP Index

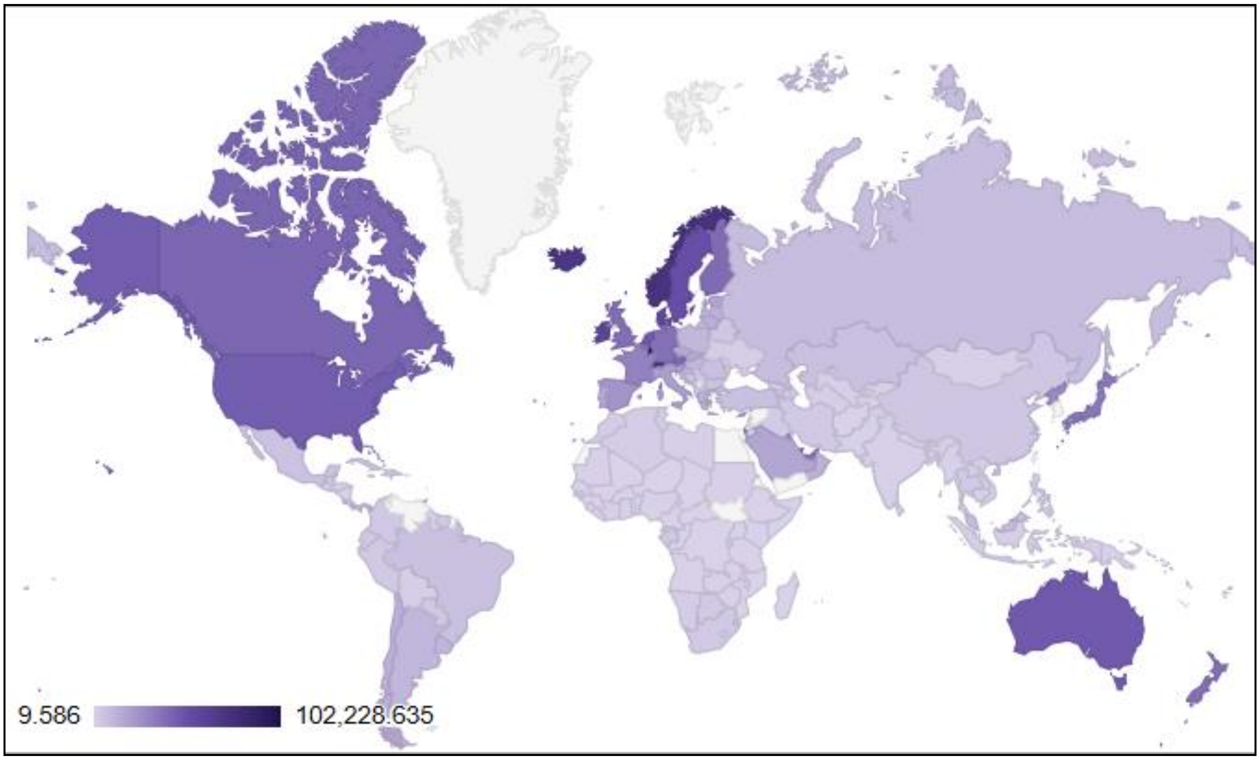
AI entrance into economic markets was modeled into the standard neoclassical growth theory by creating a novel index for representing growth in the artificial age. The AI_GDP (A) per country c index was calculated for 191 countries of the world based on Equation 1, comprised of the GDP per capita per country c and AI internet connectivity percentage of a country, $IA(c)$.

$$AI_c\_GDP_c\ (A) = GDP_c * IA_c \tag{1}$$

GDP per capita was retrieved from a World Bank database for the year 2017.[40] This measure was multiplied by AI entrance operationalized by the proxy of Internet Access percent per country, $IA(c)$, which represents country c inhabitants' internet usage in percent of the population retrieved from a World Bank database for the year 2017[41] (Puaschunder, 2020).

The table section in FIGURE 1-A in the appendix holds the $AI\_GDP\ (c)$ index value per country and tables the AI_GDP countries' indices ranked from the highest to the lowest. FIGURE 1 displays the AI_GDP country's index around the world. The higher the index, the darker the country is colored in Figure 1. The darker the country, the higher the multiplier is of internet connectivity of the country and GDP.

FIGURE 1
AI-GDP INDEX FOR 191 COUNTRIES OF THE WORLD



As visible in FIGURE 1, continent-specific AI-GDP relations reveal Africa being relatively low on AI-GDP in comparison to the rest of the world. Asia and the Gulf region are in the middle ranges with Qatar and United Arab Emirates and Japan and South Korea leading. In Europe Luxembourg, Switzerland, Norway, Iceland, Ireland, Sweden and Finland are top AI-GDP countries. North America has a higher AI-GDP index than South America, where Chile, Argentina and Uruguay appear to lead. In Oceania, Australia has a higher AI-GDP index than New Zealand.

The parts of the world that feature internet connectivity and high GDP are likely to pioneer on AI-driven big data monitoring insights for pandemic prevention. Connectivity is seen as a technology proxy. Coupled with economic potential these tech-affine parts of the world have an optimal starting ground for breeding innovation in the digital age.

Corruption Perception (CPI)-Global Connectivity (GCI) Index

Financial means as driver for innovation can come from public and private sector sources. In the public sphere, fiscal space depends not only on economic growth and productivity, but also on the level of corruption. Anti-corrupt regimes allow for fiscal space that can spark and nurture innovation (Roe, 2003, 2006).

AI advancements should be put into relation with anti-corruption, as integer institutions will aid a successful implementation of AI and healthcare free from misplaced funds, lower quality due to nepotism and overinflated price margins in light of suboptimal monopolistic lock-ins (Campos & Pradhan, 2007; Escresa & Picci, 2017; Mungiu-Pippidi & Dadašov, 2016; Rose-Ackerman & Palifka, 2016; Rose-Ackerman & Tan, 2014). [42]

In a cross-sectional study of 79 countries' relation of Corruption Perception – measured by the Corruption Perception Index of 2019[43]– and global connectivity (GCI) – as captured by the Global

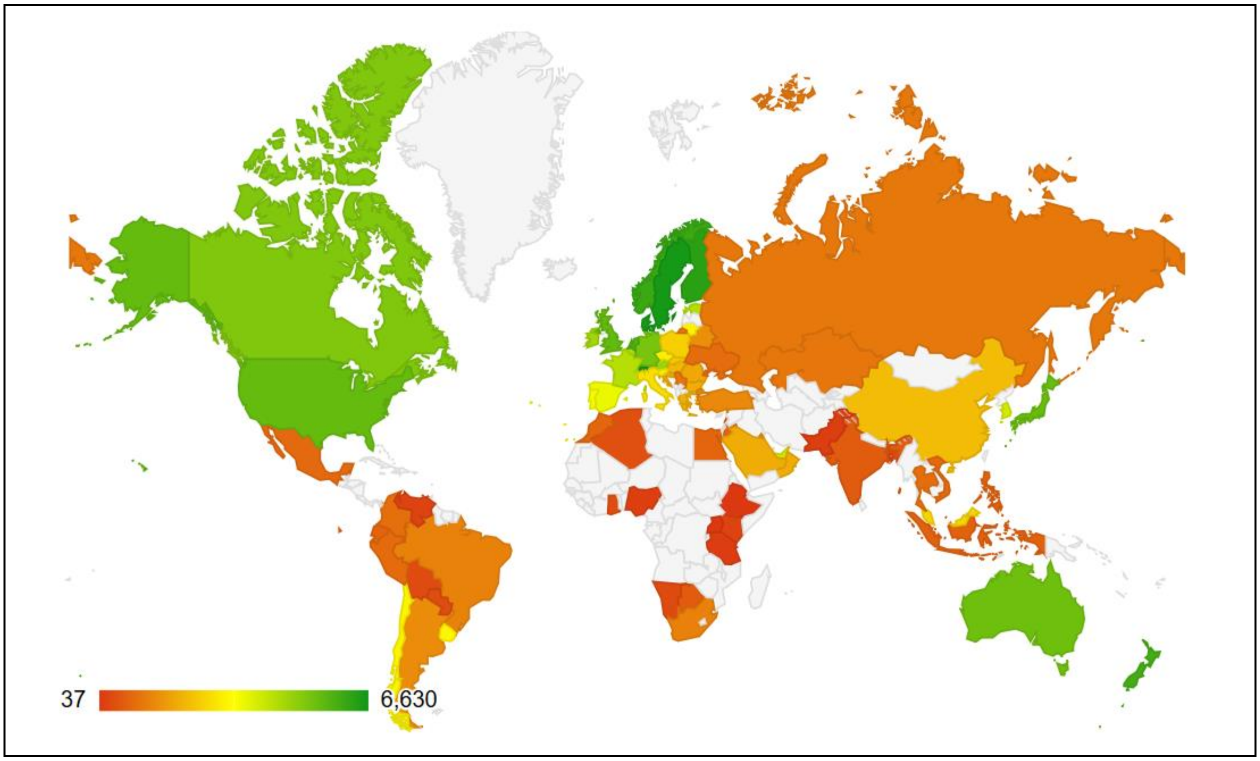
Connectivity Index for 2019[44] – AI is significantly positively correlated with anti-corruption ($r_{Pearson} = .860, n = 79, p < .000$). AI comes from parts of the world that are perceived as less corrupt.

An AI_anti-corruption index AA is calculated based on Equation 2, comprised of the global connectivity (GCI) of a country c in 2019 multiplied by the Corruption Perception Index of the same country c in 2019.

$$AI_c\_Anticorruption_c\,(AA) = GCI_c * CPI_c \tag{2}$$

The table section in Figure 2-A in the appendix holds the $AI\_anticorruption\ (AA)$ index value per country and tables the $AI\_anticorruption\ (AA)$ countries' indices ranked from the highest to the lowest. FIGURE 2 displays the $AI\_anticorruption\ (AA)$ country's index around the world. The higher the index, the better connected and less corrupt the country is perceived, and the greener the country is colored. The lower the index, the less connected and the more corrupt the country is viewed, and the redder the country is colored. Medium connectivity and corruption perception are displayed in yellow.

FIGURE 2
AI-ANTI-CORRUPTION (AA) INDEX FOR 79 COUNTRIES OF THE WORLD

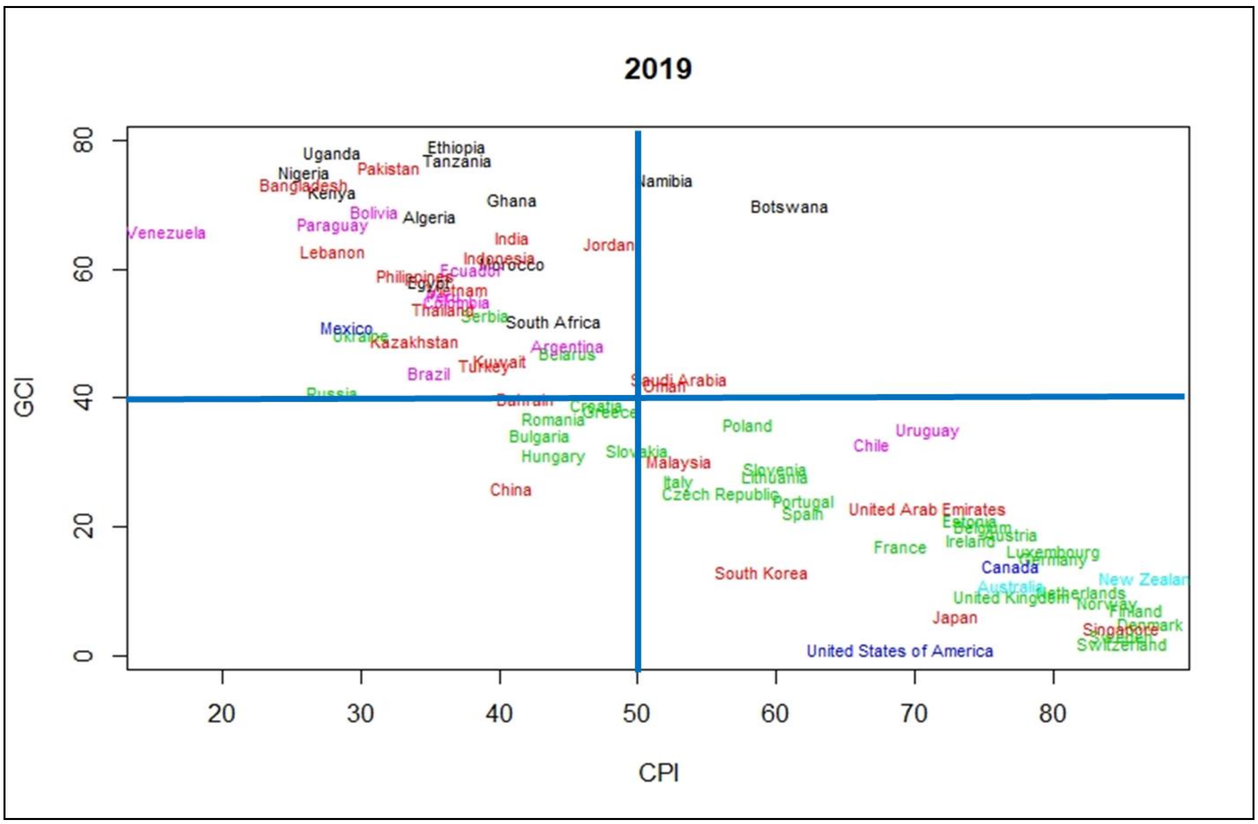


Artificial Intelligence (AI) – measured by Global Connectivity – is significantly positively correlated with freedom from corruption. AI thus springs from non-corrupt territories of the world. AI therefore offers a relatively corruption-free leadership decision making tool, which could improve support of healthcare in non-corrupt global pandemic solutions. Artificial global governance should therefore come from the countries with high global connectivity and low corruption that are exhibited in the lower right quadrant in Figure 3.

Countries that rank high on AI and corruption freedom could lead on building AI to monitor international public health and solve global healthcare problems. Artificial global governance in non-corrupt territories could unprecedentedly aid on global healthcare for the general protection and security of humankind. The detected non-corrupt AI centres exhibited in the right downward quadrant hold comparative advantages to lead on global artificial healthcare solutions against COVID-19 and serve as pandemic crisis and risk management innovators of the future.

Continent-specific relations reveal Africa being relatively low on AI and problematic on corruption as visible in Figure 3. Asia and the Gulf region are more in the middle ranges – but still feature unfavorable levels of corruption. Singapore, Japan, South Korea and United Arab Emirates, but also Malaysia are leading on AI and less corruption in Asia and the Middle East. In Europe Switzerland, Nordic countries – like Sweden, Denmark, Norway and Finland – are top AI and anti-corruption countries. North and South America are opposites – while the United States of America has a top condition to lead on AI and anti-corruption; South America and there especially Venezuela, Paraguay and Bolivia, rank lowest on AI and relatively high on corruption. In Oceania, New Zealand has a better AI and anti-corruption index performance than Australia.

FIGURE 3
GLOBAL CONNECTIVITY (GCI) AND CORRUPTION PERCEPTION INDEX (CPI)



Corruption Perception (CPI)-Global Connectivity (GCI)-Healthcare Index

In order to highlight the importance of a vital healthcare sector to drive innovations in the medical domain, the access and quality of healthcare was phased into the model.

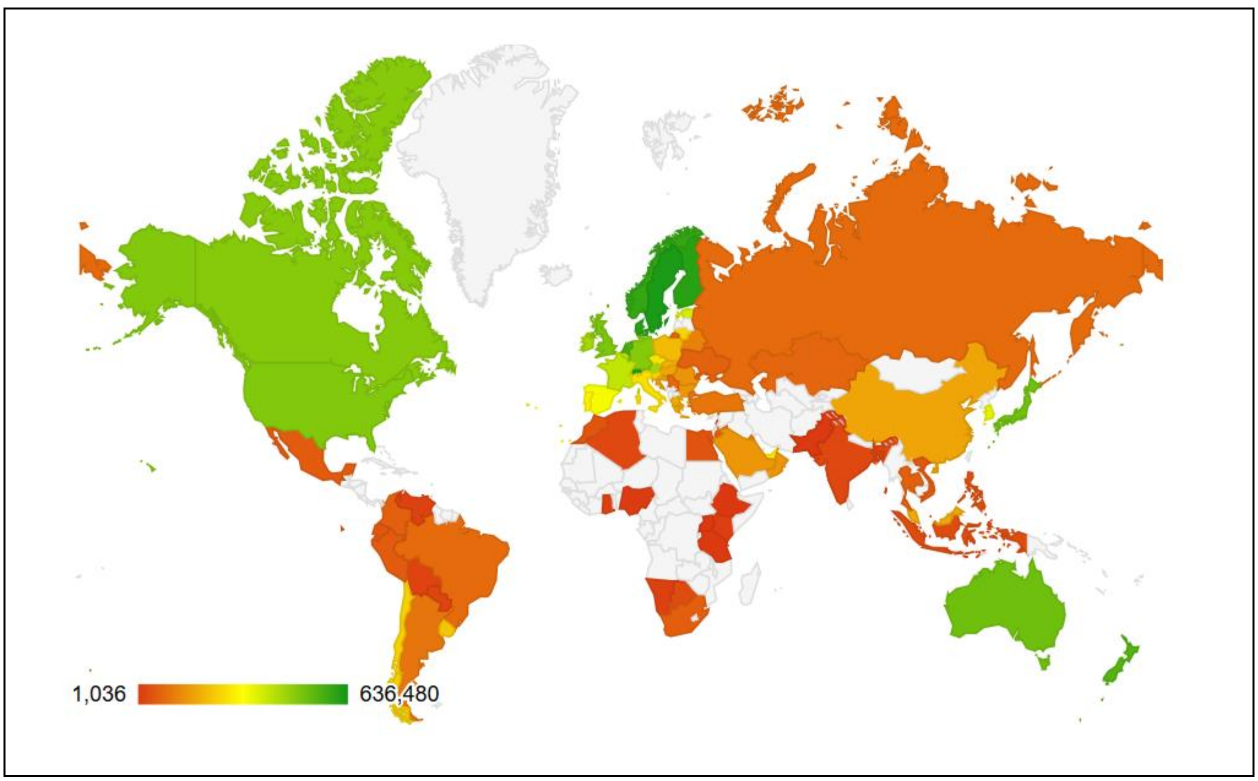
In a cross-sectional study of 79 countries' relation of Corruption Perception (CPI, measured by the Corruption Perception Index of 2019)[45] and global connectivity (GCI, as captured by the Global Connectivity Index for 2019)[46] and healthcare (as quantified by the 2016 Healthcare Quality and Access Index);[47] freedom from corruption is significantly positively correlated with good healthcare ($r_{Pearson} = .715, n = 79, p < .001$) and internet connectivity is significantly positively correlated with good healthcare ($r_{Pearson} = .896, n = 79, p < .001$). AI comes from parts of the world that are perceived as less corrupt and feature better public healthcare.

An AI_anticorruption_health index AAH is calculated based on Equation 3, comprised of the global connectivity (GCI) of a country c in 2019 multiplied by the Corruption Perception Index of country c in 2019 and multiplied by the Health Quality and Access Index of 2016. [48]

$$AI_c\_Anticorruption_c\_Health_c\ (AAH) = GCI_c * CPI_c * HAQ_c \quad (3)$$

The table section in Figure 3-A in the appendix holds the $AI\_anticorruption\_health\ (AAH)$ index value per country and tables the $AI\_anticorruption\_health\ (AAH)$ countries' indices ranked from the highest to the lowest. Figure 4 displays the $AI\_anticorruption\_health\ (AAH)$ country's index around the world. Figure 4 highlights the parts of the world that feature high internet connectivity, freedom from corruption and good access to and quality of general healthcare in green, whereas those parts of the world that have less internet connectivity and more perceived corruption and worse access to and quality of general healthcare in red. The higher the index, the better connected and less corrupt the country is perceived and the better access to and quality of general healthcare is offered in the greener-colored countries. The lower the index, the less connected and the more corrupt the country is viewed and the worse off are its citizens regarding access to and quality of general healthcare, and the redder the country is colored. Medium AI-connectivity and corruption hubs with medium access to and quality of healthcare are displayed in yellow.

FIGURE 4
AI-ANTICORRUPTION-HEALTH (AAH) INDEX FOR 79 COUNTRIES OF THE WORLD



Continent-specific relations reveal Africa being relatively low on AI, problematic on corruption as well as general healthcare provision as visible in Figure 4. Asia and the Gulf region are more in the middle ranges but still feature problematic levels of corruption and relatively weak access and quality of healthcare. Singapore, Japan, South Korea and United Arab Emirates but also Malaysia seem to be leading on AI, anti-corruption as well as access to and quality of healthcare in Asia and the Middle East. European countries like Switzerland and the Nordic countries – such as Sweden, Finland, Denmark and Norway – are top AI and anti-corruption territories with excellent general healthcare. North and South America are opposites again – while the United States of America has a top condition to lead on AI anti-corrupt and with excellent healthcare; South America, and there especially Venezuela, Bolivia and Paraguay, rank lowest on AI and relatively worse on corruption and general healthcare. In Oceania the leading New Zealand and immediately-thereafter ranked Australia have almost the same conditions as captured by the AI, anti-corruption and healthcare index.

Corruption Perception (CPI)-Global Connectivity (GCI)-Healthcare-Market Innovation Financialization Index

In order to highlight the importance of a market financialization as public sector innovation driver in the medical domain, the Corruption Perception (CPI)-Global Connectivity (GCI)-Healthcare-Market Innovation Financialization Index was created. Market innovation financialization was operated by phasing in the country of registration of a Nasdaq-rated fund that primarily focuses on AI and big data-derived insights gains and stock-market wealth creation.

As an empirical validation for the ongoing digitalization trend, the novel Nasdaq Yewno Global AI and Big Data index measures AI and big data inference wealth creation. The Nasdaq Yewno Global Artificial Intelligence and Big Data Index is designed to track the performance of companies engaged in Deep Learning, NLP, Image Recognition, Speech Recognition and Chatbots, Cloud Computing, Cybersecurity and Big Data.[49] The index began on November 12, 2018, with a base value of 1,000.[50] As for market performance, the index has increased by 23.2% in roughly one and a half years since its inception, while the overall market performance rose by 17.92% as compared to the Standard & Poor's (S&P500). If measuring from the outbreak of the crisis, which is set at January 23, 2020, around which time it became apparent that there is a global health risk lurking, the index has increased from 1.09%, while the overall market performance shrunk by -3.55% during the same time. Two before-after time snapshot pairs were created. One from the beginning of the Nasdaq Yewno Global Artificial Intelligence and Big Data Index inception (November 12, 2018) until July 15, 2020. Another before-after pair from January 23, 2020 as outbreak of the crisis until July 15, 2020. The difference between the indices over time for both before-after snapshots is significant ($t_{(3)}$=-15.04, p=.021), which indicates a statistically significant better performance of the Nasdaq Yewno Global AI and Big Data index than the rest of the market as operationalized by the S&P 500.

An AI_anticorruption_health_market innovation capitalization index $AAHM$ was calculated based on Equation 4, comprised of the global connectivity (GCI) of a country c in 2019 multiplied by the Corruption Perception Index of country c in 2019 and multiplied by the Health Quality and Access Index of 2016 and multiplied by the country-specific percent of the total market capitalization of the Nasdaq Yewno Global AI and Big Data index.[51]

$$AI_c\_Anticorruption_c\_Health_c\_Market\ Cap_c\ (AAHM) = GCI_c * CPI_c * HAQ_c * CMC_c \quad (4)$$

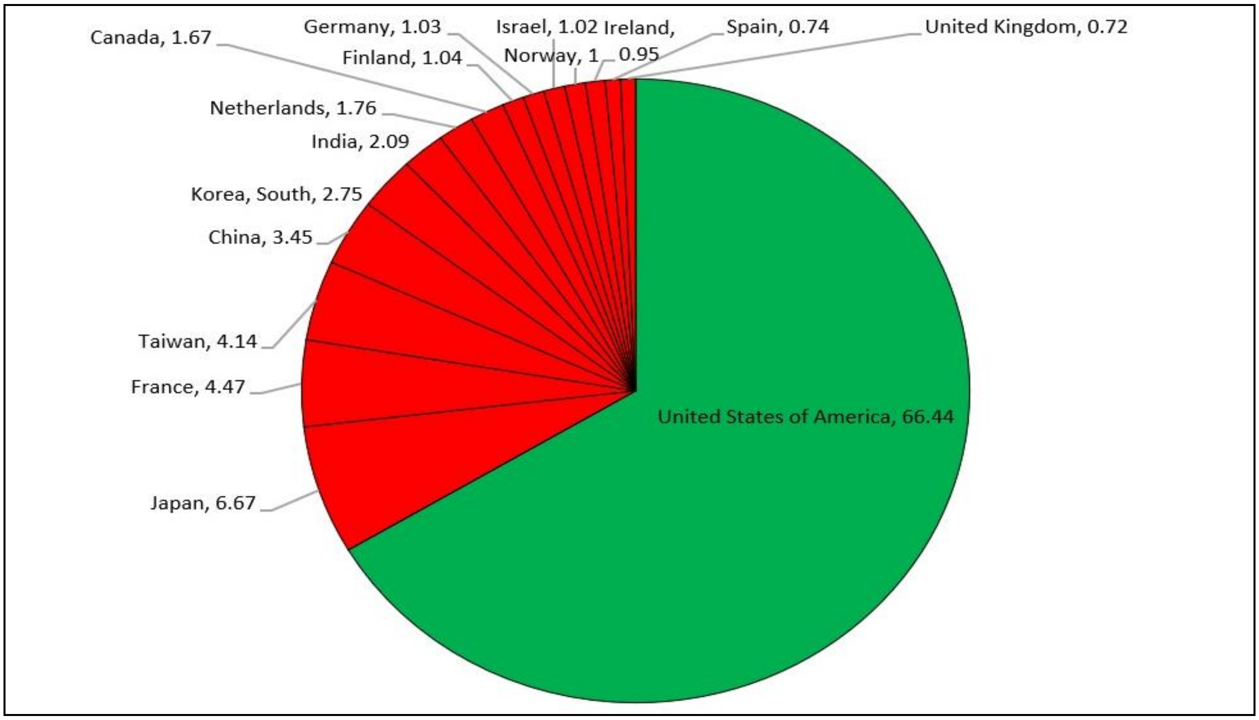
The country of registration of index funds was retrieved for the 99 companies listed in the Nasdaq Yewno Global AI and Big Data index as of April 2020.[52] The companies' listed weights w determining the market capitalization per company were added up in country categories (CC) per country-of-registration c to retrieve the country specific contribution to the index based on the following Equation 5.

$$CC_c = \sum(w_1 + w_2 + \cdots + w_n) \quad (5)$$

Figure 5 displays the country-specific market capitalization as measured by the percentage of countries' contribution to the market capitalization for AI and big data innovations as captured by the Nasdaq Yewno Global AI and Big Data index as of April 2020.

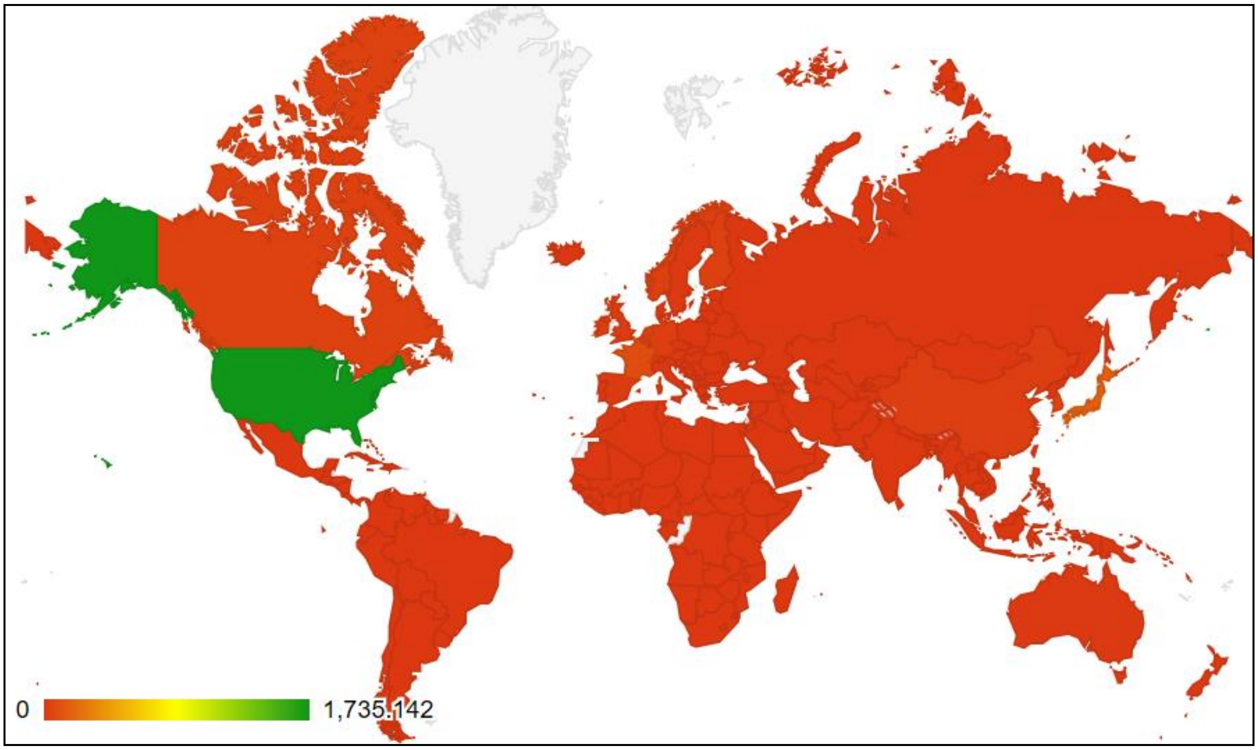
Continent-specific relations reveal Africa not being present in the respective Nasdaq Yewno Global AI and Big Data index. Asia is featured in Japan (6.67%), Taiwan (4.14%), China (3.45%), South Korea (2.75%) and India (2.09%). Middle East is represented in Israel (1.02%). European countries lead with France (4.47%), Netherlands (1.76%), Finland (1.04%), Germany (1.03%), Norway (1%), Ireland (0.95%), Spain (0.74%) and United Kingdom (0.72%). North America clearly leads with 66.44% market innovation AI and big data financialization. Canada accounts for 1.64% market share in the respective Nasdaq Yewno Global AI and Big Data index. South America and Oceania are not represented in the index.

FIGURE 5
COUNTRY-SPECIFIC CONTRIBUTIONS OF MARKET FINANCIALIZATION OF AI AND BIG DATA-MINING COMPANIES AS LISTED IN THE NASDAQ YEWNO GLOBAL AI AND BIG DATA INDEX IN PERCENT



The table section in Figure 4-A in the appendix holds the $AI\_anticorruption\_health\_market\ financialization\ (AAHM)$ index value per country and tables the $AI\_anticorruption\_health\_market\ financialization\ (AAHM)$ countries' indices ranked from the highest to the lowest. Figure 6 reveals $AI\_anticorruption\_health\_market\ financialization\ (AAHM)$ country's index around the world. Figure 6 highlights the parts of the world that feature high internet connectivity, freedom from corruption and good access to and quality of general healthcare as well as well-funded AI and big data-derived market innovations in green, whereas those parts of the world that feature less internet connectivity and more perceived corruption and worse access to and quality of general healthcare as well as lack of funding for AI and big data market innovations in red. The higher the index, the better connected and less corrupt the country is perceived and the better access to and quality of general healthcare as well as access to capital for AI and big data mining corporations are offered in the greener-colored countries. The lower the index, the less connected and the more corrupt the country is perceived and the worse off are its citizens regarding access to and quality of general healthcare and the less likely are AI and big data solutions funded, and the redder the country is colored. Medium AI-connectivity and corruption hubs with medium access to and quality of healthcare and potential funding for AI and big data market innovations are displayed in yellow.

FIGURE 6
AI-ANTICORRUPTION-HEALTH-MARKET INNOVATION FINANCIALIZATION (AAHM) INDEX FOR 181 COUNTRIES OF THE WORLD



As one can obviously see, the United States has a gigantic comparative advantage when it comes to public sector funding for market innovation in the AI and big data-mining company domain. Continent-specific relations reveal Africa being relatively low on AI, problematic on corruption as well as general healthcare and no market capital in the respective Nasdaq AI and Big Data index. When weighing in market innovation capitalization, Asia and the Gulf region are more in the middle range but still feature problematic levels of corruption and relatively weak access and quality of healthcare and market innovation financialization. Japan, South Korea, China, Singapore, India and Malaysia are leading Asia on AI, anti-corruption as well as access to and quality of healthcare but also market innovation financialization in Asia. The Middle East is foremost featuring in the United Arab Emirates and Saudi Arabia to have mediocre levels on AI, anti-corruption, a decent access to healthcare and funds for market innovations. European countries are led by France, Netherlands, Norway, Finland, Germany, Ireland and the United Kingdom but also Spain, Switzerland, Sweden, Denmark, Luxembourg and the Nordic countries – such as Sweden, Finland, Denmark, Norway, Austria, Belgium have good levels on AI and anti-corruption with excellent general healthcare and present financial market capitalization. The United States of America has a top condition to fund AI innovation anti-corrupt and with good healthcare. South America is foremost present in Chile and Uruguay, rank low on AI and relatively worse on corruption and general healthcare or raising funds for AI and big data-retrieving companies. In Oceania the leading New

Zealand and immediately-thereafter ranked Australia have almost the same conditions for funding AI and big data solutions as well as AI, anti-corruption and access to quality healthcare.

DISCUSSION

The COVID-19 crisis has challenged healthcare around the world. The call for global solutions in international healthcare pandemic outbreak monitoring and crisis risk management has reached unprecedented momentum. Digitalization, AI and big data-derived inferences are supporting human decision making as never before in the history of medicine. In today's healthcare sector and medical profession, AI, algorithms, robotics and big data are used as essential healthcare enhancements. These new technologies allow monitoring of large-scale medical trends and measuring individual risks based on big data-driven estimations.

This article provided a snapshot of the potential for AI, algorithms, big data-derived inferences and robotics in healthcare around the globe. Examining medical response possibilities to COVID-19 on a global scale makes international differences in the approaches to combat global pandemics with technological solutions apparent. Empirically, the article outlines what countries have favorable conditions to provide AI-driven global healthcare solutions based on the different components of digitalization degree, economic prosperity, healthcare standards and market finance resources for innovations.

The COVID-19 crisis has created an unprecedented need for the global community to collaborate on public healthcare solutions in the international compound. In the digital age, international healthcare pandemic crisis and risk management could thereby be most innovatively fostered by AI and big data-derived inferences. At the same time, international differences in the approaches to combat global pandemics with the use of algorithms became currently more apparent than ever before.

The prospective post-COVID era will likely show advanced healthcare. Future global digital healthcare innovations are more likely and favorable to come from corruption-free AI pioneering countries that tend to have better general medical care. Internet connectivity and AI-human-compatibility via tech-skills and digital affinity are growing competitive advantages (Puaschunder, 2019d, e). Countries that feature AI-growth potential with non-corrupt institutional support and good general healthcare systems are in a better position to lead the world on global pandemic monitoring and crisis management.

The article provided four indices that depict the international differences in digitalization, economic potential, anti-corruption and access to general healthcare as well as market funding of AI healthcare solutions. In a multi-faceted analysis, different aspects and combinations of AI-led growth, anti-corruption and general healthcare as well as market innovation financialization were highlighted. The results were meant as quantified decision-making aid on the comparative advantages to lead the world in a global solution on digitalized pandemic prevention and risk management. The countries that score high on AI, GDP, anti-corruption and healthcare excellence as well as seed funding for AI innovations were featured as ultimate world-leading, innovative global pandemic alleviation centres.

The multi-faceted presentation of different indices highlighting various components offers invaluable information on what parts of the world feature what kind of qualifications to lead the world on global healthcare solutions. Internet connectivity and high GDP are likely to guide on AI-driven big data insights for pandemic prevention and therefore European, Asian and North American countries appear to have the best starting conditions for global healthcare leadership. This is in line with the actual development of AI, robotics and big data derived inferences as AI leadership appears to develop foremost in Europe, North America and China. Together, the United States, China and the European Union represent over 93 percent of total AI private equity investment from 2011 to mid-2018.

Countries with vital AI growth in a non-corrupt environment breed good healthcare. These territories have additional essential credentials for global healthcare provision – and therefore European countries, New Zealand but also the United Kingdom and the United States have advantageous AI healthcare conditions. As for the necessity to raise funds for AI healthcare, the market capitalization for AI global healthcare solutions is likely to come from the United States, Asia and Europe. When backtesting the index assumptions with real-world data, the strongest index countries are also the strongest real-world issues of new drug patents.[53]

The outlined non-corrupt AI centres hold comparative advantages to lead on global artificial healthcare solutions against COVID-19 and serve as pandemic crisis and risk management innovators of the future. The countries that score high on AI, anti-corruption and healthcare excellence and market capitalization for AI and big data generated healthcare solutions are promoted as ultimate innovative global pandemic alleviation leaders. The advantages but also potential shortfalls and ethical boundaries in the novel use of monitoring Apps, big data inferences and telemedicine to prevent pandemics need to be discussed as well in the future.

While information was presented on how the different countries rank compared to each other on their potential of using AI to avert global pandemics, we still need a further and deeper qualitative understanding of the ethical boundaries of digitalization in healthcare. For instance, a worldwide solution on AI helping against global virus spreads will require equal access to information on health. The sharing of data will need all countries coming together to construct large datasets as learning opportunities, which different stakeholders from government, healthcare, engineering and technology can use concurrently and equally to analyze and predict the prevailing health situation and global trends. The more countries join, the more accurately the dataset will be able to draw inferences about world-wide prevalent epidemics spread and global diseases outbreaks. Within the European compound, a 5th freedom of data should incentivize data sharing and provide the legal means for combating discrimination based on big data-derived inferences as well as protection of privacy (Puaschunder & Gelter, 2019).

In the future of artificial healthcare, compatibility problems in the adoption of new technologies around the world should be alleviated by research and training in international digitalization literacy. Transnational engagement could aid in re-evaluating and seeking new competencies, technology solutions and data sources that better support patient-centric outcomes. Patients must be trained to use digital channels and be open to remote assistance. All these efforts aim at flourishing our most precious common good within the limits of digitalized growth, our all interconnected global health and well-being.

ENDNOTES

1. The author thanks Professor Director Susan Rose-Ackerman for most excellent lectures on 'Corruption, Economic Development & Democracy' at Yale Law School and online due to COVID-19 as well as the participants of the respective class for most helpful share of expertise and interesting discussions about corruption around the world.
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https://www.globalwitness.org/en/
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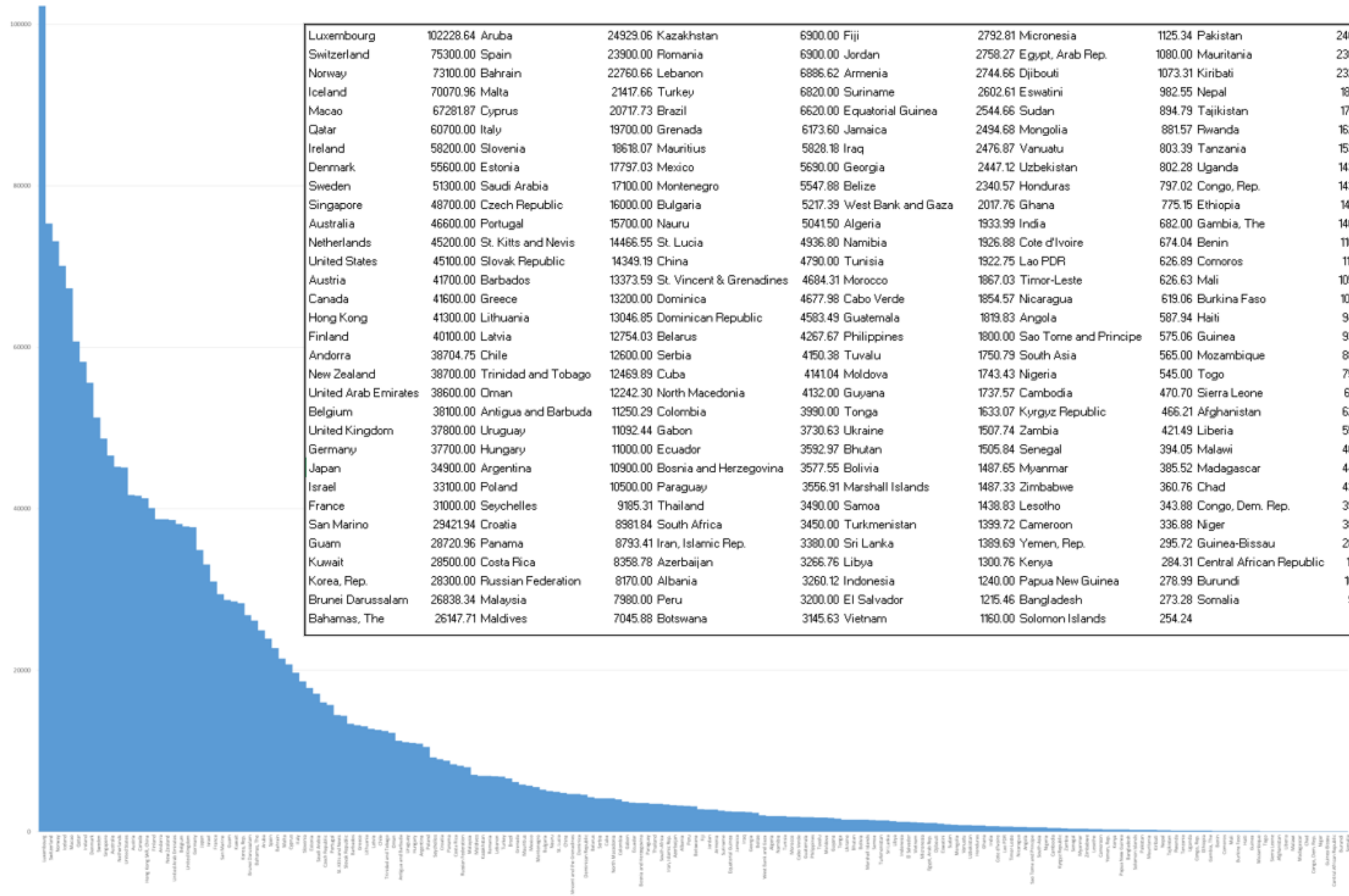
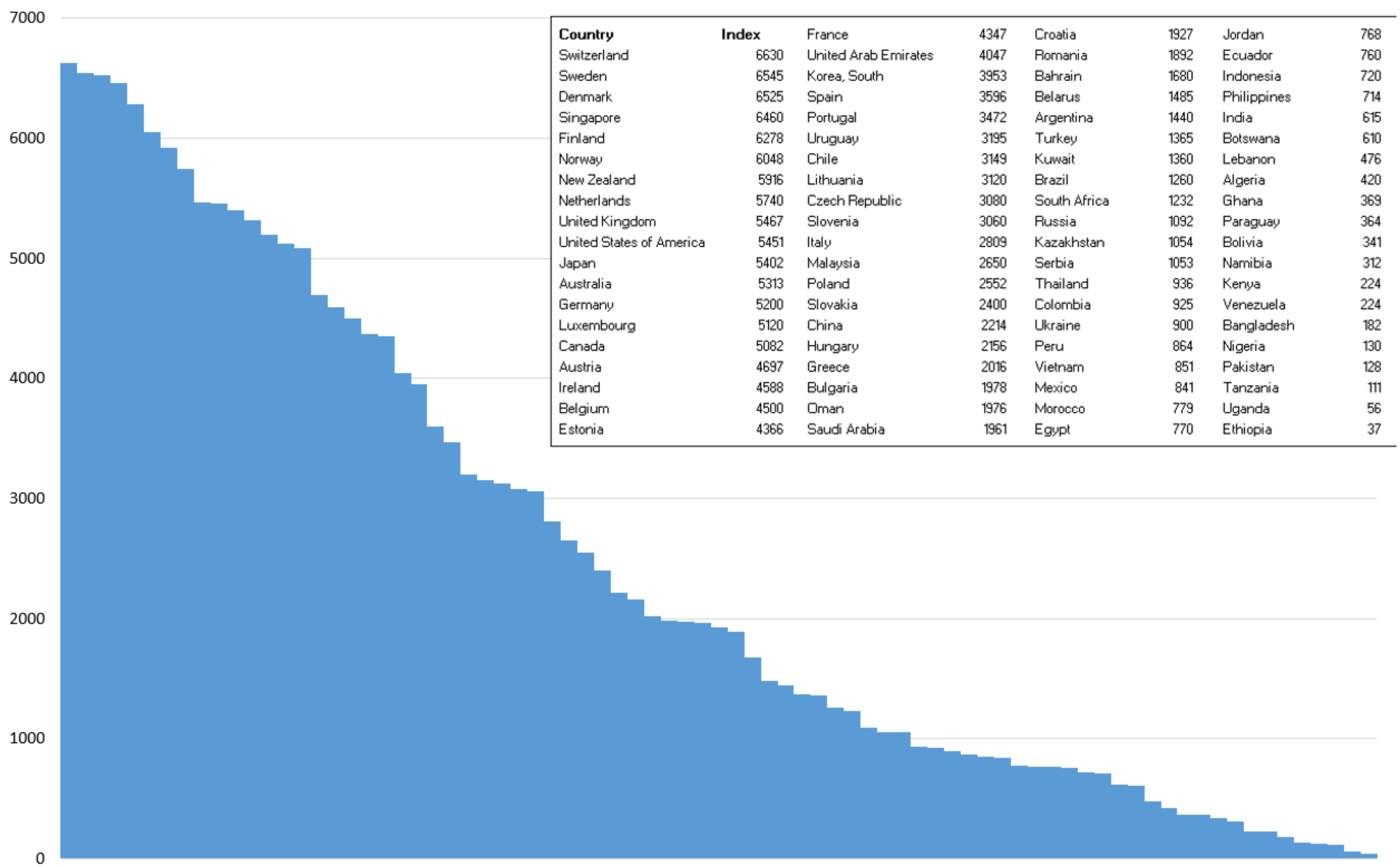
APPENDIX

FIGURE 1-A
AI-GDP INDEX FOR 191 COUNTRIES OF THE WORLD



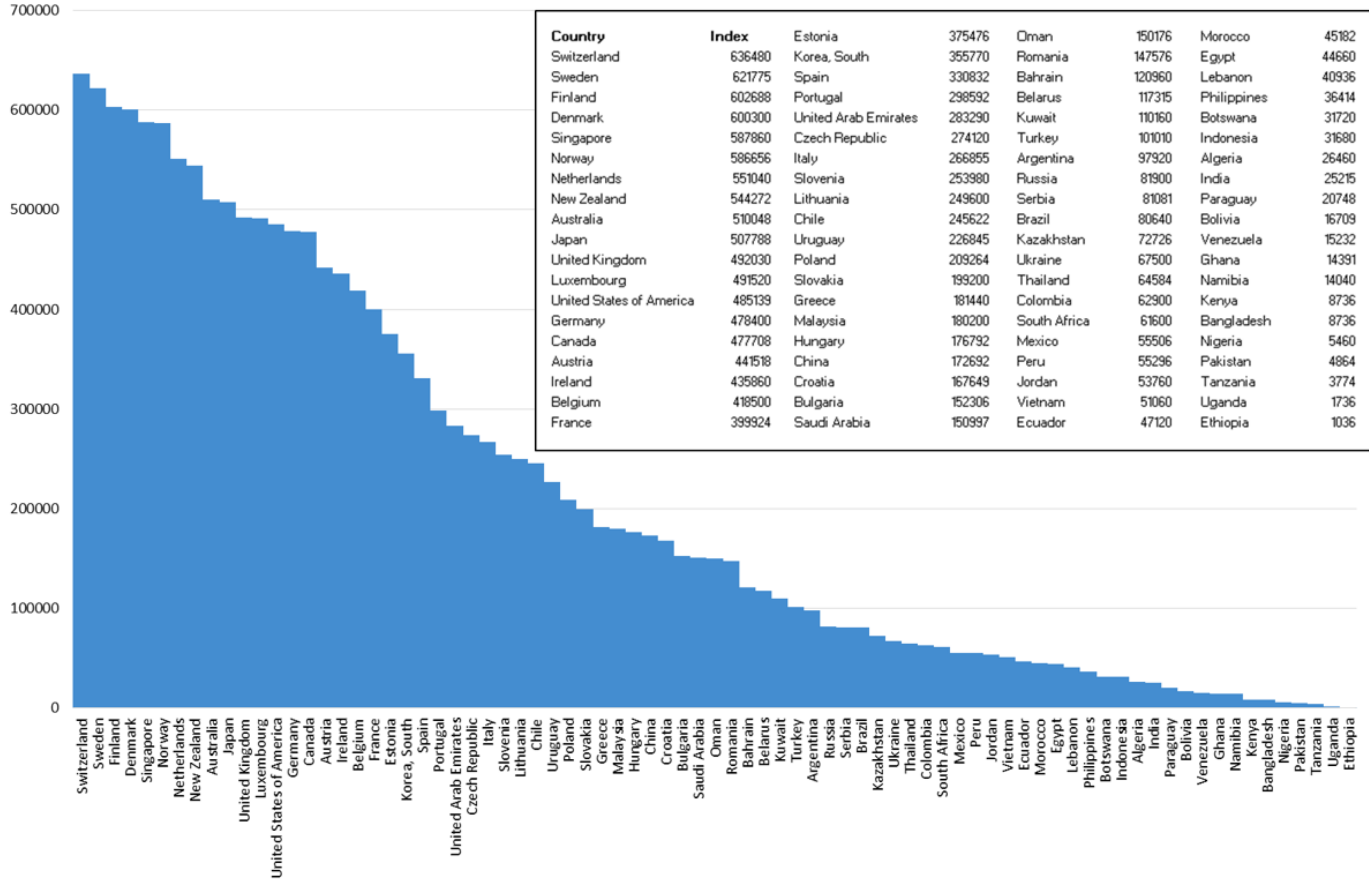
Luxembourg	102228.64	Aruba	24929.06	Kazakhstan	6900.00	Fiji	2792.81	Micronesia	1125.34	Pakistan	240.07		
Switzerland	75300.00	Spain	23900.00	Romania	6900.00	Jordan	2758.27	Egypt, Arab Rep.	1080.00	Mauritania	236.46		
Norway	73100.00	Bahrain	22760.66	Lebanon	6886.62	Armenia	2744.66	Djibouti	1073.31	Kiribati	232.48		
Iceland	70070.96	Malta	21417.66	Turkey	6820.00	Suriname	2602.61	Eswatini	982.55	Nepal	181.72		
Macao	67281.87	Cyprus	20717.73	Brazil	6620.00	Equatorial Guinea	2544.66	Sudan	894.79	Tajikistan	175.91		
Qatar	60700.00	Italy	19700.00	Grenada	6173.60	Jamaica	2494.68	Mongolia	881.57	Rwanda	162.89		
Ireland	58200.00	Slovenia	18618.07	Mauritius	5828.18	Iraq	2476.87	Vanuatu	803.39	Tanzania	153.35		
Denmark	55600.00	Estonia	17797.03	Mexico	5690.00	Georgia	2447.12	Uzbekistan	802.28	Uganda	143.77		
Sweden	51300.00	Saudi Arabia	17100.00	Montenegro	5547.88	Belize	2340.57	Honduras	797.02	Congo, Rep.	143.07		
Singapore	48700.00	Czech Republic	16000.00	Bulgaria	5217.39	West Bank and Gaza	2017.76	Ghana	775.15	Ethiopia	142.91		
Australia	46600.00	Portugal	15700.00	Nauru	5041.50	Algeria	1933.99	India	682.00	Gambia, The	140.66		
Netherlands	45200.00	St. Kitts and Nevis	14466.55	St. Lucia	4936.80	Namibia	1926.88	Cote d'Ivoire	674.04	Benin	116.82		
United States	45100.00	Slovak Republic	14349.19	China	4790.00	Tunisia	1922.75	Lao PDR	626.89	Comoros	111.26		
Austria	41700.00	Barbados	13373.59	St. Vincent & Grenadines	4684.31	Morocco	1867.03	Timor-Leste	626.63	Mali	105.20		
Canada	41600.00	Greece	13200.00	Dominica	4677.98	Cabo Verde	1854.57	Nicaragua	619.06	Burkina Faso	101.93		
Hong Kong	41300.00	Lithuania	13046.85	Dominican Republic	4583.49	Guatemala	1819.83	Angola	587.94	Haiti	94.38		
Finland	40100.00	Latvia	12754.03	Belarus	4267.67	Philippines	1800.00	Sao Tome and Principe	575.06	Guinea	93.88		
Andorra	38704.75	Chile	12600.00	Serbia	4150.38	Tuvalu	1750.79	South Asia	565.00	Mozambique	88.54		
New Zealand	38700.00	Trinidad and Tobago	12469.89	Cuba	4141.04	Moldova	1743.43	Nigeria	545.00	Togo	75.42		
United Arab Emirates	38600.00	Oman	12242.30	North Macedonia	4132.00	Guyana	1737.57	Cambodia	470.70	Sierra Leone	66.12		
Belgium	38100.00	Antigua and Barbuda	11250.29	Colombia	3990.00	Tonga	1633.07	Kyrgyz Republic	466.21	Afghanistan	62.97		
United Kingdom	37800.00	Uruguay	11092.44	Gabon	3730.63	Ukraine	1507.74	Zambia	421.49	Liberia	55.44		
Germany	37700.00	Hungary	11000.00	Ecuador	3592.97	Bhutan	1505.84	Senegal	394.05	Malawi	46.65		
Japan	34900.00	Argentina	10900.00	Bosnia and Herzegovina	3577.55	Bolivia	1487.65	Myanmar	385.52	Madagascar	44.07		
Israel	33100.00	Poland	10500.00	Paraguay	3556.91	Marshall Islands	1487.33	Zimbabwe	360.76	Chad	43.06		
France	31000.00	Seychelles	9185.31	Thailand	3490.00	Samoa	1438.83	Lesotho	343.88	Congo, Dem. Rep.	39.89		
San Marino	29421.94	Croatia	8981.84	South Africa	3450.00	Turkmenistan	1399.72	Cameroon	336.88	Niger	38.65		
Guam	28720.96	Panama	8793.41	Iran, Islamic Rep.	3380.00	Sri Lanka	1389.69	Yemen, Rep.	295.72	Guinea-Bissau	28.44		
Kuwait	28500.00	Costa Rica	8358.78	Azerbaijan	3266.76	Libya	1300.76	Kenya	284.31	Central African Republic	18.16		
Korea, Rep.	28300.00	Russian Federation	8170.00	Albania	3260.12	Indonesia	1240.00	Papua New Guinea	278.99	Burundi	16.34		
Brunei Darussalam	26838.34	Malaysia	7980.00	Peru	3200.00	El Salvador	1215.46	Bangladesh	273.28	Somalia	9.59		
Bahamas, The	26147.71	Maldives	7045.88	Botswana	3145.63	Vietnam	1160.00	Solomon Islands	254.24				

FIGURE 2-A
AI_ANTI-CORRUPTION INDEX FOR 79 COUNTRIES OF THE WORLD



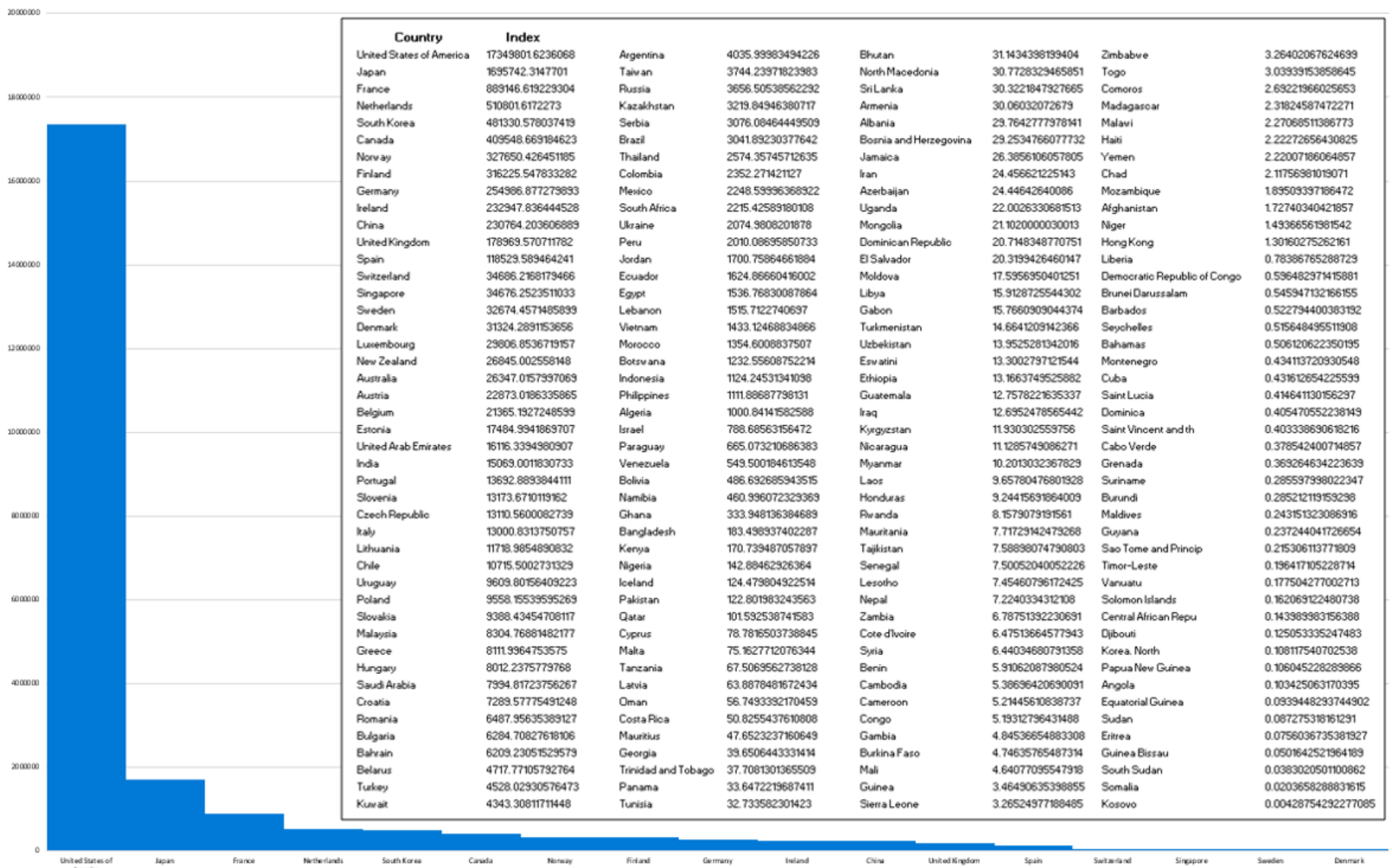
Country	Index	France	4347	Croatia	1927	Jordan	768
Switzerland	6630	United Arab Emirates	4047	Romania	1892	Ecuador	760
Sweden	6545	Korea, South	3953	Bahrain	1680	Indonesia	720
Denmark	6525	Spain	3596	Belarus	1485	Philippines	714
Singapore	6460	Portugal	3472	Argentina	1440	India	615
Finland	6278	Uruguay	3195	Turkey	1365	Botswana	610
Norway	6048	Chile	3149	Kuwait	1360	Lebanon	476
New Zealand	5916	Lithuania	3120	Brazil	1260	Algeria	420
Netherlands	5740	Czech Republic	3080	South Africa	1232	Ghana	369
United Kingdom	5467	Slovenia	3060	Russia	1092	Paraguay	364
United States of America	5451	Italy	2809	Kazakhstan	1054	Bolivia	341
Japan	5402	Malaysia	2650	Serbia	1053	Namibia	312
Australia	5313	Poland	2552	Thailand	936	Kenya	224
Germany	5200	Slovakia	2400	Colombia	925	Venezuela	224
Luxembourg	5120	China	2214	Ukraine	900	Bangladesh	182
Canada	5082	Hungary	2156	Peru	864	Nigeria	130
Austria	4697	Greece	2016	Vietnam	851	Pakistan	128
Ireland	4588	Bulgaria	1978	Mexico	841	Tanzania	111
Belgium	4500	Oman	1976	Morocco	779	Uganda	56
Estonia	4366	Saudi Arabia	1961	Egypt	770	Ethiopia	37

FIGURE 3-A
AI ANTI-CORRUPTION HEALTH INDEX FOR 79 OUNTRIES OF THE WORLD



Country	Index						
Switzerland	636480	Estonia	375476	Oman	150176	Morocco	45182
Sweden	621775	Korea, South	355770	Romania	147576	Egypt	44660
Finland	602688	Spain	330832	Bahrain	120960	Lebanon	40936
Denmark	600300	Portugal	298592	Belarus	117315	Philippines	36414
Singapore	587860	United Arab Emirates	283290	Kuwait	110160	Botswana	31720
Norway	586656	Czech Republic	274120	Turkey	101010	Indonesia	31680
Netherlands	551040	Italy	266855	Argentina	97920	Algeria	26460
New Zealand	544272	Slovenia	253980	Russia	81900	India	25215
Australia	510048	Lithuania	249600	Serbia	81081	Paraguay	20748
Japan	507788	Chile	245622	Brazil	80640	Bolivia	16709
United Kingdom	492030	Uruguay	226845	Kazakhstan	72726	Venezuela	15232
Luxembourg	491520	Poland	209264	Ukraine	67500	Ghana	14391
United States of America	485139	Slovakia	199200	Thailand	64584	Namibia	14040
Germany	478400	Greece	181440	Colombia	62900	Kenya	8736
Canada	477708	Malaysia	180200	South Africa	61600	Bangladesh	8736
Austria	441518	Hungary	176792	Mexico	55506	Nigeria	5460
Ireland	435860	China	172692	Peru	55296	Pakistan	4864
Belgium	418500	Croatia	167649	Jordan	53760	Tanzania	3774
France	399924	Bulgaria	152306	Vietnam	51060	Uganda	1736
		Saudi Arabia	150997	Ecuador	47120	Ethiopia	1036

FIGURE 4-A
AI ANTI-CORRUPTION HEALTH MARKET CAPITAL INDEX FOR 180 COUNTRIES OF THE WORLD



Country	Index						
United States of America	17349801.6236068	Argentina	4035.99983494226	Bhutan	31.1434398199404	Zimbabwe	3.26402067624699
Japan	1695742.3147701	Taiwan	3744.23971823983	North Macedonia	30.7728329465851	Togo	3.03939153858645
France	889146.619229304	Russia	3656.50538562292	Sri Lanka	30.3221847927665	Comoros	2.69221966025653
Netherlands	510801.6172273	Kazakhstan	3219.84946380717	Armenia	30.06032072679	Madagascar	2.31824587472271
South Korea	481330.578037419	Serbia	3076.08464449509	Albania	29.7642777978141	Malawi	2.27068511386773
Canada	409548.669184623	Brazil	3041.89230377642	Bosnia and Herzegovina	29.2534766077732	Haiti	2.22272656430825
Norway	327650.426451185	Thailand	2574.35745712635	Jamaica	26.3856106057805	Yemen	2.22007186064857
Finland	316225.547833282	Colombia	2352.271421127	Iran	24.456621225143	Chad	2.11756981019071
Germany	254986.877279893	Mexico	2248.59996368922	Azerbaijan	24.44642640086	Mozambique	1.89509397186472
Ireland	232947.836444528	South Africa	2215.42589180108	Uganda	22.0026330681513	Afghanistan	1.72740340421857
China	230764.203606889	Ukraine	2074.9808201878	Mongolia	21.1020000030013	Niger	1.49366561981542
United Kingdom	178969.570711782	Peru	2010.08695850733	Dominican Republic	20.7148348770751	Hong Kong	1.30160275262161
Spain	118529.589464241	Jordan	1700.75864661884	El Salvador	20.3199426460147	Liberia	0.78386765288729
Switzerland	34686.2168179466	Ecuador	1624.86660416002	Moldova	17.5956950401251	Democratic Republic of Congo	0.596482971415881
Singapore	34676.2523511033	Egypt	1536.76830087864	Libya	15.9128725544302	Brunei Darussalam	0.545947132166155
Sweden	32674.4571485899	Lebanon	1515.7122740697	Gabon	15.7660909044374	Barbados	0.522794400383192
Denmark	31324.2891153656	Vietnam	1433.12468834866	Turkmenistan	14.6641209142366	Seychelles	0.515648495511908
Luxembourg	29806.8536719157	Morocco	1354.6008837507	Uzbekistan	13.9525281342016	Bahamas	0.506120622350195
New Zealand	26845.002558148	Botswana	1232.55608752214	Eswatini	13.3002797121544	Montenegro	0.434113720930548
Australia	26347.0157997069	Indonesia	1124.24531341098	Ethiopia	13.1663749525882	Cuba	0.431612654225599
Austria	22873.0186335865	Philippines	1111.88687798131	Guatemala	12.7578221635337	Saint Lucia	0.414641130156297
Belgium	21365.1927248599	Algeria	1000.84141582588	Iraq	12.6952478565442	Dominica	0.405470552238149
Estonia	17484.9941869707	Israel	788.68563156472	Kyrgyzstan	11.930302559756	Saint Vincent and th	0.403338690618216
United Arab Emirates	16116.3394980907	Paraguay	665.073210686383	Nicaragua	11.1285749086271	Cabo Verde	0.378542400714857
India	15069.0011830733	Venezuela	549.500184613548	Myanmar	10.2013032367829	Grenada	0.369264634223639
Portugal	13692.8893844111	Bolivia	486.692685943515	Laos	9.65780476801928	Suriname	0.285597998022347
Slovenia	13173.6710119162	Namibia	460.996072329369	Honduras	9.24415691864009	Burundi	0.285212119153298
Czech Republic	13110.5600082739	Ghana	333.948136384689	Rwanda	8.1579079191561	Maldives	0.243151323086916
Italy	13000.8313750757	Bangladesh	183.498937402287	Mauritania	7.71729142479268	Guyana	0.237244041726654
Lithuania	11718.9854890832	Kenya	170.739487057897	Tajikistan	7.58898074790803	Sao Tome and Princip	0.215306113771809
Chile	10715.5002731329	Nigeria	142.88462926364	Senegal	7.50052040052226	Timor-Leste	0.196417105228714
Uruguay	9609.80156409223	Iceland	124.479804922514	Lesotho	7.45460796172425	Vanuatu	0.177504277002713
Poland	9558.15539595269	Pakistan	122.801983243563	Nepal	7.2240334312108	Solomon Islands	0.162069122480738
Slovakia	9388.43454708117	Qatar	101.592538741583	Zambia	6.78751392230691	Central African Repu	0.143989983156388
Malaysia	8304.76881482177	Cyprus	78.7816503738845	Cote d'Ivoire	6.47513664577943	Djibouti	0.125053335247483
Greece	8111.9964753575	Malta	75.1627712076344	Syria	6.44034680791358	Korea, North	0.108117540702538
Hungary	8012.2375779768	Tanzania	67.5069562738128	Benin	5.91062087980524	Papua New Guinea	0.106045228289866
Saudi Arabia	7994.81723756267	Latvia	63.8878481672434	Cambodia	5.38696420690091	Angola	0.103425063170395
Croatia	7289.57775491248	Oman	56.7493392170459	Cameroon	5.21445610838737	Equatorial Guinea	0.0939448293744902
Romania	6487.95635389127	Costa Rica	50.8255437610808	Congo	5.19312796431488	Sudan	0.087275318161291
Bulgaria	6284.70827618106	Mauritius	47.6523237160649	Gambia	4.84536654883308	Eritrea	0.0756036735381927
Bahrain	6209.23051529579	Georgia	39.6506443331414	Burkina Faso	4.74635765487314	Guinea Bissau	0.0501642521964189
Belarus	4717.77105792764	Trinidad and Tobago	37.7081301365509	Mali	4.64077095547918	South Sudan	0.0383020501100862
Turkey	4528.02930576473	Panama	33.6472219687411	Guinea	3.46490635398855	Somalia	0.0203658288831615
Kuwait	4343.30811711448	Tunisia	32.733582301423	Sierra Leone	3.26524977188485	Kosovo	0.00428754292277085