THE THIRD ANSWER

HOW MARKET-CREATING INNOVATION DRIVES ECONOMIC GROWTH AND DEVELOPMENT

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Two schools of thought have dominated the theory of economic growth over the past half-century. The first and predominant philosophy—associated with Paul Romer, corecipient of the 2019 Nobel Prize in economics, and others—holds that ideas drive economic growth.[1.] Because ideas, once produced, can be copied and shared with minimal cost (so the story goes), they can fuel sustained economic growth in ways that are not possible for other factors of production.

The second school of thought acknowledges that ideas may be the seeds of growth but points out that such seeds cannot, and will not, grow in poor soil. The most fertile soil for growth is quality institutions—the lack of which is the ultimate limiting factor in most places. Institutions refers to a nation's "soft" infrastructure and includes entities that make up the financial, judicial, legal, political, and even some social systems. Institutions can be formal (nation-states, schools, hospitals) or informal (practices and structures of authority that derive from custom and culture rather than laws and policies). This line of argument has been so persuasive that some international organizations, such as the United Nations and the World Bank, collectively spend billions of dollars trying to help people in poor countries develop new institutions or fix existing ones.[2.]

Both of these perspectives have evident merit—indeed, they are historically linked. Economies expanded at a snail's pace globally until the 18th-century Age of Enlightenment, when the simultaneous emergence of scientific methods and procedures of modern democracy propelled humanity into an era of learning and discovery far beyond any previously known.[3.]

So, which is it—do ideas or institutions fundamentally drive long-term economic growth? In this essay, we propose that the most historically accurate and practically useful answer to this question is, in fact, neither. In the place of these two conjectured fundamental drivers of long-term economic growth we propose a third: market-creating innovation.

What supports this assertion? First, ideas result in economic growth and development only when they are realized through market-creating innovation. (We explain below why we emphasize "market-creating" innovation). The actual process of market-creating innovation is nothing like the zero-cost transfer of ideas—knowledge spillovers—that are the

centerpiece of ideas-based theories of economic growth.[4] Market-creating innovation is costly and difficult.[5] It involves highly specialized and skilled agents working over extended periods of time.

Furthermore, contrary to expert consensus but consistent with history, market-creating innovation drives institutional growth, not the other way around. Institutions represent the adaptive response of human communities to changes in the environment.[6] For example, in every city in the world we observe a complex set of institutions designed to handle traffic—traffic-management systems (stoplights, railway crossings), urban planning (crosswalks, overpasses), a legal apparatus to enforce traffic laws, and so forth. However, these institutions clearly did not create urban traffic; the traffic came first, and human communities had to come up with ways to deal with it. But what created the traffic? Market-creating innovation—in our time, the revolution in transport brought about by automobiles and motorcycles. This example generalizes broadly.

In very different ways, ideas-based and institution-based theories of economic development both fail to account adequately for the central role of market-creating innovation and its close relative, individual agency. Individual agency and innovation bring ideas into economic practice and in so doing they shape the evolution of institutions.

In this essay, we begin by offering a definition and two examples of market-creating innovation that provide a foundation for the historically informed theory that follows. With this definition and the examples in mind, we next assess the two dominant theories of development—essentially, the currently dominant answers to the centuries-old question of why some countries prosper while others do not. Building on this, we assess how new influences such as Blockchain technology and emerging business models

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relate to market-creating innovation, institutional evolution, and, ultimately, economic development. We offer specific examples of how Blockchain technology is being deployed to support market-creating innovation. We conclude by considering how a better understanding of the drivers of development prompts us to reconsider the definition of development itself.

RESCUING "INNOVATION" FROM MISUSE AND OVERUSE

The word "innovation" is routinely overused and "under-understood." For clarity, we use the definition that innovation is "a change in the process by which an organization transforms labor, capital, materials, or information into products and services of greater value."[7] In essence, innovation is not necessarily high tech, overly advanced, or even entirely new, and therefore is different from invention. From an economic development standpoint, innovations can be market-creating or sustaining, or improve efficiency.

Market-creating innovations do exactly what the term implies: they create new markets. But these are not just any new markets; they are new markets that serve people for whom either no products existed or existing products were not accessible for a variety of reasons, including cost or a lack of the expertise required to use them. Market-creating innovations transform complicated and expensive products into ones that are much more affordable and accessible to an increased number of consumers. In some cases, such innovation can create entirely new product categories.

Sustaining innovations are improvements to solutions already on the market. They typically target customers who require better performance from a product or service. Sustaining innovations are ubiquitous and represent a critical component of economies worldwide. They often enable companies and their host countries to remain competitive, but their impact on an economy differs from that of market-creating innovations. For instance, companies rarely need to build new sales, distribution, marketing, and manufacturing engines when they develop sustaining innovations in a mature market because they are using established channels to sell to an existing customer base within a familiar segment of the population.

Examples of sustaining innovations are all around us: a new model of mobile telephone, a new car model, a new flavor at a local ice cream parlor, or a new dishwashing detergent. While these innovations keep economies vibrant and exciting, they have a far more limited effect than market-creating innovations on job creation, profit generation, and changing the economic climate.

Efficiency innovations enable companies to do more with fewer resources. More precisely, as companies squeeze as much as possible from existing and newly acquired resources, their underlying business model and the customers they are targeting remain the same. Therefore, as market sectors become more crowded and competitive, efficiency innovations are crucial for companies to remain viable. Efficiency innovations typically are process innovations that focus on how a product is made and not necessarily on whom the product is sold to. Efficiency innovations can make a company more profitable and, critically, free up cash flow. Outsourcing is one of the most common examples of efficiency innovation. When a firm decides to move any part of its operation to a region where costs are lower, it is practicing efficiency innovation. Another example is when an organization uses technology to reduce the cost of operating so it can generate more prof-

its. Resource extraction and low-wage manufacturing industries are prime examples of operations that thrive on efficiency innovations.

TWO EXAMPLES OF MARKET-CREATING INNOVATION

In the 1850s, several American entrepreneurs were challenging one another in court for patent infringement related to the sewing machine. These entrepreneurs continued to sue one another until they realized that the strategy was pointless. No one was making any money or any progress—with the possible exception of the lawyers who filed the suits. In 1856, recognizing this impasse, the men had the inspired idea to join together and create the world's first patent pool: the Sewing Machine Combination. Each would build their company using the pooled technology and would pay a royalty to the patent pool, to their collective benefit.[8.]

One entrepreneur who joined the sewing machine patent pool was Isaac M. Singer. Unlike the other entrepreneurs in the pool, Singer's genius stemmed from the fact that he built a company focused not just on making a good sewing machine but on creating a market for the machines. At the time, the sewing machine was not only expensive for the average American family, it was also not part of the cultural norm. People had few sets of clothing and organized their lives around that fact. Singer was told time and again by the experts of the time that he would fail. Instead of listening to the experts, he built the systems required to create a new market. Some of his innovations, many of which seem mundane today, include branch sales offices, door-to-door sales, lessons for prospective customers on how to use the machine, selling on credit, building distribution and transportation infrastructure into his operations, and many others. Singer understood that to create this market he needed to build and manage a system that would make it easy for customers to purchase and use these machines. This also would bring costs down and make the machine accessible to many more Americans.

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The success of Singer's company was unprecedented. I. M. Singer & Co. became the first major multinational American company built by an entrepreneur without major government support. His operation led to the creation of many other industries: the closet/wardrobe industry so people could store their clothes, the fashion industry, textile manufacturing, clothing stores, and many others.

Another outcome of Singer's innovation was that workers in the textile industry, and in a few others such as steel, coal, and other manufacturing, played a signifi-

cant role in the labor movement to improve workers' rights and the condition in which they worked. The institutions that led these changes emerged only after market-creating innovators had created enough workers and consumers. It didn't happen the other way around.

The key to Singer's success, however, wasn't simply the technology. It was in his business model, which targeted non-consumption and created a new market for a whole set of people who previously had no sewing machine. In Singer's case, and whenever that happens, society benefits immensely.

Today the frontier for market-creating innovation is arguably in the countries that have most recently become part of the global economy—so-called developing countries. In the late 1990s, before Sudanese entrepreneur Mo Ibrahim created a market for mobile phones in Africa, fewer than 20 million, or 2.5 percent, of the 800 million people living in Africa had mobile phones. The Democratic Republic of Congo, for instance, with a population of more than 55 million people, had only 3,000 cell phones. Nigeria had fewer than one million telephone lines for its 126 million people. In just six years, however, Ibrahim's Celtel built mobile telecommunications operations in 13 African countries—including Uganda, Malawi, the two Congos, Gabon, and Sierra Leone—and gained 5.2 million customers. It was common to see eager customers line up by the hundreds for the opening of many of Ibrahim's stores.

Celtel was so successful that, by 2004, revenues had reached $614 million and net profits were $147 million. Ibrahim sold the company in 2005—for $3.4 billion. Perhaps more impressive is the fact that the mobile telecommunications market in Africa now supports more than 950 million subscriptions, employs more than three million people, and is forecast to add more than $210 billion in value to African economies. It is hard to believe that, as recently as the turn of the century, cell phones were largely toys for the rich. To achieve his success, however, Ibrahim first had to create the market. Once he did, the attendant benefits—taxes, enforceable regulations, jobs, infrastructure, and so on—followed.

MARKET-CREATING INNOVATION AS A VEHICLE FOR CONVERTING IDEAS INTO ECONOMIC GROWTH AND DEVELOPMENT

In ideas-based theories of economic growth, "ideas" are special in two ways. First, they augment production, as a larger pool of ideas allows more output with the same set of inputs. Second, although investment is required to generate new ideas, once an idea is produced it is transferable at zero cost. In technical parlance, ideas in such models are characterized as being non-rival and non-excludable. Non-rival means that one person's use of an idea does not keep another person from using it; non-excludable means it is impossible to keep a person from using an idea once it is out in the open. Another term, "knowledge spillovers," refers to the free transmission of ideas that are non-rival and non-excludable. In contrast, a product is rivalrous if its consumption by one person precludes its consumption by another; it is excludable if access to it can be limited. An automobile, for example, is rivalrous and excludable; sunshine is neither.[9]

Let's now reconsider the story of Mo Ibrahim and Celtel in light of the argument that, because ideas are non-rival and non-excludable, economically relevant innovations are characteristically subject to knowledge spillovers. The idea for the mobile phone and for mobile phone net-

works—which in this context we'll consider the "invention" of the mobile phone—existed long before Ibrahim began to bring mobile phone service to the African continent. However, it is a gross over-simplification to say that the idea for the mobile phone and mobile phone networks simply "spilled over" into Uganda, Malawi, and Sierra Leone, ultimately creating a $3.4 billion company that provided service where it was previously unavailable. What was required to bring the mobile phone to sub-Saharan Africa to provide service to those who had no access to telecommunications of any type and in so doing to propel economic growth was *not* the idea for the mobile phone and for mobile phone networks. What was required was market-creating innovation.

As pioneering evolutionary economist Sid Winter wrote fully 50 years ago, "'Knowing how to bake a cake' is clearly not the same thing as 'knowing how to bring together all of the ingredients for a cake.' Knowing how to bake a cake is knowing how to execute the sequence of operations that are specified, more or less closely, in a cake recipe."[10.] Much of the work of executing the "recipe" for market-creating innovation is not available in any "innovation recipe book" and cannot be transferred at a low cost. To the contrary, the ideas (or recipes) that are critical to market-creating innovation, and that actually propel growth and development, are overwhelmingly uncodified, context dependent, and transferable only at significant cost—which is to say that tacit knowledge dominates, information asymmetries are the norm, and transaction costs are significant.[11.]

There is no disputing that ideas created by one person or one firm can reach other people or firms through multiple pathways, many of which do not involve the beneficiary directly compensating the innovator. If we define such pathways as knowledge spillovers, then evidence of spillovers will be everywhere. However, the critical point we are making is that, when such pathways involve economic benefit derived from market-creating innovation, they usually also involve significant costs: recruiting a key employee from a competitor firm or industry leader; undertaking research to invent around an existing patent; reverse-engineering a product; paying for employees to attend conferences; hiring consultants; and building trusted relationships with buyers and suppliers.

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Market-creating innovation thus necessarily and systematically involves the search for ideas that are, in fact, rivalrous and excludable (at least temporarily), out of which ventures with proprietary value can be created.[12.] The impediment to market-creating innovation that matters most is not a lack of appropriability of returns (as default New Growth formulation would suggest) but the everyday battles involved in communicating ideas, building trust, and making deals.[13.] Consequently, while knowledge spillovers of the type emphasized by Romer are

present everywhere, they are unlikely to be relevant to the activities that are most critical to economic growth and development.[14.]

In this sense, there is almost total contrast between the view of productive knowledge that emerges from the micro-theory of entrepreneurship and the view that characterizes dominant macro-theories of economic growth.

MARKET-CREATING INNOVATION AS A DRIVER OF INSTITUTIONAL EVOLUTION

Our simple definition of innovation and its categorization into three types provides a frame for how innovations impact an economy and, more specifically, the development of institutions in an economy. Our experience has revealed that innovation is not something that happens on the fringes of society after society has "fixed" itself—that is, after it has developed functioning and trusted institutions. Innovation is, rather, the process by which institutions that are critical to development emerge. It is through innovations that create or connect to new markets that societies can create jobs, pay taxes, and, ultimately, build strong and lasting institutions. Innovation, we have found, is what keeps economic engines rolling and a society progressing, as illustrated by the following cases.

Japanese Transportation Regulations

Today, Japan has more than one million kilometers of paved roads and thousands of traffic laws that help manage the 69 million motor vehicles operating in the country. These roads and laws not only regulate traffic in Japan, they also help keep Japanese drivers safe. As a result, the country has one of the lowest traffic fatality rates in the world—6.5 fatalities per 100,000 vehicles each year. To put that into perspective, the United States has twice the rate of fatalities, Europe has almost three times as many deaths per vehicle, and China has a fatality rate approximately 16 times that of Japan. From that vantage point, the Japanese institutions that manage the nation's traffic and transportation are working. But that was not always the case. Japan's traffic laws have in fact evolved to solve the specific challenges brought about by the proliferation of motor vehicle innovations in the country.

Jeffrey Alexander's book, *Japan's Motorcycle Wars: An Industry History,* provides a brilliant summary of how the Japanese government developed traffic institutions first as a response to the proliferation of all wheeled vehicles and later specifically to motorized vehicles. In the early 1900s, it was common to find "cars, trucks, motorcycles, horses, horses, ox-drawn vehicles, rickshaws, men pulling wagons, and pedestrians" on urban roads. Alexander writes, "Improved traffic enforcement was thus required in urban centres such as Tokyo, and the motorcycle came to play a key role."[15.] He explains that the government responded to the spread of vehicles by legislating who could access and operate motor vehicles. By 1918, Tokyo had established a traffic police squad, instituted traffic police uniforms, and provided traffic stations for these new government employees. At first the enforcement of these laws was haphazard, but standardization improved over time. Today Japan finds itself in the enviable position of having one of the safest traffic systems in the world.

Low- and middle-income countries would do well to study the effect on Japanese society of the proliferation of motorcycles and other vehicles before the

country developed institutions to enforce traffic laws and regulations. The innovations came first, then the institutions that helped to manage the impact of the innovation.

European Parliaments and Courts

A lack of rule of law, corrupt judiciaries, and untrustworthy parliamentary bodies are the hallmarks of many low- and middle-income countries. Rich and prosperous nations in Europe boast much better systems, at least relatively speaking. How did they get these systems? In Prosperity and Violence: The Political Economy of Development, Robert Bates describes the sequence of events that led to the development of Europe's distinctive political institutions.[16.] Consider, for example, how our understanding of the risks associated with sovereign debt has changed over the past few centuries. Today we may see sovereign debt, especially that of prosperous European nations, as less risky than private debt. However, that was not always the case. Hundreds of years ago, when most of Europe was made up of individual monarchies where rulers could take, plunder, and kill at will, investors grew increasingly unwilling to lend money to kings and to those subject to these social conditions. As measures of wealth expanded from royal landholdings (unmovable assets) to include precious metals and currency (assets more easily moved), investors became more powerful and selective in choosing the monarchs to whom they loaned money. This led monarchs to figure out new ways to extract resources from their subjects. Bates writes that "monarchs innovated new ways of tapping the private wealth of their citizens. Among the most significant was the creation of parliaments—fora in which they could trade concessions in public policies for the payment of public revenues."[17.]

Parliaments were created to be institutions that could negotiate with investors, manage the public purse, and provide guarantees on the debt taken up by monarchs. The era of bullying gave way to an era of seduction because, all of a sudden, citizens could move their assets (innovations) more easily. A new type of economy had emerged, from one that plundered wealth to one that sought to create it. A similar sequence of events happened with the establishment of the European courts. Originally established to resolve disputes expeditiously, the courts became more relevant as they resolved more and more disputes. The fees they charged in time caused the courts to become profit centers for many European monarchs. When first established, parliaments and courts did not satisfactorily represent the will of the people. Over time, however, as the citizenry became more prosperous, these institutions became more effective and representative. We must remember that innovation and prosperity came first, and the institutions—at least the well-functioning ones—followed.

Once again, the innovation of movable currency resulted in the creation of new economic features and, subsequently, more institutional stability in the region.

U.S. Food and Drug Administration

Consider the emergence of the U.S. Food and Drug Administration (FDA). Because of the nature of foods and drugs and how they are integrated into our lives, fewer industries are more important when it comes to protecting public health and safety. History provides too many examples of how allowing "bad foods" into the market can be fatal, often with little or no warning. A similar case could be made for drugs. If any industries made it necessary to force regulations on them in order to

protect the population's health and safety, it was food and drugs. But, in fact, even the FDA did not push regulations onto these industries before entrepreneurs had discovered market-creating innovations that impacted millions. The innovations came first.

In his short paper, "History of Food and Drug Regulation in the United States," Marc T. Law, an economist at the University of Vermont, notes that from colonial times to the mid-19th century most food and drug regulations in the United States were enacted on the state and local level and focused on limited types of food.[18.] At that time, a majority of U.S. households grew their own food, thus it would have made little sense to enact sweeping food production regulations when most foods were not produced for the mass market. Regulations at the time focused on products produced and distributed by industry, such as beef, pork, fish, bread, wine, etc. It wasn't until the second half of the 19th century that the scale and scope of regulation increased considerably. Law notes that regulation increased for three reasons: specialization and urbanization, technological change in food manufacturing, and the average consumer having difficulty detecting foods gone bad.

Again we see that as innovation improved production it also increased the variety of foods available to millions of people. At the same time, it led to greater negative consequences from tainted foods or unintended reactions to drugs. As the technology and complexity of food and drug production increased, it became more difficult for the average observer to detect harmful products. This created a growing perception that regulation by experts was necessary.[19.] Meanwhile, in order to increase barriers to market entry, traditional manufacturers disadvantaged new competitors by calling for more regulations. While these events led to an improved regulatory environment, it is also clear that regulations and the enforcing institutions can stymie innovation and new entrants.

In each of these circumstances, innovation preceded regulation. It was only after an innovation was introduced into the market, thereby reducing costs and expanding product availability, that regulations began to take hold. Even for industries as sensitive as food and drugs, it is hard to make the case that regulations preceded innovation. In fact, the decision to create the FDA was made only after events led the U.S. Congress to pass the 1906 Pure Food and Drugs Act and the 1906 Meat Inspection Act.[20.]

Nollywood

Most of the world is unaware that Nigeria has a thriving movie industry, largely because Nigerian movies are primarily created to entertain Africans and Africans in the diaspora. Nollywood's production of 1,500 movies annually is second only to India's Bollywood—a surprising statistic in a country where fewer than 60 percent of the population has access to electricity and only 40 percent of households have a television. Nollywood has been able to thrive precisely because many in the industry focused on creating a new market that targeted non-consumers. Before the rise of the Nigerian movie industry, most Africans viewed movies produced in Hollywood and Bollywood. Few movies from these markets reflected the lives of average Africans or considered their cultures and collective experiences. As such, although Western and Indian movies were interesting, they were not relevant. Nollywood changed that.

Nollywood's annual revenues have reached $1 billion and the industry currently employs more than one million people, second only to the country's agriculture industry. Nollywood's success in democratizing access to Nigerian movies

and entertainment is a win for everyone legitimately participating in the industry. As a result, Nollywood has been able to pull in better governance as it relates to piracy and copyright laws. Appreciating the industry's importance as a major source of employment and potential income from the sale of movies, the National Export Promotion Council, the Nigerian Copyright Commission, and the National Film and Video Censors Board are now collaborating on programs to reduce piracy in Nigeria's film industry.

Governments clearly have a role to play in ensuring that their nations become prosperous, but our experience suggests that a government's enabling role often follows the success of innovators. And thus the classic chicken-or-the-egg question arises: What comes first—building institutions or investing in innovations? Our view is that market-creating innovations act as a magnetic force that pulls in the institutions that have the capacity to trigger further investment and innovation. Without market-creating innovations, it is incredibly difficult to build and sustain such institutions. When we put the proverbial cart before the horse, neither the cart nor the horse can move forward.

BLOCKCHAIN-BASED INNOVATIONS TO DRIVE ECONOMIC DEVELOPMENT

Blockchain technology has garnered significant attention as of late because it is the foundation on which cryptocurrencies are based, and the foundational technology on which many applications aside from cryptocurrencies can be built. In this section, we strip Blockchain technology down to its elemental functions by presenting use cases in which Blockchain drives economic development by enabling market-creating innovations.

First, a definition: a Blockchain is a public, decentralized, distributed digital ledger that is used to record electronic transactions. Each "block" in a Blockchain contains specific information that cannot be altered, due to the distributed nature of the technology. For example, your personal bank account contains information about deposits, withdrawals, and other transactions such as bank fees. These transactions are either stored on a server that is managed by the bank in a central location or, increasingly, distributed among servers in "the cloud." The bank spends millions of dollars on security to reduce the likelihood that bad actors can steal your account information by getting into its systems or accessing its cloud-based resources. However, even with these massive and ever-growing investments in cybersecurity, instances of large-scale intrusion (most of which are never known to the public) continue to increase. When successful, the bank's ability to keep your information and transactions safe and secure builds trust between you and the bank. When not successful, this mode of service points out the inherent vulnerabilities of large-scale scale centralized databases. Trust is expensive to earn and even more costly when lost.

A similar thing happens with the registries that manage most of our personal information, from property to healthcare records. The "managers" store this information, and how we transact with it, in a centralized location. And, of course, they strive to protect it; their ability to protect our information impacts how much we trust them. In many poor countries, where governments are often under-resourced, there is a lack of trust in the institutions that manage these registries. Land disputes are particularly common. Disputes may arise over overlapping ownership claims, tenancy-based and use-based assertions of rights, deliberate

land grabs, and a simple lack of proper recordkeeping, among other causes. The prevalence of such disputes results in a systematic lack of confidence in the institutions of land administration. Absent reliable institutions, investors have little assurance that their property rights will be registered accurately and subsequently protected. This in turn adversely impacts investment not only in real estate but in other related asset classes.

Blockchain technology has the potential to reduce uncertainty around land ownership and other property claims by providing verified records, and thereby strengthening institutions.

Blockchain technology has the potential to reduce uncertainty around land ownership and other property claims by providing verified records, and thereby strengthening institutions. The likelihood of corruption, misunderstanding, and administrative errors is significantly reduced when a transparent, distributed, and immutable system is used to manage the transfer of assets from one party to another. The clarity and reliability of claims and the increased strength of institutions that follows from the introduction of Blockchain-based data systems can dramatically reduce the frequency of disputes and accelerate the adjudication of disputes when they do occur.

More fundamentally, Blockchain technology dramatically reduces the gap between market-creating innovation and the institutions that evolve in response to those innovations. In a Blockchain-based economy, the market-creating innovation and the institution governing it are fundamentally intertwined. The following two use cases serve to illustrate.

Blockchain Use Case #1: Converting Land Occupancy to Land Ownership

Decades ago, acclaimed Peruvian economist Hernando De Soto wrote, "Without an integrated formal property system, a modern market economy is inconceivable. The inefficiencies of non-Western markets have a lot to do with the fragmentation of their property arrangements and the unavailability of standard representations."[21] In line with institution-centric theories of development, De Soto argued that the key to unlocking the latent potential of development in poor places is for governments to improve the systems that enable citizens—particularly the poor—to assert and defend property claims of all types, especially those related to land.

Decades later, economists generally recognize that De Soto's dream remains far from a reality in most of the world. Many fail to appreciate two additional facts. First, inadequate land administration systems undermine development for all actors in society, not just the poorest. Second, realizing De Soto's dream is far more likely to be achieved through market-creating innovation than through international donor-driven institutional reforms.

One coauthor of this essay (Gabrielle D. Gay) oversaw the later stages of the construction of the Ensign College of Public Health, a $15 million private college campus in Kpong, Ghana, some 45

miles outside Accra, only to discover that the title to the land on which the campus was built was tied up in a dispute involving at least three other parties. The college's effort to secure a clear land title turned into three-year process that involved hiring legal teams on both sides of the Atlantic and frequent journeys between continents, courthouses, and various government agencies. All the while the college operated under a threat of property seizure and the revocation of its accreditation. After the disputes were resolved, the college purchased the land with a full and legitimate title. Due to remaining concerns about institutional weakness and the ongoing and unresolved threat of expropriation through squatting, Ensign College did as most Ghanaians do to signal their indisputable claim to land—it erected a mile-long wall around the perimeter of the 50-acre campus.

Scenarios like this one illustrate why property rights are foundational to societal development and are the reason many well-intentioned and even well-funded endeavors in sub-Saharan Africa end in failure.[22.] Unclear property ownership and property registration not only deter foreign investment, they also curb the entrepreneurial initiative of citizens. If one cannot clearly lay claim to land, what incentive does one have to build on and invest in that land? Moreover, how can one use one's land as a verified asset and employ that asset for the purposes of finance and investment?

This story illustrates that demand exists in the private sector for improved land administration services. While the source of that demand in this case was an organization focused on social investment, in many other cases the source of the demand is purely commercial.

Blockchain Use Case #2: Ensuring the Integrity of the Pharmaceutical Supply Chain

Sadly, and with tragic results, the African continent has become a dumping ground for counterfeit pharmaceuticals. A 2017 World Health Organization report estimates that at least one in ten drugs in low- or middle-income countries is either substandard or fake. The organization also found that, in Nigeria in 2007, at least 64 percent of antimalarial medications were fake or substandard. A former director general of Ghana's National Health Service estimated that up to two-thirds of the drugs on the shelves in that country are either degraded or counterfeit, noting that making a more precise estimate is difficult due to the lack of accurate supply-chain data.

The market for drugs has long attracted bad actors. The pharmaceutical industry is particularly vulnerable to fraud, due to the high markup associated with pharmaceutical products, the complexity and increased fragmentation of pharmaceutical supply chains, and the almost total inability of consumers—many of whom are poor and have few options—to assess the authenticity of pharmaceutical products.

The distributed architecture of Blockchain technology has the potential to enable traceability and transparency in the pharmaceutical supply chain. A chain-of-custody log can trace a drug's provenance, not only to its manufacturer but to the source of its raw ingredients. Individual permissioned logs can trace the drug through raw material sourcing, manufacturing, packaging, registration, procurement, and the end stages of distribution. This means that a drug's authenticity can be determined with confidence. The transformational potential of this technology is enormous: millions of lives

could be affected and thousands of lives saved.

In this case, again, the market-creating innovation and the institution that manages it are essentially the same, as the innovation is related to improved governance.

THE BEST WAY TO PREDICT THE FUTURE IS TO CREATE IT

Technology alone rarely solves social challenges; however, the application of technology through innovation has often done so. Blockchain is no exception. Blockchain's potential to transform many sectors of the world's economies—especially in low- and middle-income countries—is immense. The two examples above demonstrate that Blockchain can advance development through better recordkeeping, particularly in economies where systems either don't exist or the systems that do exist are untrustworthy.

Blockchain technology also has the potential to spark a whole new set of entrepreneurial activities we can barely fathom today—much as it was difficult to imagine 15 years ago that a company such as Facebook would emerge and grow to have a valuation of nearly $400 billion (at the time of writing). During the early days of the Internet, there were many skeptics who neither understood what the World Wide Web really signified nor believed that any significant economic value could come from it. Blockchain is in a similar phase, but we believe that Blockchain technology has the potential to transform how we engage with the world and the global economy in as fundamental a manner as the Internet.

The challenges faced in realizing the potential of Blockchain technology are abundant and increasingly well understood. They range from the cost of transitioning from legacy systems to a fundamentally new data architecture, to the societal and behavioral uncertainties that underlie the introduction of any major new innovation. Despite these real challenges to its implementation, there is every reason to believe that Blockchain technology will pull a whole new category of innovations into existence—as has been the case with market-creating innovations for centuries.

CONCLUSION: SHIFTING FROM AN ASSET-CENTERED TO A VALUE-CENTERED ECONOMY

Governments around the globe are looking for opportunities to create robust and inclusive economic development for their citizens. The rapid development of machine-learning technology—and the new generation of artificial intelligence that machine learning has enabled—makes the challenge of sustaining inclusive development all the more urgent. Some governments, inspired by institution-based theories of development, have focused on improving their ranking in the World Bank's "Doing Business" indicators and signaled in other ways that their jurisdictions are structured favorably for external investment. Others, inspired by ideas-based theories of development, have focused on increasing the intensity of their investment in academic infrastructure and basic research. As laudable as these efforts are, history has shown that, without a firm commitment to investing in market-creating innovations, many of these programs will not result in sustained economic growth and authentic development.

As famed Austrian economist Joseph Schumpeter wrote in his foundational work, *Capitalism, Socialism, and Democracy,*

> Queen Elizabeth [I] owned silk stockings. The capitalist achievement does not typically consist in providing more silk stockings for queens but in bringing them within the reach of factory girls in return for steadily decreasing amounts of effort. The capitalist process, not by coincidence but by virtue of its mechanism, progressively raises the standard of life of the masses.[23.]

In his 2007 Harvard commencement address, Bill Gates stated similarly that "humanity's greatest advances are not in its discoveries but in how those discoveries are applied to reduce inequity."[24.]

The innovations that matter most are not those that provide marginal improvements in offerings for the already well-served but those that open up entirely new possibilities for otherwise excluded market majorities. The greatest discoveries will be those that, when rightly applied, enable entire populations to enjoy healthier lives, greater freedom, and expanded opportunities for self-definition.

Unlike the current generation of platform-based business models that concentrate the ownership of information and drive value to the center, Blockchain-based business models are structured to distribute the ownership of information and drive value to the edges—where customers and citizens are located. By intrinsically linking market-creating innovation and the evolution of institutions, Blockchain provides a vehicle for reducing inequity not through a temporary and contentious redistribution of income but through a more fundamental and sustainable redistribution of value.

As we have illustrated with the above examples, Blockchain will realize its potential to drive development only to the extent that entrepreneurs and innovators take the lead in building market-creating innovation on Blockchain ledgers. The process will be halting and unpredictable. As has always been the case with emergent technologies, the alignment of public interest and business purposes will not follow from any single plan or directive but will be shaped over time by millions of individual choices.

Blockchain provides a vehicle for reducing inequity not through a temporary and contentious redistribution of income but through a more fundamental and sustainable redistribution of value.

What is more, as this process unfolds, the limiting factor will not be the volume of new ideas available to Blockchain innovators—it will be the capacity of each of us to embrace our true identity and to benefit from new forms of social contribution. Just as the sewing machine and the mobile phone opened up new modes of human creation and connection, Blockchain-based business models will require us to leave behind the 20th-century mindset in which our identities are defined by jobs and our wealth is defined by our assets. We will be challenged to embrace an emerging world in which our identities are once again anchored in our relationships and our wealth is defined by

what we have the capacity to offer.

Now, as in the past, the pathway to progress will be blazed not by ideas or institutions but by market-creating innovations.

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1. Properly, the Sveriges Riksbank Prize in Economic Sciences in Memory of Alfred Nobel.

2. This view, quite understandably and often with the best of intentions, causes us to push the "right" institutions onto poorer nations. But many of these institutions not only cost billions of dollars to operate, they also fail to bring about lasting change in the regions where they are being brought in. Andrews (2013) reports that "as many as 70% of [institutional] reforms seem to have muted results." Perhaps what's worse is that the "success" of many institutional reform projects, according to World Bank specialist Kate Bridges and World Bank social scientist/Harvard University lecturer Michael Woolcock, is measured by how much the new institutions resemble those in wealthy countries, rather than whether the institutions actually solve a problem (Bridges & Woolcock, 2017, p. 7). Bridges and Woolcock (2017) document that, between 2006 and 2011, institutional reform was a feature of more than $50 billion worth of World Bank-sponsored projects and accounted for about a quarter of the cost of these projects. Other major development organizations, such as the Department for International Development and the Asia and Africa Development Banks, are also increasing the number of "institutional reform" projects they fund. The trend is growing rapidly with no signs of slowing down, and the view that institutions are the primary problem in poor countries has even become mainstream. Ask any layperson what some of the major reasons are that poor countries remain poor, and they will soon mention a lack of functioning institutions

3. For the purpose of this article, we will designate high-income countries, as defined by the World Bank, as prosperous.

4. Romer (1986, 1990), among others.

5. Christensen (1997).

6. Those changes can be exogenous (for example, institutions created to manage periodic flooding) or endogenous (for example, institutions created to manage traffic in cities).

7. This definition is consistent with Schumpeter (2005/1912), who defines innovation as taking an invention and placing it firmly into a market, a process that leads to development or the production of new combinations. In Chapter 2, Schumpeter writes that "to produce means to combine materials and forces within our reach. To produce other things, or the same things by a different method, means to combine these materials and forces differently" (p. 65). This is important because innovation is often mistaken for invention, or something entirely new. For the purpose of economic development, this isn't the case. According to Schumpeter, one illustration of this process of combination is "the opening of a new market, that is a market into which the particular branch of manufacture of the country in question has not previously entered, whether or not this market has existed before" (p. 65). In essence, it does not matter that something existed in another country; if it is new to the country where it is being introduced, it is bound to have an impact on development.

8. Hounshell (1985, p. 67).

9. In the deliberately over-simplified model of the world known as "perfect competition" in economics, trade exclusively refers to goods that are rivalrous and excludable. Exchange occurs without any frictions. It is in contrast with this toy model that economists use the term "market failure" to refer to an array of ubiquitous frictions that can occur in exchanges, including transactions costs, monopoly power, asymmetry of information, and imperfect appropriability. Imperfect appropriability results directly from a lack of excludability,

not from rivalry. It is a general concept, as applicable to the dredging of a river to minimize the risk of flooding as it is to the creation of a nursery rhyme. In the case of dredging, the lack of excludability results from the diffuse impact of the investment. In the case of the nursery rhyme, the lack of excludability results from the ease of copying. Activities subject to imperfect appropriability are, generically, those for which private and social returns to investment diverge. The creation of new ideas is widely thought to be subject to imperfect appropriability for reasons of both diffuse impact and ease of copying. Each use of a new vaccine, for instance, will create lower susceptibility to contagion for an entire population. Thus, while a particular dose of a vaccine is both rival and excludable, its benefits are neither. Price will not reflect marginal social benefits (or costs, as the case may be).

10. Winter (1968, p. 9).

11. Winter (1968); Agwara, Auerswald, & Higginbotham (2013); Auerswald (2017).

12. Auerswald (2007, 2008, 2010).

13. More fundamentally, the greater the intensity of market failures, the stronger the motivation for the creation of new firms. See Coase (1937) and Auerswald (2007).

14. Romer (1986, 1990).

15. Alexander (2008).

16. Bates (2001).

17. Bates (2001, p. 52).

18. Law (n.d.).

19. Law (n.d.) notes that this rationale for regulation was articulated by a member of the 49th Congress (1885): "In ordinary cases the consumer may be left to his own intelligence to protect himself against impositions. By the exercise of a reasonable degree of caution, he can protect himself from frauds in under-weight and in under-measure. If he can not detect a paper-soled shoe on inspection he detects it in the wearing of it, and in one way or another he can impose a penalty upon the fraudulent vendor. As a general rule the doctrine of laissez faire can be applied. Not so with many of the adulterations of food. Scientific inspection is needed to detect the fraud, and scientific inspection is beyond the reach of the ordinary consumer. In such cases, the Government should intervene" (Congressional Record, 49th Congress, 1st Session, pp. 5040-5041).

20. The Pure Food and Drugs Act was passed in 1906, thanks in part to the public outrage at the shockingly unhygienic conditions in the Chicago stockyards that were described in Upton Sinclair's book, *The Jungle*.

21. De Soto (2000, p. 164).

22. Gay (2018).

23. Schumpeter (1942).

24. Gates (2007).