

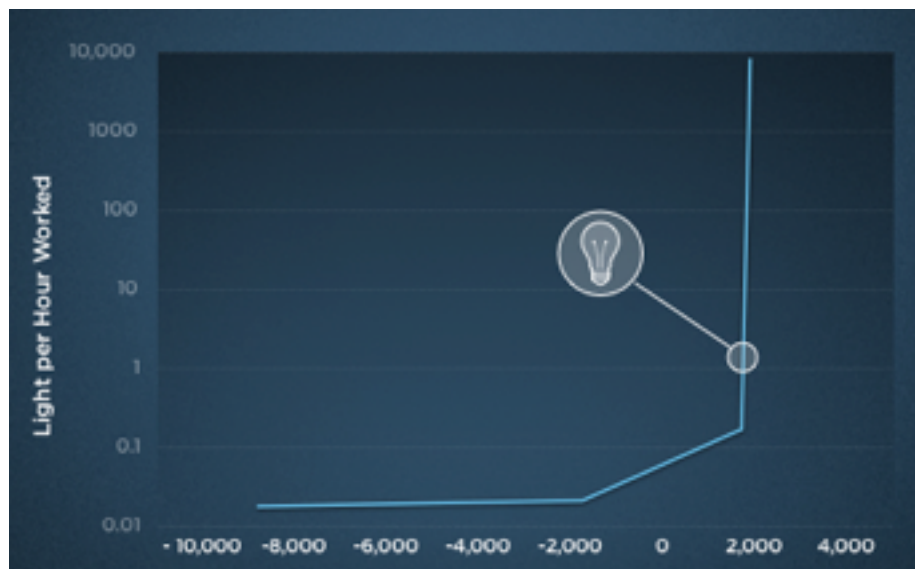
Technologies and Rules Drive Progress

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Proper perspective

In the late 1970s many economies faced seemingly out of control inflation. People were very pessimistic about the ability of central banks and governments to tame the high rates of inflation, let alone promote sustained economic growth moving forward. The Club of Rome commissioned a famous report called *The Limits to Growth* which said that resource scarcity would doom us to catastrophic decline in the level of economic output. Looking at the broad sweep of history, it became increasingly clear that these near term concerns about the prospects for growth were completely misplaced.

Yale economist William Nordhaus (1997) compiled historical data on light that captures an important fact about human history that the Club of Rome seems to have missed. The graph below measures the amount of light (lumen-hours) the typical human can buy with one hour of work, tracked from 10,000 years ago to the present. Notice that the vertical axis uses a ratio scale so slope tells us about the rate of increase in the amount of light you can get from one hour of work.



This stunning graph shows not just how much better off we are than people were in the past but also that the rate of improvement is increasing over time. The myopic doom and gloom of the 1970s and the pessimism we feel about the recent economic crisis is misplaced in the context of this broad trend that will lead to continuing improvements in the quality of life all over the planet.

The power of technology

We know quite a bit about what drives this process of continuous improvement. In the late 1800s the invention of the light bulb was a new technology that made light much more convenient and much less expensive. The light bulb involved various component technologies. Technologies are ideas about how to arrange physical objects — ideas like how to generate electricity, how to transmit electricity to homes and businesses, and how to construct the actual bulb that converts electricity to light.

One key feature about technologies, one that distinguishes them from scarce objects, is that we can share them. Because ideas are sharable, we benefit from interacting with many people. The more people with whom we can trade ideas the better off we will all be. Cities, places where millions of people can connect and share ideas, are therefore immensely important for economic growth and development. Sharing also means that developing economies that start from behind can catch-up to developed economies by copying existing technologies.

There's a well known parable that captures this idea of being able to share ideas: "If you give someone a fish, you feed them for a day. If you teach someone to fish, you feed them for a lifetime." A more appropriate modern update of this parable might be: "If you give someone a fish, you feed them for a day. If you teach someone to fish, you destroy another aquatic ecosystem." Over the same historical period where our access to light was improving dramatically, a combination of improvements in fishing technology and unchecked access to fisheries led to this unfortunate outcome.

Rules: ideas about how people interact

The fisheries example highlights the fact that sustainable growth and development relies on something more than just the power of technology. We can lump the ideas behind fishing nets and trawlers under the category of technology, but there's another category of ideas needed to ensure a sustainable catch: rules.

If technologies are ideas about how to arrange physical objects — for example, ideas about how to combine iron and carbon to make steel — rules are ideas about how to structure interactions among people. Like technologies, rules can be shared and copied. As the fishing parable suggests, progress comes not just from the discovery of new technologies but also from the implementation of new and better rules. For example, many fisheries use rules that specify a system of tradable quotas to successfully and sustainably manage harvest.

Just as we've started to think carefully about what will lead to the discovery and implementation of better technologies, we need to pay attention to the mechanisms that lead to the discovery and implementation of better rules. We need to think harder not just about where new and better rules come from but also about how they get implemented.

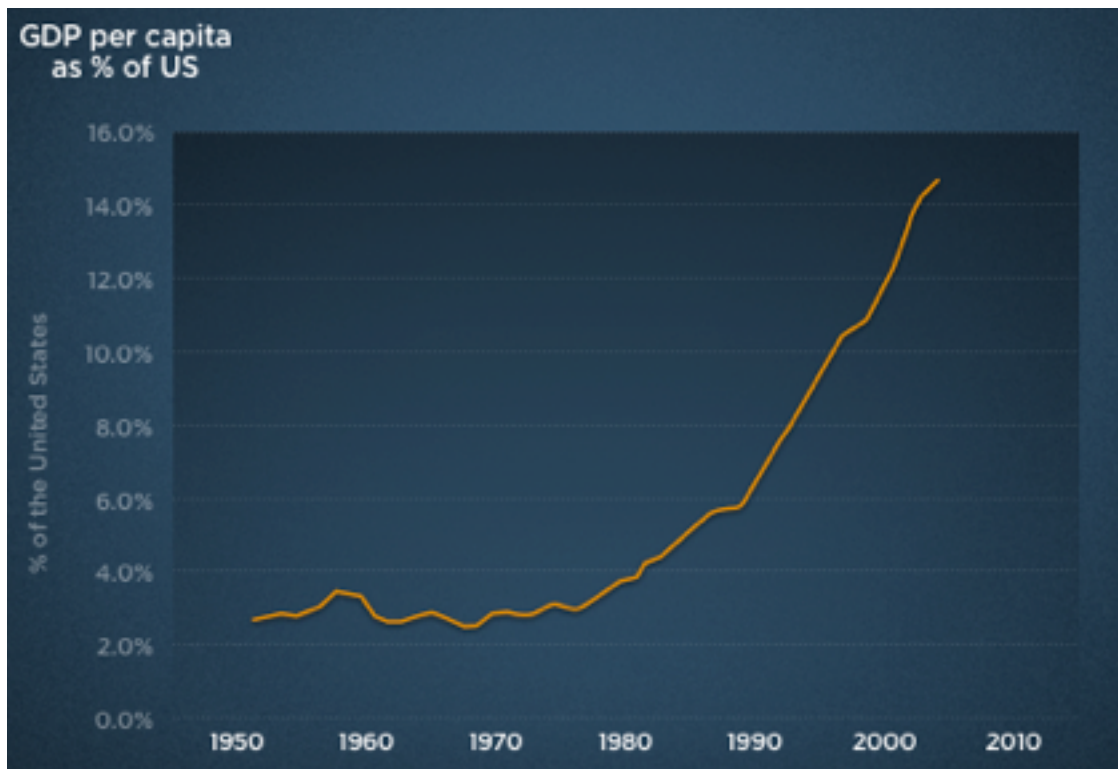
As developing countries pursue catch-up growth, there is the potential for copying technologies. For example, a government that creates the appropriate conditions for foreign direct investment (FDI) will benefit from the exchange of ideas between locals and people within multinational corporations. But a critical and thus far unanswered question concerns the potential for copying rules. What types of mechanisms will allow developing countries to copy the rules that work well in the rest of the world?

If there is a potential for copying good rules, we need to consider why it sometimes does not happen. China's economic experience illustrates both the promise of adopting better rules and the failures from shunning them. About 1,000 years ago, China was the world leader in economic output and innovation, pioneering important technologies like steel. Shortly thereafter, China began to fall dramatically behind as the world's leading countries discovered and implemented new technologies.



Source: The World Economy (<http://www.theworldeconomy.org/statistics.htm>)

Through the 1950s, 60s, and 70s income per capita in China was about 3% of that in the United States. Looking back in 100 years or so the event that will have the most historical salience will not be the financial crisis of 2008 but the moment around 1980 when, after 1,000 years of stagnation, China started to catch-up with the technological frontier. China employed mechanisms, including special economic zones, that allowed it to copy good rules from the rest of the world, especially its thriving neighbors in Hong Kong.



Source: Penn World Table (http://pwt.econ.upenn.edu/php_site/pwt_index.php)

What are some examples of rules? One simple rule concerns whether we drive on the left or on the right. The side we choose is not important, it only matters that we choose a side and stick to it. Another example is ownership, the idea that someone can own a piece of property like a piece of land. Yet another rule, which came later in human history, was the notion of open science, an arrangement in which certain kinds of ideas were not subject to individual ownership. Instead, people who discovered ideas were rewarded with publication and academic prestige.

Developing new rules

Economists are accustomed to asking how particular rules will impact society. For example, we understood that a patent can create a very important incentive — a motivator for Thomas Edison to invent the light bulb. Similarly, we can say that the rules of open science can lead to something like Maxwell's laws of electricity and magnetism which helped engineers design the transmission networks that made light in the home possible. In these cases, the rules of intellectual property rights and open science worked together to create the appropriate incentives for the development of new technologies.

What is less typical for economists is to ask where the rules came from. Consider the human breakthrough that led to cultivation of cereal grains. For hunter-gatherers, the ownership of land was not important. When humans begin to cultivate cereal grains it becomes increasingly important to have ownership of land to determine who gets the grain. In this case, it is likely that rules about property ownership or land arose in response to the advent of new technology.

Because its not always obvious what the best rules are, we often struggle to discover and implement the good rules necessitated by new situations. Consider the fishing example. If people can use only their bare hands to catch fish then a rule of free access to fisheries works relatively well. The development of nets makes fishermen more productive — enough so that they begin to deplete fisheries under the rules of free access. Attempts to limit depletion with rules that limited the length of a fishing season typically failed to stanch the depletion and had harmful side effects because they put a premium on fishing as rapidly as possible.

Eventually, we came up with the idea to use individual tradable quotas (ITQs). An ITQ gives the owner rights to a fraction of the total allowable catch in a fishery and the ability to sell that right. The value of the ITQ is based on the productivity of the fishery. ITQs in fisheries on the verge of collapse will be worth very little. As a result, the fishermen who own the ITQs have a strong incentive to preserve the fishery thereby increasing the value of their rights (Heal and Schlenker, 2008). The ITQ solution came only after a period of trial and error and a number of collapsed fisheries. Even now political roadblocks prevent more widespread use of this beneficial rule system. The fisheries example suggests that we need to give more thought to mechanisms that speedup the adoption and implementation of good rules.

Rules are often embodied in social norms. Rules against spitting evolved over time and became an important public health issue as humans lived in higher density urban areas rather than in the countryside or in hunter-gatherer bands. But the rules against spitting are typically enforced not by laws or police but by social norms about what is right or wrong. As recent Nobel recipient Elinor Ostrom pointed out, this type of social norm offers some advantages: when we share common notions of acceptable behavior, we achieve order more efficiently than active policing.

Social norms present challenges as well. If suboptimal rules are embodied in our notions of what is right and wrong, it can be very difficult to transition to better rules. For example, we may have felt that it was wrong for any one person to take ownership of mother nature in hunter-gatherer societies. When grain cultivation made land ownership more efficient than common property, we had to overcome the moral sense that it was wrong to have someone own land. Some societies spent centuries making the transition to private ownership of land and in some places common property is still the accepted social norm. Those places that have made the transition have been more successful in experiencing catch-up growth.

Meta-rules: rules for changing the rules

Meta-rules are rules about rules. They get at the issue of how we go about changing our rules. The kind of meta-rules that we most often think about are standard political dimensions that fall on a continuum between something like democracy and something like authoritarian decision making. Democratic meta-rules require some form of voting, perhaps by referendum or a representative body, to change the rules. Under more authoritarian meta-rules, a rule change may only require the approval of an executive.

Stockholm's recent adoption of congestion pricing offers an interesting example of a meta-rule. To encourage the adoption of more efficient traffic rules there, city officials employed a meta-rule based on the "try before you buy" strategy that firms use to enhance the credibility of their product claims. Instead of committing everyone to a permanent change, the officials let residents sample the new traffic rules that charged higher prices for entering the center city at peak times during a seven-month trial period. Officials also increased citywide bus service to demonstrate the benefits of the charge to non-drivers. In pretrial polls, the majority of residents opposed the charge. After the trial ended, 52 percent of residents voted in favor of permanent congestion pricing (Harsman and Quigley, 2009). Firsthand experience with the benefits of the scheme appears to have tipped the scales in favor of a beneficial rule change that electorates worldwide have shown great reluctance to adopt.

In evaluating meta-rules, we need to be open minded and look at a broad range of alternatives. One that is little used now but could be revived involves designing entirely new systems and letting people who want to try the new system opt into it. Historically, the ability to move between countries in search of better opportunities — to vote with one's feet — was a powerful force for progress. While modern globalization offers greater mobility of capital, goods, services, and ideas, restrictions on the mobility of labor keep many people from leaving bad systems of rules for better ones. Moving forward, the effort to create new places with good rules and let people opt in could offer an important supplement to familiar democratic or authoritarian mechanisms.

New systems with opt in

What are some examples of new systems with opt in? Consider the way rules change within industries. IBM had a corporate culture, a rule set, that was great for selling mainframe computers to large businesses but was not the right rule set for selling personal computers or hand-held devices. Brand new organizations, like Apple, emerged with rule sets that moved computing to the consumer level. As the new rule sets proved successful, customers, workers, and technologies gravitated toward them. It was not just Moore's Law that gave us high-performance computers in our pockets. New entrants with new systems of rules that people could opt into led to this dramatic change as well.

Discount retailing in the United States offers another example. Before the 1960s, the rule sets used by department stores and variety or dime stores dominated retailing. Discount retailing, the notion that a store could retain elements of quality and selection found in department stores while offering goods at lower prices, began to take shape in the early 1960s. New entrants like Walmart came in with new rules for discount retailing. Target emerged as a special division — a skunkworks — of an existing department store retailer called Dayton-Hudson. Target illustrates that new rules come not only from start-up firms but also from autonomous divisions within existing organizations. Though still accountable to Dayton-Hudson, Target had the freedom to hire independently and create their own rules for discount retailing. Target experienced tremendous success as a skunkworks, eventually growing large enough to take over the entire company.

What would this mean for the larger governance structures that people live under? Accidents of history made Hong Kong a new system for political and institutional reform in China. The British administered this small piece of Chinese territory and many Chinese people opted into the new set of rules that prevailed there. Later, the Chinese government deliberately established the nearby city of Shenzhen, adopting rules similar to those that prevailed in increasingly prosperous Hong Kong.

Like Target, Shenzhen grew up as a special division within an existing organization. The city's administrators were accountable to the Chinese government, but the rules they enforced were very different from those that prevailed in other Chinese cities at the time. Notably, the rules in Shenzhen allowed foreign firms, people, and technologies to work and prosper with locals under the rules of a market-based economy. Many people chose to opt into the new rules in Shenzhen which grew very quickly from an area with very little population to an urban area of approximately 15 million people.

The challenge for Mexico

China's special economic zones demonstrate the potential in urbanization to create entirely new places, which were sparsely populated before, that could be operated under different sets of rules. The challenge for Mexico is to do something similar to drive changes in the rules within your existing system of governance. The white space on this image represents a piece of land the size of Hong Kong where, at urban densities, 10 million people could live and work.



Suppose Mexican leaders pick an essentially uninhabited piece of land of this size somewhere in Mexico, create a new set of rules, and allow willing participants to opt in. Changing the rules under current political process requires leaders to persuade and sometimes coerce people to change what they're doing. The potential for opt-in avoids the need for coercion or for consensus, and can therefore speed up the changes in rules. Might adding the new system and opt in approach give Mexico the opportunity to do things that it won't be able to do under the current political process for changing the rules?

For example, under the current system you may never be able to implement congestion pricing in Mexico City just as American leaders have until now failed to implement the policy in cities like New York and Chicago. Modifications to the democratic process like those used in Stockholm might eventually work, but they might not. After all, even after experience with the new system, the vote to approve congestion prices was very close. But a new city might that builds congestion pricing in to its traffic rules from the start will circumvent the electoral roadblock. Many people will be willing to move to the congestion free city even though they might not support congestion charges where they currently live.

How might a new city with new rules be administered? One possibility is a partnership with one or more foreign countries, similar to the Hong Kong arrangement between the British and the Chinese but one that is entered into voluntarily. Another option is more akin to the Chinese administration of Shenzhen. The new city could be an autonomous area with new rules that are administered by a city manager with strong executive powers. The city manager might have wide discretion in the pursuit of a mandate to oversee a safe and prosperous city, but he or she would ultimately be accountable to Mexico's elected leaders.

Modern central banks use this type of strong but accountable executive mechanism with a great deal of success. We give central bankers clear mandates on issues like price stability and banking regulation. We also give them wide discretion in pursuit of those mandates. Elected representatives don't have a say on the rules of monetary policy, but they do get to hold central bankers accountable for meeting mandates. In monetary policy this system for changing the rules has been extremely effective. Since the pessimism about inflation in the late 1970s, we made enormous strides as more countries adopted rules that specified an independent central bank with a strong but accountable executive. Central bank-like governance arrangements for new, well-run cities could encourage private financing of infrastructure, rapid urbanization, and a much more rapid economic transition toward manufacturing and services.

Just as there are many more technologies to discover, there are many more prosperity-inducing rules to discover and many existing good rules worth copying. The key challenge is to find meta-rules that encourage productive changes in Mexico's rule system — the types of changes that will allow you to keep up with or surpass the rest of the world. The chartering of new cities is an example of a meta-rule that can help Mexico to quickly adopt new rules in new cities — the growth of which can drive economic progress in the rest of the country.

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