

# Disruptive Innovation in America and China

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The concept of disruptive innovation arose from the study of innovation in companies, but it can also be applied to nations. In this essay I will use some of the concepts of disruptive innovation to analyze the dynamics of national innovation and growth in America and China.<sup>1</sup>

The United States is supposed to be the home of disruptive innovation, but Harvard Business School professor Clayton Christensen has identified two dilemmas that limit company investments in disruptive technologies. The innovator's dilemma arises when companies that invent a new technology cannot commercialize it because doing so would disrupt their existing business. The capitalist's dilemma occurs when companies refuse to make the risky investments needed for disruptive innovations because of high "hurdle rates" (required rates of return). These problems limit disruptive innovation in many parts of the American economy. The exception is the tech sector, where "new economy" companies face very different market dynamics. These companies operate in winner-take-all markets where the rewards of success are so enormous that venture capitalists compete with each other to fund risky start-ups.

China has circumvented these dilemmas by pioneering a new approach to global competition. This approach marries cheap labor (at least initially)

with foreign technology and high investment to develop competitive advantages in targeted industries. This strategy has allowed China to sweep the field of low-wage—and increasingly higher-value—manufacturing and achieve the fastest growth in history.

But this strategy has also reduced manufacturing-led growth in other nations, including the United States. In part, this is because China's approach, in key respects, has been the opposite of America's: China rejects high hurdle rates in favor of cheap capital and investment subsidies to maximize its total level of national investment. Indeed, consciously or not, China's strategy has been perfectly compatible with U.S. economic preferences, which prioritize short-term returns to shareholders, while China prioritizes the long-term development of its industry and increasingly advanced technologies.

## **High Hurdle Rates, Low Growth**

Most Americans are aware that U.S. growth and productivity gains have been slow since the Great Recession, but many are not aware that the slowdown began in the early 2000s. The problem was not falling corporate profits—profits rose. The problem was that many companies began to invest less of their earnings in human and physical capital that could raise productive capacity. Productivity growth dropped in 2004 and again after the Great Recession.

Why did this happen? There are multiple causal factors, but I will focus on one driver that has to do with disruptive innovation dynamics: high hurdle rates for new investments.

In the 1980s, the U.S. government began a systematic effort to deregulate finance, and U.S. companies began to modify their investment practices under the influence of the theory of shareholder primacy. Shareholder primacy encouraged companies to focus on maximizing returns to shareholders. The theory held that making companies focus more on shareholder profits would lead to higher national productivity and growth.

But this is not what has happened. A recent study by the U.S. Senate Project for Strong Labor Markets and National Development, led by Senator Marco Rubio, argues that excessively high corporate hurdle rates have “reduced private investment [which has contributed to] . . . slower economic growth, stagnant productivity growth, and less pay for workers.”<sup>2</sup>

In theory, corporate hurdle rates (required rates of return that proposed investments have to meet in order to be approved) should be related to the cost of capital. A company should make an investment if the return on invested capital (ROIC) exceeds the weighted average cost of capital (WACC). But this is not the way that American companies have been operating. The Rubio report quotes studies showing that “most large public companies use company hurdle rates between 6.5 and 7.5 percent above their ‘actual cost of capital.’” That means that a WACC of 8 percent could lead to a hurdle rate of 15 percent. At such a high required rate of return, companies will forgo many investments that would have created economic value. As the report says, “If a firm makes investment decisions using a cost of capital over the ‘real’ rate, then . . . the firm is under-investing, and so foregoing real future returns.”<sup>3</sup>

Why would firms set hurdle rates that are significantly above the cost of capital? The report suggests that a major reason is the incentive structure of the financial sector. Shareholders can generate returns through corporate share buybacks and other financial engineering methods over a relatively short horizon with very little risk. In order to be considered viable, therefore, new investments must be more attractive on a risk-adjusted basis than these financial engineering alternatives. And since investment in new innovations usually carries more risk over a longer time horizon, the expected return threshold for such investment is typically quite high and significantly in excess of the cost of capital.<sup>4</sup>

The Rubio report contrasts current U.S. business practices with the strengths of America's earlier model of "managerial capitalism" as described by business historian Alfred Chandler. Before shareholder primacy took hold, companies like Ford, General Electric, and DuPont did not focus on short-term returns, but on building the long-term competitive capacity that Chandler believed was critical to sustained productivity and profit gains:

The continuing productivity, competitiveness, and profitability of these enterprises and of the industries and nations in which they operate depend on constant reinvestment in order to maintain and improve product-specific facilities and to develop and maintain product-specific technical and managerial skills. A crucial theme of this history of the modern industrial enterprise is that creating and maintaining such capabilities is a continuing, long-term process—a process that requires sound, long-term perspectives from the decision-makers responsible for the health and growth of their enterprise.<sup>5</sup>

Christensen likewise believes that high hurdle rates have hurt long-term productivity. He furthermore distinguishes between “efficiency innovations” that reduce costs or cut jobs and “market-creating” or disruptive innovations that create jobs. Because efficiency innovation investments usually pay off quickly, they can often pass high hurdle rate tests. But because market-creating or disruptive innovations frequently require investments that take years to pay off and have high risks of failure, they often cannot. As a result, “companies invest primarily in efficiency innovations, which eliminate jobs, rather than market-creating innovations, which generate them.”

Christensen sees this as part of a larger problem. When American companies use high hurdle rates to ration investment, they are treating capital as a scarce asset. But in economic terms capital is not scarce; in fact, the world is “awash in capital.” Global financial assets have increased much faster than global output of goods and services, and the cost of borrowing is extremely low. This should produce lower hurdle rates and higher investment. But U.S. companies don’t treat capital that way, which limits the ability of capitalism to perform one of its basic social functions—encouraging Schumpeterian creative destruction and national economic advance. As Christensen says:

This, then, is the capitalist’s dilemma. Doing the right thing for long-term prosperity is the wrong thing for most investors, according to the tools used to guide investments. In our attempts to maximize returns to capital, we reduce returns to capital. Capitalists seem uninterested in capitalism—in supporting the development of market-creating innovations.<sup>6</sup>

## **Faang Exceptionalism**

If the capitalist's dilemma is such a big problem, how has Silicon Valley been able to produce so many successful companies (the faangs or the g-mafia)?<sup>7</sup> Do capitalists' dilemma constraints not apply to them? In fact, the answer is that they do not. To understand why, we have to dive deeper into the unusual business dynamics of these companies.

Some of the best insights into the faangs have been offered by venture capitalist Peter Thiel.<sup>8</sup> Thiel argues that most Silicon Valley companies begin as start-ups with a single business concept. Many start-ups compete in a given sector, but normally only one emerges to dominate it. The risk of failure at the start-up phase is therefore extremely high. This makes the race to break out of the pack intense—start-ups and their venture capital supporters often accept extensive losses in order to expand their number of customers rapidly.

They do this because of the unusual characteristic of network effects—the value of the product to each individual user increases as the number of users expands (often exponentially). The factors driving this phenomenon differ in each case: Microsoft's business software became the industry standard; Google had a superior search engine; Facebook built the preferred social media product. But in each case one company came to dominate the market and reap “winner-take-all” rewards. These dynamics are further reinforced by the low marginal cost of expansion for internet and software businesses. Once the initial infrastructure is in place, the cost of adding new users to the network, and the time it takes to scale the business, is relatively low, in contrast to manufacturing businesses, which require more capital to expand.

Thiel is quite clear that these network effect businesses often acquire substantial monopoly power. He sees this as a good thing. In addition to providing the necessary returns that make venture investing attractive, it helps companies develop new technologies quickly, spread them widely, and invest in further improvements.

Moreover, the Silicon Valley model avoids the innovator's dilemma. Established companies often have great difficulties investing in or commercializing disruptive innovations because doing so would cannibalize their existing business lines, require new business methods, or conflict with existing corporate cultures. To address these problems, Christensen recommends that companies put disruptive innovations in separate divisions or start new companies. Silicon Valley start-ups avoid this problem altogether by starting out as independent enterprises with a desire to disrupt the status quo.

Second, start-ups and their venture capital funders do have to worry about rates of return, expected payback periods, and risks of failure, but these concerns are much more easily met because of winner-take-all effects. The risks of failure are extremely high, but the rewards of winning—the prospect of monopoly returns—are so great that increasing amounts of capital flow to venture investors to chase these opportunities.

The economic dominance of the faangs suggests that the United States is well positioned for future economic and technological competition, as does America's strong record in leading innovation and the strength of our universities. These are real strengths. But the United States also has some weaknesses.

First, the technology innovations of the faangs have not led to broad-based changes in mainline American businesses. As Thiel has observed, we have seen innovation in the world of bits, but not the world of atoms. Integration of digital technologies into non-IT businesses is difficult to do. Deciding what corporate processes can most benefit from artificial intelligence, for example, requires knowledge of both the business and the technology. The challenges involved in this sort of innovation, moreover, have become more difficult because advanced manufacturing industries and skillsets have been offshored, as Harvard Business School professors Gary Pisano and Willy Shih have argued.<sup>9</sup>

Second, public funding for basic research is down. One of the keys to American leadership of the IT revolution was the high investment that the U.S. government made in basic research and technical education in the 1950s and '60s. This investment was made for national security reasons, but it produced many of the foundational technologies that gave rise to Silicon Valley. As MIT economists Jonathan Gruber and Simon Johnson have argued, there are hard economic reasons why private companies will not invest enough in basic research, and why fundamental research breakthroughs depend heavily on public funding.<sup>10</sup> The United States is still the leading funder of public research, but that funding is down significantly from its post-Sputnik peak of 2.0 percent of GDP. Today it is 0.7 percent of GDP and declining.<sup>11</sup>

## **Disruptive innovation in China**

When China began its reform and growth push in the late 1970s, it built on East Asian precedents, modified them to suit its needs, and pioneered a new

approach to foreign investment.

In some areas, China's post-Mao leaders followed in the footsteps of East Asian predecessors. Like Japan, Korea, Taiwan, and others, China embraced state activism, industrial policies, and mercantilism. But China also modified the East Asian model. First, it relied more heavily on cheap labor as its main source of competitive advantage. Second, it took the East Asian practices of high savings and investment further. Investment levels in most of the "Asian Tigers" were in the range of 25–35 percent of GDP at their peaks, but China's investment reached an incredible 35–45 percent of GDP.

These incremental innovations might have allowed China to achieve fairly strong catch-up growth. But the key to China's hyper-growth—the main factor that has put it in a different league—has been its unique approach to foreign technology. China's leaders made a critical decision to welcome foreign investment at the very start of Deng Xiaoping's growth push. This was a major departure from the paths that Japan and Korea had taken (both had blocked foreign investment).

Surprisingly, China's leaders were able to agree on this policy without a great deal of debate. Why? One reason was that it was not a direct challenge to Communist Party ideology. Decisions about domestic economic reforms were contentious, but foreign investment was viewed in more instrumental terms. China had long had an interest in acquiring foreign technology (going back to the Soviet period), and foreign investment was one way to do that. China's leaders were also still attracted to Mao's idea of a great leap forward. They saw foreign investment as helping to achieve that—as

suggested by the label they adopted: “foreign leap forward” (sometimes translated as “Western leap forward”).<sup>12</sup>

The new model began to produce benefits quickly. Very soon after China opened its borders, investors from Hong Kong and elsewhere in Asia began manufacturing operations in Shenzhen, which allowed the region to make very rapid gains in exports (doubling every year). The benefits grew as regional investment expanded along the coast, driving many of China’s gains in manufactured exports. It is hard to say how fast China would have grown without the foreign component. Its reforms in agriculture and township and village enterprises would have brought some growth, but the foreign-assisted export sector was key. It helped China increase the pace at which it moved workers from farms to factories, dramatically increasing productivity.

## **China’s Growth After WTO Accession**

China’s growth was strong in the 1980s and ’90s, but the vast majority of China’s gains in total GDP have come since 2001, when China joined the WTO. American policymakers were quite supportive of China’s accession to the WTO and imposed few conditions on U.S. support for it. Because WTO accession would require China to reduce its tariff barriers, many claimed it would produce one-sided gains in favor of the United States. China saw the WTO in very different terms, however: it would use the WTO seal of good housekeeping to launch a more aggressive push in manufactured exports and to tap the interests of foreign companies in helping it do it.

China reduced its tariffs as required, but in these early years it substituted an undervalued currency that effectively penalized imports and subsidized exports. It also used every tool in its tool kit to subsidize investments and exports, maximize acquisition of foreign technology, and dominate low-wage manufacturing.

China was greatly assisted in this process by the eagerness of American and other Western companies to invest in China. Western investment had begun to tick up in the 1990s, but went into overdrive after 2001. The companies had two motivations: to get in on the ground floor of China's expanding domestic market and to use China as a base of production for labor-intensive phases of their value chains for exports.

The second function was facilitated, on the one hand, by fundamental changes in technology and, on the other, by the growing prevalence of shareholder-oriented corporate management. New developments in information technology and communication made it possible for Western companies to locate different phases of their value chains in different countries.<sup>13</sup> As a result, it became much easier for companies to offshore labor-intensive phases of their production, which they did with enthusiasm. American companies were particularly keen to offshore because it helped them respond to increasing pressure from shareholders to reduce capital intensity and increase returns.

In British economist Richard Baldwin's account, Western offshoring could have gone to many low-income countries. But in practice the vast majority of it went to China, because China had a manufacturing base, was a low-cost producer, and made it easy for foreign investors to enter into

advantageous partnerships. Offshoring required Western companies to send technology to China to make advanced production processes work. This meant that China dominated a new synthesis of its cheap labor and Western technology, which boosted its economy to another level. Foreign technology not only helped China increase the dollar-denominated value of its exports fivefold from 2001 to 2007, but also raised the technology level of those exports.<sup>14</sup> This helped China achieve fast productivity gains and rapid industrial upgrades.

## **A Whole-of-Nation Strategy**

China also used joint venture requirements, forced technology transfers, intellectual property theft, an enormous overseas scholarship program, and other methods to boost the movement of technology and manufacturing from Western nations to its own shores.

Western companies who wanted to invest or sell into China often had to comply with joint venture requirements and accept forced technology transfers. The companies were often willing to make these major technology concessions in return for short-term benefits (again to satisfy shareholders). China has also been the world's leader in the theft of Western intellectual property and business secrets for commercial purposes. It has sent thousands of students to Western universities in technical disciplines, and China has become a great advocate of technical cooperation, shared research, and research labs that cross national boundaries, which has allowed it to gain access to Western knowledge.

Furthermore, China has been highly adept at adapting foreign technologies to local needs. According to business analysts Dan Breznitz and Michael Murphee, Chinese companies for the most part don't try to compete with Western companies at the cutting edge of technology; instead, they specialize in products that are "one step behind."<sup>15</sup> They focus on process improvements that make them more efficient partners in multinational production or allow them to produce lower-cost versions of goods that are more suitable for markets in China and other emerging-market countries. Chinese companies have achieved great success by creating local versions of products that offer 80 percent of the value at 50 percent of the cost.

Finally, China has taken a radically different approach to public and private investment. First, it treats public investment in research and technical education as an instrument of national economic and security strategy. It has been steadily increasing this investment and focusing much of it on critical technologies such as quantum computing, robotics, and genetic engineering.

Second, China completely rejects the American model of high corporate hurdle rates. In the Chinese view, the purpose of capital is to not to ensure high rates of return on individual investments, or maximize value to individual shareholders, but to maximize the total volume of investment—because that maximizes the pace of industrial advance. To maximize the volume of investment, capital should be cheap or free, or even provided by the government. Chinese provincial and local governments regularly give favored investors free land, low-cost loans that may not have to be paid back if the business fails, and favorable treatment in government procurements. They are aggressively subsidizing corporate investment.

China is also willing to front-load the costs of getting a new industry started if it views that industry as important for future growth. For example, the government has extensively subsidized electric vehicle development, including public funding of a charging station network in advance of market demand, a Chinese version of “if you build it, they will come.”

These practices depart radically from Western norms, but they have been highly effective in promoting rapid industrial advance. The combination of strong productivity gains, boosted by foreign technology, and extremely high investment has been a powerful one-two punch.

The results have been world-beating. From 2001 to 2013, foreign direct investment (FDI) inflows to China rose 300 percent, China’s share of global manufacturing rose 400 percent, and China’s exports increased 500 percent. From 2001 to 2016, China increased its share of global manufacturing value added from 6 percent to 26 percent, overtaking the United States and the European Union to become the largest manufacturer of goods in the world.<sup>16</sup> According to investment banker Stewart Paterson, “In the first decade of the century, an additional 205 million people moved from the countryside to urban areas. Wages would rise twelvefold over the coming fifteen years.”<sup>17</sup>

Experts believe that foreign investment has been responsible for a large share of China’s hyper-growth. For example, business analyst Michael Enright estimates that foreign investors and foreign-invested enterprises accounted for 33 percent of China’s GDP and 27 percent of its employment in 2013.<sup>18</sup> The new model combined China’s cheap labor and willingness to invest in a strong manufacturing base with the cutting-edge technology, skills, and

marketing of Western companies. China did suffer minor disruptions from this strategy—letting foreign companies sell in China made it harder for local companies to compete. But China reaped compensating benefits in joint ventures and forced technology transfers that were worth much more. Overall, the strategy has been almost pure gain for China.

## Others Have Paid

The same cannot be said for the rest of the world. If China has transferred technology and manufacturing from Western nations to itself, the implication is that Western nations have suffered losses. How great are those losses? Economists have offered different views. Many in the neoclassical tradition have argued that the costs to the West have not been that large, while others say that the costs have been quite high. The latter group includes Richard Baldwin, who says of offshoring:

The result was a quite sudden and massive deindustrialization of the advanced economies. . . . Industrialization took a century to build up in advanced economies. Deindustrialization and the shift of manufacturing to emerging nations took only two decades. . . . [Western] workers no longer had privileged access to the know-how developed by their national firms. The monopoly that advanced-economy workers used to have on advanced-economy technology was broken.<sup>19</sup>

Investment banker Stewart Paterson agrees. He argues that “economic engagement with China from 2001 onwards led to a rapid and dramatic deterioration in the real earning power of workers in the developed world.

There has not been a period in which median earnings in the developed world have been so stagnant for so long since the Victorian Age.”<sup>20</sup>

These negative impacts on Western manufacturing are now increasingly discussed, but the negative effects on industrial advance in developing nations have received much less attention. China likes to portray itself as a champion of the developing world, but the economic reality is that its dominance of low-wage manufactured exports and of Western offshoring has been so complete that it has been difficult or impossible for other developing nations to develop their own industries. The “China price” is so low that other producers cannot compete. If manufactured exports are the “growth escalator” for poor countries wanting to advance, China has crowded other developing nations off the escalator. They have been forced to rely on commodity exports, often to China, which may boost their growth for a while, but which often lead to overvalued currencies when commodity prices are high, and to recession when commodity prices fall.

## **The New Game**

These impacts have not been totally of China’s making. China made wise choices to encourage investment and acquire foreign technology, but the full power of its strategy came later when its policies were buttressed by external developments: the shift in value chains, the Western decision to admit China to the WTO with few conditions, and the aggressive pursuit of offshoring by Western companies, encouraged by a narrow focus on shareholder value.

Where are China and America headed in the future? I will offer three predictions.

First, China's hyper-growth is likely over. China's growth has slowed since the Great Recession and is likely to decline further because of aging, rising wages, and high corporate debt. China's leaders also know this, however, which further motivates their efforts to achieve homegrown technological dominance, as exemplified by the Made in China 2025 strategy, which calls for developing global champions in key advanced industries.

Second, China will continue to benefit from technology flows from America and other Western nations. American companies will continue to want to both sell their products and maintain production in China. Some politicians are rethinking these involvements because of the threats to critical technologies posed by the Made in China 2025 strategy and other tensions, but corporate leaders, and shareholders, have no interest in a mass exodus. China will also continue to benefit from the openness of Western institutions.

Third, the challenges that Chinese companies pose to Western companies, including tech companies, are likely to increase. Chinese companies can be expected to push further with their strategies of producing goods with 80 percent of the value at 50 percent of the cost, which will put them in an advantageous position to serve the expanding customer bases of emerging market nations that are expected to lead future global demand. Chinese companies will also likely be the dominant providers of core infrastructure technologies worldwide, such as 5g components, and this will boost their companies further up the value chain. Meanwhile, unless significant reforms

are undertaken to alter incentives for U.S. companies and financial institutions (as well as increasing government research), the U.S. will likely continue to underinvest in new innovations and domestic industry.

As Christensen has argued, challengers who come up from the low-cost end can be powerful competitors, and incumbents often don't see these new threats coming.

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The views expressed in this article are the author's own and are not the official views of National Defense University.

<sup>1</sup> I am using the term disruptive innovation in the general way that it is often used in popular discourse, rather than the precise technical definition that Clayton Christensen had in mind when he coined it. Christensen's concept applied to new producers who enter markets from the low-cost end with products that are initially of inferior quality but whose quality improves over time, allowing them to take increasing market share from the market leaders. For example, in the American steel industry, mini-mills took market share from the integrated steel mills. In looking at the United States I will use the term disruptive innovation in its more popular sense to refer to new technologies or new business models that transform old orders. In the case of China I will use the term in a broader sense to examine China's innovative approach to foreign investment and its disruptive consequences.

<sup>2</sup> *American Investment in the 21st Century*, Project for Strong Labor Markets and National Development (May 2019), 12.

<sup>3</sup> *American Investment in the 21st Century*, 30.

<sup>4</sup> *American Investment in the 21st Century*, 24.

<sup>5</sup> *American Investment in the 21st Century*, 38.

<sup>6</sup> Clayton Christensen and Derek van Bever, “[The Capitalist’s Dilemma](#),” *Harvard Business Review* (June 2014).

<sup>7</sup> The faangs refer to Facebook, Apple, Amazon, Netflix, and Google. Some prefer the less well-known g-mafia label (Google, Microsoft, Amazon, Facebook, IBM, and Apple).

<sup>8</sup> Peter Thiel and Blake Masters, *Zero to One: Notes on Startups, or How to Build the Future* (New York: Crown, 2014).

<sup>9</sup> Gary P. Pisano and Willy C. Shih, *Producing Prosperity: Why America Needs a Manufacturing Renaissance* (Boston: Harvard Business Review Press, 2012).

<sup>10</sup> Jonathan Gruber and Simon Johnson, *Jump-Starting America: How Breakthrough Science Can Revive Economic Growth and the American Dream* (New York: Public Affairs, 2019), 85–111.

<sup>11</sup> Gruber and Johnson, 8.

<sup>12</sup> Julian Baird Gewirtz, *Unlikely Partners: Chinese Reformers, Western Economists, and the Making of Global China* (Cambridge: Harvard University Press, 2017), 33.

<sup>13</sup> Richard Baldwin has written two books on the subject: *The Great Convergence: Information Technology and the New Globalization* (Cambridge: Belknap, 2016) and *The Globotics Upheaval: Globalization, Robotics, and the Future of Work* (New York: Oxford University Press, 2019).

<sup>14</sup> Stewart Paterson, *China, Trade and Power: Why the West's Economic Engagement Has Failed* (London Publishing Partnership, 2018), 42.

<sup>15</sup> Dan Breznitz and Michael Murphee, *Run of the Red Queen* (New Haven: Yale University Press, 2011).

<sup>16</sup> U.S. Library of Congress, Congressional Research Service, *U.S. Manufacturing in International Perspective*, by Mark Levinson, R42135 (2018), 3.

<sup>17</sup> Paterson, *China, Trade and Power*, 3.

<sup>18</sup> Michael Enright, *Developing China: The Remarkable Impact of Foreign Direct Investment* (Abingdon: Routledge, 2017), 3.

<sup>19</sup> Baldwin, *The Globotics Upheaval*, 65–68.

<sup>20</sup> Paterson, *China, Trade and Power*, 85–86.

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