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Sectoral Policies to Drive Productivity Growth

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Productivity growth is the most important factor in economic performance, yet economists and policymakers give it little attention. It is time to develop a national productivity strategy with sector-specific analyses and policies at its core.

KEY TAKEAWAYS

- Without robust productivity growth, strong across-the-board income growth is almost impossible. Since markets acting on their own will underperform, nations need explicit, well-thought-out productivity policies that include a sectoral focus.
- There are more than 850 U.S. industry categories, so any sectoral productivity policy needs to start with an industry typology. Four keys are: firm size, competitive forces, internal incentives, and technological opportunities.
- Industries with smaller firms face productivity challenges. Government can either induce consolidation to achieve economies of scale or help firms boost productivity, as NIST's Manufacturing Extension Partnership does with small manufacturers.
- Many industries operate in competitive markets where they have strong incentives to boost productivity. But some operate in environments where these forces are considerably muted, often because government provides shelter.
- Industries have different incentives to increase productivity. There are three main types of limitations: 1) firms controlled by workers (e.g., law firms or realtors); 2) firms with strong union representation, and 3) government organizations.
- Given current technologies, industries also have differing potentials to drive productivity by upgrading or transforming. Government's R&D and technology strategies for boosting productivity should be informed by these sectoral realities.

FORWARD

Before doctors treat patients, they identify key attributes, such as gender, age, and weight. But economic "doctors" assume all "patients" are the same: They (businesses) all seek to maximize productivity and profits. In reality, industries differ in critical ways. It follows that if a nation wants to develop an effective productivity policy to boost per-capita income growth, it should start with a sophisticated understanding of how industries differ and thus which policies will be most effective in driving productivity improvements. Toward that end, this report develops and describes a typology to classify industries into different types, each deserving its own unique set of productivity policies.

WHY A PRODUCTIVITY POLICY?

Before having a discussion of sectoral types, it's first worth noting that few nations—and certainly not the United States—have an explicit productivity policy. Economist and pundit Paul Krugman got it right when he wrote, "Productivity isn't everything, but in the long run it is almost everything."[1] He then concluded: "So what are we going to do about productivity growth? Nothing." In other words, he reflected the standard view among economists that governments can do little to raise the long-term per-capita income growth rates—and certainly not by instituting an explicit productivity policy.

In part, this is because, as Canadian economist Don Drummond argued:

> Public aversion to the concept of productivity is so intense that government officials dare not refer to it by name ... Canadian governments react to the public's misunderstanding, even fear of productivity, by borrowing a concept from Harry Potter. Just as Lord Voldemort must be referred to as "He-Who-Must-Not-Be-Named" or the "Dark Lord" so must "productivity" be globally replaced by "innovation" or "competitiveness."[2]

Nonetheless, Krugman is right, in the long run, productivity is almost everything. And given that the U.S. economy is in the midst of a more than decade-long productivity-growth drought, perhaps it's time to name the "Dark Lord" and start thinking about specific actions the federal government can take to raise productivity.

To be effective, any national productivity policy needs to be grounded in sector-based productivity analysis and strategies.

Most economists hold that to the extent governments should promote productivity, the main, or even only thing to do is to remove barriers and fix policy failures so firms can react to more accurate price signals. This passive framework ignores the complexity and enterprise-like nature of economies, which require strategic productivity policies. As the Information Technology and Innovation Foundation (ITIF) argued its report "Think Like an Enterprise: Why Nations Need Comprehensive Productivity Strategies," any effective productivity policy needs to embrace four key components. The first is incentives, including tax policies, to encourage organizations to adopt new "tools" to drive productivity. The second is policies to drive the advance and take-up of systemic, "platform" technologies that accelerate productivity across industries. The third is a

research and development (R&D) strategy focused on spurring the development of productivity-enabling technologies such as robotics.

The fourth, and the subject of this report, is sectoral productivity policies that reflect the unique differences between industries.[3] To be effective, any national productivity policy needs to be grounded in sector-based productivity analysis and strategies. To counter the immediate howls of "picking winners" and "industrial policy," sectoral productivity strategies are about analyzing opportunities and constraints by industry and understanding what policy can do to improve the productivity of all industries. This requires the development of typologies to classify industry. It is not about picking particular sectors as favorites.

INDUSTRY TYPOLOGY FACTORS AND PRODUCTIVITY POLICY

Given that there are over 850 different U.S. industries (at the six-digit NAICS code level) any sectoral productivity policy needs to start with an industry typology. This report suggests four key factors to differentiate industries when it comes to considering productivity policy. (See table 1.)

Firm Size

Industries differ in terms of average firm size. For example, the average U.S. automobile manufacturing firm employs 450 workers, and the average construction firm just 8. This matters because firm size plays a significant role in not only determining productivity (larger firms are generally more productive) but also in determining the capability of firms to boost productivity through their own independent actions. In industries with very large firms, those companies not only have considerable resources to drive productivity, but sometimes play either a lead-adopter or coordinating role to ensure that systems for suppliers are optimized. There is seldom such coordination in atomized industries.

On average, larger firms are more productive than smaller firms. Thus, there are two opportunities related to increasing productivity in industries characterized by small firms. The first is to encourage an increase in average firm size, either through mergers and acquisitions or the loss of market share of smaller firms to larger firms. For example, the history of "unit banking" laws that protected small local banks from competition by outlawing branch banking among states, and sometimes among cities within a single state, shows that compared with other nations, America still suffers from too many small banks.[4] But even with the number of banks falling by more than half, bank economies of scale have still not been exhausted. As the Federal Reserve has found, even the largest banks face increasing returns to scale in terms of cost, meaning as they get larger, their cost per customer and dollar deposited go down.[5] Per the Fed, "Our results suggest that capping banks' size would incur opportunity costs in terms of foregone advantages from IRS [increasing returns to scale] in terms of cost."[6] Other studies have found similar results.[7] Regulators could ensure that banking laws don't favor small banks over large, support mergers involving small and mid-size banks being bought, and let small banks go bankrupt.

We see a similar dynamic in telephone and utility companies. There are around 3,300 electric utilities (1 for every 37,000 households) with an average of 45 workers per establishment, and around 1,300 phone companies.[8] Regulations help maintain this size structure. State public utility commissions often limit acquisitions of in-state smaller electric utilities, while the Federal Universal Service Fund props up small, inefficient telecommunications providers.

To be clear, this is not a choice between completely atomized industry structures and monopolies. Rather, in industries in which there are still considerable economies of scale and scope to take advantage of, government policy should remove barriers to combination and, wherever possible, support increases in scale. As Michael Lind and I wrote in *Big Is Beautiful: Debunking the Myth of Small Business*, ensuring that policies are size neutral—for example, ensuring that small firms pay the same tax rate as large firms and face the same regulatory obligations would help move the economy toward a more-efficient firm-size structure.

For sectors characterized by small, low-wage/low-productivity firms, government should do more to facilitate collective action as a way to help firms overcome some of the limitations of their small size.

There are industries wherein it is not economically efficient for firms to grow much in size. For these industries, there are two possible paths. One is for technical assistance to be provided in order to help these firms adopt new technologies and other practices (including workforce training) in an effort to boost productivity. This is the concept behind the Department of Agriculture's Co-op Research and Extension Services program and the National Institute of Standards and Technology (NIST) Manufacturing Extension Partnership (MEP) program.[9] Funding for both programs should be increased and the Department of Commerce should examine whether other industries (such as construction) could benefit from a similar program.

For other sectors characterized by small, low-wage/low-productivity firms, government should do more to facilitate collective action as a way to help firms overcome some of the limitations of their small size. The Small Business Administration should operate a Small Business Board program that provides matching grants for states to launch pilot projects in the least-productive, lowest-paying, non-traded service sectors. Projects could focus on joint technology sharing; R&D collaboration; production technology modernization; marketing; vocational training; health insurance and retirement plans; and more.[10]

Competitive Forces

Industries differ in the extent to which they face competition. This has less to do with industry concentration ratios and more to do with the ability of consumers to make informed and demanding choices and with the actual structure of the industry. In this sense, it's more about Michael Porter's Five Forces model that should determine firm strategy.[11] For Porter, these forces are 1) competition in the industry, 2) potential of new entrants, 3) power of suppliers, 4) power of customers, and 5) threat of substitute product.

Many industries operate in competitive markets in which they have strong incentives to boost productivity. But some industries operate in environments where these forces are considerably muted, often through government policies sheltering the industry and its firms from the forces. And industry concentration is not always the determinant force. For example, the airline industry has become more concentrated, but the major firms face intense pressure to cut costs through productivity gains, in part because of the power of customers who can easily compare prices and many of their costs (e.g., buying and flying airplanes) being relatively fixed over the medium term.[12]

Some industries use government to limit competition. A case in point is the automobile-dealer industry. Auto dealers have lobbied state legislatures for protection from auto manufacturers

selling directly to consumers.[13] Likewise, beer, wine, and spirits wholesalers are protected from direct sales from producers. Optometrists have long opposed rules to make it easier for consumers to get contact lenses from other sources, such as online sellers.[14] Some states require attorneys to be involved in real estate closings. In most cases, Congress should overrule these state and local protectionist laws, either by passing national legislation, as it did with Contact Lens Prescription Release Act, or by tying federal aid to states and cities to eliminate the regulations.

The goal of policy should be to enable consumers to make effective choices in markets, thus increasing the pressure on firms to compete and raise productivity.

In other industries, firms collectively control key infrastructures and use that control to limit more efficient, often Internet-based competitors. Some industries, such as real estate and optometry, control key factors (the multiple-listing service (MLS), and the requirement for lenses to be provided with a prescription). All else equal, policymakers should attempt to provide consumers with more information to make better choices, and to limit the ability of incumbents to stifle entry.[15] In real estate, antitrust regulators at the Department of Justice (DOJ) and the Federal Trade Commission (FTC) should investigate whether MLS actions to block data from online listing companies are collusive and exclusionary, and state policymakers should require brokers to provide open access to their real estate listings. In the financial services sector, the Consumer Finance Protection Bureau (CFPB) should establish guidance for financial institutions to allow third parties to access customer data, securely and with customers' permission, through open APIs (application programming interfaces).

Other industries, such as health care and higher education, have less motivation to increase productivity, in part because consumers have considerable difficulty accurately assessing quality and seldom pay full costs. For example, the National Survey of Student Engagement by the Pew Trusts gathers annual data on America's 1,300 colleges and universities, measuring critical factors related to learning and learning opportunities.[16] But due to an agreement with schools, Pew does not release the information to the public. While schools have access to the data in order to gauge how they compare to other schools, parents, guidance counselors, and students do not. Making such surveys public would reward high-performing schools and hold poor performers' feet to the fire.[17]

The goal of policy should be to enable consumers to make effective choices in markets, thus increasing the pressure on firms to compete and raise productivity. This means limiting laws that deter entry, and providing consumers with more information to make better choices.

Internal Incentives

Industries differ in terms of the intensity of internal incentives to increase productivity. There are three main types of limitations: 1) firms controlled by workers, 2) firms with strong union representation, and 3) government organizations. In addition, there are external dampers on companies abilities to boost productivity, often imposed by government.

For-profit industries wherein a firm is controlled by the owner or professional manager have considerable incentives to raise productivity. They only experience an upside from boosting productivity—higher sales and higher profits—while any negative effects are borne by workers.

But some industries are controlled more by the workers themselves, making them sometimes less supportive of productivity growth. These include industries such as accounting, law, medicine, real estate, and higher education. In these industries, higher productivity means fewer professionals, including professionals who make key decisions. For example, this is a key reason why universities have fought so hard against massively open online courses. While they mean lower tuition for students, they also mean fewer professors—and professors exert considerable power over university decision-making.

For these industries, policy should ensure that their influence on restrictive regulations is limited. At the same time, government can provide incentives for industries not to resist technological change. Case in point would be higher education aid, which should be more generous for institutions that allow and encourage students to get credits using massively open online course. An even bolder proposal would be for federal policy to encourage the separation of learning and credentialing.[18] Similarly, the federal government should continue to push back against efforts by the real estate industry to limit online real estate companies, while legislatures and administrations should support allowing online provision of a wide array of goods and services, including law, contact lens sales, and others that will boost industry productivity.

Government can provide incentives for industries not to resist technological change.

Some industries can be hindered by unions in their ability to raise productivity. For example, in some shipping ports, unions have successfully fought to limit automation as a way to protect jobs, such as with the U.S. International Longshoremen's Association long resisting the move to containerization and having recently stated that its members would not service automated vessels operating without crews.[19] Here, governments should counter union efforts that are firmly against automation, and instead encourage companies to engage unions in how automation should be introduced and how affected workers might actually be supporters.

Overall, government enterprises have limited incentives to raise productivity. In some cases, unions oppose change. In other cases, managers resist because of fear of change or job loss. Agency heads seldom get rewarded for productivity gains, and often are punished by appropriators in the form of budget cuts. Both administrative and legislative bodies should focus on how to consistently cut costs through productivity.

Finally, even in industries where firms have strong incentives (and capabilities) to boost productivity, some face external barriers or hurdles, sometimes imposed by government. For example, the Federal Railroad Administration is considering preventing freight rail companies from moving to one-person crews, even though new technology can enable this to be done safely and it would boost productivity.[20] In other cases, cities have banned or limited productivity-enhancing technologies such as self-checkouts at grocery stores, sidewalk delivery robots, and cashless stores. A robust sector-based productivity strategy would identify all these externally imposed limitations and seek to remove them.

Technological Opportunities

Finally, industries differ in terms of the potential for technological upgrade or transformation to drive productivity, given existing technologies in the development pipeline. There appear to be few technological opportunities to improve the productivity of the hair salon industry, for

instance. Absent either drugs that slow hair growth or artificial-intelligence-enabled robotic barbers, the sector's productivity growth is likely to remain constant. In contrast, technological opportunities for improving productivity of home construction (e.g., 3D printing) and the postal service (e.g., robotic delivery) appear promising.[21] In general, because of the emergence of a new, broader IT-based technology system, which includes sensors, new connectivity such as 5G, autonomous systems, and artificial intelligence, more sectors now have greater technological opportunities to boost productivity.

For example, agriculture has long been a dynamic sector with increasing productivity. But existing and emerging technologies could enable that process to continue. Investments in robotics to pick vegetables, fruit, and other crops that require manual labor would boost productivity. Continued improvements in genetically engineered seeds would do the same. Vertical farming technologies could hold promise. As could e-commerce and data analytic applications to help farmers better use data.[22] Construction is another example, wherein improvements in digital design tools, 3D printing and other technologies could revive stalled productivity growth. (See case study of the construction industry below).

Overall, government's R&D and technology strategies should be informed by sectoral opportunities to boost productivity.

Table 1: Selected industries by type

Industry	Size	Competitive Forces	Incentives	Tech Opportunity
Fruit and Tree Nut Farming	Medium	Strong	Strong	Medium
Oil and Gas Extraction	Medium	Strong	Strong	Medium
Residential Building Construction	Small	Strong	Strong	Medium
Basic Chemical Manufacturing	Large	Strong	Strong	Medium
Machine Shops	Small	Strong	Strong	Medium
Semiconductors	Large	Strong	Strong	Medium
Motor Vehicle Manufacturing	Large	Strong	Strong	Medium
Beer, Wine, and Alcohol Wholesalers	Medium	Weak	Strong	Low
Automobile Dealers	Medium	Weak	Strong	Low
Grocery Stores	Medium	Strong	Strong	Moderate
Electric Power Distribution	Small	Weak	Strong	Low
Department Stores	Large	Strong	Strong	Medium
Scheduled Air Transportation	Large	Strong	Strong	Low
Rail Transportation	Large	Strong	Strong	Medium
General Freight Trucking	Small	Strong	Strong	High

Industry	Size	Competitive Forces	Incentives	Tech Opportunity
Postal Service	Large	Weak	Strong	High
Software Publishers	Large	Strong	Strong	High
Wired Telecomm Carriers	Large	Strong	Strong	Medium
Depository Credit Intermediation	Small	Strong	Strong	High
Offices of Real Estate Agents and Brokers	Small	Strong	Weak	Medium
Legal Services	Small	Strong	Weak	High
Waste Collection	Small	Strong	Strong	High
Direct Title Insurance Carriers	Small	Weak	Strong	High
Colleges, Universities, and Professional Schools	Large	Weak	Weak	High
Administration of Social Service Programs	Medium	Weak	Weak	Low
Offices of Optometrists	Small	Weak	Weak	Low
Offices of Physicians	Small	Weak	Weak	Low

Case Study of the Construction Industry

To understand how such a sector-based analysis might work, consider the construction system. The U.S. construction industry accounts for about 4.5 percent of gross domestic product (GDP), but the construction system (lumber and wood products, architecture services, real estate sales, etc.) is much larger.

Over the last 40 years, U.S. construction industry productivity has actually declined. Many aspects of the industry limit productivity improvement. First, the industry lacks scale. According to the National Academy of Sciences, in 2009, 98 percent of U.S. construction firms had fewer than 100 workers and these smaller firms employed 79 percent of construction workers. In part because of that lack of scale, the industry invests little in R&D, about 1/25th the rate of the broader manufacturing sector. Not only are firms small, they are also generally not horizontally integrated, as different firms deal with different aspects of the system (design, planning, development, engineering, construction management, construction operations), and within construction, even more sub-specialization. This makes developing and deploying shared tools difficult. For example, much of the industry involves communication among designers, contractors, suppliers, and construction workers. Often costs and delays are added as construction managers wait for crews, materials, or supplies that are sometimes stored in the wrong place. A National Academy of Sciences report cites "25 to 50 percent waste in coordinating labor and in managing, moving, and installing materials."[23] Another study finds that "interoperability, the goal of which is to seamlessly integrate systems capable of exchanging and interpreting data among members of the design and construction teams, causes losses of between $15.6 and $36 billion per year."[24] However, emerging technologies such as the Internet

of Things could play a key role by enabling everyone in the industry to know where everything is at any time.

An effective national productivity policy needs to be based on an analysis of individual industries and, when appropriate, broader production systems. However, because these inefficiencies occur at the industry and system levels, as opposed to just the firm level, the market is at best a weak mechanism to address these issues. As one study notes, "Once the industry begins to recognize how everyone in the process pays a price for permitting incomplete and uncoordinated design documents, we can start to address the imminence of how new technology will bring greater efficiency and profitability to the entire industry."[25] Taking full advantage of these technologies, though, would require interoperable standards and overcoming chicken-or-egg issues. Why, for example, would construction managers and workers have devices such as wireless tablets if no materials can be kept track of electronically?

Second, the industry has relatively weak incentives to improve productivity, in part because customers tend to be relatively unsophisticated, buying buildings only infrequently. As Barry LePatner wrote in *Broken Buildings, Busted Budgets: How to Fix America's Trillion-Dollar Construction Industry*,

> Contractors have every incentive to bid low on a project to get the job. Because the business is highly competitive at the bid stage, most firms know that their low bid will not return an adequate profit. But after a contractor is awarded a contract, the situation changes radically. The contractor then becomes a monopolist, who will attempt to recoup through change orders the profits denied it by the bid process. This explains the pervasiveness of mutable-cost (open-ended) contracts. Owners realize that, even with a seemingly straightforward fixed-price contract, once they are embroiled in construction, they have few good options but to pay up in order to keep the project moving ahead so as not to incur even greater delays and costs. The industry is caught in this unvirtuous cycle.[26]

Finally, there is significant variation in building codes, permitting processes, and construction-related regulations, usually at the state and local levels. This variation makes it difficult to develop products and solutions that can gain national scale, including more use of prefabrication.

But this is not William Baumol's string quartet industry example wherein productivity gains are difficult. In reality, opportunities for productivity improvements that firms are not now taking advantage of appear to be ample. The National Academies of Sciences identifies five key areas for improvement, including 1) widespread deployment and use of interoperable technology applications; 2) improved job-site efficiency through more effective interfacing of people, processes, materials, equipment, and information; 3) greater use of prefabrication, preassembly, modularization, and off-site fabrication techniques and processes; 4) innovative, widespread use of demonstration installations; and 5) effective performance measurement to drive efficiency and support innovation.

Indeed, given advances in information technology (IT), the industry is ripe for transformation. It is easy to imagine a system whereby architectural plans are prepared using computer-aided design software, sent to various factories where the parts are made and partially assembled by

automated machines, shipped to site in a just-in-time basis, and finally assembled by workers using highly automated equipment.

Without a construction system productivity agenda, however, system productivity will lag behind potential productivity. Government can play a key role in helping to increase construction system productivity by using three main policy approaches: public procurement to drive competition and change, support for precompetitive industry R&D, and the streamlining and aligning of regulation.

Any construction productivity effort should start with a national construction productivity strategy. For example, in response to anemic productivity growth in the industry, the United Kingdom established its Government Construction Strategy in May 2011. In the United States, no national government entity has the mission to examine and work to improve construction system productivity. If it were given a new, more proactive mission, as well as funding to support it, NIST could play this role.

In many nations, because government is the largest purchaser of construction services, how government buys services can help move the industry in particular directions. For example, the United Kingdom and the European Union have developed a public procurement directive that requires the use of building information modeling (BIM) software. Among other things, the U.K. construction strategy report announces the government's intention to require collaborative 3D BIM (with all project and asset information, documentation, and data being electronic) on its projects by 2016. BIM has been shown to help integrate operations and boost efficiency. About two-thirds of surveyed contractors stated that BIM had improved labor productivity, one-third of which said that productivity increased by 25 percent.

Government can play a key role in helping to increase construction system productivity by using three main policy approaches: public procurement to drive competition and change, support for precompetitive industry R&D, and the streamlining and aligning of regulation.

But procurement can also help in another way: to help drive more competition and, by extension, scale. As LePatner noted,

> The industry relies so heavily on change orders and cost overruns it has little incentive to boost productivity. If governments engaged in contracts that had strong fixed price bids, it would not only provide stronger incentives for firms to boost productivity in order to meet bid requirements, it would likely lead to consolidations as smaller firms would face too much risk of going over price and having to bear the costs themselves.[27]

Even large corporate construction buyers are generally not sophisticated buyers—which is one of the key drivers of industry competitiveness in Michael Porter's famous Five Forces model. However, national governments have tremendous power to shape the future of the industry by being demanding buyers. Earthquake resilience is a good example. NIST came up with earthquake standards for buildings, but few contractors used them until the federal government required them in its procurement policies. They then became de facto industry standards.

In part because of small average firm size, the construction industry engages in little R&D. Yet an array of R&D areas, if pursued, could significantly boost productivity. One solution is to

support industry-cooperative research institutes. For example, South Korea establishing the Institute of Construction Technology, which employs more than 600 people, may be one reason South Korean construction industry productivity growth in the 2000s was 10 times higher than its U.S. counterpart. Europe has funded its construction technology platform that includes more than 600 partners from industry (including IT) and government. The Research Council of Norway has implemented a construction productivity and technology program. Governments can also support construction research more directly. For example, in the United States, the National Science Foundation could establish a construction-oriented Engineering Research Center. Likewise, NIST could be given increased funding to expand its construction laboratory efforts.

In the United States, the issue of precompetitive R&D in the construction industry has been recognized and discussed for more than half a century. In the 1960s, the Johnson administration proposed a civilian technology program in which one focus was construction, but Congress never provided adequate funds. In 1986, the National Research Council study on construction productivity proposed federal government actions to promote increased efficiency in construction, but nothing happened. In 1995, a White House National Science and Technology Council study proposed targeted funding for research into construction and building, but again nothing happened. In 2009, the National Academies of Science issued the report "Advancing Competitiveness and Efficiency of the U.S. Construction Industry" and yet again nothing happened.

The industry did form Fiatech as a cooperative research organization (modeled in part after the late-1980s government-industry consortium Sematech for the semiconductor industry) and developed an industry roadmap that sets out the goal: "The future environment is one where information is available on demand, wherever and whenever it is needed to all interested stakeholders. Such an integrated environment could enable all project partners and project functions to interconnect—instantly and securely—all operations and systems."[28] The lack of a recognized need for a national productivity strategy—much less one with a sectoral focus—has meant that none of these construction R&D efforts has really come to fruition, and why, without federal government funding, Fiatech has worked on a shoestring budget. The U.S. federal government should expand its National Network of Manufacturing Innovation program to include construction, and let firms support and cofund an institute.

One challenge for improving construction productivity is standardization to enable more scale economies. A barrier in many nations is the lack of national construction standards. National governments could make funding for construction projects (e.g., housing and infrastructure) contingent on states and localities adopting nationally uniform building codes and related regulations.

CONCLUSION

Unfortunately, the economics profession, the media, and elected officials largely ignore productivity. The result has been that the field of productivity policy is largely stillborn. It is time for governments to change that—and if they do, understanding how to craft sector-based productivity policy will be key.

About the Author

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About ITIF

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