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Deep Competitiveness

Current proposals to stimulate U.S. competitiveness are necessary but not sufficient to meet the challenges posed by a rapidly evolving global economy and the aggressive policies of other nations.

Competitiveness is the new buzzword in Washington, DC. Many public and private leaders proclaim that the United States faces a new and formidable competitiveness challenge. Nancy Pelosi and House Democrats unveiled their Innovation Agenda in late 2005. President Bush announced his American Competitiveness Initiative in the 2006 State of the Union Address. And Congress has introduced several major legislative packages addressing competitiveness. But even if Congress were to enact all of the proposed policies—a good thing—they would not go far enough to ensure the nation's continued technological leadership. Part of the reason why rhetoric is not being sufficiently translated into action is that many people in and out of official circles simply lack a sense of urgency about the situation. That must change.

Seventeen years ago, I wrote my doctoral dissertation to explain why some states responded to the competitive and economic restructuring challenges of the 1980s with sound and significant policy initiatives, whereas other similarly situated states did not. The answer was in some ways profoundly simple: States in which there was a broad and highly developed consensus about the need to act did more, and did it better, than states where consensus was less broad and less developed. In short, a widely shared understanding of the need to act, coupled with the right analysis of the problem, matters.

That lesson is relevant today at the national level. Even with the numerous reports, books, editorials, conferences, and hearings highlighting the "gathering storm" of global competitiveness, many leaders are seemingly still not completely convinced. Indeed, the prevailing mood in many quarters and among much of the economic policy punditry is one of complacency. For these skeptics, the case simply has not been made that the United States faces a significant competitiveness challenge. For example, in reference to reports citing a shortage of U.S. graduates in sci-

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ence, technology, engineering, and mathematics, *Newsweek* economic columnist Robert Samuelson claims that it is "A Phony Science Gap?" The *Washington Post's* Sebastian Mallaby agrees, calling it "The Fake Science Threat." Mallaby adds that the United States need not feel threatened because China is, after all, just a "low-wage country that crams on science." He further claims that China's efforts in moving aggressively ahead with science and technology–led economic development are irrelevant because "innovation depends neither on low wages nor science."

Really? Although a low-wage country that crams on science might not produce the next Intel, Google, or Apple (although it has produced technology companies such as Lenovo and Legand), it can and does attract (and sometimes coerce) innovation-based multinational companies to set up production there. Developing countries do not need to grow strong domestic companies to have a more innovation-based economy as long as they are able to attract innovation-based activities. In other words, low wages and high science are a powerful combination. By way of example, R&D investments by U.S.-based firms in China grew from $5 million in 1994 to $506 million in 2000, and multinational companies are establishing more than 200 new R&D laboratories per year in China.

Even when economists and pundits do acknowledge a threat, they dismiss it by pointing out that the United States has successfully faced challenges before. Why should this time be any different? When discussing the issue of the offshoring of jobs, Morgan Stanley's Stephen Roach argued in the *New York Times*, "This is exactly the same type of challenge farmers went through in the late 1800s, sweatshop workers went through in the early 1900s, and manufacturing workers in the first half of the 1980s." Robert Samuelson wrote, "Ever since Sputnik (1957) and the 'missile gap' (1960), we've been warned that we're being overtaken technologically."

What such observers fail to realize is that one reason the United States survived such technological challenges is precisely because it took them seriously. In response to Sputnik, the government created the National Atmospheric and Space Administration and the Defense Advanced Research Projects Agency and beefed up funding for education in science, technology, engineering, and mathematics. Similarly, when the nation faced competitiveness challenges in the late 1970s and 1980s, leaders from both parties in government, as well as from industry and academia, acted with creativity and resolve. Policymakers responded with a host of major policy innovations, including the Stevenson-Wydler Act, the Bayh-Dole Act, the National Technology Transfer Act, and the Omnibus Trade and Competitiveness Act. They created

a long list of programs and initiatives to boost innovation and competitiveness, including the Small Business Innovation Research program, the Manufacturing Extension Partnership, and Cooperative Research and Development Agreements. They put in place the R&D tax credit and lowered capital gains and corporate tax rates. They created a host of new collaborative research ventures, including the semiconductor consortium SEMATECH, the National Science Foundation's (NSF's) Science and Technology Centers and Engineering Research Centers, and the National Institute of Standards and Technology's Advanced Technology Program.

Moreover, Washington did not act alone. Virtually every state transformed its practice of economic development to stress technology-led economic development. Many states realized that R&D and innovation were drivers of the new economy and that state economies prosper when they maintain a healthy research base closely linked to the commercialization of technology. For example, Pennsylvania, under the leadership of Governor Richard Thornburgh, established the Ben Franklin Partnership Program to provide matching grants primarily to small and medium-sized firms to work collaboratively with the state's universities.

All these steps, coupled with efforts by the private sector and universities, helped the United States to respond effectively to that competitiveness challenge. Today, it may very well be that the United States will successfully confront its new challenges. But success is much more likely if the nation and its various leaders act with the resolve and creativity demonstrated in the past.

And action should reflect a sense of urgency, because many other counties, including most of Southeast Asia and Europe, have made innovation-led economic development a centerpiece of their national economic strategies during the past decade. In doing so, many of the nations looked to the United States for guidance. Why? The answer is simple. They know that moving up the value chain to more innovation-based economic activities is a key to boosting future prosperity and that losing this competition can result in a relatively lower standard of living as economic resources shift to lower value–added industries.

Consider what some nations and regions have done. Europe's Lisbon Agenda has set an ambitious, if somewhat unrealistic, goal of making Europe "the most competitive and dynamic knowledge-based economy in the world by 2010." Many European nations, including Belgium, Finland, the Netherlands, Sweden, Switzerland, and the United Kingdom, are not only boosting R&D funding but also introducing policy changes and government initiatives to more effectively transfer technology from universities and government laboratories to the private sector for commercialization. Canada has announced a national innovation strategy that focuses on boosting the production and commercialization of knowledge; improving the skill level of workers through expanding activities such as adult learning, producing more students with advanced degrees, and revising immigration policies; improving the environment for innovation by building in tax and regulatory competitiveness; and strengthening communities by promoting the growth of high-tech clusters, among other actions. As part of its effort, Canada set a goal to rise from 15th to 5th among countries in the Organization for Economic Cooperation and Development (OECD) in its ratio of R&D to gross domestic product by 2010. South Korea set a goal in 1997 to raise R&D's share of the government's budget from 3.6% to 5%, and the figure already has hit 4.7%. Many other nations have set similar goals. As a result, whereas investments in R&D as a share of gross domestic product actually decreased in the United States from 1992 to 2002, comparative investment levels increased in most other nations, including Japan (15%), Ireland (24%), Canada (33%), Korea (51%), Sweden (57%), China (66%), and Israel (101%).

The seriousness of these competitors also is evident in the statistics for R&D tax credits. When the United States adopted its R&D tax credit (a 20% credit on the incremental increases in research investments) in the early 1980s, it was a policy leader and had the most generous tax treatment of R&D among OECD nations. But today, while Congress debates whether to the make the credit permanent (or even whether to extend it for a few years), many other nations have forged ahead to provide much more generous tax treatment of R&D. The result is that by 2004 the United States ranked 17th among OECD nations in tax treatment of R&D. For example, the United Kingdom and Australia provide what is equivalent to a 7.5% flat credit on R&D, meaning that their effective credit is almost twice that of the United States. Japan's credit is almost three times as generous as that of the United States, and for small companies, Japan's credit is four times as generous. China provides a 150% deduction on R&D expenses, provided that R&D spending increased 10% over the prior year. Canada, in an explicit effort to attract U.S. corporate R&D, is even more generous. Large companies are eligible for a flat 20% credit and small firms can receive a 35% credit. In many provinces, equally generous credits can be added on. Even France, a nation that many pundits deride as a socialist basket case, has acted with resolve, adopting in 2004 a credit essentially equiva-

lent to a 40% incremental R&D tax credit.

Given the generosity of these tax policies, it is perhaps not surprising that U.S. majority–owned affiliates have been investing twice as fast in foreign countries as they have been in the United States during most of the past decade. Many of these projects are in developing nations. The United Nations reports, for example, that of 1,773 "greenfield" R&D projects set up between 2002 and 2004, more than half (953) were from companies in developed countries establishing projects in developing nations, with 70% of these in China and India.

In response to such developments, some observers not only minimize the competitive challenge to the United States but actually define it away, claiming that countries do not really compete against each other. Mallaby expressed this widely held view when he wrote in the *Washington Post* in early 2006: "The science lobby should also stop pretending that countries compete the same way companies do . . . the 'China threat' argument ignores the ways that competition between countries, unlike companies, is a positive-sum game."

To be sure, there are aspects of competition between nations that are beneficial. But is also seems clear that if other nations move up the value chain to high value–added innovation-based economic activities, the United States will pay at least some cost. Even with continued entrepreneurial innovation and scientific progress, worldwide demand for software, airplanes, pharmaceuticals, microelectronics, instruments, and other high value–added goods and services is not unlimited. For the same reason that companies want to be in these higher-margin businesses, so too do countries. As a result, whereas the conventional approach to competition (firms compete, countries do not) provides some important insights, it is simply not an adequate guide to explaining how nations achieve or sustain competitive advantage, particularly in an economy driven by knowledge and innovation.

This view of competition not only serves to minimize the importance of the challenge, it also confines the scope and character of policy proposals in response. According to this view, if U.S. aviation, machine tool, semiconductor, or software firms lose in competition to firms in other nations, or if U.S. firms move high value–added facilities to other nations, all will be well as long as the United States maintains flexible labor and capital markets. The "lost" resources simply will flow into other industries, creating new firms in more innovative and higher value–added sectors.

Policies promoting competitiveness

If this view accurately describes today's economic environment, then many of the recommendations proposed in Washington today, such as boosting education and training, ensuring an adequate supply of engineers, and helping displaced workers, will suffice. (This assumes that the nation's political leaders have the will to implement them effectively, which is no small task.) In this scenario, if the United States loses domestic high value–added innovation-based production to foreign competition, U.S. workers will have the skills to take advantage of new opportunities.

But what if the conventional view is not sufficient to explain industrial and economic change, particularly in an economy in which knowledge is increasingly the major factor of production? What if a significant share of knowledge is embedded in organizations, not just in individual workers? What if there are significant "spillovers" from firm activities? What if there are considerable "first-mover" advantages, including learning effects, which let firms translate early leads into dominant positions? What if there are significant network effects that mean that advancement in one industry (say, broadband) results in advancement in a host of others (such as Internet video or telemedicine)? What if lost higher value–added activities end up being replaced with lower value–added ones? What if, when you lose it, you cannot easily recover it?

I would argue that these factors more accurately describe the workings of the 21st-century knowledge-based global economy. Accordingly, a better guide to today's economic reality can be found in the disciplines of what some observers call evolutionary or growth economics. In such models, losing corporate competitions in knowledge-based industries means losing much more than just the firms. It means losing deeply embedded knowledge that is hard to replicate. It means that it can be very difficult to recreate value from the dispersed pieces of value represented by unemployed workers, used machinery, and underutilized suppliers. Perhaps the simplest way to put it is this: If the United States were to lose a company such as Boeing, the nation likely could not rely on market forces, even a dramatic drop in the value of the dollar, to later recreate a domestic civilian aviation industry. To do so would require recreating not just the firm, but its complex web of suppliers, professional associations, university programs in aviation engineering, and other knowledge-sharing organizations.

In this view, a robust national competitiveness policy needs to be grounded in a simple understanding: Like it or not, in an increasingly global economy most nations enact policies to tilt the choice of corporations to invest there. This means that the United States needs to develop a comprehensive competitiveness policy focused on ensuring that innovative activities, as well as innovative people, are attracted

to, stay in, and grow in the United States.

Part of this policy, of course, must focus on accelerating government funding of frontier research and improving education at all levels to ensure that U.S. workers have the skills needed for high-wage jobs. Toward these ends, policymakers already have taken a number of steps or proposed programs and initiatives. President Bush proposed increasing research funding for the physical sciences by $50 billion over 10 years, calling for large increases at NSF, the National Institute of Standards and Technology, and the Department of Energy. The National Innovation Act of 2005, introduced by Sen. John Ensign (R-NV) and Sen. Joe Lieberman (I-CT), includes a number of measures to boost spending on science and math education and authorizes the doubling of the NSF budget. Another bipartisan Senate proposal, the Protecting America's Competitive Edge Acts, also would boost funding for science and math education and federal support for research.

Congress should enact and fully fund these and other related measures. But even if policymakers do so, they should not think they are done with competitiveness and can move on to other matters. Winning the new global competitiveness race will require at least a decade of careful attention to the issue by government leaders, businesses, and universities. In particular, four steps will be critical for the next phase of the competitiveness agenda.

Work to create a global trade regime based on markets, not mercantilism. Companies in the United States, no matter how innovative and lean, now find it difficult to expand innovation-based activities domestically because many other nations are not competing on a level playing field. Many nations, particularly in Asia, are practicing what might be called market mercantilism: putting in place liberalized investment rules coupled with a host of other policy actions—some legitimate, some distorting and illegitimate—to attract foreign investment and boost domestic innovation-based growth.

For these nations, achieving an "innovation economy" is the goal at any cost. They do not want to wait the 20 or more years it takes to get there if they limit their policy actions to legitimate means, such as boosting university research, passing strong intellectual property protection rules, and investing in infrastructure and skills. Rather, they take a shortcut, turning a blind eye while domestic firms (and sometimes government agencies themselves) steal foreign intellectual property, pressure foreign firms to share intellectual property in order to gain access to their consumer markets, manipulate standards to favor domestic firms, and engage in massive government intervention to keep their currency prices below what the market would otherwise produce.

CONGRESS COULD ENCOURAGE STATES TO FOCUS MORE ON TECHNOLOGY-BASED ECONOMIC DEVELOPMENT BY APPROPRIATING $1 BILLION ANNUALLY FOR A COMPETITIVE MATCHING GRANT FUND TO CO-INVEST IN STATE-SUPPORTED TECHNOLOGY-BASED INITIATIVES.

When China pressures U.S. companies to open R&D laboratories as a quid pro quo for selling in the Chinese market, that is not capitalism; it is mercantilism. When 70% of the software used in India is pirated, that is mercantilism. When Japan's central banks engage in massive purchases of the dollar to keep the value of the yen low and thus artificially lower prices of Japanese exports, that is mercantilism. When the European Union reclassifies information technology (IT) products under its Combined Nomenclature rules so that they can engage in a back-door exercise to raise tariffs on U.S. products, that is mercantilism. Such steps not only violate the spirit and the letter of global trade agreements, they seek to substitute the actions of government for the allocative efficiencies of markets, leading to a global misallocation of resources and lower global productivity.

As a result, the United States must work harder to ensure that national economic development strategies around the world are based on positive-sum strategies such as investing more in science and technology, building infrastructure, and boosting education, and not on negative-sum mercantilist strategies. Competition to see who has the best university system, the largest share of scientists and engineers, the best broadband infrastructure, and the best system for protecting intellectual property makes all nations better. Therefore, the United States should continue to push for expanded global market integration and reduction of tariffs and other nontariff barriers, while at the same time working with the World Trade Organization and other international bodies to move the world trading system to one based more on markets and less on mercantilism.

To complement such outward-looking efforts, the federal government needs to take even more robust steps to improve the nation's competitive readiness. This means supporting more basic research and expanding the domestic supply of skilled workers. But it also means that the government should take steps to make it more likely that companies invest in innovation-based activities domestically, particularly by addressing the cost differential between the United States and "low-wage countries that cram on science."

Overhaul the corporate tax code to spur innovation. The tax code can be a powerful tool not only for boosting innovation but for helping level the playing field between the United States and other nations, particularly lower-wage nations and those that manipulate their currency levels. Accordingly, the government should create a new knowledge tax credit that allows companies to take a 40% credit on incremental increases in expenditures on research and experimentation, global standards–setting, and workforce training. Companies could take the credit if their R&D-to-sales ratio had increased over a defined prior base period. Companies not meeting this requirement still would be allowed to take a credit equaling 10% of research and training expenses that exceed 60% of research expenses in the prior base period. The Senate PACE Finance legislation would be an important step forward, calling for a doubling of the R&D tax credit to 40%.

But even more is needed. The government should create a flat 40% credit for company expenditures on research at universities, federal laboratories, and research consortia and on support for education and training in U.S. schools and universities. One reason for this more generous collaborative R&D credit is that more of the benefits of collaboration spill over to the economy than is the case with proprietary in-house R&D. The additional cost for this new knowledge credit would be approximately $22 billion per year.

In order to pay for the new tax incentives, Congress could institute a modest business activity tax (BAT) of the kind proposed by Gary Hufbauer at the Institute for International Economics. As a consumption tax, the BAT would be levied on all domestic sales of goods and services less purchases from other U.S. firms that are also subject to the BAT. Purchases of all intermediate materials and raw materials from firms that have already paid the BAT on their value-added would thus be exempted, and purchases of software and equipment would be exempt and thus effectively expensed. Such a tax not only would pay for these and other tax incentives to spur innovation and investment but would do so in a way that would be "border-adjustable"—that is, imports would also be subject to the tax and exports would be exempt—in contrast to current corporate taxes that are not.

Create new research partnerships. Simply spending more money on R&D will not be enough. One of the key lessons from the policy innovations of the 1980s and 1990s was the importance of "institutional innovation." For example, the Bayh-Dole Act opened up a whole new avenue for increasing the commercialization of university research. Thus, the government needs to envision and implement new models of innovation partnerships. It is not enough simply to fund more proposals from individual investigators, although that will be important. The government must do more to boost university/industry partnerships and to mobilize collective talents around key technological challenges. This is needed, in part, because there are still large gaps between the for-profit research community and the nonprofit research community, which includes universities, hospitals, and federal labs, among others. The for-profit community does not always know what capabilities and results the nonprofit research community has produced, or could pro-

duce, that would be useful, whereas nonprofits often do not fully understand industry's needs.

To help bridge this divide, Congress should establish an Industry Research Alliances Challenge Grant initiative to co-invest with industry-led research alliances. Industry members would establish technology "road maps" and use them to make targeted investments in research conducted at universities or federal laboratories. This initiative would increase the share of federally funded university and laboratory research that is market-relevant, and in so doing better adjust the balance between curiosity-directed research and research more directly related to societal needs. To jumpstart this, the federal government should provide $2 billion per year to fund up to 100 industry/university research alliances. To be eligible for funding, industry-led consortia would have to include at least 10 firms, agree to identify generic science and technology needs that the firms share, provide support that at least matches federal funds, and invest the funds in universities and federal laboratories through a competitive selection process. Such a process would not entail the government "picking winners and losers," because industry, in conjunction with academic partners, would identify the broad technology areas critical for research.

The government also needs to do more to build viable state/federal innovation partnerships. Historically, the federal innovation system has focused on larger firms and on the 30 or so largest research universities. But in the new economy, entrepreneurial startups and small and medium-sized enterprises are playing an increased role in the nation's innovation system. Moreover, many colleges and research universities not among the "top 30" have developed significant science and technology strengths and play key roles in working with industry in their regions.

States are well positioned to work with these kinds of firms and universities, and each state has in fact developed initiatives to promote technology-based economic development. But because the benefits of innovation typically spill over state borders, states invest less in innovation-based economic development than is in the national interest. Congress could encourage states to focus more on technology-based economic development by appropriating $1 billion annually for a competitive matching grant fund to co-invest in state-supported technology-based initiatives.

Make digital transformation of the economy within 10 years a national goal. The digital economy—that is, the ubiquitous use of IT in all applications and industries that can be digitized—is the source of all of the recent rebound in productivity growth. Moreover, accelerating digital transformation, particularly in the service sector, will be a key driver in the future not only of economic growth but of progress in an array of areas, including education, environmental protection, government, health care, homeland security, law enforcement, and transportation. Unfortunately, a number of market problems have caused some bottlenecks in this transformation. Problems have included classic "chicken-or-egg" dynamics of product deployment, as well as active industry resistance from some sectors threatened with digital disintermediation. This lag in digital transformation is especially visible in the health care sector, though many other sectors, including education, much of government, construction, and transportation, also have fallen behind. Moreover, in a growing number of IT application areas, including deployment and adoption of broadband telecommunications, the United States lags behind other nations. To catalyze advances, the government needs to develop tax, regulatory, procurement, and other policies not only to remove a host of barriers to digital transformation but also to encourage companies, nonprofit organizations, governments, and individuals to catch the coming digital wave.

Action is needed on each of these fronts—now. In 1942, with the first inklings that the war effort might finally be turning the Allies' way, Winston Churchill famously proclaimed: "This is not the end. It is not even the beginning of the end. But it is, perhaps, the end of the beginning." Perhaps recent times can be viewed similarly. With all the yeoman's work that has highlighted the importance of the competitiveness issue, perhaps it is the end of the beginning. Now the nation must redouble its efforts to see that rhetoric is translated into action.

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