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Is the United States Losing Its Productivity Advantage?

Mary Amiti and Kevin Stiroh

Strikingly high rates of labor productivity growth in China, India, and other emerging economies have prompted concerns that U.S. workers and firms are losing ground to their competitors in world markets. A closer look at the evidence, however, suggests that rapid foreign productivity growth will bring gains as well as losses to the U.S. economy. Some import-competing firms may be compelled to restructure or leave the market, but consumers will benefit from lower import prices and more import varieties, and U.S. exporters may gain access to cheaper intermediate products from abroad.

Since 1995, the United States has experienced a period of strong labor productivity growth, with GDP per employee advancing at a rate of 2.0 percent a year. While this rate easily exceeds the 1.0 percent average growth rate seen in the euro area, it falls markedly short of labor productivity growth in emerging markets, which has averaged more than 4.0 percent across developing Asia and Eastern Europe.¹ China and India, two large emerging economies of particular interest, have seen spectacular growth rates of 6.4 and 4.4 percent per year, respectively.

Labor productivity growth—the ability to produce more output per hour worked—is almost universally viewed as a positive development for an economy. When productivity growth is strong, an economy becomes wealthier, living standards rise, and short-run inflationary pressures may be tempered. Many observers of the rapid rise of China and India, however, express fear that strong productivity growth in foreign countries will harm the U.S. economy, displacing workers and making it more difficult for U.S. producers to compete in a global marketplace.

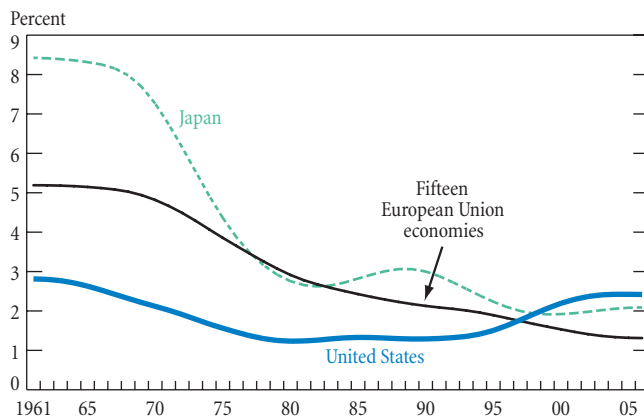
In this edition of *Current Issues*, we look more closely at differences in productivity growth across countries and

examine how strong productivity growth abroad may affect the U.S. economy. We consider the reasons for the euro area's weak productivity growth and the emerging market economies' robust performance. We then turn our attention to the potential channels through which foreign productivity growth can affect U.S. workers, producers, and consumers. Our review of the evidence suggests that rapid growth of productivity abroad will have mixed effects on the U.S. economy, bringing gains to some groups and losses to others. Consumers, for example, may benefit from lower import prices and a greater variety of imports, while U.S. firms that compete with firms in emerging economies may be forced to restructure or exit the market. In the concluding section, we discuss some of the implications of our analysis.

Productivity Trends in the United States and Developed Economies

We begin with a long-term perspective and compare trend productivity growth in the United States, fifteen European Union economies (EU-15), and Japan over the last forty-five years (see box).² In the 1960s and 1970s, trend

Chart 1
Trend Labor Productivity Growth



Source: The Conference Board and Groningen Growth and Development Centre, Total Economy Database, January 2007, <<http://www.ggdc.net>>.

Notes: Labor productivity is defined as real GDP per hour worked. Trend estimates are based on a Hodrick-Prescott filter with a smoothing parameter of 100.

productivity growth rates in Japan and the EU-15 were much higher than those in the United States. The contrast was especially sharp in the 1960s: while Japan's productivity grew more than 8 percent per year and the EU-15 saw annual growth rates above 5 percent, the United States experienced growth rates of less than 3 percent (Chart 1).

This picture has changed recently, however, with a dramatic reversal in the mid-1990s as the United States experienced a sharp rise in productivity growth while the EU-15 in particular entered a period of slowing growth. The resurgence of U.S. productivity growth since 1995 has been traced to the impact of information technology (IT) through two primary channels. Firms that produce IT have benefited from fundamental technological progress that has allowed them to develop more powerful IT products at lower prices. This advance is measured as rapid productivity growth in the relatively small *IT-producing* sector of the U.S. economy. Firms in other industries have made massive investments in IT and incorporated the latest technology in their production processes—developments that have improved labor

productivity in the *IT-using* sectors. These IT-related productivity gains have been facilitated by competitive product markets, flexible labor markets, and the ability of firms to adapt quickly to changing economic conditions.³

Why is productivity growth in Europe and Japan slowing? One key reason is that these countries are nearing the end of a “catch-up” phase, after largely closing the technological gap with the United States, the country whose production efficiency defines the world's technology frontier. Economic theory predicts that economies very far from the frontier with low productivity levels will experience relatively strong productivity growth for two reasons. First, when levels of capital per worker are low, capital is relatively productive, so it has a high marginal product and makes a substantial contribution to labor productivity growth. Second, firms have the ability to imitate the latest technologies and production processes to which they are exposed through foreign direct investment or collaborative ventures. As economies approach the frontier and productivity levels rise, however, the marginal product of capital falls, imitation becomes harder, and achieving relatively fast productivity growth rates proves increasingly difficult.⁴ This progression toward the technology frontier helps explain why productivity growth in the 1990s in Europe and Japan was much slower relative to the United States than it was during the 1960s.

A second reason for slower productivity growth in Europe is that the labor and product market frictions that characterize many European economies may have become more binding. In a recent report on European policy reforms, the Organisation for Economic Co-operation and Development (OECD 2006) highlighted a number of these frictions: barriers to entry in product markets and other regulations that inhibit competition, administrative burdens on new business formation, widespread public ownership, restricted foreign direct investment, limited financing structures for research and development, weak protection of intellectual property, excess regulation of the financial sector, and agricultural supports.

While these types of labor and product rigidities have long been a feature of many European economies, recent research summarized by Aghion and Howitt (2006) suggests that it is the interaction between an economy's place in the catch-up process, its use of new technologies, and the flexibility of its markets that determines how fast its productivity will grow relative to the frontier. At low levels of productivity,

¹All data on output per employee are from the Groningen Growth and Development Centre and predate the July 2007 revisions to the U.S. National Income and Product Accounts. The estimate of U.S. productivity growth cited here is somewhat lower than the headline numbers produced by the U.S. Bureau of Labor Statistics (BLS). The difference reflects the Groningen Centre's use of a broader measure of output—full-economy GDP as opposed to nonfarm business output in the BLS data. Unless explicitly stated otherwise, productivity refers to labor productivity.

²Our trend estimates are made via a Hodrick-Prescott filter (smoothing parameter of 100), using annual data from the Groningen Growth and Development Centre. Productivity here is defined as GDP per hour worked. This approach follows van Ark and Fosler (2007) and Gómez-Salvador et al. (2006).

³See Jorgenson, Ho, and Stiroh (2007) for a review of the literature on the U.S. productivity resurgence and the role of IT, and Baily (2002) for a discussion of deregulation, increased competitiveness, and other structural changes that have contributed to stronger productivity growth in the United States.

⁴Economists refer to this phenomenon as “convergence”; there is a large literature on other factors that may contribute to or hinder the catch-up process.

Comparing Productivity across Countries

International comparisons of productivity growth are notoriously difficult to make because of differences in the way countries construct official measures of output, the need to convert currencies into common units, and the paucity of detailed labor market data, particularly for developing countries. Given the critical importance of productivity in understanding economic growth across countries, however, economists spend considerable resources developing productivity estimates that are as comparable as possible.

In our analysis, we rely primarily on data constructed jointly by the Conference Board and the Groningen Growth and Development Centre.^a The data provide comparable measures of labor productivity for a wide range of countries that produce virtually all of world output. The underlying sources for the data are country national accounts, surveys, and labor market indicators.^b

Our primary measure of productivity is labor productivity, defined as output per hour worked. Output is measured as real GDP, converted into 1990 U.S. dollars using the Gheary-Khamis purchasing power parities to adjust for differences in relative prices. Because comparable data on hours worked do not exist for all countries, however, we also use output per total employment as a measure of labor productivity when examining a broader range of emerging market economies. Labor productivity reflects all of the factors that allow a worker to produce more output, including access to more or better capital and improved technology.

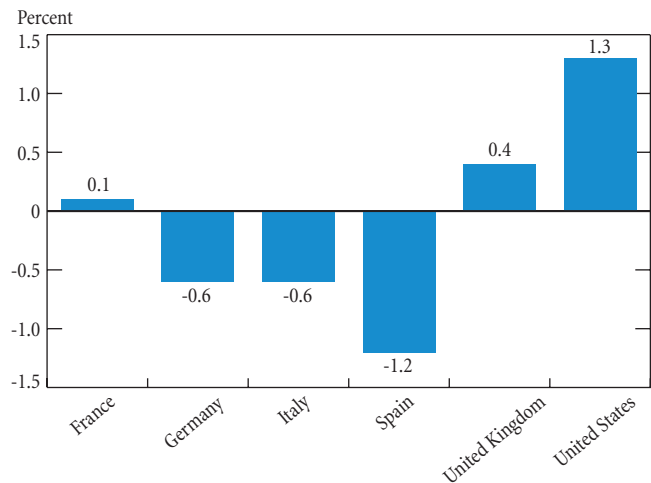
A second productivity concept, also used in our analysis, is total factor productivity, defined as output per all units of input. Total factor productivity growth is often viewed as a measure of efficiency gains or technological progress and reflects the ability to produce more output from the same set of inputs. The production process is complicated, however, and measured total factor productivity growth also includes the impact of any measurement error or omitted inputs such as intangible capital.

^aThe Conference Board and Groningen Growth and Development Centre, Total Economy Database, January 2007, <<http://www.ggdc.net>>.

^bMethodological details and information on the sources are available from the Groningen Centre's website, <<http://www.ggdc.net>>.

the positive catch-up effects dominate, and countries may grow fast relative to the frontier. Closer to the frontier, however, market rigidities become more of a constraint, reducing the economy's ability to innovate, make technological advances, and reallocate resources efficiently. In sum, market rigidities and institutional factors are more of a detriment to productivity growth for those countries that

Chart 2
Efficiency Growth in Service Industries



Source: Inklaar, Timmer, and van Ark (2007).

Note: Efficiency growth is measured as average annual growth in total factor productivity for 1995-2004. Service industries include trade, hotels and restaurants, transport, telecommunications, finance, business services, and social and personal services.

have achieved relatively high levels of productivity and are near the technological frontier.

There is considerable evidence, for example, that European economies have been less able to benefit from the information technology revolution since the mid-1990s. For example, one recent study (Inklaar, Timmer, and van Ark 2007) compares the growth rate of total factor productivity (TFP), a common measure of the overall efficiency of production (see **box**), in the service industries of major European economies and the United States. The performance of service industries in this respect is particularly revealing because they are intensive users of IT and, in the United States, have played a key role in the recent resurgence of productivity growth.⁵ The study shows a stark divergence in TFP growth in the service industries of these countries, with slow growth in European services and much faster growth in the United States (**Chart 2**). The authors find no single factor, such as product market regulation, that would explain this divergence, but suggest that the difference in performance is linked to organizational structure, management, and workplace practices.

Productivity Trends in the United States and Emerging Markets

We now compare U.S. productivity growth with productivity growth in several large emerging markets—Brazil, China, India, Indonesia, Mexico, Russia, and South Korea. We chose these economies because they were the largest in terms of

⁵See Bosworth and Triplett (2007).

market size in 2006. Our measure of productivity growth, plotted in **Chart 3** for each country, is growth in GDP per employee for the 1995-2005 period.⁶ China experienced spectacular productivity growth of 6.4 percent, while South Korea, Russia, and India saw growth rates above 3.0 percent per year. These rates are all considerably faster than the 2.0 percent growth rate in the United States over the same period. Nevertheless, not all emerging markets outpaced U.S. growth rates; Indonesia, Brazil, and Mexico showed slower growth.

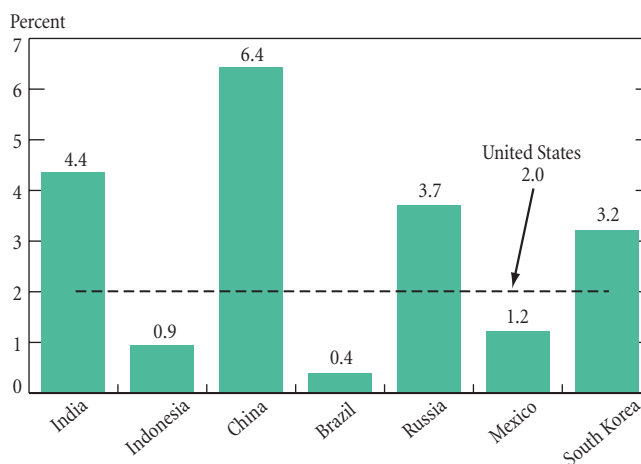
Given the importance of an economy's place in the catch-up process, it is not surprising that some of these emerging market economies are experiencing strong productivity growth, because they are still at the beginning of their catch-up phase and have ample high-return investment opportunities and scope for technological advance. Indeed, these countries lag far behind the United States in productivity levels. For example, GDP per worker in China was only 15 percent of that in the United States in 2005. In the same year, South Korea posted the highest productivity level of any of the emerging countries in the sample, but its GDP per worker was just 58 percent of the U.S. level.

Because the factors that determine productivity growth interact in complex ways, it is not possible to isolate any one factor that leads some emerging markets to grow rapidly while others lag behind. For example, although Brazil has undergone major episodes of trade liberalization, which often spurs productivity growth, it has more rigid labor markets than China and some other countries in the sample—a feature that may have prevented it from reallocating resources to more efficient uses (Aquino Menezes Filho and Muendler 2007).

Nonetheless, it is useful to review what is known about the sources of productivity growth in China and India, two of the largest and most discussed countries. While the data for these countries are far from perfect, Bosworth and Collins (2007) have investigated these factors and concluded that both capital accumulation and increased efficiency played an important role in the recent strength of productivity growth.

The authors' estimates for China suggest that about half of its growth in labor productivity over the last decade can be traced to capital deepening (rapid investment that provides more physical capital to workers) and half to increased efficiency in the use of inputs (measured as TFP growth). Government policies have helped increase productivity growth in China where, for example, many industries have been privatized (OECD 2005). In addition, trade has been lib-

Chart 3
Labor Productivity Growth in Large Emerging Market Economies



Source: The Conference Board and Groningen Growth and Development Centre, Total Economy Database, January 2007, <<http://www.ggdcc.net>>.

Notes: Labor productivity growth is defined as the average annual growth in real GDP per employee for 1995-2005. Countries are sorted by the level of 2005 GDP per employee.

eralized with China's entry into the World Trade Organization in 2001, rules on inflows of foreign direct investment have been relaxed, and labor mobility out of agriculture and into industry has risen as restrictions have been lifted.

For India, Bosworth and Collins estimate that total factor productivity has accounted for roughly 60 percent of the country's aggregate labor productivity growth—an experience similar to that of China. Many observers, however, have focused on India's service industry, particularly that part of the industry related to outsourcing technology and support services, and there are substantial differences with China. Bosworth and Collins estimate that TFP growth in service industries averaged 3.9 percent for 1993-2004 in India—a far higher growth rate than the 0.9 percent rate for China. In the primary sectors (agriculture, forestry, and fishing) and in manufacturing, however, both labor productivity growth and TFP growth were weaker in India than in China.⁷ Despite differences in the sectors where the booms in efficiency are taking place, both India and China are experiencing much faster productivity growth than the United States.

Foreign Productivity Growth and the U.S. Economy

How does strong productivity growth abroad affect the U.S. economy? In general, rapid foreign productivity growth, by reducing the price of foreign goods, has the direct effect of increasing the competition faced by U.S. producers at home

⁶Because we do not have data on total hours worked in these countries, we use total employment to construct the labor productivity estimates.

⁷India did enjoy high productivity growth in its manufacturing sector—a fact that has been partly attributed to the country's trade reforms in the early 1990s. Tariffs, for example, fell from an average of 80 percent in 1990 to 37 percent in 2001 (Topalova 2004).

and abroad and benefiting U.S. consumers. Of course, increased foreign competition could equally result from a reduction in international trade costs stemming from, say, lower U.S. import tariffs or lower shipping costs. However, U.S. tariffs have been low for the last couple of decades, so reductions in trade costs are unlikely to be the source of increased foreign competition over this period.

In addition to its direct effects, strong foreign productivity growth may have indirect effects on the U.S. economy by hastening the adoption of new technologies by U.S. firms and encouraging the creation of global production networks—outcomes that may increase U.S. productivity. For example, U.S. firms are purchasing an increasing share of intermediate material and services inputs from abroad, a practice that is commonly referred to as international outsourcing. As firms relocate the relatively inefficient stages of their production processes to countries where those stages can be carried out more cheaply, they are better positioned to expand their domestic output in stages where they have a comparative advantage, and thus they increase their productivity. Furthermore, the productivity of the remaining workers is also likely to improve because the imports of new services may enable firms to restructure their operations and activities (Amiti and Wei 2006).

Below, we discuss in more detail the individual channels through which foreign productivity growth can potentially affect the U.S. economy. Throughout the discussion, we highlight the complex linkages between these channels and various parts of the economy. After reviewing the evidence, we conclude that it is not particularly useful to think about foreign productivity growth as having a single impact on the U.S. economy as a whole. Rather, one should consider the impact from a number of perspectives—those of the consumer, worker, and firm, for example—all of which can be affected in different ways and through different mechanisms.

Consumers. U.S. consumers should gain from strong productivity growth abroad primarily through lower import prices.⁸ For example, prices for imported goods from the newly industrialized countries (NICs) of Asia—a group that includes Hong Kong, Singapore, South Korea, and Taiwan—fell 2.4 percent per year from 1993 to 2006, compared with a 0.3 percent rise in price for total non-oil imports into the United States.⁹ Although this evidence is consistent with foreign productivity gains being passed through to lower prices, to date there is no rigorous evidence establishing this link.¹⁰

⁸If the foreign productivity gains occur in industries where the United States imports, consumers will directly benefit from lower prices; however, if the productivity gains occur in industries where the United States exports, there will be no effect on U.S. consumer prices unless the gains are strong enough to induce the United States to begin importing those goods.

There could also be gains to consumers arising from more product varieties. The number of different products imported into the United States increased by 40 percent in the 1990s, with China accounting for 6 percent of this growth (Broda and Weinstein 2006).¹¹ Finally, Schott (2004) shows that countries with higher GDP per capita tend to produce higher quality goods, another boon for U.S. consumers. All of these effects are positive developments for U.S. consumers, who now enjoy access to a broader range of consumer goods at lower prices.

Exporters. The net impact of strong foreign productivity gains on U.S. exporters is less clear. U.S. exporters are likely to benefit as fast productivity growth raises incomes abroad and increases demand for U.S. exports. For example, the share of exports to China from the United States increased from 2 percent in 1995 to 5.5 percent in 2005.¹² U.S. exporters can also benefit from access to relatively cheap intermediate inputs that are produced abroad—semiconductors being a notable example. Strong productivity growth abroad, however, also has the potential to erode the market share of U.S. exporters in foreign countries as they are faced with increased competition. Given the relatively low productivity levels of emerging markets and the small overlap between the products of U.S. exporters and those of emerging market firms, however, it seems unlikely that this latter effect would dominate.

Import-Competing Firms. Gains in foreign productivity relative to U.S. productivity should improve the ability of foreign firms to produce at lower prices and to compete internationally. Such an outcome would directly affect the U.S. firms whose products are in competition with imports from foreign countries. These import-competing firms will either have to become more efficient or be forced out of the market.

Bernard, Jensen, and Schott (2006) show that U.S. manufacturing industries that face more low-wage competition (defined as imports from countries with less than 5 percent of U.S. GDP per capita) have incurred the largest employment losses over the last three decades. In these industries,

⁹The Bureau of Labor Statistics began constructing import price indexes by country of origin in 1993 (see <<http://www.bls.gov/mxp/>>). Data on imports from China are available beginning in 2003 and show price trends similar to those for the Asian NICs.

¹⁰Some or all of the foreign productivity growth may be retained as profits or passed on to workers in the form of higher wages. This dynamic is the subject of ongoing research. Of course, lower import prices may arise from factors other than increased productivity growth.

¹¹A new variety is generally defined as a product that is being imported from a particular foreign country for the first time. While widely used, this measure may overstate product variety if the United States begins to import identical products from many countries.

¹²The data are from the U.S. Bureau of the Census, Foreign Trade Division.

including leather, textiles, and apparel, each 10 percentage point increase in import share for low-wage countries is associated with a 1.3 percent fall in employment growth for a U.S. plant. In contrast, industries that do not face direct competition from low-wage countries, such as instruments and plastics, have experienced employment growth over this period. If these low-wage countries are also experiencing relatively strong productivity growth, then one would expect the import-competing industries in the United States to feel the biggest impact.

Increased competition from low-wage countries also leads to more plant closures in the import-competing industries. According to Bernard, Jensen, and Schott (2004, 2006), the probability of a plant shutting down increases by 13 percent with a 10 percentage point increase in low-wage competition. Not all of these plants disappear, however; some change their product mix to make goods that are not in direct competition with imports from low-wage countries.

Labor. Strong foreign productivity growth has heterogeneous effects on U.S. workers. Drawing on a displaced worker survey by the Bureau of Labor Statistics for the 1984–2000 period,¹³ Kletzer (2001) finds that 37 percent of displaced workers in import-competing industries were not reemployed at the time of the survey and 25 percent took longer than six months to find new employment.¹⁴ Even among those able to find new employment, however, the effects varied widely—average earnings were 13 percent lower than in the original job, with 40 percent of the reemployed respondents showing income declines and 23 percent showing income gains.

With heightened foreign competition, incentives to outsource production and pressure to adopt new technologies increase. These developments have also had large impacts on labor markets by shifting demand away from unskilled workers toward skilled workers. Feenstra and Hanson (1999) found that 25 percent of the increase in the wages of skilled relative to unskilled workers can be explained by outsourcing and 30 percent by the growing use of high-tech capital.¹⁵ Outsourcing, by increasing productivity, also

increased the real wage of skilled workers by 1 to 2 percent per year during the 1990s while having no significant effect for unskilled workers.

Conclusion

Productivity growth is the engine of economic growth, and the rapid gains in many foreign countries, particularly large emerging economies such as China and India, will produce significant benefits for these countries. In the United States, however, strong foreign productivity growth will likely have mixed effects, with some winners and some losers. Consumers are likely to gain from lower import prices and more varieties of imports, for example, while U.S. firms and workers in direct competition with emerging economies are likely to experience potentially painful disruptions and reallocations.

These diverse effects of strong foreign productivity growth raise important policy questions. Whenever a particular portion of the economy disproportionately bears the adverse impact of heightened competition, a common reaction is to call for increased support and protectionism for that particular sector. While the disruptions and losses brought about by foreign competition are real, policymakers should consider the full range of costs and benefits when evaluating such proposals. For example, levying import tariffs on inputs such as paper or steel can help U.S. producers that compete in those markets, but will hurt the U.S. producers that use these goods in making other products, as well as U.S. consumers who are effectively denied the benefits of lower cost products.

Another key issue concerns the outlook for the United States as it continues to face increased competitive pressures from large emerging economies. Although China's GDP per worker grew at a spectacular rate over the last decade, its level of productivity remains low, only 15 percent of that in the United States. Moreover, the set of goods that China exports are quite different from those produced in developed countries,¹⁶ suggesting that direct competition from China has been limited to a subset of industries. Nevertheless, as China and other emerging market economies continue to grow, such differences with the United States are likely to diminish. In that event, strong competitive pressures from abroad will prompt U.S. firms to develop new and more advanced production techniques that will further push out the world technology frontier.

¹³See <<http://stats.bls.gov/news.release/disp.nr0.htm>>.

¹⁴In each survey, adults (twenty years and older) were asked if they had lost a job in the preceding three to five years because of a plant closing, an employer going out of business, or a layoff from which they were not recalled. (Note that individuals were only surveyed once.) In Kletzer, all workers displaced from a high-import-competing industry were treated as if they had lost their jobs because of increased imports from low-wage countries, although they could have lost their jobs for other reasons, such as automation. We are unaware of any evidence on whether the subsequent employment and earnings experience of displaced workers varies with the reason for their job loss.

¹⁵Of course, firms also adopt new technologies for reasons other than strong productivity growth abroad.

¹⁶Schott (forthcoming) shows that the products exported by China are more like those exported from other Asian countries than those produced by the OECD nations and other developed countries.

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About the Authors

Mary Amiti is a senior economist in the International Research Function of the Research and Statistics Group; Kevin Stiroh was a vice president in the Banking Studies Function at the time this article was written.

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