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in an Era of Uncertainty

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EXECUTIVE SUMMARY

This chapter examines whether China will be able to sustain high rates of economic growth over the coming decades and draws implications for the Chinese defense budget.

MAIN ARGUMENT:

- Numerous weaknesses in the Chinese economy include a banking system with non-performing loans, serious environmental challenges, and the need to accommodate 300–500 million rural-to-urban migrants over the next two decades.
- Barring war in the Taiwan Strait, however, high rates of economic growth are likely to continue in China for at least the next decade. Both China's high rate of investment and the rapid expansion in the education level of its workforce are likely to continue. The large pool of underemployed rural labor can also be shifted to higher productivity urban jobs.
- During the first half of the reform period, military expenditures did not seem to increase at all in real terms. Since 1996, however, defense expenditures have been rising more rapidly than the growth rate of GDP.

POLICY IMPLICATIONS:

- Sustained high rates of growth help China to remain politically stable, which is in the best interests of the U.S.
- By contrast, protectionist trade measures directed at China will make little real difference to unemployment levels in the U.S. or the size of the U.S. current account deficit, but could hurt Chinese growth and certainly increase tension between the two nations.
- China's defense expenditure will continue to rise. The U.S. is not in a position to stop this growth, but there is likewise little reason for the U.S. (or the European Union) to try to facilitate this growth, either through direct sales of advanced weaponry or by cooperation in research that has clear military applications.

China's Economic Growth: Implications for the Defense Budget

Dwight Perkins

China's rapid economic growth and the need to sustain this high growth rate well into the future have, for the past two decades, driven Chinese policy decisions not only in the economic sphere but also in the political and foreign policy arenas. Economic considerations are likely to be equally central in both China's domestic and foreign policies for the coming decade. Though most policy choices are shaped by economic considerations, the need to sustain high levels of growth will not override what Chinese leaders feel to be fundamental challenges either to Chinese sovereignty (e.g., if Taiwan were to declare independence) or to the rule of the Chinese Communist Party (CCP).

Sustained, rapid economic growth is desirable not only because it will raise the standard of living of the Chinese people, but also because it is essential if the government is to maintain political stability. The CCP bases its continued legitimacy on the fact that Party rule has brought unprecedented prosperity to a large portion of the Chinese people, particularly those in urban areas. Communist ideology, by contrast, plays very little role in maintaining popular support for the CCP-led government or in providing the cement that holds the Party itself together. Rapid economic growth over the past quarter century has also fueled feelings of nationalism brought on by pride in China's rising strength on the international stage.

It thus does not take much imagination to see how a failure to sustain high economic growth rates could lead to both domestic and international crises. The demands of economic efficiency have already led to large-scale

unemployment (particularly in northeastern China), and slower growth would both produce fewer jobs for urban residents and slow or halt increases in their still overall low standard of living. More importantly, a vast store of underemployed labor remains in the countryside; this massive workforce could move to the cities without any significant decline in farm output. If, over the next two decades, China follows the pattern laid down by neighboring countries such as Japan and South Korea, roughly 300–500 million workers and their families will migrate to urban areas and take up non-agricultural employment. If the economy is not able to supply the additional jobs required by this massive infusion of labor, these migrants will either remain underemployed in large urban slums or languish in the countryside and resent the better life of registered urban residents. Either way, discontent among the citizenry will rise and the government will resort to non-economic means—such as strident appeals to Chinese nationalism—in order to try to maintain control. Such appeals would no doubt have a strong anti-foreign element and would thus impact China's international relations.

If China does manage to sustain high economic growth rates, not only will such growth strengthen political stability, but Beijing would also find it easier to expand China's military expenditures. Over the long term, China will likely strive to become a world military power commensurate with the country's size, population, and role in world history.¹ Slow growth will not necessarily stop this military expansion (Beijing can to some degree raise the share of GDP allocated to the military), but would certainly make this expansion much more difficult. Attempts to forecast China's future economic growth rate, therefore, are not simply exercises designed to provide information to investors on the Shanghai and Shenzhen stock exchanges. Having a reasonably reliable estimate of China's future economic growth prospects is also essential for any informed discussion of China's future domestic stability and the likelihood of continued international stability in Asia more broadly.

In the analysis that follows, therefore, the first section tackles the issue of whether China can in fact sustain the high rates of economic growth that it has achieved over the past two decades. This question will be divided into two parts. The first will look at whether China can maintain high rates of investment and high rates of growth in the labor force (particularly the highly

¹ There is no authoritative way of establishing that this is China's long-term goal. Statements by government officials or members of the military (even those not meant for public consumption) are not a very good guide to China's long term ambitions. There is considerable evidence that Chinese leaders, together with the internationally aware population at large in China, want to see China take its place in the world alongside the great powers as a major player in the political, economic, and military arenas. The same can also no doubt be said of several other large countries, such as Russia and India, that do not now play a role in international affairs commensurate with their potential importance in the future.

educated part of the labor force). The second explores whether China, given some of the enormous problems that exist, can maintain the relatively high productivity growth of recent decades. These problems include the reform of a very weak financial sector and the need to accommodate the migration of hundreds of millions of workers and their families from the rural areas to the cities.

The second section of the chapter then attempts to explore the implications of continued high growth for the size of the Chinese military budget. Building upon the work of others that suggests that the real Chinese military budget is double (or more) the size of the published official budget, this section attempts to convert that budget into real terms (i.e., stripped of the impact of rising prices). The argument is that the budget in real terms probably stagnated in absolute numbers until the mid-1990s, and actually declined significantly as a share of GDP. From the mid-1990s onward, however, that budget has risen rapidly in real terms both in absolute size and to some degree as a percentage of GDP. The chapter concludes with a summary of the basic argument and outlines implications for U.S. policy.

Prospects for Sustained High Growth

Any attempt to forecast China's future economic growth must begin with an understanding of what has driven the high growth rates of the past quarter century. With the changes over the past two decades as background, one can then ask whether the conditions that brought about such high growth in the past will remain in place in the future or will be replaced by other equally supportive conditions.

The Fundamentals of Growth

An understanding of past and future high growth rates can be approached on three different levels. The first level is based on the fundamental components of high economic growth anywhere in the world. These components include a high rate of investment or capital formation, a rapidly growing labor force, a rapid rise in the education level of that labor force, and the efficiency with which these increases in capital and labor are being used. China today has an extraordinarily high rate of investment—gross capital formation as a share of GDP has been above 35% in every year since 1985 and even reached 42.3% in 2003.² With that level of investment, China's economic policymakers can make quite a few mistakes and yet the economy

² National Bureau of Statistics, *China Statistical Yearbook, 2004*, 65.

will still continue to grow. Such a high rate of investment is fueled by China's equally high rate of savings. This high rate is partially explained by the lack of adequate retirement support from public programs, by what appears to be an East Asian cultural preference for high savings, and, most of all, by China's current low dependency ratio (the number of young and old outside the labor force relative to the number in the labor force).³ This low dependency ratio will gradually disappear due mostly to the long-term effects of the one-child policy and the increasing life expectancy of the Chinese population; this withering away will not, however, happen in the next decade or even the next two decades. China's savings and investment rates are thus likely to remain very high for some time into the future.

The education level of China's labor force is also rising rapidly; this trend will, regardless of the overall growth rate, likely continue over the next decade and beyond. Although the government has supported rapid expansion of education at the secondary and tertiary levels, private demand has outstripped the public supply and has led to the creation of private educational institutions, particularly at the tertiary level. For example, in 2003 secondary schools enrolled 96 million students out of a relevant age group pool of approximately 100 million. This is in contrast to 62 million in 1995 and 51 million in 1985.⁴ By any standard, this is a rapid increase for a two-decade period, although universal education is compulsory for only the first eight grades, with some poorer rural areas not yet even complying with that standard. There were 11 million students enrolled at the university level in 2003, up from 2.9 million in 1995 and 1.7 million in 1985. This rise is even more rapid, though still translates into only about 10% of the relevant age cohort attending post-secondary institutions.⁵

Educated labor and human capital, of course, are not the only inputs into growth. Due to China's current level of per capita income, there is also a very large demand for unskilled labor. Though the one-child policy is slowing down growth in the total Chinese labor force, this is an irrelevant figure for understanding the sources of GDP growth. A more telling statistic is the rate of increase in the labor force in the modern non-agricultural sectors. Due to migration from low productivity jobs in the countryside, this rate of

³ The underlying theory behind the connection between the dependency ratio and the savings rate is based on the life-cycle savings model as developed by Franco Modigliani. The basic idea is that families have lower savings when their children are young and at home, save at high levels during their most productive years after their children are grown, and then dissave when they retire. Thus the more people there are who are not in the labor force (because they are too young or too old), the lower savings will be.

⁴ The size of the age cohort is the author's estimate based on census data. The data on secondary enrollment are from The National Bureau of Statistics, *China Statistical Yearbook, 2004*, 779.

⁵ *Ibid.* The statement that poorer rural areas often do not fully comply with the compulsory education standard is based on direct observation by the author and by many others.

increase will remain high well beyond the coming decade. During the past several years employment growth in urban areas has been slow, largely because of all of the layoffs in the state sector made necessary by the policies of overemployment in state firms in earlier years. Urban employment growth between 2000 and 2003, for example, was around 3.5% per year, but with continued rapid growth in output and large-scale migration from the countryside, the urban labor force and employment could grow at a faster rate.⁶

Maintaining High-Productivity Growth

The inputs required for growth in China are thus likely to continue growing rapidly over the next decade and beyond. Inputs, however, are only a little more than half of the story. The other half involves the efficiency with which these inputs are used: the rate of growth of productivity (or to use the technical term, total factor productivity). Productivity growth in China since reforms began in 1979 can be understood largely as the result of a series of specific reforms that led to significant leaps in productivity growth in particular sectors. These increases occurred in first one sector and then another, but in all cases the jump in productivity petered out over time and productivity growth had to be sustained by a new reform that accelerated growth in another sector.

The first sector to experience an increase in productivity was agriculture, a change that was brought about between 1979 and 1985 as a result of the return to household farming and the freeing up of rural markets. After 1985, however, agricultural and productivity growth slowed markedly. The second sector to experience a leap in productivity was the township and village enterprise (TVE) sector, which benefited from the freeing up of industrial and other inputs for purchase on the market instead of allocation through the central plan. This TVE boom began in 1985 and continued, after a brief slowdown in 1989–90, into the 1990s, after which the sector began a much more significant slowdown. The third sector to experience a boom was foreign direct investment (FDI) enterprises, which took off in 1992 or 1993, and have continued to grow at a high level ever since. The FDI growth rate has, however, also slowed down largely due to the finite amount of capital available for investment in developing countries in general and China in

⁶ These estimates of the urban employment growth rate are more problematic than many of the other figures used in this essay. The Chinese government reports figures for employment in industry and services in the *China Statistical Yearbook 2004*, and I have assumed that these figures are a rough estimate of the growth rate of urban employment—even though some of industry and services employment has not taken place in the urban areas. Moreover, these figures probably do not accurately reflect the employment of many of the unregistered migrants to the cities from the rural areas. The 3.5% figure, therefore, should be seen as a conservative estimate of the growth of urban employment. See The National Bureau of Statistics, *China Statistical Yearbook, 2004*, 120.

particular. FDI will no doubt continue to grow, but the boom that whisked FDI from a few billion dollars a year to the current \$60 billion a year will not be able to continue at such a heated pace.⁷

Two other reforms have helped bring about these sector jumps in growth and productivity that existed throughout the 1980s and '90s. One key reform has been the expansion of foreign trade from the relatively miniscule level of \$26.4 billion in 1978 to \$1,154.8 billion (imports plus exports) in 2004. With export earnings of \$593.4 billion and FDI of another \$60.6 billion (in 2004), China has enough foreign exchange to import virtually anything that the country needs—but is unable to produce more efficiently at home—for urban sector development. No longer do Chinese industrial firms have to rely on inferior domestic parts and machinery simply because of a lack of foreign exchange to import those items from Japan, the United States, or Germany. Nor do industrial firms have to endure the bottlenecks that were usually so prevalent in the planning period, when key inputs were simply not available for long periods of time due to lack of foresight in the central plan.

There is a second way in which the opening up to foreign trade has boosted Chinese growth, particularly in recent years. In 2003 and 2004 exports grew at an average rate of 35% per year. That very large expansion in exports (well over \$100 billion a year in each of these two years) played an important role in maintaining growth in the demand for Chinese output.⁸ By contrast, consumer demand in China grew more slowly than the GDP (the downside of the high and rising rate of savings). China will not, however, be likely to sustain exports of this magnitude—or even half of this magnitude in percentage terms—for many more years. At 91% of GDP (Exports+Imports/GDP), China's foreign trade ratio in comparative terms is already extraordinarily high for a large country.⁹ Continued increases in exports of over \$100 billion a year will inevitably lead to resistance from countries that buy Chinese goods, many of whom feel they are being forced to adjust too quickly. This has already occurred, when in 2005 receiving countries slapped high

⁷ The foreign direct investment into China that is actually utilized is regularly reported in the annual statistical yearbooks. The 2004 figure of \$60.6 billion is from The National Bureau of Statistics, *China Monthly Economic Indicators*, 2005.2, vol. 59, 43.

⁸ *Ibid.*, 35. To be more precise, total Chinese exports in 2004 grew by \$154 billion over total exports in 2003, and the growth rate of exports in the first half of 2005 has slowed only slightly in percentage terms from the export growth rate of 2004. See also Chris Buckley, "China's Economy Grows Despite Effort to Slow It," *International Herald Tribune*, July 21, 2005, 11.

⁹ One of the basic findings of Nobel Laureate Simon Kuznets was that the ratio of foreign trade to GDP tends to decline in more populous countries. The ratio of exports+imports/GDP for the United States, for example, was 19% in 2001, and 18% for Japan. In terms of population China is the largest country in the world, yet its trade ratio is five times that of two of the other large trading nations. See The World Bank, *World Development Report 2003: Sustainable Development in a Dynamic World* (Washington, D.C.: The World Bank, 2003), 238–41.

tariffs on certain Chinese textile exports that had rapidly expanded in the wake of the termination of the international fiber agreement. Thus in the future China cannot rely as much on the growth stimulus of rapid increases in demand for Chinese exports. China will instead have to find ways of stimulating a more rapid rise in domestic consumer demand.

The real challenge in this area for both China and its trading partners is to keep trade disputes from escalating into sustained vitriolic confrontations based more on domestic politics than on any consideration of actual national interest. In this regard China's July 2005 decision to revalue its currency—even if only by a minuscule 2%—was a step in the right direction. The hope is that this initial revaluation will be followed by additional revaluations in the not-too-distant future. Hopefully trade disputes can be kept as much as possible within the technical framework of the World Trade Organization (WTO) dispute mechanism. That may be wishful thinking, but trade disputes that escalate into political confrontations and undermine security cooperation are not in the interests of any country.

The other change underlying growth in all of China's economic sectors has been the steady expansion of the role of the market to the point where most goods and services today are sold on the market. The market first expanded most rapidly in the rural areas but then began expanding for industrial inputs in late 1984, with a portion of those inputs being made available on the market at market prices. By the end of the 1990s virtually all industrial inputs were being distributed through the market at market prices. Thus China today has as much of a market economy as most other developing (and many developed) countries.¹⁰ China's market economy is highly imperfect, however, lacking many of the strong institutions of market economies in high-income countries.

Maintaining high productivity growth over the next decade and beyond will depend critically on China's ability to steadily improve market-supporting institutions. As the above analysis has indicated, all of the other sources of high productivity growth over the past quarter century appear to have run out of steam. The past decades have basically involved correcting major weaknesses caused by the centrally planned command system. For the most part, these structural weaknesses no longer exist. The market still needs to function much more efficiently, however. This effort must involve improving corporate governance by making enterprises and their management truly independent of the government and the CCP, as well as subject to boards

¹⁰ This statement will seem controversial to some since both the United States and the European Union have not been willing to grant China market economy status for trade purposes. Goods and services in China, however, are overwhelmingly allocated through the market, and even imports are not as subject to various quantitative quotas as is common in many developing countries.

of directors whose sole function is to ensure the success of the enterprise. There will also need to be a steady improvement in the quality and independence of the judiciary in order to enable commercial disputes in a wide variety of areas (including bankruptcies and mergers) to be handled without intervention from the executive branch of the government. The challenge for China will be to build these and other related institutions in a way that supports rapid, stable, and sustained growth. There are also specific sectors that are particularly weak and in need of reform.

Potential Economic Crises

The weaknesses in many of China's economic institutions are apparent to even the most casual observer of the Chinese economy. The best known example is the Chinese financial system. China's banks have been burdened with large portfolios of non-performing loans virtually from the moment the government first stopped financing state enterprise investment directly from the government budget and entrusted that task to the banks. Some have implied that the weakness of these banks, which would all be formally bankrupt if their loan portfolios were properly classified by international standards, could bring down the Chinese economy in a financial crisis similar to what occurred in Asia in 1997–98. That particular crisis, however, occurred in countries that engaged in heavy short-term borrowing from abroad in dollar- or yen-denominated debt and had very low and declining foreign exchange reserves (in part because of overvalued exchange rates). China has massive foreign exchange reserves (\$610 billion at the end of 2004)¹¹ and a still undervalued exchange rate (despite the recent revaluation). Chinese public and private borrowing from foreign sources has been mostly long term, and debt service-to-export ratios in China was and remains low.

Any financial crisis in China would occur for different reasons. The banking system could collapse under a massive run on Chinese banks prompted by depositors at last aware of how weak these institutions really are. This is not, however, a very realistic scenario. For both economic and political reasons, the government cannot afford to let state banks fail: antagonizing hundreds of millions of depositors is a formula for political suicide. If refinancing the banks with bonds is not possible, the government could always simply print the money required by the banks. This step might be inflationary, but given that China today does not have a serious inflation problem, some increase in inflation would be economically tolerable.

The real danger from the weak banking system is more long term in nature. If sustaining high rates of growth requires China to make its mar-

¹¹ National Bureau of Statistics, *China Monthly Economic Indicators*, 2005.2, vol. 59, 51.

ket economy steadily more efficient, then one of the areas most in need of attention is the banking system (and the financial system more generally). The Chinese stock market, to take only one example, is plagued by insider trading and company reporting requirements that are far from adequate. Beijing has been trying to reform China's banks for nearly a decade now, and in recent years there has been some evidence of progress. The share of non-performing loans in bank portfolios has been falling and the range of bank services and technical capacity has been improving. Pressure from foreign banks entering China under the new WTO rules will lead to further improvements in bank performance. The largest single remaining problem is that bank loans are still heavily influenced by local politicians; thus many of these loans go bad because they are often lent to the chronically loss-making state enterprises. This politicization makes it harder to reduce the non-performing portion of their portfolios. China could end up in a system similar to Japan, where the banking sector is so conservative that it does not lend to the most dynamic entrepreneurs in the economy. Conservative in the Chinese context means loaning mainly to state enterprises and the government (i.e., by buying government bonds) and lending little to the private sector.

The proclivity of the state banks to lend mainly to state enterprises is illustrative of a related problem that goes beyond the problems of the banks and financial markets themselves. A high percentage of Chinese investment in general is carried out by the state, with state investment in China having commonly been subject to high levels of waste (including corruption). If China is to enhance the overall productivity of its investment, more of that investment needs to be carried out by private firms operating in response to market forces without state subsidies. In particular, investment by many of the state enterprises has involved little more than propping up firms that have grim prospects of ever becoming competitive. The solution to many of these problems is to close the chronic loss-makers and privatize those with a chance of survival. This seems to be happening: note that most TVEs, for example, have been privatized in one way or another. The central government has also made clear that Beijing will no longer subsidize most of the state enterprises. The localities will have either to privatize these firms (though the word privatization is seldom used) or to find a way to subsidize them should they continue to make losses. The key remaining question is not whether most state enterprises will eventually be privatized, but whether the pace of privatization will be fast enough to maintain high rates of growth in productivity. Beijing is, however, walking a tightrope between the need to accelerate the devolution of state firms to private owners, and the implications for political stability inherent in creating the inevitable high rates of unemployment among older state enterprise workers. Though some critics

suggest that the pace of devolution has been too slow, China has laid off more than 30 million urban workers from the formerly bloated payrolls of closed, reorganized, and privatized state enterprises.

A second danger for the Chinese economy is that current efforts to rein in growth may lead to what many refer to as a “hard landing.” Though often times not clearly articulated, presumably the idea behind this term is that efforts to control inflation will misfire and cause a recession. An analogous situation in the United States would be a recession generated by too-high interest rates imposed by Federal Reserve policies rather than underlying fundamental problems with the economy. Certainly such a policy-generated recession is possible (even though the current stewardship of China’s central bank is in the ablest hands in Chinese history). Such a recession would, however, consist of only a year or two of slow or negative growth, and not necessarily indicate a fundamental downturn in the long-term growth trend. Recessions of this sort can also be generated by external shocks of various kinds. Given China’s increasing dependence on imports of energy and minerals, a sharp rise in energy and other raw material prices, for instance, could trigger a recession in China. If private investment were to experience a sharp downturn (as happens in all advanced market economies), then that could also generate a one- or two-year recession. Short-term political turmoil is another possibility. In short, there are many ways in which China could experience a year or two of very slow or negative growth, but none of these “hard landing” scenarios have much long-term significance.

A problem of greater long-term significance is the impact of environmental degradation on Chinese economic growth. For a variety of reasons China is experiencing major problems of environmental degradation at a much earlier stage of growth than the nations of Europe, North America, and even Japan.¹² Beijing is increasingly cognizant of the fact that, if the health of the population is not to suffer, substantial sums will have to be spent on controlling certain environmental hazards. In particular, urban air pollution requires immediate action and expenditures.

From a budgetary point of view, the acute shortage of water in much of northern China is also an alarming problem. The water table in the region is falling to ever greater depths as water is consumed at a rate greater than that which can be replenished by natural flows.¹³ If this situation continues, economic growth in many of the northern cities would not be sustainable, and

¹² Presumably the main reason is that, although China’s total geographic area is quite large, most of the country’s 1.3 billion people are concentrated in the eastern half of the country. As a result, Chinese population centers are much more crowded than in North America or Europe.

¹³ Evidence that the water is being mined is based on the fact that tube wells in the rural areas and elsewhere are being dug deeper and deeper to find water.

northern farmers would have to depend entirely on the weather for a successful harvest. To combat this dire prospect, China is currently spending tens of billions of dollars to divert water from the Yangtze River in the south to the parched northern regions. Three routes are being developed precisely for this purpose, each involving the transport of large amounts of water over long distances (not unlike the diversion of the Colorado River in the United States). For all of this expense, however, it is difficult to see how this or any other environmental problem will stop Chinese growth. Though several tens of billions of dollars is a large sum, China's annual level of gross investment in 2004 alone was over \$600-700 billion (after conversion of Chinese data into dollars at the official exchange rate).¹⁴

Another worry is that a shortage of key resources will create bottlenecks in the economy. The most likely scenario would be a severe shortage of energy, but shortages of food are also plausible. China today is rapidly increasing its petroleum imports and will no doubt be importing large quantities of natural gas in the future. Chinese investors are scouring the world for opportunities to secure energy supplies for the future. The most recent attempt was the effort by the China National Offshore Oil Company (CNOOC) to purchase Unocal, a company with large oil and natural gas fields (many of which are in Asia). In 2004 China imported 122 million tons of crude petroleum (roughly 2.7 million barrels a day). China's consumption of petroleum over the past decade has grown at just over 6% per year, while domestic production of petroleum has grown at only 1.6% per year.¹⁵ If these trends continue over the next decade, the gap between consumption and domestic production will continue to widen, and Chinese petroleum imports could reach over 350 million tons (or around 7 million barrels) per day.¹⁶ Yet 7 million barrels a day at \$50 per barrel is \$128 billion a year, the equivalent of 21% of China's foreign exchange earnings from exports in 2004. At \$70 per barrel, these figures rise to \$179 billion and 30% respectively. Though these are large sums, Chinese export earnings within the next decade are likely to go well past \$1 trillion. There is no reason to suppose that imports of this

¹⁴ China's GDP in 2004 in Chinese currency was RMB13,615.5 billion, around 40% of which went into gross capital formation for a total investment of RMB5,446 billion (which converts into \$672 billion at the new official exchange rate of US\$1 = RMB8.1). By applying purchasing power parity estimates of GDP and investment, the investment figure in dollars would be significantly higher.

¹⁵ Petroleum consumption and production data, as well as energy consumption and production data, are given in a number of sources. See The National Statistical Office, *China Statistical Yearbook, 2004*, 275.

¹⁶ A more refined forecast of future Chinese petroleum demand would require a much more elaborate formal econometric model that would take into account shifts between high and low energy-using sectors, assumptions about improvements in the efficiency of energy use, and much else. Such refined forecasts, however, are not likely to be substantially different from these straight-line projections into the future.

magnitude will cripple growth in any substantial way. Only an oil embargo on China could seriously restrict China's growth prospects and, barring a major war involving China, such an embargo is highly unlikely.

Social and Political Challenges to Sustainable Growth

China also faces challenges in the social sphere. In China today, roughly half of the work force of 760 million people is employed in agriculture.¹⁷ The other half has already shifted to industry and services mainly in the cities but also on the urban fringe. During the two decades after reaching this point in their structural transformation, Japan and South Korea experienced a shift out of agriculture where the percentage of workers in agriculture fell to 10% of the total work force. If something similar occurs in China (and in a very real sense this is already well underway), 250 million or more workers will shift out of agriculture and into urban and suburban areas over the next two decades. Over the coming decade alone, approximately 100 million new workers are likely to join the 100 million recent rural migrant workers that have come into the cities over the past two decades.¹⁸ If these workers bring their families with them, Chinese cities will have to accommodate around 200 million new migrants per decade.

This massive migration—the largest rural to urban migration in history over such a short period of time—will present both an opportunity and a challenge for China. Such migration could generate a large, sustained building boom to house these migrants and their families, and provide them with adequate urban infrastructure. For migrants from the poorer and more remote areas, this influx into urban areas will present an opportunity to provide their children with access to a far better education than anything they could have received in their home villages. This assumes, however, that the migrants are accompanied by their families and that the cities do provide the necessary housing, infrastructure, and education. None of this is occurring on a substantial scale at present, as the migrants are being treated as temporary residents who have no rights to any urban services. If this situation persists into the next decade, China's cities are likely to have very large populations of poor young men and women who are separated from the stable environment of their families. The potential for urban unrest, crime, and the

¹⁷ To be more precise, 49.1% of the labor force is in the primary sector, which is mainly made up of agriculture but also includes mining. The percentage in agriculture would thus be several percentage points less than the percentage for the primary sector as a whole. See The National Statistical Office, *China Statistical Yearbook, 2004*, 120.

¹⁸ There is no officially published figure for the number of rural migrants currently in the cities, but there have been a variety of informal statements by officials and others suggesting that the total was probably somewhere in the vicinity of 100 million.

spread of deadly diseases such as HIV/AIDS is substantial. Such problems could easily have an unwanted impact on the political stability so essential for sustained rapid growth.

Though improper management of this massive migration may constitute a potential threat to political and social stability, there are other serious threats as well. Essays elsewhere in this volume deal with the possible political changes that may occur in China. Here we will only deal with the implications of two of the greatest potential threats to continued stability. The implication easiest to understand stems from the consequences of a war in the Taiwan Strait. If such an outbreak of hostilities were prolonged and drew in the United States and others (as seems quite possible), then there would be little prospect of continued rapid growth in China. Many of China's export markets would be closed, and the United States and others would move to place an embargo on all manner of strategic sales to China—including oil. Foreign investors, even those sympathetic of the Chinese position in the dispute, would pull out. Though it is possible that growth might continue at a much slower pace, China would more likely be driven into a deep recession.

Whether and when China will make a transition to a more pluralistic political system—one involving the active participation of the Chinese population as a whole in major national decisions—is the second political issue of relevance. There is no way of knowing when or if such a change will occur, and if so whether the transition would be gradual and peaceful or abrupt and violent. The most that can be said is that, given China's rapidly growing educated and urban populations, the Chinese citizenry is not likely to tolerate indefinitely rule by a self-selected group of leaders, regardless of how capable that leadership might be in a technical sense. That said, however, China still has a large rural and poor population that is no doubt more interested in greater economic benefits than in political participation—unless they come to see the latter as essential to the former. Thus the most plausible estimate is that this transition will occur beyond the time frame of the one decade that is the focus of this essay. An earlier and violent transition would obviously disrupt growth, but the duration of such a disruption would depend on the nature and length of the violence. South Korea went through two somewhat violent transitions: the assassination of President Park in 1979 that was followed by a coup in 1980, and the 1987 student demonstrations-riots over the contested direct election of the president. The former contributed to only a one-year downturn in the economy and the latter had little economic impact. China will chart its own transition with consequences that cannot be predicted with confidence.

The Likely Range of GDP Growth over the Coming Decade

How do the above considerations translate into concrete economic forecasts for the next decade? Since the beginning of economic reforms in 1978, the official GDP growth rate has been slightly over 9% per year. Since 1995 the GDP growth rate has averaged over 8% per year. Some outside observers argue that China's GDP growth rate may be somewhat overstated. During the early 1990s, for example, there was some evidence that the value added of TVEs was included in GDP in current prices that did not adjust for inflation. There are also questions about China's GDP at the height of the Asian financial crisis in 1997–98, when the official growth rate remained above 7% despite the severe decline in output in much of the rest of East and Southeast Asia.¹⁹ On the other hand, there are also questions about whether Chinese GDP growth properly measures the rapid improvement in quality occurring in a wide variety of manufactured products. Measuring quality improvements properly has been difficult even in advanced economies; the tendency in most such estimates (probably including China's) is to understate the pace of quality enhancement. Thus China's actual growth rate for many years may even be higher than the official estimates.

Fifty years ago a growth rate of 9% or even 8% per year would have been considered a "miracle," and many observers use that term today to describe what has been happening in China. Prior to the 1950s and 1960s, the fastest GDP growth rates in the world averaged less than 4% or 5% per year. Growth rates of 7% to over 9% became common in Asia, however, in the 1950s through the early 1990s, beginning in Japan and then spreading to South Korea, Taiwan, Singapore, and even to Thailand and Indonesia.²⁰ Basically any developing country that adopted the proper policies could take advantage of the large backlog of unexploited technologies and begin to catch up with the high-income countries. Economies regulated under sound policies often tend to converge or catch up over time with the countries with the highest per capita income.

Thus China has, over the past twenty-six years, been gradually converging to the levels of per capita income of the high income countries, yet still

¹⁹ The official data for GDP growth are put out regularly by the National Statistical Office and reported in the annual statistical yearbooks cited above. The argument that the GDP growth rate figures for 1997 and 1998 may be overstated is based on work by such analysts as Thomas Rawski at the University of Pittsburgh that argues that the official figures are not consistent with certain other statistical indicators that normally are correlated with GDP growth. Though this latter view is controversial, whether it is correct or not applies mainly only to the late 1990s. There is little doubt among most foreign analysts that GDP growth in China since the year 2000 has been very rapid, and some analysis even suggests that the real growth rate could be higher than the official rate. Delving into these statistical issues is well beyond the scope of this essay.

²⁰ Data on the growth rate of these other Asian nations can be found in many sources. See The World Bank's annual *World Development Reports*.

has a long way to go. In 2004 Chinese per capita GDP in U.S. dollars (converted using the official exchange rate at that time) was still only \$1,270. The Chinese exchange rate—much like the exchange rates of South Korea and Japan during the early phases of their rapid growth—is widely perceived to be undervalued, however. If China's exchange rate is still undervalued by 25% (even after the July revaluation of 2%), then China's exchange rate-converted per capita GDP would be roughly \$1,600, still a low figure. The purchasing power parity (PPP) figure most often quoted for China in recent years is over \$4,000 per capita.

China is thus very much still a relatively poor developing country. As such, assuming China adopts the proper policies as outlined above and maintains high productivity growth, the economy should continue to grow at an accelerated rate. As per capita income rises toward levels currently seen in economies such as South Korea and Taiwan, that growth rate will come down. The higher a country's income and the more complex and advanced its modern industrial and service sectors, the harder it is to achieve sustained rapid growth in the 7–9% range. The GDP growth rate in South Korea and Taiwan over the past decade has been around 5% per year. Rather than reflecting problems with their economies, these lower growth rates simply demonstrate the fact that these two economies can no longer simply follow along a well-trodden path laid down by the more advanced economies. The same situation occurred in Japan in the 1970s, when near double-digit growth rates came to an abrupt end. All of these economies have had to rely increasingly on their own research and development efforts in order to sustain high growth rates; growth at the frontiers of new technologies is a much slower process.

China, however, will not catch up to the current per capita income levels of South Korea or Taiwan for at least two decades—and will only do so if it grows on average at over 7% per capita or around 8% overall for the next 20 years. Can China sustain such high growth rates? As argued at the beginning of this essay, there is no clear reason for presuming China cannot achieve sustained growth rates of this magnitude, though there are also clearly many unknowns (such as unanticipated external shocks) that could upset growth for a time. Uncertainty also hovers over whether or not China can create efficient market institutions fast enough to sustain high productivity growth. Thus a conservative estimate of the growth prospects for China would be below 8% per year. This essay assumes a growth rate of 6–8% per year over the next decade. If growth is situated within this range over the coming decade, Chinese GDP in 2015 will be about double what it is today. Should growth at these rates be maintained for two decades, GDP will be around four times the current level.

China's Defense Budget Growth

China's rapid GDP growth has facilitated an even more rapid growth of the Chinese defense budget, at least over the past decade. At the beginning of the reform period in 1978, however, the officially reported Chinese defense budget was a much higher share of GDP (4.3%) than it is today. That percentage declined steadily throughout the 1980s and into the 1990s, bottoming out at just under 1.1% of GDP in 1996. By 2003, the official share of defense spending in GDP had risen to 1.6%.

It is well known, however, that the official defense budget does not include many items that would normally appear in the defense budgets of the United States or the nations of Europe. Certain expenditures, for example, are supported by funds from local, county, municipal, and provincial governments and are not formally part of the defense budget. One particularly murky area for almost two decades were the funds derived from the profits of industrial and commercial enterprises. Chinese leaders issued a directive in 1998 ordering the Chinese military to withdraw from the management of non-military businesses. Moreover, items known to be excluded from the official defense budget include certain major purchases of weapons from abroad; a portion of the budget for military-related research, development, testing and evaluation; and the funds for the People's Armed Police (*Wujing*), a paramilitary force.²¹

Estimates regarding the size of the expenditures that are not included in the formal budget vary widely but, for the purposes of this study, a figure roughly double the official defense budget will be used since something in that range is similar to the estimates of many prominent sources of defense expertise.²² The figures for the official defense budget and the estimated (doubled) budget are presented in **Table 1**. Two straightforward conclusions can be drawn from the data. Accelerated Chinese growth has enabled Beijing to expand China's military budget very rapidly at least in nominal terms. However, China has—at least until the mid-1990s—actually chosen to steadily reduce defense expenditures as a share of GDP.

One can speculate as to why the Chinese government steadily reduced the share of GDP spent on defense, but one plausible reason is that the perceived external military threat from the Soviet Union began to recede

²¹ This brief discussion is based on David Shambaugh, "Calculating China's Military Expenditure" (report prepared for the Council on Foreign Relations, Task Force on Chinese Military Power, June 25, 2002).

²² A figure of roughly double the official defense budget is preferred in *ibid.* See also Office of the Secretary of Defense, "Annual Report of the Military Power of the People's Republic of China, 2004," May 2004; and International Institute of Strategic Studies, *The Military Balance, 2004–2005* (London: Oxford University Press, 2004).

steadily in the 1980s (from a high point in the 1970s). A second reason is that most Chinese weapons (such as aircraft and tanks) were obsolete, and China did not yet have the technological capacity to significantly upgrade these weapons. Simply expanding purchases of obsolete weapons and recruiting more infantry soldiers would do little to enhance China's military capacity. China's homeland defense efforts in the 1970s and early 1980s were based on what the Chinese called "peoples' war," a strategy which utilized a vast militia trained in the use of infantry weapons. Such a militia could not stop an armored invasion from the Soviet Union or other adversary, but could make life miserable for any invading army trying to occupy and govern any significant amount of populated territory.

By the mid-1990s, in contrast, China had begun to establish its research and development capacity in a wide variety of areas of advanced technology, including some areas of military technology. Furthermore, as mentioned above, China had acquired the capacity to earn large amounts of foreign exchange, making purchases of military equipment from abroad easily affordable. With foreign exchange earnings of over \$600 billion per year (exports plus foreign direct investment), China can afford purchases of foreign military equipment totaling in the tens of billions of dollars per year. Beijing has, however, chosen to purchase far less than this, presumably because it does not want to become dependent on foreign sources of military equipment. Beijing is also deterred by the fact that U.S. and European military equipment is not available for purchase.

Before speculating on how large the Chinese military budget might become over the next five to ten years, it is useful to try to understand what such a budget (measured either in Chinese currency or in U.S. dollars) indicates regarding China's military capacity. Roughly one-third of China's official military budget is allotted for expenditures on personnel, whether in the form of salaries or the direct provision of benefits such as housing and healthcare. With the rise of the market economy and the elimination of labor allocation policies (which had determined where a person could work), China's military has had to compete for skilled personnel by offering increasingly competitive wages. Wages in the Chinese military have thus risen rapidly in recent years, a change that has been reflected in the military budget.

The cost of military equipment and of maintenance services has no doubt also risen over time, but we do not have an appropriate deflator for military equipment. **Table 1**, for lack of a better deflator, uses the index for ex-factory prices of industrial products. For personnel costs, the state sector's average wage change stands as a plausible estimate for the change in the average salary of all military personnel. The use of this wage index to

Table 1. China's Official and Estimated Defense Budget

	Official Budget (bn yuan, current prices)	Defense expenditures (as share of GDP)	Estimated defense budget (official budget x 2; bn yuan, current prices)	"Real" national defense expenditures (bn yuan, 2003 prices)
1978	16.8	0.046	33.6	...
1980	19.4	0.043	38.8	...
1985	19.2	0.021	38.3	113.7
1990	29.0	0.016	58.1	97.2
1991	33.0	0.015	66.1	102.8
1992	37.8	0.014	75.6	104.6
1993	42.6	0.012	85.2	95.6
1994	55.1	0.012	110.1	96.0
1995	63.7	0.011	127.3	95.5
1996	72.0	0.011	144.0	100.3
1997	81.3	0.011	162.5	109.1
1998	93.5	0.012	186.9	120.0
1999	107.6	0.013	215.3	133.1
2000	120.8	0.013	241.5	140.0
2001	144.2	0.015	288.4	157.9
2002	170.8	0.016	341.6	180.0
2003	190.8	0.016	381.6	190.8

... = data not available for price deflation

Methodology: The official national defense budget in current prices is taken from the year-books of the National Statistical Office. The share of that budget in GDP is obtained by dividing the official Chinese GDP in current prices by the official military budget. The estimated total defense budget was obtained by multiplying the official budget by two. Many attempts to estimate the true size of the defense budget come up with figures double that of the official budget, but there are somewhat lower estimates and some much higher estimates of the true figure. The total defense budget in 2003 prices was calculated by first assuming that one third of defense expenditures were for personnel (this is the figure sometimes given in Chinese sources although it is unknown whether it would apply to total defense expenditures including items excluded from the official defense budget) and two-thirds for non-personnel expenditures such as military equipment. The personnel budget in current prices was then converted into 2003 prices using the index of wages in the state sector as the assumed deflator for personnel wages. The non-personnel expenditures were converted into 2003 prices using the ex-factory price index. The personnel and non-personnel figures so obtained were then added together and that is the figure presented in this table. This methodology, it needs to be emphasized, is only a very crude indicator of the real changes in defense expenditures over the period covered because a variety of plausible assumptions subject to a considerable margin of error had to be made in making these calculations.

convert Chinese military personnel expenditures into constant year 2000 prices probably understates the growth in actual military personnel budget since these prices assume no improvement in personnel quality over time. Because the quality of both military and civilian personnel has certainly improved since the 1990s, Chinese military capacity in real terms grew somewhat faster (though by an unknown amount) than the deflated figures in **Table 1**.

The above exercise provides imperfect measure of the real increase in Chinese military expenditures, but does not indicate the size of the Chinese military budget relative to that of other countries. To make that comparison, the data must first be converted from Chinese renminbi into a common currency such as U.S. dollars. The usual practice is to use the official exchange rate between the Chinese yuan and the U.S. dollar, as has been done in **Table 1**. Exchange rate conversions are, however, notoriously unreliable measures of the difference in standards of living between countries that have widely varying per capita incomes. For similar although not identical reasons, exchange rate conversion comparisons are also an unreliable basis for comparing military capacities between countries with very different levels of per capita income. The preferred method for trying to attain a reliable comparison of living standards between developed and developing countries is PPP—although this method poses its own theoretical problems. The question that should now be posed is: what is the equivalent to the method in the military sphere?

A direct application of the PPP method to Chinese military expenditures would involve revaluing each item in the budget at international prices (usually in U.S. dollars). For the Chinese military budget, this would mean an erroneous increase in the personnel expenditures. Chinese military personnel are no doubt less well-trained and less skilled than those in the U.S. military, but the difference in fighting abilities (ignoring, for now, the quality of equipment) hardly approaches the salary differential. By contrast, weapons are, at least in principle, traded goods with similar prices on the world market. China can and does purchase military aircraft and other weapons from abroad at international prices. Because China places a premium on the ability to produce its own military equipment, however, it is no doubt more expensive for China to produce high technology military hardware than it is for the United States to produce similar hardware. On the flipside, China can certainly produce standard infantry weapons at a lower cost than can the United States.

Plausible PPP estimates of Chinese military expenditures suggest that the figure would be at least double current total defense expenditure esti-

mates (which are themselves double the official defense budgets).²³ Does this supposed PPP figure imply, however, that China's true military capacity is twice that of Western estimates of four times the official published figure for China's true defense expenditures? Any answer to such a question depends on what kind of war this military would be expected to fight.

A war in defense of the Chinese homeland would presumably make use of China's vast reserves of manpower, including, but not limited to, the regular military, the peoples' armed police, and the militias. Such a force would be difficult to defeat by any measure. Thus it is reasonable to calculate China's military capacity as being far greater than even a PPP figure four times the official defense expenditure. On the other hand, should a military engagement take place far from the Chinese mainland, involve large naval and air force capacities, and be dominated by high-tech weapons, then the exchange rate conversion of the Chinese military budget would be a better measure of the country's true military capacity. Manpower and infantry weapons would be largely ineffective in such a conflict.

When contrasting military capacity with military expenditure, therefore, the Chinese budget is not a very reliable guide. True analysis of China's military capacity needs to take into account, in addition to many other factors, the quality of specific weapons and the training and motivation of personnel; even then, the measure of capacity would depend on the situation. Such a calculation is beyond the scope of this paper. All that can be attempted here are a few projections concerning the Chinese military budget likely to occur under realistic circumstances, keeping in mind, of course, the limitations of budgetary figures and the true capacity of the Chinese military in specific situations.

How large could the Chinese military budget become over the next five to ten years? The most plausible range of scenarios encompasses a China largely at peace with the rest of the world and hesitant to settle the Taiwan issue through military means. A more extreme scenario would include a China determined to settle the Taiwan issue militarily—even at the cost of an extended confrontation with the United States. Under the former scenario, one could anticipate Chinese defense expenditures rising slowly from the current roughly 3% of GDP to perhaps 3.5% over the next five to ten years. If, as suggested above, GDP growth is 6% to 8% a year (or, to simplify

²³ A plausible exercise is to revalue the wages of the 2 million personnel in the armed forces at the U.S. minimum wage rate (a rate that applies to the least skilled workers in the U.S. labor market). This assumption probably understates the true worth of the Chinese soldier, but even this rate leads to Chinese expenditures on military personnel of 172 billion yuan (5x40x52x8.28x2,000,000=172 billion yuan). This figure is almost as large as the total official defense expenditures in the 2003–04 period. If the percentage of personnel costs in the unofficial parts of the defense budget estimates is similar to that in the official budget, then the PPP figure for personnel alone would double the unofficial defense budget (which is in turn double the official defense budget).

the calculations, 7%), then GDP would rise by 40% in five years and would double in ten years. In that case, defense expenditures would rise to around \$80 billion in 2010 to nearly \$140 billion in 2015. These figures assume that the Chinese yuan-U.S. dollar exchange rate remains similar to what it was after the July revaluation (which seems unlikely). If, for instance, the Chinese exchange rate is revalued to RMB7=US\$1, then defense figures for 2010 and 2015 would be \$95 billion and \$164 billion respectively (in 2004 prices). In the more pessimistic scenario, China could easily expand defense expenditures to 5% or 6% of GDP, with resulting defense expenditures of \$135–160 billion in 2010 and \$230–280 billion in 2015.²⁴

Though the specific figures in these projections are not of great significance, they do make one important point. If China's leadership so demands, then the country will soon have the capacity to support a very large military budget. A budget of even 5% or 6% of GDP could be sustained for quite some time without cutting into the overall rate of economic growth. If, for example, the increase in military expenditure came out of the investment total currently at around 40% of GDP, that investment rate would fall to 37% or 38% of GDP, which is still an extraordinarily high figure. If a reduction in the rate of investment led to an increase in the efficiency of the remaining investment (since the investment cut out was largely the least productive public sector investment), then the GDP growth rate might not fall at all.

Although these higher projections suggest that Chinese defense spending is at levels four times the current projections, it is important to reiterate that this does not necessarily mean that China's military capacity will similarly increase fourfold as well. The main constraint on China's military capacity at present is not the country's inability to fund an expanding military. The real constraint is China's inability to rapidly improve its military technology to a point where the Chinese military can effectively engage in conflicts some distance from the Chinese mainland. Chinese technological capacities are clearly improving at a quick pace, but whether or not that pace is also rapidly catching up with the technological capacities of potential adversaries is an issue beyond the scope of this chapter.

Conclusion

Since the beginning of the reform period in 1978, China's rapid growth has impacted China, the region, and the world in ways that extend well beyond economics. With the notable exception of the Tiananmen Square tragedy, this sustained growth has been a prime factor contributing to the most

²⁴ These figures also assume an exchange rate of RMB7=US\$1.

prolonged period of political stability in China in the past century. Such growth has also enabled China to become a major international power influencing both the economic and political sphere. The question for the future is whether this high economic growth can sustain itself.

As the above analysis has indicated, China is likely to accumulate both physical and human capital at an accelerated rate for at least the next decade (and probably longer). The real challenge for China's economy will be to maintain a high rate of growth in the efficiency with which those inputs of capital and labor are being used. Many of the productivity gains to date have been one-shot affairs, and China needs to find a way of sustaining high productivity growth. That goal will involve a steady and determined effort to improve institutions such as corporate governance and the legal and financial system. Beijing is trying to accomplish precisely this, in part through the steady expansion of the private sector and in part through the curtailment of the share of the state-owned industrial and service sectors. The only real question concerns whether or not the Chinese leadership is doing so with sufficient determination and speed to obtain the desired results.

This chapter has argued that, if Beijing can avoid a major domestic political upheaval or international conflict, then China is very likely to sustain high rates of economic growth over the next decade and beyond. Rapid growth in and of itself will help to maintain political stability in the short term. Over the long term, however, rapid economic growth will create a more prosperous and better-educated population that will demand greater participation in the political arena. The transition to a more pluralistic political system, however, is likely beyond the single decade framework of the forecasts in this essay.

In addition to facilitating a rapid rise in the standard of living of most of the Chinese people, rapid economic growth will also make possible a steady rise in the Chinese military budget. Having the ability to increase the military budget, of course, is not equivalent to actually expanding military expenditures to match or surpass the growth rate of GDP. Even in a peaceful environment, however, China will eventually desire major world power status in military as well as economic terms. The Chinese military already has a formidable capacity for defense of the homeland. With continued enhancement of its military technological capacity, China will no doubt at some point possess a major military capacity extending beyond its borders, but this is probably unattainable within the coming decade.

All of these rapid-growth forecasts could, of course, come to a grinding halt should China suffer a sustained period of domestic political instability or become involved in major military confrontations with other world powers. A slowly growing China that stumbles from crisis to crisis would,

however, probably be of more danger to the outside world than it is today, or is likely to be if high growth continues. Chinese military technology would continue to improve and the military budget could become a much larger share of GDP. Most importantly, the world would have to deal with a Chinese leadership desperate to use whatever means possible to retain power. Such a leadership would be far more difficult to deal with than one which works in the context of an increasingly prosperous economy. The best hope for the long-term future, therefore, is that China continues to enjoy high rates of economic growth and increasing integration of its economy into the world economic system.

The United States can draw two primary conclusions from the above discussion. First, China's continued rapid growth, combined with the steady integration of China's economy into the global economic system is, from Washington's perspective, the most ideal scenario. Conversely, a slow-growing China lumbering from crisis to crisis would have far graver implications for the United States, particularly in the security sphere. This situation does not preclude the United States from taking whatever measures it deems necessary to support domestic industries facing inappropriate forms of competition from China. It does, however, preclude the United States from pushing for across-the-board protectionist measures certain to do real harm to the Chinese economy, particularly if similar measures were introduced by the European Union. Such measures would, of course, also undermine the global economic system in general, given China's large and growing role in that system—a system that the United States has spent decades trying to build and strengthen.

Second, there is little Washington can do to significantly slow the growth of Chinese military expenditures or of Chinese domestic research and development efforts in the military sphere. That said, U.S. and European Union long-term interests are clearly not served through advanced weapon sales to Beijing or research assistance with clear military applications.