

THE G4:

UNDIMINISHED EXPECTATIONS

THE SOURCES OF GROWTH

SEPTEMBER 2015

PREPARED FOR PROFESSIONAL CLIENTS ONLY



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After years of crisis and upheaval, some commentators have resigned themselves to an era of “mediocre” growth. But four of the world’s biggest economies* (Japan, America, China and India) are now in the midst of recovery, reform, or both. What if all four fulfilled their economic potential at the same time? That is the optimistic scenario examined in the G4 white-paper series. If this scenario materialized, the consequences would be profound. The G4 would lift growth and trade in the rest of the world, reverse the slide in commodity prices and support a rally in equity markets. Their joint success would also enliven geopolitical relations between these four Asian powers.

In the first paper in the G4 series, we concluded that each of these economies has “room to recover”. If demand revives, they can grow quickly for a spell before running into capacity constraints. Further progress will then depend on growth in the G4’s productive capacity. Its evolution over the rest of this decade will reflect workforce trends, capital accumulation, and productivity gains - the three ultimate sources of growth. They are the subject of this second paper.

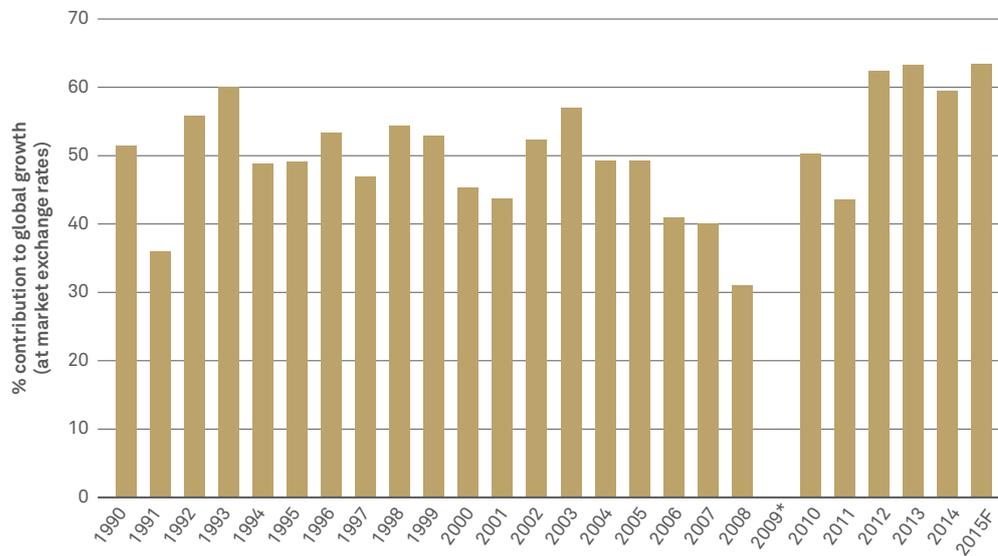
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* In terms of GDP measured at purchasing-power parity

1. Half the world

Japan, America, China and India are home to over three billion people and produce almost 45 percent of global GDP ¹. Their contribution to the *growth* of GDP is even bigger: more than 60 percent in 2015, according to the IMF's forecasts (see chart). At various points in their economic history, each of these countries has looked to another as an inspiration for the future. India hopes to emulate China's manufacturing success; China drew inspiration and investment from Japan; and Japan assimilated expertise from America, before America began to return the compliment.

G4 contribution to global growth



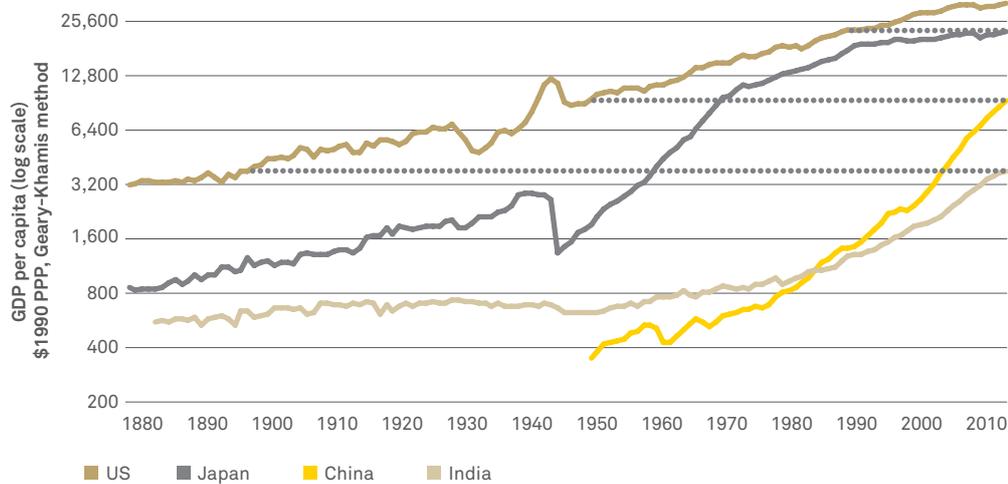
* The world economy and the combined G4 economy shrank in 2009

Source: BNY Mellon calculations, based on IMF data and forecasts

Despite their joint significance, these four economies are rarely analyzed as a group. It can seem as if nothing unites them but size and complexity. That makes it formidably difficult to wrap one's head around even one of these giants, let alone all four of them. And yet no comparable intellectual effort yields such rich rewards: understand these four, and you would understand almost half the world.

¹ In 2014, they accounted for almost 45 percent of global GDP when currencies are converted at market exchange rates and a similar proportion (almost 44 percent) at purchasing-power parity, according to IMF figures. Purchasing-power parity attempts to value similar goods and services at the same dollar prices wherever they are sold. By this measure, they are already the four biggest economies in the world.

G1,2,3,4



Source: Total Economy Database, The Conference Board

At BNY Mellon we are taking some initial, modest steps to consider Japan, America, China and India in parallel. We call them “JACI” amongst ourselves and the G4 in more formal settings, a shorthand befitting the world’s four biggest economies, valued at purchasing-power parity.

It is a particularly interesting time to be thinking about this quartet. As we pointed out in our first G4 paper², all of these economies are currently falling short of their potential, thanks to recent economic setbacks and subdued spending. But all four of them are also in the midst of recovery, reform, or both. In America, unemployment has dropped surprisingly quickly in the past two and a half years allowing the Federal Reserve to contemplate higher interest rates. And with the emergence of Xi Jinping in China, Shinzo Abe in Japan and Narendra Modi in India, Asia’s three great powers all now boast assertive governments, who profess their commitment to economic reform as a means to national revival. That is a rare confluence of events.

These developments prompted us to ask the question: what if all four of these giant economies began firing on all cylinders at roughly the same time? That is the G4 scenario that I sketched out in the first paper in this series and will explore in more detail in this sequel. The scenario envisages growth over the rest of this decade averaging 2 percent in Japan, 3 percent in America, 7 percent in China and 8 percent in India³. These rates of expansion are undeniably ambitious. They are somewhat faster than the IMF now expects for the years until 2020, and the IMF has a reputation for overoptimism. But the scenario is not outside the bounds of possibility.

² <https://www.bnymellon.com/apac/en/g4/download-whitepaper.jsp>

³ Growth of 2 percent in Japan is consistent with the Cabinet Office’s “revitalization scenario” published in July 2014. Three percent growth in the US is in keeping with historical averages and past IMF forecasts, before the IMF lowered its sights. Growth of 7 percent in China matches the rates envisaged by the Development Research Centre of the State Council in joint work with the World Bank. Finally, 8 percent was the median long-term forecast in the latest survey of professional forecasters carried out by the Reserve Bank of India.

At BNY Mellon's Tokyo Foresight conference in May, our audience was asked to give their own assessment of the scenario's plausibility. According to the anonymous vote, 42 percent of the attendees thought the scenario was utopian, but a small majority (55 percent) thought it was feasible. (A few optimistic souls - about 2 percent - even thought it was conservative.)

In exploring these four countries' economic potential, we do not want to sound boosterish or bombastic. As buy-side investment strategists, we should be suitably humble about what can be expected of the world economy. But before settling for the consensus forecast of mediocre progress, we should also be appropriately humble about what analysts really know about the future of economic growth. Growth rates have varied a great deal within all four of these economies, frequently catching economists by surprise. Some of those surprises have even been pleasant. To describe the G4 scenario as unthinkable is to set a rather tight limit on what can be thought.

In this optimistic scenario, the combined GDP of the G4 will grow by about 30 percent, or over \$10 trillion ⁴, from 2014 to 2020 ⁵. Where will this growth come from? In the previous paper, we looked at the "demand-side" of the G4 economies, exploring the boost to growth that stronger spending could provide. In this paper, we turn to the "supply-side". The G4 scenario will require additional "inputs" of labor and capital. It will also require significant gains in productivity, yielding additional output per input. In this second paper, therefore, I will try to square the growth rates envisaged in the G4 scenario with what we know about the prospects for employment, investment and productivity in these four economies.

⁴ At 2014 prices and exchange rates. BNY Mellon calculations

⁵ This is a compound annual growth rate of 4.5 percent for the G4 as a combined unit.

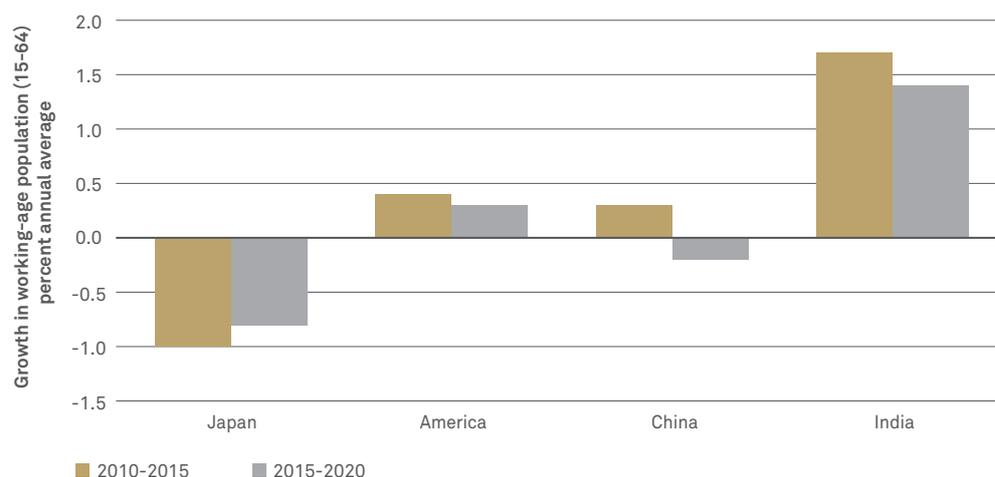
2. Labor

The size of the G4's workforce in 2020 will reflect three trends: how many people of working age exist (demography) how many of those people seek work (labor-force participation) and how many of them find it (employment).

2.1 Demography

The first of these trends, demography, is a powerful and somewhat predictable economic force. That combination - power and predictability - gives it a tight grip on the imagination of pundits, who often talk as if demography is destiny. According to this line of thinking, population dynamics will doom Japan, bedevil China and bless India⁶.

Growth in working-age population



Source: World Bank, BNY Mellon calculations based on Statistics Japan and US Census Bureau⁷

India's demographic prospects are indeed better than China's, which are, in turn, better than Japan's. But it is important to keep a sense of proportion. China's working-age population has grown by only half a percent from 2010 to 2014. Its GDP meanwhile has grown by more than 35 percent over the same period⁸. Demography was clearly not the principal force at work. In Japan, the working-age population has shrunk in the past five years. But the number of people working has actually risen⁹. Increases in employment and participation helped Japan defy its demographic destiny.

⁶ <http://thediplomat.com/2013/02/japans-demographic-disaster/>
<http://www.businessspectator.com.au/article/2015/1/22/china/chinas-ticking-demographic-time-bomb>
<http://personal.lse.ac.uk/debp/Papers/GP201.pdf>

⁷ The US figures are based on Census Bureau population projections and 2010 census results.
<http://www.census.gov/population/projections/files/summary/NP2014-T9.xls>
<http://www.census.gov/prod/cen2010/briefs/c2010br-03.pdf>
The figure for Japan 2015-2020 is based on the size of the 10-59 year old cohort in April 2015 compared with the 15-64 year old cohort in the same month, as estimated by Statistics Japan. The figure for Japan 2010-2015 is based on the provisional estimate for April 2015 by Statistics Japan and the final estimate for April 2010.
<http://www.e-stat.go.jp/SG1/estat/ListE.do?lid=000001066754>
<http://www.e-stat.go.jp/SG1/estat/ListE.do?lid=000001133790>
The figures for India and China are based on World Development Indicators. SP.POP.1564.TO

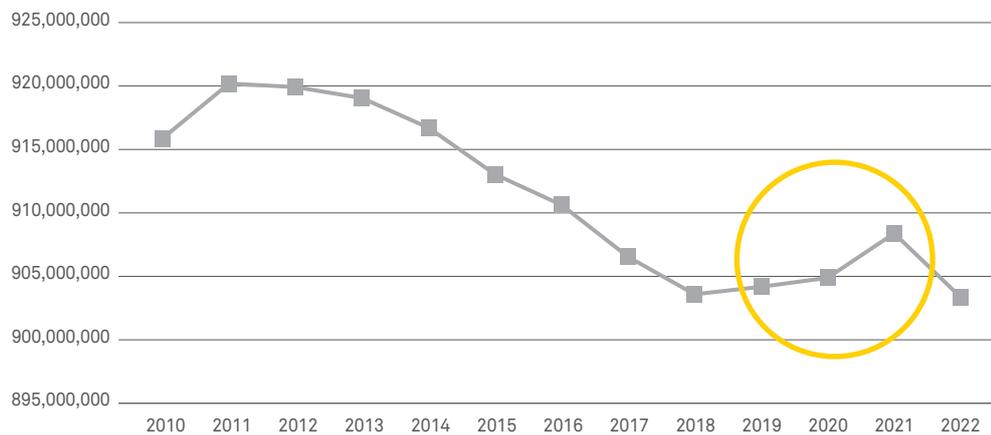
⁸ National Bureau of Statistics, China Statistical Yearbook

⁹ <http://www.stat.go.jp/data/roudou/longtime/zuhyou/lt01-a10.xls>

Japan's working-age population (aged 15-64)¹⁰ will continue to shrink by about 0.8 -0.9 percent a year for the rest of the decade. That will undoubtedly be a drag on Japan's economic performance over the next five years. But it will be less of a demographic drag than Japan has suffered over the past five years (see chart on previous page).

China's working-age population has also begun to fall. But the decline will be fairly gentle for the next few years. It is not until the 2020s that China's larger cohorts begin to retire. Indeed, China's population of 16-59 year olds (the government's definition of working age¹¹) may start growing again for a couple of years at the end of the decade. This lull in demographic pressure represents the distant echo of China's Great Famine of 1959-1961. Relatively few Chinese were born (or survived childhood) during that period; relatively few people will therefore retire 60 years later.

China's working-age population (aged 16-59)



Source: China census 2010. This chart assumes that the number of 16-59 year olds in 2020 will be the same as the number of 6-49 year olds in the 2010 census.

China's population by age

(Based on 2010 census)



Source: China 2010 census. This chart assumes that each age cohort in 2015 is the same size as the cohort that was five years younger in 2010.

¹⁰ This broad definition of working age makes international comparisons easier.

¹¹ http://www.stats.gov.cn/english/PressRelease/201402/t20140224_515103.html

In India, pundits are right to be impressed by the country's demographic potential. From 2015 to 2020, its population aged 15-64 will increase by over 65 million people, which is about the size of the entire UK population. India alone will account for 28 percent of the *global growth* in the working-age population, according to United Nations projections¹². Even so, the demographic dividend will not be quite as generous over the next five years as it was over the previous five, when India's working-age population grew even faster in percentage terms.

2.2 Participation and employment

Not everyone of working age actually works, of course. Not everyone even wants to. In the language of economists, a person who is employed or seeking employment is said to be participating in the paid labor force. If that person is participating but not working, they count as unemployed. If they are not even seeking a job, however, they do not count as unemployed because they are not taking part in the labor force at all^{13,14}.

In Japan and the United States, unemployment is already fairly low (3.3 percent in Japan¹⁵ and 5.3 percent in America¹⁶). Some people therefore argue that these economies cannot grow much faster without running into labor shortages.

Our growth scenario assumes otherwise. In our view, these countries' lowish unemployment rates mask considerable *underemployment*. We assume that millions of missing workers who are not now counted as unemployed would nonetheless return to the job force if their prospects improved. Many others who are already employed would work for longer hours, if they could. And we assume there are millions more whose hours are emptier than they could be.

Why do we think this? In the **United States**, labor-force participation is unusually weak, having fallen to its lowest rate since 1977, according to the Bureau of Labor Statistics (BLS)¹⁷. Some of that decline is permanent, the result of structural trends, such as aging, that will persist even if the economy improves. But some of it is reversible, the consequence of "cyclical" weakness that might disappear if the economy prospers.

¹² United Nations World Population Prospects, 2015 Revision.

¹³ Labor-force participation is usually measured as a percentage of the working-age population (or the population over 16). Unemployment is measured as a percentage of the labor force. Employment can be measured as a percentage of either. In this paper, we will define the employment rate as the percentage of the working-age population that is actually working in a paid job.

¹⁴ India's latest National Sample Survey for 2011/12 records unemployment rates of 1.7 percent for rural men and women, 3 percent for urban men and 5.2 percent for urban women. China's official, urban unemployment rate, according to the Ministry of Human Resources and Social Security, was about 4 percent (4.1 percent, to be exact) in the fourth quarter of 2014, as it almost always is. However, in developing countries like India and China, the unemployment rate is a misleading statistic. Jobless benefits are rare. Therefore most people cannot afford to be unemployed. If a person is participating in the labor force at all, they are probably working, even if they are only scraping by in petty, informal jobs, such as selling trinkets at traffic lights.

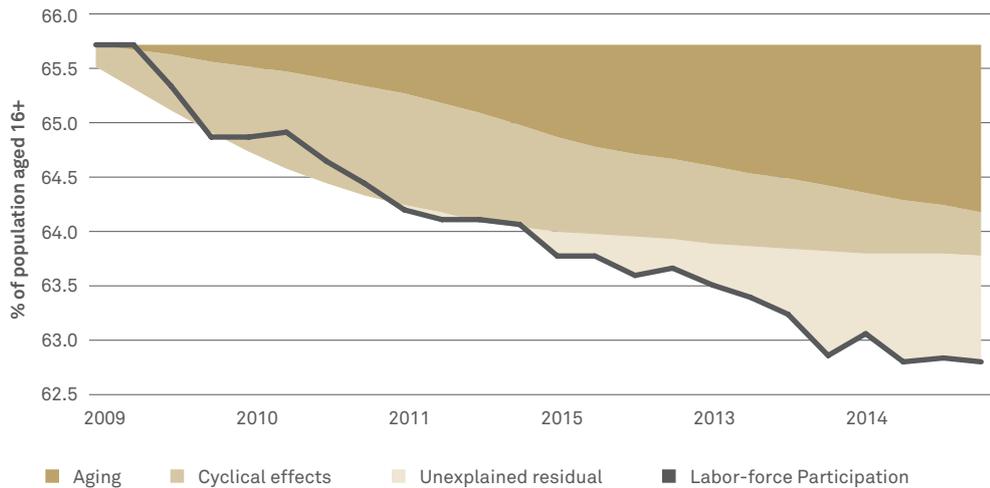
¹⁵ In May 2015, seasonally adjusted, according to Statistics Japan.

¹⁶ In June 2015, according to the US Bureau of Labor Statistics.

¹⁷ <http://data.bls.gov/timeseries/LNS11300000>

According to the White House Council of Economic Advisers (CEA), a little more than half of the decline in participation from end-2007 to end-2014 was due to aging¹⁸. About 16 percent of it reflected a cyclical effect of the kind seen in previous downturns. The remainder – about 30 percent – was harder to explain (see chart)¹⁹.

US labor-force participation



Source: Council of Economic Advisers, BLS, Current Population Survey

The first of these three factors, aging, will continue to depress participation over the rest of the decade. But the other two forces may fade as the economy strengthens. This was one of a number of possibilities modelled by the CEA. Combining their most optimistic participation projection with BLS population forecasts²⁰ suggests that America’s labor force could grow noticeably faster over the rest of the decade than it did over the past six years (as our chart opposite illustrates).

If unemployment also drops, then the number of people actually in work would grow even faster. Economists at the Federal Reserve Bank of Chicago reckon that America’s natural unemployment rate may fall as low as 4.4 percent by the end of the decade²¹. This is partly because older workers are less likely to be unemployed, an underappreciated benefit of an aging workforce. Assuming that unemployment does indeed drop to 4.4 percent, as it did in the last cycle, employment could grow by 1.1 percent a year on average in 2015-2020.

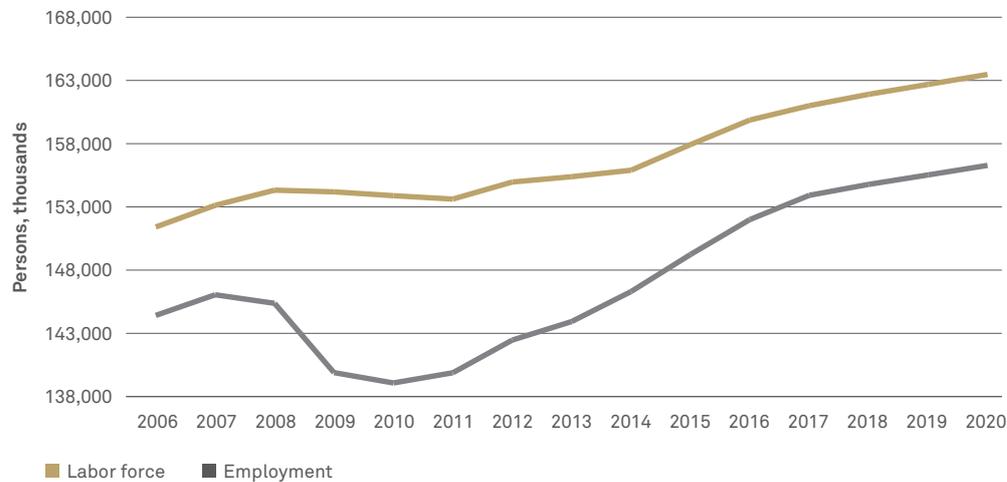
¹⁸ https://www.whitehouse.gov/sites/default/files/docs/labor_force_participation_report.pdf

¹⁹ https://www.whitehouse.gov/sites/default/files/docs/cea_2015_erp.pdf

²⁰ Unlike the Census Bureau projections reported earlier, these BLS population projections cover people aged 16+ who are not in the military, prison or other institutions. <http://www.bls.gov/opub/mlr/2013/article/labor-force-projections-to-2022-the-labor-force-participation-rate-continues-to-fall.htm>

²¹ Chicago Fed Letter, Number 338, 2015.

US labor force and employment



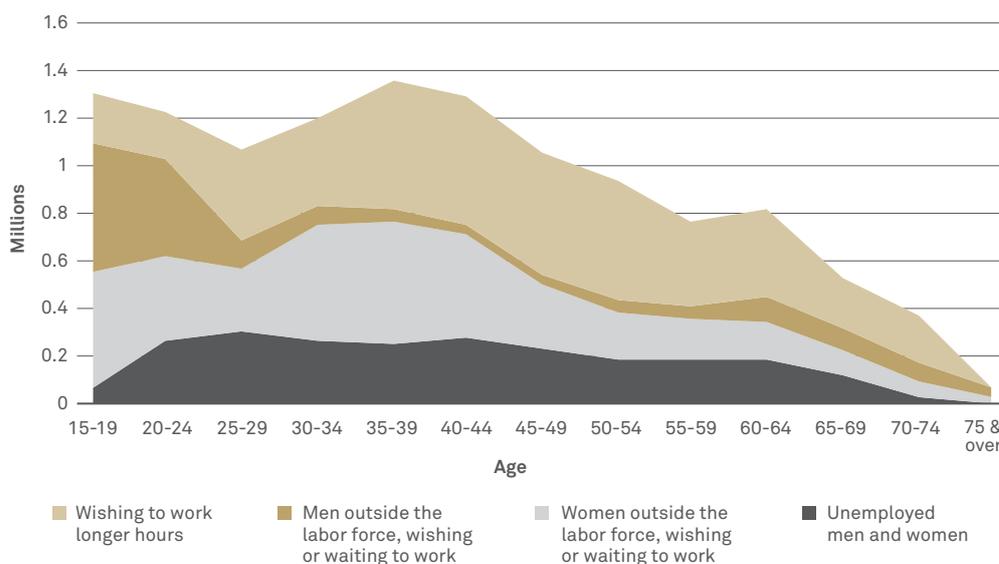
Source: 2006-2014 Bureau of Labor Statistics. 2015-2020 BNY Mellon projection based on BLS and Council of Economic Advisers.

In **Japan**, employment and participation rates have both risen since Abenomics began²². But they could both be higher. In the first quarter of 2015, 4.09 million people who were not in the labor force said they nonetheless wanted to work²³. Furthermore, 4.38 million employees wished to work more hours²⁴.

These are big numbers. To put them in perspective, if the 4.09 million people who want to work all entered employment, it would increase the number of people working by 6.5 percent.

Japan's potential workers

(2014 annual average)



Source: BNY Mellon calculations, based on Japan Labor Survey

²² In the fourth quarter of 2012, 74 percent of Japanese aged 15-64 participated in the labor force, according to Statistics Japan. That rate rose to 75.8 percent two years later.

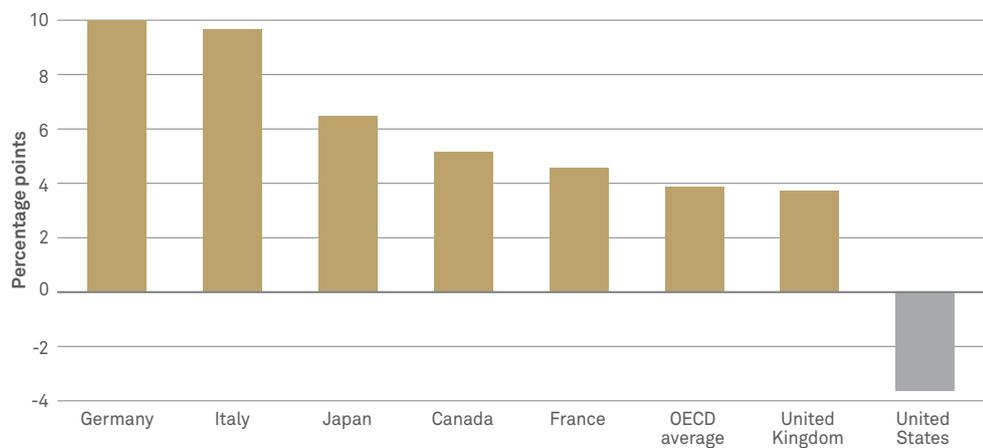
²³ <http://www.e-stat.go.jp/SG1/estat/ListE.do?lid=000001134116>

²⁴ <http://www.e-stat.go.jp/SG1/estat/XlsdlE.do?sinfid=000029559688>

2.3 Womenomics

Many of the G4's missing workers are women. In the United States, women's participation in the workforce peaked in 1999, the end of a long postwar trend ²⁵. This turning point in the feminization of American labor is often treated as an inevitable social transition. That's surprising, because the decline makes the US an outlier among G7 countries (see chart) ²⁶.

Change in women's labor-force participation rate 1999-2014



Source: BNY Mellon, OECD data

In Japan, women's participation in the job market has evolved quite differently. After rising steadily for several decades, it slowed after the global financial crisis but accelerated sharply after Abenomics began ²⁷.

Thanks to these trends, Japan has reached a significant milestone. It now employs a higher percentage of its working-age women than the United States (see chart) ²⁸. The rising number of female workers is one underreported success of "womenomics" ²⁹, Japan's campaign to revitalize the economy by making better use of women's talents. But the campaign still faces significant obstacles, some of them deeply rooted in Japan's economic history.

²⁵ <https://research.stlouisfed.org/fred2/graph/?g=1mJg>

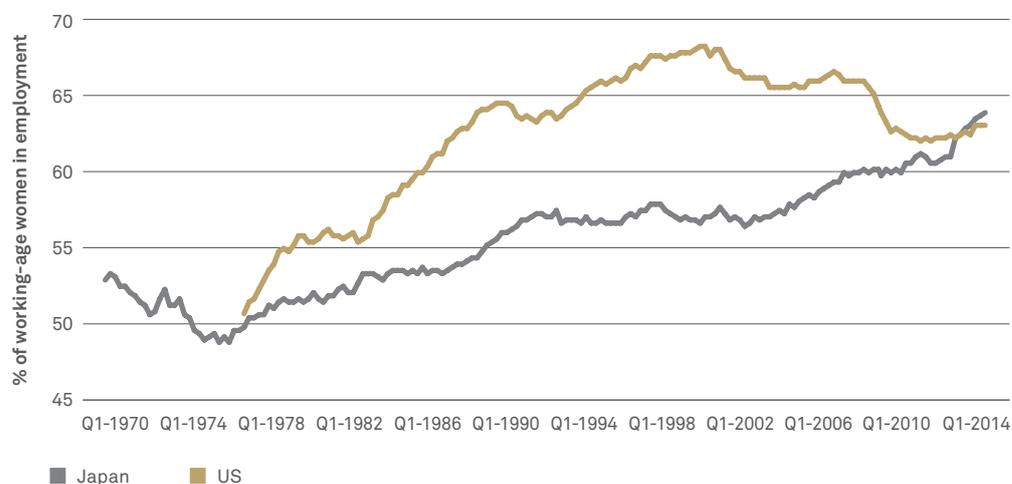
²⁶ The US is an outlier in other ways also. According to the International Labor Organization, it is the only developed country in the world not to ensure paid maternity leave.

²⁷ https://stats.oecd.org/Index.aspx?DataSetCode=LFS_SEXAGE_I_R#

²⁸ In the US higher female participation is offset by higher unemployment

²⁹ <http://www.goldmansachs.com/our-thinking/outlook/womenomics4.0.html>

Female employment rate



Source: <http://www.oecd.org/gender/data/employmentandunemploymentratebysexandagegroupquarterlydata.htm>

Japan's industrial success was built in part on a two-tier labor market. An upper tier of workers (sometimes called *sogoshoku*) enjoyed life-time employment and seniority pay. Their long tenures allowed firms to invest heavily in their progress, teaching them skills that would bear fruit later in their careers. The workers likewise invested heavily in the company, acquiring firm-specific skills that might be of less value elsewhere³⁰.

This locked-in relationship was valuable but not flexible. Workers moved a lot within firms but not much between them. And employers could not vary the size of their core labor force in step with the business cycle. Firms therefore retained a second-tier, peripheral workforce that could be hired and fired as cyclical conditions dictated. Unlike life-time employees, who were underpaid in their early, apprentice years in anticipation of better pay later, the wages of peripheral workers varied relatively little with age³¹.

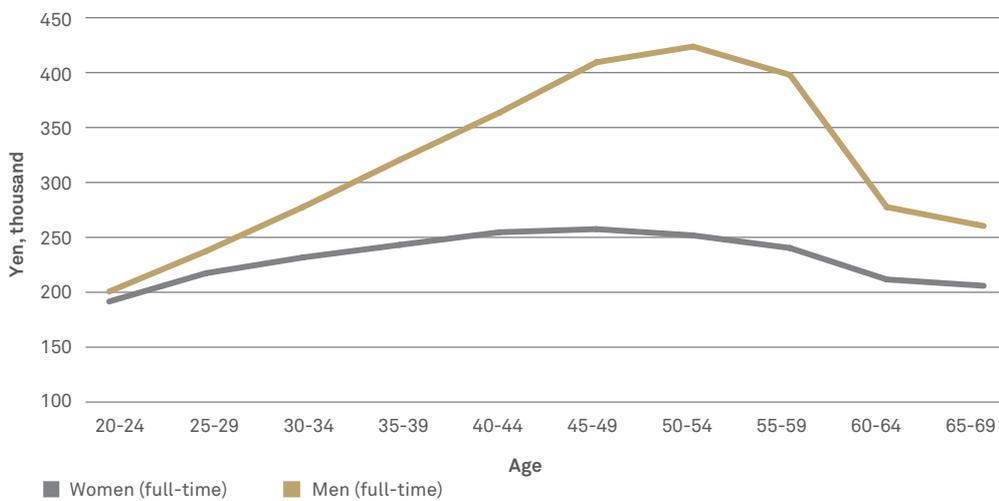
This dichotomy does not have to be gendered (women can be *sogoshoku*, men peripheral workers). But in practice, this two-tier system has damaged women's pay and prospects. The system disproportionately rewards career continuity and seniority. Not only that, it rewards the *expectation* of continuity and long service. Those who stay and were always expected to stay can be groomed for higher positions. The same is not true for peripheral workers. Even if one of these second-tier workers ends up serving a company for many years, the firm will not have counted on her doing so, and will not have trained her for highly paid roles.

³⁰ <http://www.matanle.net/writing/publications/chapters/LTE21.pdf>

³¹ "Gender income gap of white-collar regular employees" by Kazuo Yamaguchi, cited in "What can boost female labor force participation in Asia?" Yuko Kinoshita and Fang Guo.

The impact on Japanese women is visible in their shorter workweeks and lower pay. More than 40 percent of Japanese working women work fewer than 35 hours a week, according to the OECD ³². In the US, the figure is only about a quarter. Japanese women also face a daunting pay gap. They earned almost 27 percent less than men in 2013 ³³, a gulf that is second only to Korea’s within the OECD. The gap tends to grow over the first 30 years of a career, as men benefit from career continuity and seniority in ways that women find hard to replicate (see chart below).

Monthly wage of full-time employees in Japan



Source: Basic Survey on Wage Structure 2012

The womenomics campaign has identified several barriers preventing women from working longer weeks. For one thing, the tax and benefit system discourages longer workweeks. Married women earning less than ¥1.3 million a year are eligible for healthcare and a pension through their husband’s coverage. In addition, if a married woman earns less than ¥1.03 million, her husband can claim a big tax deduction ³⁴. Young mothers also face what is known as the “first-grade” wall, a lack of after-school childcare for young schoolchildren.

If all such walls were removed, how much additional labor might women provide to Japan’s economy? According to the country’s most recent survey of time use, Japanese women spend 3.2 hours per day (averaging across weekdays and weekends) on work, whereas men spend six ³⁵. That would seem to suggest that women could almost double their working hours to match those of men. But of course much of that time is already spoken for. Women spend far more hours than men on unpaid chores and childcare. Adding paid and unpaid work together, their hands are every bit as full as men’s (see chart).

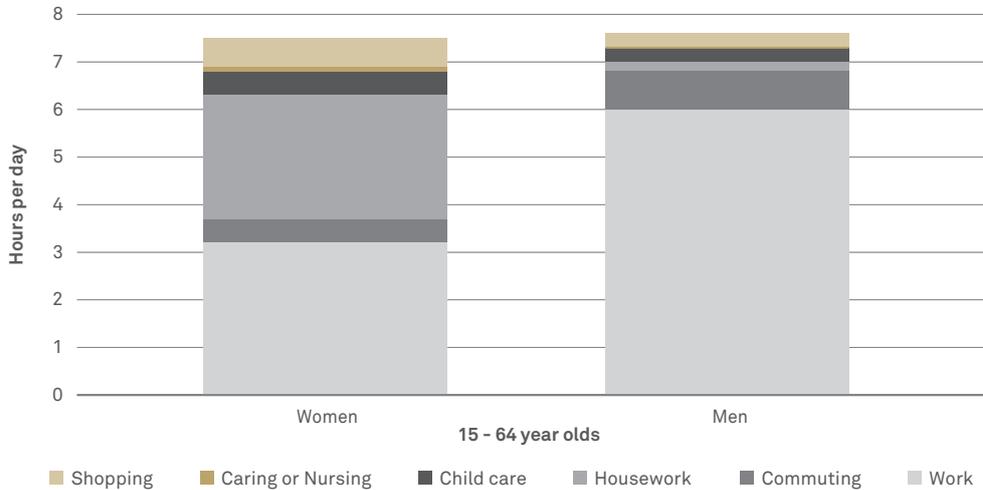
³² http://www.oecd.org/els/family/LMF2_1_Usual_working_hours_by_gender_July2013.pdf

³³ Source: OECD. 2013 is the latest year for which comparable data is available.

³⁴ <http://www.tokyoofoundation.org/en/articles/2014/rethinking-personal-tax-exemptions>

³⁵ These averages refer to people aged 15-64 whether they work or not.

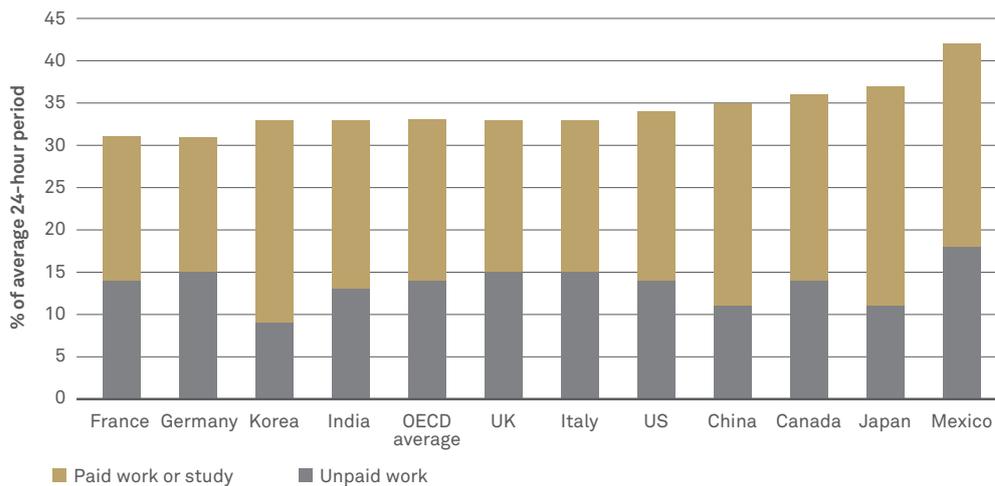
Time spent on work and chores in Japan



Source: Japan 2011 Time-Use Survey

Men could and should take on more of that housework, giving women more time to build their careers. But if men shouldered more unpaid work, they would probably have to do less work of the paid variety, blunting any net gains to the economy. International comparisons show that Japanese men and women both work hard, if paid and unpaid work is added together (see chart). Their combined duties would not seem to leave an awful lot of slack.

Paid and unpaid work



Source: Miranda, V. (2011), "Cooking, Caring and Volunteering: Unpaid Work Around the World", *OECD Social, Employment and Migration Working Papers*, No. 116. The years covered vary by country.

Would it be possible to reduce the hours Japanese women spend on chores and unpaid work without simply shifting the burden on to men? Is it possible to reduce the burden rather than simply redistributing it?

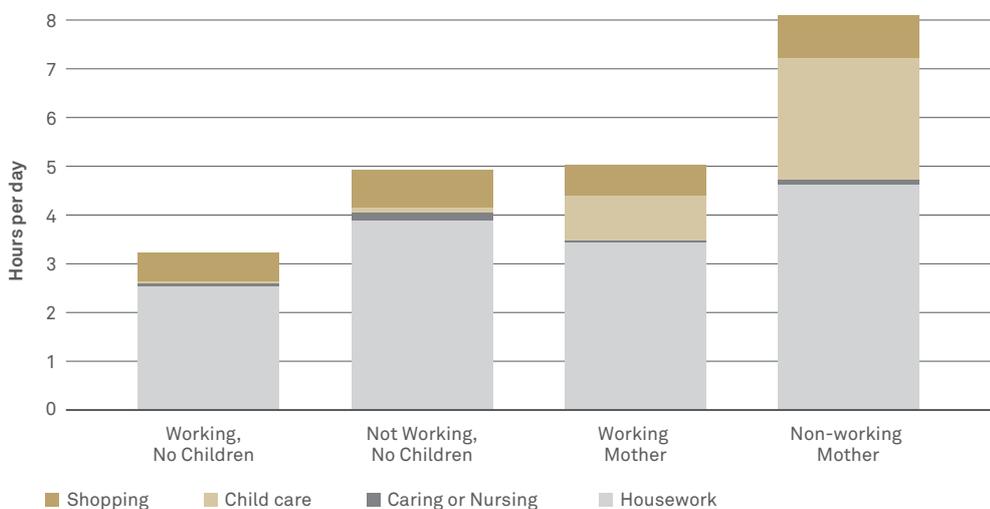
Perhaps. There may be some scope to “economize” on these duties. Women who are in paid employment tend to spend less time on chores than women who are not, according to Japan’s latest time-use survey (see chart). It is possible that their husbands are taking up the slack, but unlikely. In surveys of time-use, Japanese men show little willingness to take on these tasks in full ³⁶.

Some childcare and housework can also, of course, be “outsourced” to professionals ³⁷. That converts it from an unpaid duty into paid employment. Whereas domestic duties are not counted as part of Japan’s GDP, the national accounts do include paid childcare and cleaning. Outsourcing these duties will therefore boost the GDP figures, somewhat artificially.

The professionalization of housework and childcare can also, however, yield genuine economic benefits. Each employee at a daycare center or after-school club supervises many more children than a mother typically does. Thus one person employed in professional childcare can free up the time of several women to carry out other kinds of work.

In addition to such economies of scale, the professionalization of unpaid work also allows greater specialization and a more sensible division of labor. Without it, every Japanese woman is obliged to be a part-time cook, cleaner, gardener and chauffeur. These are all vital, underappreciated tasks. Nonetheless, every hour that a doctor, lawyer, entrepreneur or engineer spends ironing shirts or cleaning curtains is an hour that largely squanders her expensively acquired skills.

Time spent on chores and childcare by married Japanese women



Source: Japan 2011 Time-Use Survey

³⁶ Even men who don’t work spend less time on household chores and childcare than women who do

³⁷ According to a survey last year by Japan’s government, only 3% of women aged 25-44 had used housekeeping services. <http://asia.nikkei.com/Life-Arts/Life/Why-housekeepers-are-a-good-idea>

Womenomics in India

If womenomics is gaining ground in Japan, India remains its final frontier, where the greatest untapped potential remains. According to the latest National Sample Survey, carried out in the 2011/12 fiscal year, only a third of working-age women participate in the labor market³⁸. That is far below the global rate of about 50 percent or East Asia's average of about 63 percent, according to Sonali Das of the IMF and her co-authors³⁹.

India's low participation rate implies that over 237 million of the country's working-age women were not working (or looking for work) in 2011/12⁴⁰. That is a startling figure. If India's female participation rate were as high as China's, an additional 156 million women would join the workforce, boosting its overall size (counting men and women) by an extraordinary 37 percent⁴¹.

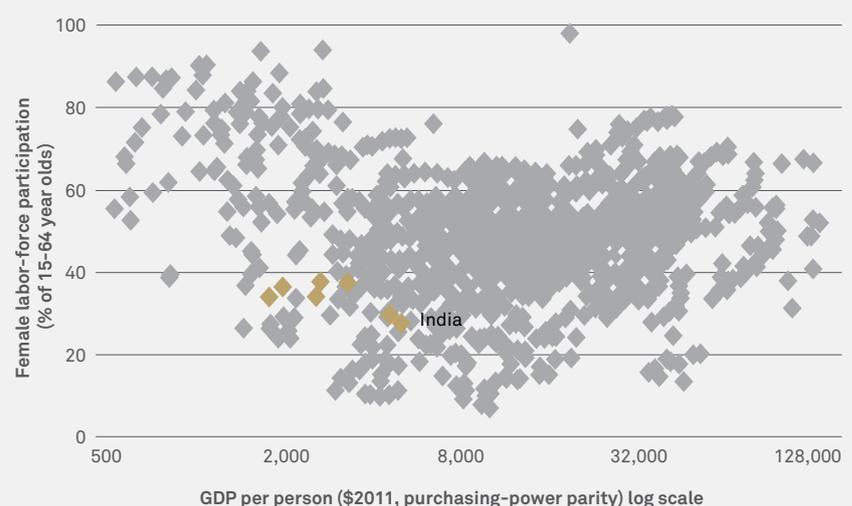
Are India's women likely to flock into the labor force? Recent trends suggest not. Participation rates have actually fallen as India has made economic progress. In India's villages, not working is a sign of status. Thus

households often remove women from work as soon as the household's income allows them to do so. Researchers such as Claudia Goldin of Harvard have documented a U-shaped relationship between women's participation and development⁴². As a country's per capita GDP increases, participation rates first fall before they rise, as Goldin explains below:

"When incomes are extremely low and when certain types of agriculture dominate (for example, poultry, dairy, rice, cotton, peanuts...), women are

in the labor force to a great extent... As incomes rise in most societies... women's labor force participation rates fall. Women's work is often implicitly bought by the family, and women retreat into the home, although their hours of work may not materially change... But as female education improves and as the value of women's time in the market increases... they move back into the paid labor force, as reflected in the move along the rising portion of the U-shaped curve."

Female labor-force participation across the world 1990-2013



Source: BNY Mellon calculations, based on World Development Indicators

³⁸ The exact figure is 33.1 percent of India's women aged 15-59. Key Indicators of Employment and Unemployment in India, 2011-12, Table 1, p.9

³⁹ "Women workers in India: Why So Few Among So Many?"; by Sonali Das, Sonali Jain-Chandra, Kalpana Kochhar, Naresh Kumar, IMF working paper, March 2015.

⁴⁰ According to India's census, the number of women aged 15-59 was 354.6 million in 2011.

⁴¹ These calculations use OECD figures for labor-force participation rates of people aged 15-64 and India census figures for the number of people aged 15-64 in 2011.

⁴² Goldin C. The U-Shaped Female Labor Force Function in Economic Development and Economic History. In: Schultz TPIvestment in Women's Human Capital and Economic Development. University of Chicago Press; 1995. pp. 61-90

At what stage of development do women start returning to the labor force? We have compared historical participation rates and incomes across all of the countries in the World Development Indicators database. By our calculations, the upward curve of the U appears to start at per capita incomes of about \$8,000 (in PPP terms and 2011 prices). India, with a per capita GDP of about \$5,500 is still some distance from this turning point. But if it grows as quickly as we envisage in our G4 scenario, it should make the turn by the end of the decade.

Just as Japan's two-track labor-market hurts women's careers, the fault-lines in India's labor market may also reinforce women's disadvantage. India's heavy-handed labor laws, for example, may have a disproportionate effect on women's employment.

Many economists argue that those laws, and the zealous inspectors who enforce them, deter firms from growing to their natural size. One example is the Factories Act of 1948, which governs many aspects of factory life, laying down punctilious prescriptions for everything

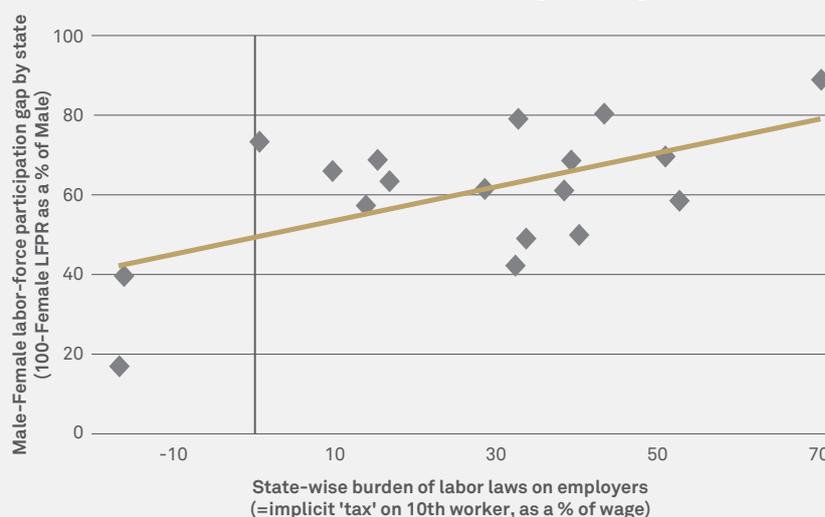
from cleaning and varnishing schedules to the placement of spittoons on factory premises⁴³. Since it only applies to firms with ten or more employees, many companies prefer to stay small and informal, below the reach of the law.

A recent study by Amrit Amirapu and Michael Gechter of Boston University identifies a sharp drop-off in the size distribution of factories: there are roughly 4 times as many nine-man outfits as ten-person establishments⁴⁴ (see chart on opposite page). Hiring a tenth worker brings a lot of additional regulatory hassle. It is hard to quantify the cost of this burden, but Amirapu and Gechter have tried to do so.

Their calculations suggest that the additional burden is equivalent to an implicit "tax" of 35 percent of the wage on average. In some states, it is even higher.

The burden of labor regulation seems to deter female labor even more than it does male. In states with a higher implicit "tax" on the tenth worker, the gap between male and female labor-force participation is greater than elsewhere (see chart below). Similarly, the states in India that have carried out the most labor reforms, as counted by Sean Dougherty of the OECD, tend also to have higher female participation rates⁴⁵.

The impact of India's labor laws on the gender gap by state



Source: BNY Mellon calculations, based on Amrit Amirapu and Michael Gechter (2014) and National Sample Survey

⁴³ The detailed laws are fleshed out by painstaking rules. In some states, for example, the spittoons must take the form of "a galvanised iron container with a conical funnel shaped cover" or "a container filled with dry, clean sand and covered with a layer of bleaching powder and quick lime".

⁴⁴ "Indian Labor Regulations and the Cost of Corruption: Evidence from the Firm Size Distribution" by Amrit Amirapu and Michael Gechter

⁴⁵ This is demonstrated rigorously in "Women workers in India: Why So Few Among So Many?", by Sonali Das, Sonali Jain-Chandra, Kalpana Kochhar, Naresh Kumar, IMF working paper, March 2015

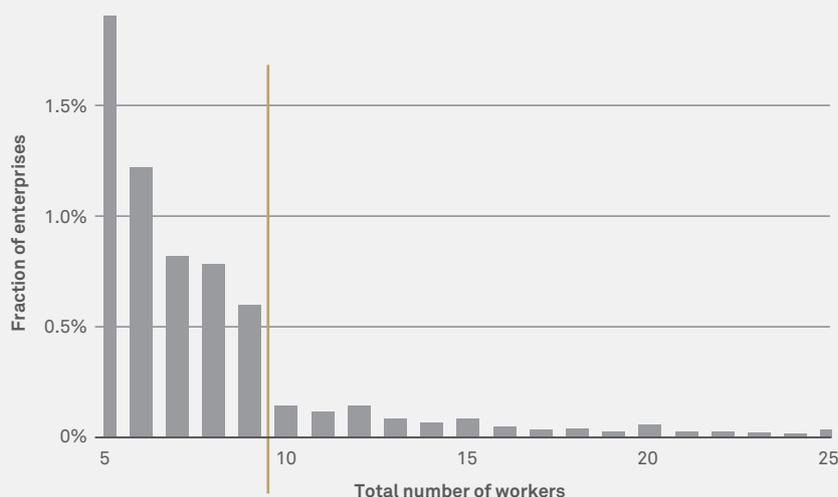
A bill to reform the Factories Act is now being considered by India's national parliament ⁴⁶. The new bill would allow state governments to restrict the act's reach to bigger factories only. The bill was introduced in August 2014, just a few months after the government's election victory. It is still pending.

As the Modi administration is discovering, rewriting India's labor laws is fiendishly difficult. However the text of the legislation is often less important than the way it is enforced - and streamlining the administration of these laws may be politically easier than amending them.

For example, the government last year launched the Shram Suvidha online portal, which allows firms to file a single compliance report for 16 central-government labor laws (out of 44). Computers will randomly dispatch labor inspectors to firms and oblige them to upload their findings within 72 hours ⁴⁷, with the aim of preventing officials from preying on particular firms for bribes.

If these efforts to streamline labor inspections succeed, it should reduce the regulatory hassle of hiring more than nine workers. And with luck, that tenth worker might be a woman.

Indian firms are afraid of hiring a tenth worker



Source: "Indian Labor Regulations and the Cost of Corruption: Evidence from the Firm Size Distribution" by Amrit Amirapu and Michael Gechter

⁴⁶ <http://www.prsindia.org/billtrack/the-factories-amendment-bill-2014-3353/>

⁴⁷ <http://nalgonda.nic.in/pmo2.pdf>

3. Capital accumulation

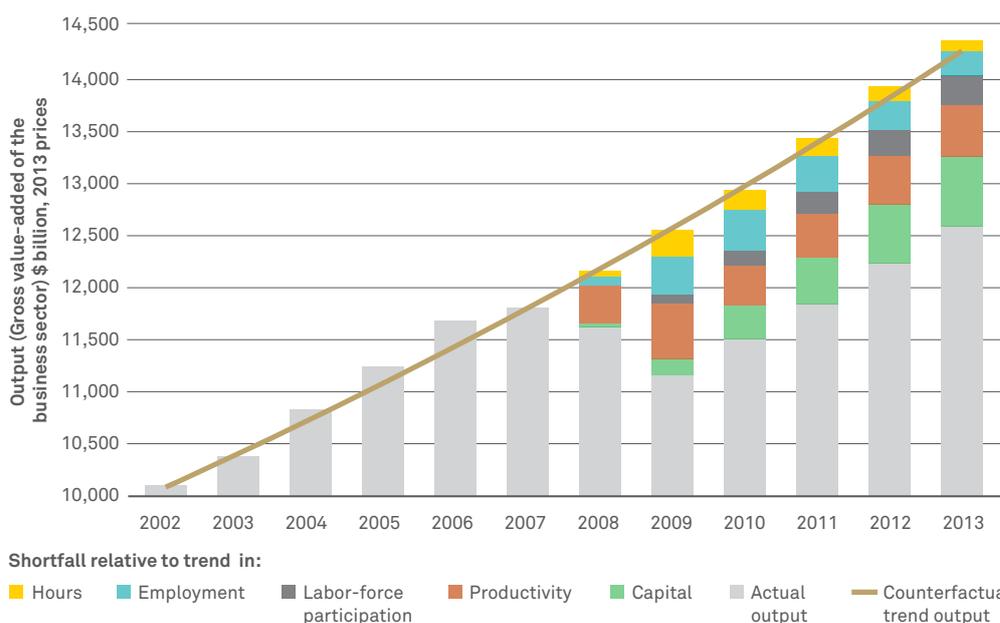
For our G4 scenario to materialize, it is not enough for these four economies to draw more labor out of their workers. They will also have to add more capital to their labor, increasing the amount of machinery, equipment and infrastructure at each worker’s disposal. A fresh wave of investment would benefit the G4 in at least two ways. First, the capital expenditure would provide a fresh source of demand, replenishing the order books of machinery-makers, road-builders and tunnel-diggers. Second, this wave of investment would also add to the economy’s productive assets, providing a fresh source of supply that will help relax any capacity constraints that might begin to bite towards the end of the decade. The G4 economies will not prosper unless capital expenditure also thrives.

3.1 Investment in America and Japan

In Japan and America, investment in new capital has been weak in recent years. In America, real investment per person peaked in 2006⁴⁸. In Japan it has yet to regain its 2007 peak, which was itself below the levels it reached in 2001 and earlier⁴⁹.

This spell of underinvestment is one reason why the US and Japan have fallen short of their pre-crisis growth trajectories. Robert Hall of Stanford reckons that the US economy in 2013 was 13 percent below its 1990-2007 trend. By his calculations, weak investment made an even bigger contribution to this shortfall than weak employment (see chart).

US output: Contributions to the post-crisis shortfall



Source: Based on “Quantifying the Lasting Harm to the U.S. Economy from the Financial Crisis”, by Robert Hall. NBER, April 2014

⁴⁸ BNY Mellon calculations based on Bureau of Economic Analysis data.

⁴⁹ BNY Mellon calculations based on data from Japan’s Cabinet Office.

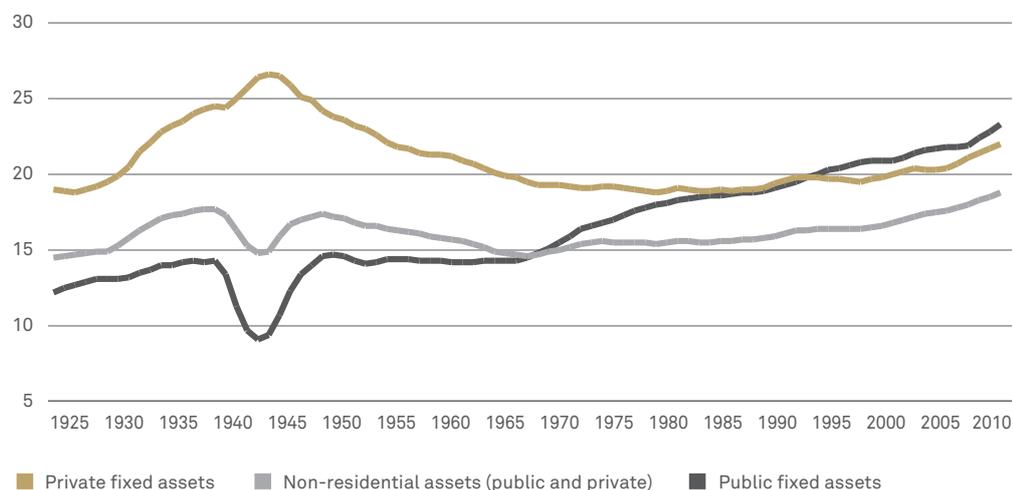
Although the financial crisis disrupted the supply of credit to firms, financial constraints are not enough to explain firms' failure to plough more money into expanding their operations. The chief deterrent to such spending, according to a recent study by the IMF, is instead economic weakness⁵⁰. But one of the chief causes of economic weakness is itself a lack of capital spending. It is, then, possible to imagine a virtuous cycle in which improved confidence and a strengthening recovery spurs investment, which in turn helps to bolster the economy.

When that virtuous cycle begins, firms will not have to search too hard for worthwhile capital projects. The underspending of recent years has left the capital stock in some disrepair. Indeed the aging of the capital stock is almost as striking as the aging of the workforce.

In the United States, private fixed assets now average about 22 years in age, the oldest they've been since the 1950s, according to the BEA. Public assets are even more decrepit: according to the same BEA data, which begins in 1925, they have never been as old as they are now.

In Japan, meanwhile, the capital equipment used by manufacturers is similarly long in the tooth: it is estimated to be 3-4 years older than equipment used in the US⁵¹.

Average age of US fixed assets



Source: Bureau of Economic Analysis. Last data point: end-2013=latest data available.

⁵⁰ <http://www.imf.org/external/pubs/ft/weo/2015/01/pdf/c4.pdf>

⁵¹ <http://www.imf.org/external/pubs/ft/wp/2014/wp14141.pdf>

3.2 Investment in India

The barriers to investment in India are more complex than in the US and Japan. Obstacles include financial constraints, as well as bureaucratic bottlenecks. At the end of March 2014, India's backlog of stalled investment projects amounted to 8.4 percent of GDP, according to HSBC, based on data from the Centre for Monitoring Indian Economy (CMIE). But interest rates are falling and investment approvals are becoming easier to obtain. As a result, the backlog is beginning to clear. HSBC calculates that stalled projects had fallen to 6.6% of GDP at the end of June 2015.

The reasons behind stalled investment are also changing. Few of the projects that stalled in the first three months of 2015 faltered because of bureaucratic delay or disapproval⁵². Of greater importance were bad market conditions and a loss of appetite on the part of the investors themselves.

This loss of appetite can be blamed in part on the indigestible debts that weigh on the balance sheets of many big infrastructure companies and the banks that lend to them. Those bad debts may prevent the private sector taking the lead in the next investment cycle. That task will fall instead to India's government, which has sharply increased its capital expenditure in recent months, and to the country's state-owned firms (known as public-sector undertakings). The early signs are encouraging: production of capital goods rose by 5.7 percent in the first half of 2015, compared with a year earlier, according to India's (admittedly volatile) index of industrial production.

3.3 Investment in China

As bureaucratic hesitation passes in India, it seems to be growing in China, despite the country's reputation for brisk, even slapdash, investment planning. The central government's aggressive efforts to stamp out corruption, curb extravagance, tidy up municipal balance sheets, and clean up pollution all appear to have inhibited provincial and local government spending and decision-making. Accustomed to collusive wheeler-dealing, local officials sometimes lack the incentive or the capacity to implement proper approval procedures quickly. That seems to have gummed up public investment. The manager of a waterworks recently expressed the following complaints to Li Keqiang, China's premier⁵³:

"We need to go through environmental assessment, water resources assessment and assessments on energy, work safety, traffic, geology, earthquakes, heritage, thunder, weather" [the manager said] He told me that it would take at least one or two years."

It all sounds rather reminiscent of India. No wonder Mr Li was upset.

⁵² A lack of regulatory clearances (environmental or otherwise) scuppered only 6.5 percent of the stalled projects by value; problems acquiring land, fuel, raw materials or other feedstock accounted for another 13.3 percent of them. <http://www.cmie.com/kommon/bin/sr.php?kall=wclrdhtm&nvdt=20150413124438133&nvpc=099000000000&nvtype=INSIGHTS>

⁵³ <http://www.scmp.com/news/china/economy/article/1773314/chinas-premier-blasts-delays-created-big-projects-risk>

This frustration with bureaucratic bottlenecks is understandable. But some judicious oversight of public investment is sorely needed in China. Past investments have often been clumsy or wasteful. If the country were now to invest with greater care and deliberation, that would be a good thing. Those virtues - care and deliberation - are not antithetical to growth. They can themselves add to employment and GDP insofar as they are purchased from professional surveyors and assessors. After hearing the complaints of the waterworks manager, Li said he will encourage the private sector to expand into these services, so that the government can buy them in the quantities it needs. Staff with the necessary skills are in short supply in China - a notable example of *undercapacity* in a country more often identified with the opposite problem⁵⁴.

Because China often invests wastefully, many people conclude that it also invests excessively. They argue that its investment boom must slow sharply, rendering impossible the kind of 7 percent growth rates we have penciled in for the rest of the decade.

These critics are right to point out that China has overinvested in some industries. The list of “overcapacity” sectors includes coal, cement, aluminum, shipbuilding, flat glass, solar-power, steel, iron, lead-smelting, building materials, textiles, and tasteless villas. But just because China has overcapacity in some industries, does not mean it has overcapacity in everything. The proliferation of surplus mines, mills and malls is a sign that it must change its investment *mix*, spending far less on some kinds of capital. But that does not mean that it must drastically reduce its investment *rate*. If China spends less on overcapacity industries, it can spend more on undercapacity sectors.

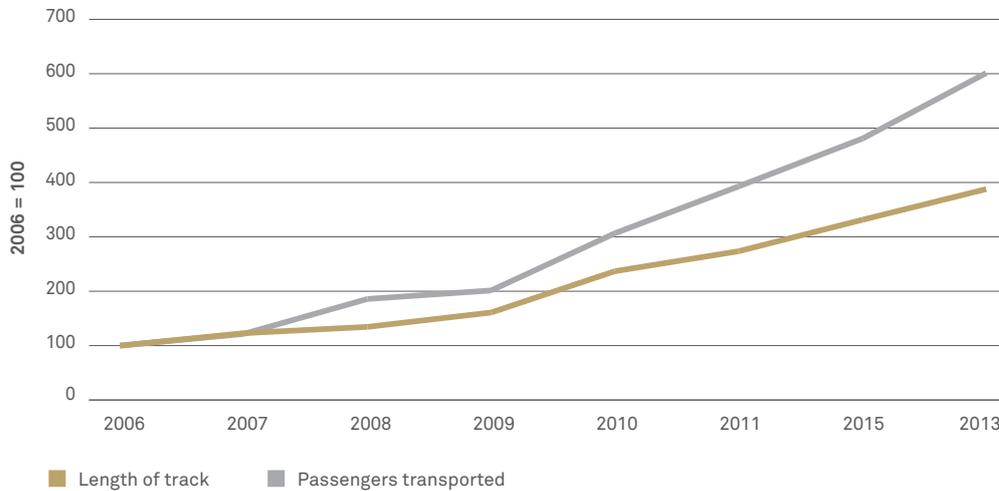
Such sectors are not hard to identify. Despite urban China’s impressive surface infrastructure, many city-dwellers are still at risk of flooding, thanks to inadequate drainage systems⁵⁵. China has only 24,709 hospitals, according to the National Bureau of Statistics, about 18 for every 1 million people, compared with over 40 per million in Germany. China’s cityfolk have only 12.6 square metres of parkland and green spaces per person, compared with a median of over 50 in America’s 100 most populous cities⁵⁶. And despite enormous outlays on subways, the length of track has not kept up with the number of passengers (see chart).

⁵⁴ <http://www.scmp.com/news/china/economy/article/1773314/chinas-premier-blasts-delays-created-big-projects-risk>

⁵⁵ http://usa.chinadaily.com.cn/china/2013-07/20/content_16805895.htm

⁵⁶ <https://www.tpl.org/2015-city-park-facts>

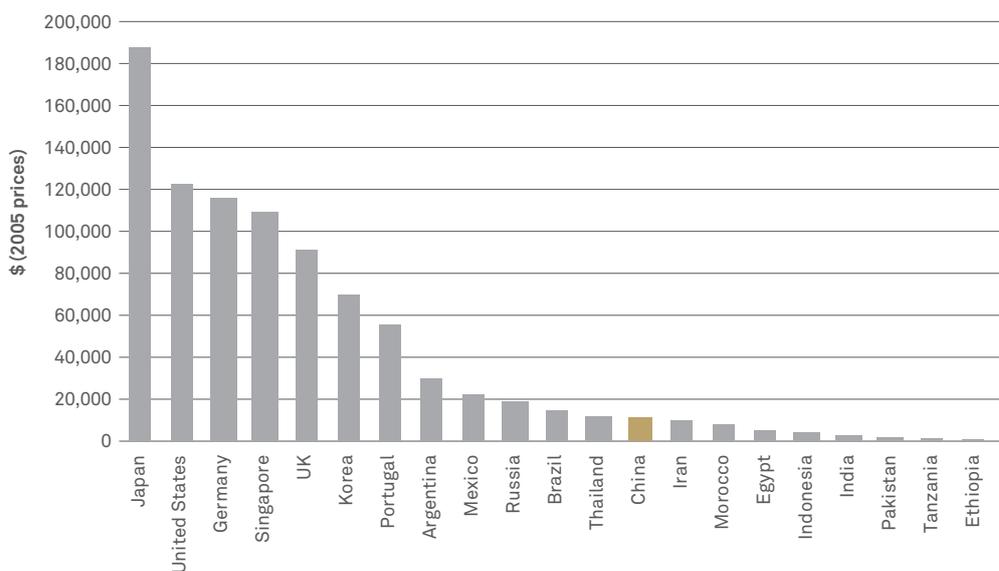
China's subways, light rail and street cars



Source: China Statistical Yearbooks

China has been investing a high percentage of its GDP for many years. But China's GDP used to be much smaller than it is now. Therefore its accumulated stock of capital is not yet large, relative to the size of its population and workforce. Michael Berleemann and Jan-Erik Wesselhöft of Helmut-Schmidt University in Hamburg have calculated capital stocks for 103 countries, based on consistent assumptions. We have extended their estimates to 2013 and divided them by population. China's capital stock per person ranks far down the list. In the chart below, China does not jump out at you as a country that should be worrying about having invested too much.

Capital stock per person 2013



Source: BNY Mellon calculations, based on M. Berleemann and J.-E. Wesselhöft, "Estimating Aggregate Capital Stocks Using the Perpetual Inventory Method" (2014)

China's "credit-fueled investment binge"

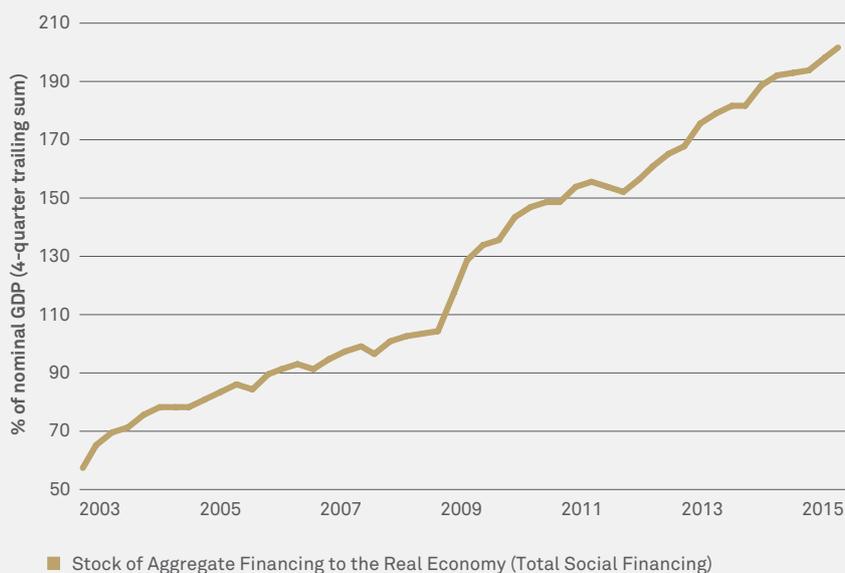
Many people argue that China's capital-spending boom must turn to bust. This is partly because this investment is wasteful, creating "white elephants" and other assets of dubious worth. But that is not the only concern. Economists also fret about the way this investment is financed and the debts it leaves behind. The stock of outstanding credit in China stood at 201 percent of GDP in mid-2015 (see chart), according to the central bank's measure of "aggregate financing to the real economy" (which is also known as "total social financing" or TSF)⁵⁷.

This stock of credit is rising faster than China's nominal GDP. Many commentators describe this as an increase in the "credit-intensity" of China's growth. It takes more new lending to generate a single yuan of GDP growth. On the face of it, the concept of credit intensity seems similar to the more familiar concept of labor intensity. According to this view, the rise in credit intensity is worrying because it suggests that China's firms are using resources less efficiently. The economy has the wrong kind of growth.

Is this interpretation correct? To answer this question, it's necessary first to clarify the concept of growth. A country's GDP only counts newly produced goods and services. It does not include financial assets or pre-existing physical assets, such as land or second-hand houses, created in an earlier period. Therefore a loan that is spent on buying land from its current owner will not add to GDP directly, even though it does add to the stock of outstanding credit.

This distinction between new and "second-hand" assets is reflected in the two different investment figures that China reports. "Gross capital formation" only counts spending on newly created assets that add to the country's stock of capital and contribute to GDP. "Fixed-asset investment" (FAI) on the other hand counts investment spending on new and second-hand assets alike⁵⁸. In the past decade or so, fixed-asset investment has grown much faster than gross-capital formation, as the second chart shows. Indeed its growth has even kept pace with the torrent of new lending (third chart).

China's credit ratio



Source: BNY Mellon, People's Bank of China data

⁵⁷ Until this year, the People's Bank of China only reported the flow of TSF, not the stock. To calculate the stock of TSF in earlier periods, we therefore had to deduct the quarterly flow from the newly released stock figures for 2015.

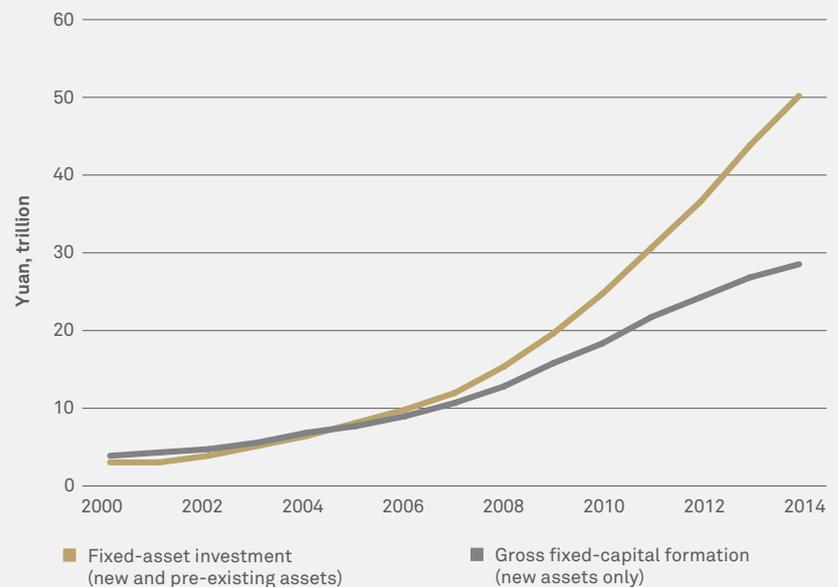
⁵⁸ Peterson Institute for International Economics. <http://blogs.piie.com/china/?p=188>

This suggests that China has the wrong kind of credit. Much of its excess lending has probably financed the purchase of land, second-hand property and other pre-existing assets. That has allowed credit to rise without a proportionate increase in nominal GDP.

Credit intensity is not, then, like labor intensity. All labor generates GDP. But only a portion of credit does the same. The rest of it merely finances the repurchase of assets that already existed.

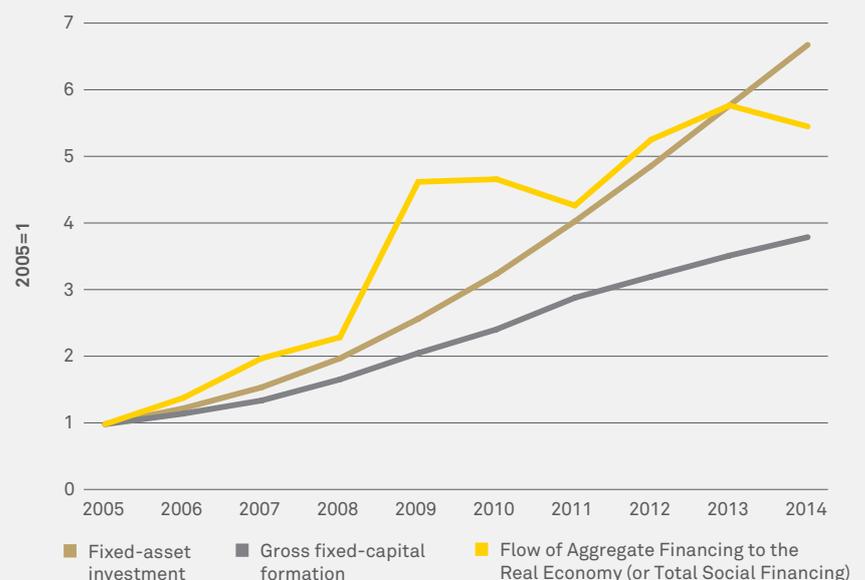
In fact, if an analogy for “credit intensity” is needed, then it would be better to look at the ratio of population to GDP not labor to GDP. This analogy is closer because only a subset of the population contributes to new production, just as only a subset of credit contributes to it. If a large swathe of the working population downed tools and stopped contributing to the economy, the ratio of population to GDP would rise sharply. But no one would describe it as an increase in “labor intensity”. The solution would be to redirect the missing workers back into employment, just as the solution to China’s problem is to redirect credit back into the ‘real’ economy, where new goods and services are produced and purchased.

Two measures of Chinese investment



Source: BNY Mellon, data from National Bureau of Statistics

Chinese financing and investment



Source: BNY Mellon, data from People’s Bank of China, and National Bureau of Statistics

4. Productivity and technology

For our G4 scenario to materialize, labor productivity in America and especially Japan will have to grow considerably faster than it has over the past decade or so. Some of this improvement, we have argued, will stem from additional inputs of capital, as investment revives, giving people more infrastructure and equipment to work with. But the remainder will have to flow from improvements in technology and technique: i.e, giving people better equipment to work with, in better ways. Although capital accumulation can be important over the five-year horizon we wish to examine, long-run progress depends mostly on technological change⁵⁹.

Optimists (let's call them technotopians) argue that the world is in the midst of a third industrial revolution every bit as exciting as the first revolution (from 1750 to 1830), which introduced steam engines, the cotton gin, manufacturing and rail-roads, and the second revolution (from 1870 to 1900) which ushered in light bulbs, motor cars, radio, indoor plumbing and petrochemicals.

This third industrial revolution is mostly digital, driven by the rapid growth and diffusion of networked computer power throughout the economy. It includes the ubiquitous digital devices that generate big data and the algorithms that make sense of it. It has yielded dexterous robots like Quince (see box) and decorous ones like Pepper, the "empathetic" robot, which greets customers at Japan's SoftBank.

Technotopians imagine a future of driverless cars, refurbishable bodies and artificial minds. The inventions of the third revolution may also change the nature of invention itself, making research and development more collaborative and cosmopolitan. It is increasingly easy to draw on the wisdom of virtual crowds, scattered across the globe, mobilized and marshalled by the latest communication technologies. The best manifesto for this revolution is Andrew McAfee and Erik Brynjolfsson's 2014 book, "The Second Machine Age". In describing the technological wonders on the horizon, McAfee likes to say that "we ain't seen nothing yet".

The problem, however, is that we really haven't seen anything yet in America's productivity figures. Despite all of the exciting breakthroughs covered by the technology press, the productivity numbers published by America's Bureau of Labor Statistics have been miserable for the past ten years or so.

⁵⁹ Capital accumulation on its own, without technological change, merely creates more of the same type of machinery and equipment. It amounts to "piling wooden plows on top of wooden plows," as the economist Evsey Domar once put it.

Packbot versus Quince

After the terrifying meltdown at the Fukushima Daiichi nuclear plant in March 2011, humans could not enter the damaged reactor buildings for fear of radiation poisoning. Robots seemed the obvious alternative. But Japan's robots were not initially equal to the task. The first robot to enter the reactor buildings was American: the battle-tested PackBot, designed in Massachusetts and previously deployed in Iraq and Afghanistan. Its edge over its Japanese peers was a further blow to the pride of a country that still cherished its technological lead in robotics, even if it had lost its dominance in other fields.

The disappointment spurred Japan's robot-makers into action. Within months, Quince, a four-legged robot originally designed to navigate the rubble of an earthquake, was clambering into the plant's second and third stories, climbing steep stairs that defeated lesser machines⁶⁰. And April 2015 saw the introduction of a shape-shifting robot that can squeeze through narrow pipes by swiveling its tracks outwards, like the feet of a ballerina in plié.

Both robots ran into difficulties⁶¹. The shapeshifter stopped responding to its operator. Quince struggled to turn in a stairwell that proved to be narrower than the floorplans suggested. The cable that connected it to its operator was also easily snagged on obstacles. These problems were compounded because the plant-owner had to operate the robot itself rather than allowing a more skilled, outside operator into the risky radioactive zones.

The Fukushima episode demonstrates two general truths about technological progress. First, technology does not evolve in a vacuum. It responds to pressing and practical demands. When the Fukushima disaster struck, Japan's existing robots were insufficiently battle-hardened because Japan does not fight many battles. Its robot research was geared more towards the country's pressing need for nursing care and personal assistance⁶². Second, new technology requires complementary investments in organizations and personnel before its benefits can be felt.

Equipping a robot to cope with radioactive interiors was only part of the problem. The Quince missions also had to overcome the organizational handicap posed by a skeletal staff of inexperienced operators.

⁶⁰ <http://www.naefrontiers.org/File.aspx?id=43671>

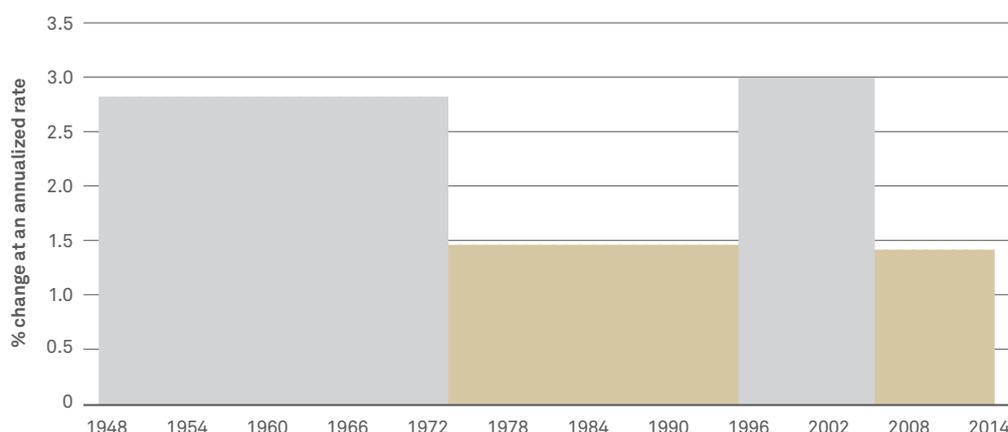
⁶¹ <http://spectrum.ieee.org/automaton/robotics/industrial-robots/robot-stranded-inside-fukushima-nuclear-reactor>

⁶² <http://www.japantimes.co.jp/news/2012/01/06/news/domestic-robots-failed-to-ride-to-rescue-after-no-1-plant-blew/#.VTnkc9Kqqko>

According to Robert Gordon, America’s post-war productivity performance can be divided into several periods of unequal length (see chart⁶³): a golden era that lasted until 1972, when the US economy systematically exploited the breakthroughs of the second industrial revolution, building highways, airports and fuel stations, and installing telephone wires, plumbing and TV networks. After those innovations were exhausted, US productivity entered a second era of moribund growth, which lasted until the 1990s revolution in information and communication technologies (ICT). For a brief span of time, that revolution matched the golden era. But the IT revolution was fleeting: it did not show up in the productivity statistics until 1996 and disappeared from them ten years later.

Labor productivity

Output per hour in the non-farm business sector



Source: Bureau of Labor Statistics.

Whether the IT revolution is over or just beginning is, therefore, a question of great importance to America’s long-term economic prospects. Gordon argues that ICT’s biggest advances lie in the past. During the late 1990s boom, he points out, new and more powerful microprocessors would arrive each year for much the same price as the previous model. That meant that the price of a “unit” of processing power fell precipitously. The steep drop in price inspired a steep rise in demand. Firms spent heavily on new computers and software, which claimed a big share of corporate investment.

But this drop in price and increase in investment has not lasted, according to Gordon. “The boom of the late 1990s was driven by an unprecedented and never-repeated rate of decline in the price of computer speed and memory,” he writes, “and a never-since matched surge in the share of GDP devoted to information and communication technology investment.”

⁶³ The chart shows growth in output per hour in the non-farm business sector. Gordon looks more broadly at output per hour in the economy as a whole. See <http://www.nber.org/papers/w19895>

Others are more optimistic about the IT revolution in general and microprocessors in particular. The clockspeed of chips may not be rising as quickly as it did, but manufacturers have found other ways to maintain the pace of improvement. In a working paper for the Federal Reserve, David Byrne, Stephen Oliner and Daniel Sichel find that the price of chip performance, defined more broadly than sheer clockspeed, has continued to decline swiftly⁶⁴.

To improve worker productivity, these improved technologies have to be embodied in new equipment, and widely deployed by firms. That requires investment. On the face of it, IT's share of business investment has stagnated (the share of software, computers and communication equipment in capital expenditure is about the same as it was 16 years ago, according to the Bureau of Economic Analysis). But that may partly be a statistical illusion. Chips now appear in everything. They have transformed navigation equipment, electro-medical equipment and industrial-process equipment, point out Byrne, Oliner and Sichel. Spending on those items is, therefore, also spending on IT, even if it is not counted as such.

Recent technological advances may not show up in the productivity statistics immediately. But that is not unusual. It takes time for firms to learn how best to exploit new technologies, just as it took time for Quince's new operators in Fukushima to master the robot's subtleties. The arrival of computers did not make a measurable difference to productivity growth until the mid-1990s long after they had invaded homes and offices. The same is true of earlier technologies. Back in the early 20th century, factories did not take full advantage of electricity until four decades after the first central power stations were built. Factories first had to abandon their traditional layouts, in which machines huddled around a central steam engine, and rearrange themselves into assembly lines each with their own power source⁶⁵. Ultimately, as Paul David has pointed out, manufacturers could not "embody" the full possibilities of electric power until "a general fixed capital formation boom in the expansionary macroeconomic climate of the 1920s".

The IT revolution may, therefore, revive when capital formation finally booms in another expansionary macroeconomic climate. Byrne, Oliner and Sichel explore the possibilities of such a revival. Their most optimistic scenario assumes growth of 2.47 percent in output per hour among businesses, excluding farms. That would translate into productivity growth of about 2 percent for the economy as a whole (which includes farms and the government).

Our G4 scenario foresees growth of about 3 percent in the US economy over the rest of the decade. If output per hour grows by 2 percent a year, then the aggregate number of hours of work must grow by about 1 percent, through a combination of higher employment and longer workweeks for the underemployed. Our projections for US population growth, participation and employment, described on p.8-9, suggest that is possible, although admittedly optimistic.

⁶⁴ "Is the Information Technology Revolution Over?" <http://www.federalreserve.gov/pubs/feds/2013/201336/201336pap.pdf>

⁶⁵ "The Dynamo and the Computer", by Paul David. AEA Papers and Proceedings. May 1990.

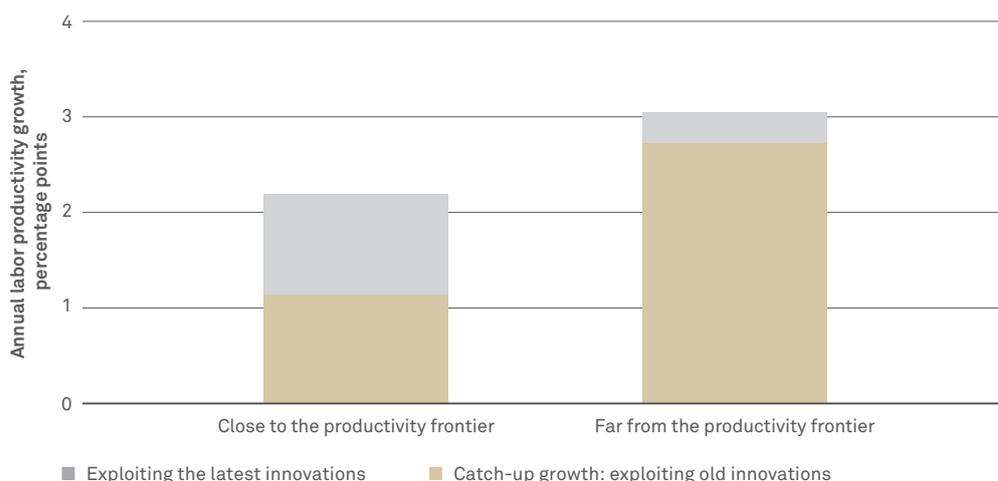
4.1 Catch-up growth

Even if technological progress remains as slow as the pessimists fear, China, India and perhaps even Japan still have great scope to enjoy “catch-up growth”. They can improve their productivity by assimilating techniques that are not new to the world, but are new to them. Until countries get close to the productivity frontier, they derive most of their growth from exploiting past innovations not fresh ones, according to recent calculations by three economists at the OECD (see chart).

In both China and India, ambitious firms in flagship industries operate near the global frontier of knowledge. But trailing behind these celebrated companies is a long tail of firms that are still years, decades, or generations behind. If India's worst companies merely caught up with its mediocre ones, the economy could grow enormously in size, without ever troubling the patent office.

Contributions to labour-productivity growth

1950-2013, average of 60 countries



Source: “Productivity Spillovers From The Global Frontier And Public Policy: Industry-Level Evidence”, by Alessandro Saia, Dan Andrews and Silvia Albrizio

India's income per head, for example, is equivalent to that of China ten years ago (according to economists' best attempts to hold prices constant between countries and across time, using purchasing-power parities). China's level of development, by the same measure, is equivalent to Japan's back in 1970⁶⁶.

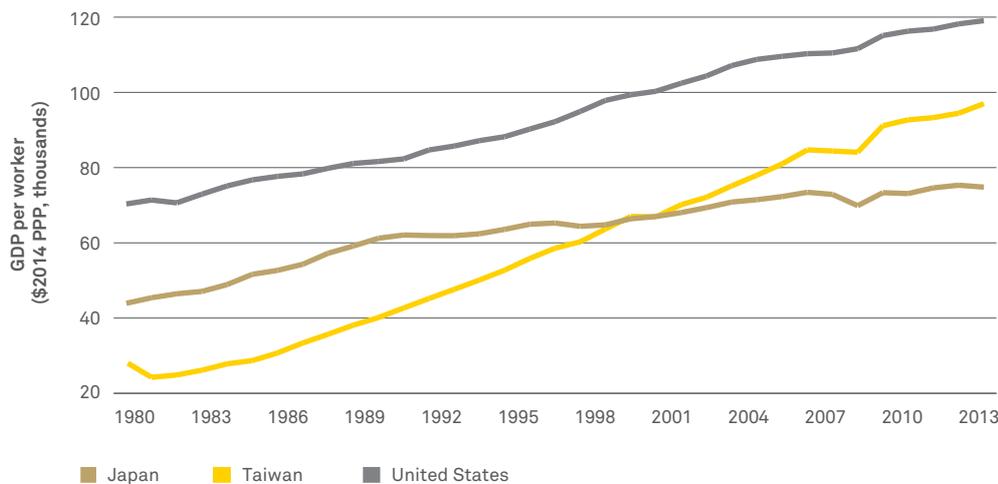
⁶⁶ In 1970, 72 percent of Japan's population lived in cities and only 16.5 percent of its workforce still toiled in agriculture, according to Statistics Japan. In China, the urbanization rate was only 55 percent in 2014, according to the National Bureau of Statistics, which also reports that agriculture (“the primary sector”) accounted for 31.4 percent of employment in 2013, the latest figure available. Indeed, agriculture still employed more people than industry in 2013.

Even Japan now lags decades behind the US and several years behind one of its regional protégés, Taiwan, by some measures. This comparatively low level of output per worker reflects a variety of shortcomings, only some of which are technological. But it does mean that Japan now has a large backlog of productivity improvements - technological, organizational, and logistical - it could assimilate from the US before it needs to fret about the pace of change at the bleeding edge of research and development⁶⁷. To put it another way, Japan does not have to worry too much whether the Next Big Thing out of Silicon Valley lives up to the hype, because it has yet to take full advantage of all the Previous Big Things America has pioneered over the past couple of decades.

In our scenario, we expect Japan’s working-age population to shrink by about 0.8-0.9 percent a year over the remainder of this decade (see p.5-6 above). But the number of people in employment could nonetheless remain flat or even grow, if demand is strong enough to pull sufficient numbers of Japan’s potential workers into the labor force. Thus to achieve the growth we have envisaged in our scenario, Japan will need to improve output per worker by about 2 percent a year.

That should be possible. Taiwan reached Japan’s current level of GDP per worker back in 2004 (valued at purchasing-power parity). Since then its output per worker has grown by 2.6 percent a year on average. The US also shows that it can be done. Since America reached Japan’s current level of GDP per worker, it has had two spells (in the late 1980s and the late 1990s) when output per worker grew comfortably faster than 2 percent. In principle, it should be easier for Japan to replicate that success because America has already shown the way.

GDP per worker, 1980-2014



Source: BNY Mellon calculations, based on IMF World Economic Outlook

⁶⁷ SoftBank makes venture-capital investments in innovative firms in the US and Europe, then imports the technology back to Japan a few years later. SoftBank’s CEO calls this “time-machine management”.

Catch-up growth allows poorer economies to grow faster than richer ones, narrowing the gap between them. But not every economist puts much faith in this principle of economic convergence. Many people believe that countries fall into a systematic “middle-income trap” that interrupts their progress (see box).

Other economists harbor subtly different fears. Lant Pritchett and Larry Summers of Harvard argue that fast growth is rarely sustained and bears little systematic relationship to the level of income⁶⁸. Instead of converging towards high incomes, emerging economies “regress” towards a mean rate of growth (of about 2.2 percent in per capita GDP) that is the same for poor and rich economies alike.

Either of these dangers - regression to the mean or middle-income entrapment - would scupper the G4 growth scenario we have laid out. How worrying are they?

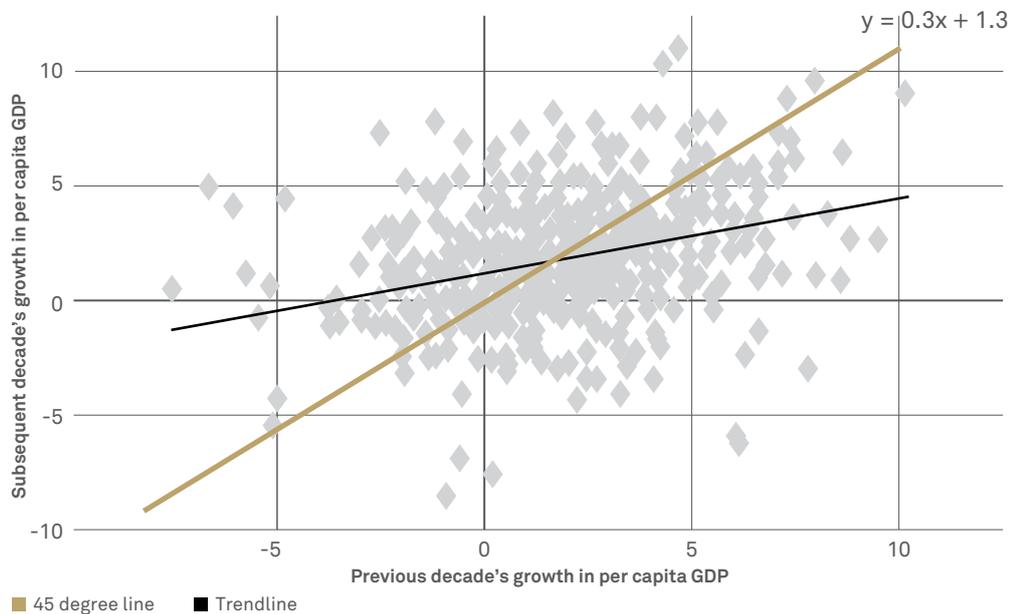
4.2 Regression to the mean

Pritchett and Summers believe that China and India have been enjoying a spell of “Asiaphoric” growth that cannot last. The two economists calculate that growth in GDP per person from 1950 to 2011, across 142 countries, has averaged about 2.2 percent. They think this figure constitutes a mean rate of expansion towards which faster-growing countries (and slower-growing ones) revert.

As evidence for this proposition, Pritchett and Summers demonstrate that fast growth shows little persistence. A country’s rate of expansion in one decade is a poor predictor of its growth in the next. The chart on next page illustrates their argument. Each point represents a country at the turn of a decade: Britain in 1990, for example, or Kenya in 1970. The horizontal axis shows how fast that country grew in the preceding ten years. The vertical axis shows how fast it grew over the next ten. If growth persisted from one decade to the next, countries would cluster along the 45-degree line in the chart on next page: 10 percent growth in one decade would be followed by 10 percent growth in the next. In reality, they cluster around the shallower trend-line. Ten percent growth in one decade is likely to slow to something like 4.3 percent growth in the next, much closer to the mean. (Likewise, very slow or negative growth tends to be followed by somewhat faster growth in the next decade.)

⁶⁸ “Asiaphoria meets regression to the mean”, by Lant Pritchett and Larry Summers. NBER, October 2014.

How a country's growth in one decade compares with its growth in the next



Source: BNY Mellon calculations, based on Penn World Tables 8.1 and "Asiaphoria meets regression to the mean", by Lant Pritchett and Larry Summers. NBER, October 2014.

This argument should shake analysts out of any complacency about convergence. But it is still hard to believe that global postwar averages tell us much about the future of China or India. The scatterplot is very scattered (the trendline has an R-squared of just 0.1). And it does not fit China or India at all well.

In trying to flesh out his vision of the growth process, Pritchett points out that most rich economies became so by growing steadily not by growing quickly. Their expansion was rooted in stable institutions that survived cyclical downturns and political upheaval. In developing countries, by contrast, growth tends to burn brightly but briefly. It accelerates when political leaders strike fruitful bargains with powerful economic actors. But when those deals come unstuck (perhaps because a key personality falls from power or grace) growth also unravels.

This institutional fragility may explain why growth fails to persist in many emerging economies. But those fragilities are not as apparent in China or India. In both countries, growth has become institutionalized and entrenched, surviving several transitions of leadership. Critics often express disappointment at the pace of economic reform in both countries. But few seriously expect reform to move backwards.

The middle-income trap

The notion of a middle-income trap is intuitive and popular, but surprisingly hard to confirm in the data. Lots of middle-income countries have suffered slowdowns, of course. But the same is true of economies at all stages of development. A growing body of work casts doubt on the notion that there is anything especially treacherous about the intermediate steps between poverty and prosperity⁶⁹.

The term “middle-income trap” was coined by Homi Kharas now of the Brookings Institution and Indermit Gill of the World Bank, who used it in a 2007 World Bank publication. But the idea is older than that. Kharas and Gill cite a 2004 article in *Foreign Affairs*, by Geoffrey Garrett of the Wharton School, which identified

globalization’s “missing middle”, a shortage of successful middle-income countries. He illustrated his point by dividing economies into low-, middle- and high-income groups based on their GDP per head in 1980. He then compared how each group fared over the subsequent years. The middle-income countries, he argued, performed worse than their richer or poorer counterparts.

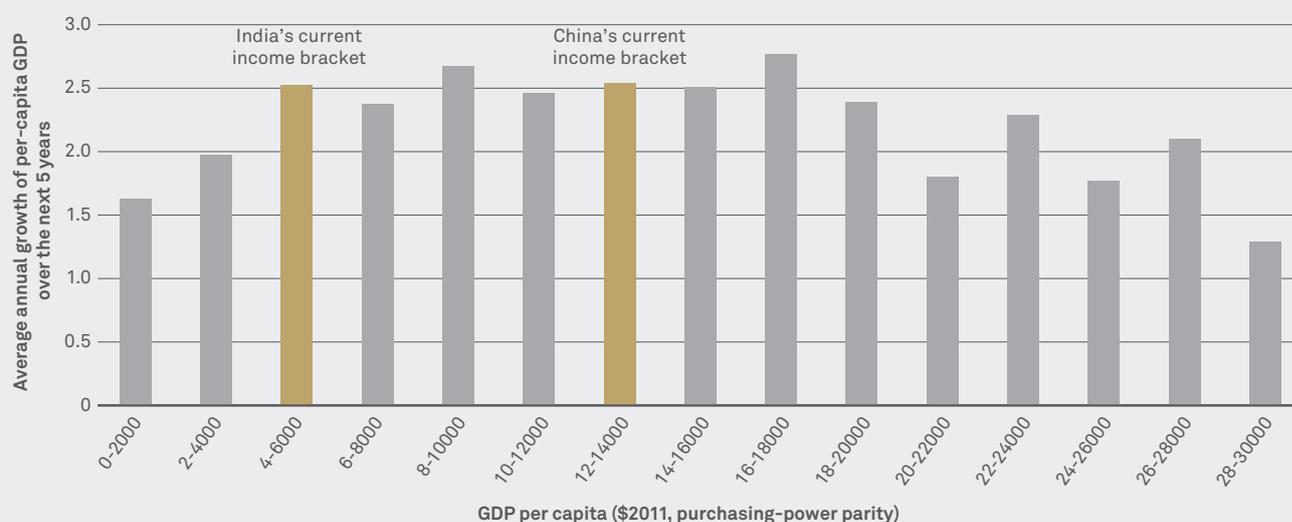
We have extended Garrett’s exercise beyond 1980 to earlier years and later ones. Like Garrett, we divide the world’s economies into separate income brackets and compare their subsequent performance. But rather than choosing a single initial year, we look at every year from 1960 to 2009. We then see

how countries perform over the subsequent five years. The chart shows the average result for each income bracket.

For example, Mexico in 1974 and Austria in 1960 both had per capita incomes of \$10,000 - \$12,000, holding prices constant across time and space. So in the chart below, they both belong in the same income bracket. After achieving this level of income, Mexico’s per capita income grew by 3.5 percent on average for the next five years; Austria’s grew by 3.7 percent.

If the middle-income trap exists, we would expect growth rates to dip in the middle range of income brackets. But no such dip is discernible in any consistent way. If anything, the opposite is true.

How fast do countries grow after reaching a given level of GDP per person? 1960 - 2009



Source: BNY Mellon calculations, based on World Bank World Development Indicators

⁶⁹ See for example “Re-examining the Middle-Income Trap Hypothesis: What to Reject and What to Revive?” by Xuehui Han and Shang-Jin Wei, ADB Economics working paper, July 2015.

5. Conclusion

In the first paper of the G4 series, I argued that Japan, America, China and India all have “room to recover”. None of them is yet operating at full capacity. Therefore, when demand picks up, all four can grow faster for a spell before capacity constraints begin to bite.

But eventually, those constraints will begin to assert themselves. Slack will disappear and these four economies will run up against their “supply-side” limits. At that point, further progress will depend on some of the deeper forces analyzed in this paper. The supply of labor will be constrained by demographics. The supply of capital will depend on the pace of investment. And to squeeze more out of both labor and capital, these economies will require improvements in technology and technique.

In light of these supply-side constraints, the growth rates we envisage in our G4 scenario (8 percent for India, 7 percent for China, 3 percent for America, 2 percent for Japan) are ambitious but not impossible. The growth will be somewhat front-loaded, driven by a cyclical upswing as demand revives in the next year or two. As the decade wears on, the pace of productivity growth will become decisive.

Unfortunately, productivity is a particularly elusive part of the macroeconomic “equation”⁷⁰, which economists struggle to understand and predict. “Productivity forecasts have had no success historically,” Robert Hall points out. “Whether the return to a normal economy will result in a catchup in productivity growth in the longer term is an unsettled question of growth economics⁷¹.”

This paper does not pretend to settle that question. On the contrary, it aims to keep the question open. Those who foresee an era of economic stagnation have already decided that productivity growth will continue to disappoint as the world economy revives. But that conclusion seems to us premature. This unsettled question of economics might still be settled either way. Good investors will remain open to both possibilities.

⁷⁰ “Work and Welfare” by Robert M. Solow

⁷¹ “Quantifying the Lasting Harm to the U.S. Economy from the Financial Crisis” by Robert E. Hall

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