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Dreaming With BRICs: The Path to 2050

- Over the next 50 years, Brazil, Russia, India and China—the BRICs economies—could become a much larger force in the world economy. We map out GDP growth, income per capita and currency movements in the BRICs economies until 2050.
- The results are startling. If things go right, in less than 40 years, the BRICs economies together could be larger than the G6 in US dollar terms. By 2025 they could account for over half the size of the G6. Of the current G6, only the US and Japan may be among the six largest economies in US dollar terms in 2050.
- The list of the world's ten largest economies may look quite different in 2050. The largest economies in the world (by GDP) may no longer be the richest (by income per capita), making strategic choices for firms more complex.

Dominic Wilson
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1st October 2003

Many thanks to Jim O'Neill, Paulo Leme, Sandra Lawson, Warren Pearson and our regional economists for their contributions to this paper.

SUMMARY

- Over the next 50 years, Brazil, Russia, India and China—the BRICs economies—could become a much larger force in the world economy. Using the latest demographic projections and a model of capital accumulation and productivity growth, we map out GDP growth, income per capita and currency movements in the BRICs economies until 2050.

- The results are startling. If things go right, in less than 40 years, the BRICs economies together could be larger than the G6 in US dollar terms. By 2025 they could account for over half the size of the G6. Currently they are worth less than 15%. Of the current G6, only the US and Japan may be among the six largest economies in US dollar terms in 2050.

- About two-thirds of the increase in US dollar GDP from the BRICs should come from higher real growth, with the balance through currency appreciation. The BRICs' real exchange rates could appreciate by up to 300% over the next 50 years (an average of 2.5% a year).

- The shift in GDP relative to the G6 takes place steadily over the period, but is most dramatic in the first 30 years. Growth for the BRICs is likely to slow significantly toward the end of the period, with only India seeing growth rates significantly above 3% by 2050. And individuals in the BRICs are still likely to be poorer on average than individuals in the G6 economies, with the exception of Russia. China's per capita income could be roughly what the developed economies are now (about US$30,000 per capita).

- As early as 2009, the annual increase in US dollar spending from the BRICs could be greater than that from the G6 and more than twice as much in dollar terms as it is now. By 2025 the annual increase in US dollar spending from the BRICs could be twice that of the G6, and four times higher by 2050.

- The key assumption underlying our projections is that the BRICs maintain policies and develop institutions that are supportive of growth. Each of the BRICs faces significant challenges in keeping development on track. This means that there is a good chance that our projections are not met, either through bad policy or bad luck. But if the BRICs come anywhere close to meeting the projections set out here, the implications for the pattern of growth and economic activity could be large.

- The relative importance of the BRICs as an engine of new demand growth and spending power may shift more dramatically and quickly than expected. Higher growth in these economies could offset the impact of greying populations and slower growth in the advanced economies.

- Higher growth may lead to higher returns and increased demand for capital. The weight of the BRICs in investment portfolios could rise sharply. Capital flows might move further in their favour, prompting major currency realignments.

- Rising incomes may also see these economies move through the 'sweet spot' of growth for different kinds of products, as local spending patterns change. This could be an important determinant of demand and pricing patterns for a range of commodities.

- As today's advanced economies become a shrinking part of the world economy, the accompanying shifts in spending could provide significant opportunities for global companies. Being invested in and involved in the right markets—particularly the right emerging markets—may become an increasingly important strategic choice.

- The list of the world's ten largest economies may look quite different in 2050. The largest economies in the world (by GDP) may no longer be the richest (by income per capita), making strategic choices for firms more complex.

The world economy has changed a lot over the past 50 years. Over the next 50, the changes could be at least as dramatic.

We have highlighted the importance of thinking about the developing world in our recent global research, focusing on key features of development and globalisation that we think are important to investors with a long-term perspective. A major theme of this work has been that, over the next few decades, the growth generated by the large developing countries, particularly the BRICs (Brazil, Russia, India and China) could become a much larger force in the world economy than it is now—and much larger than many investors currently expect.

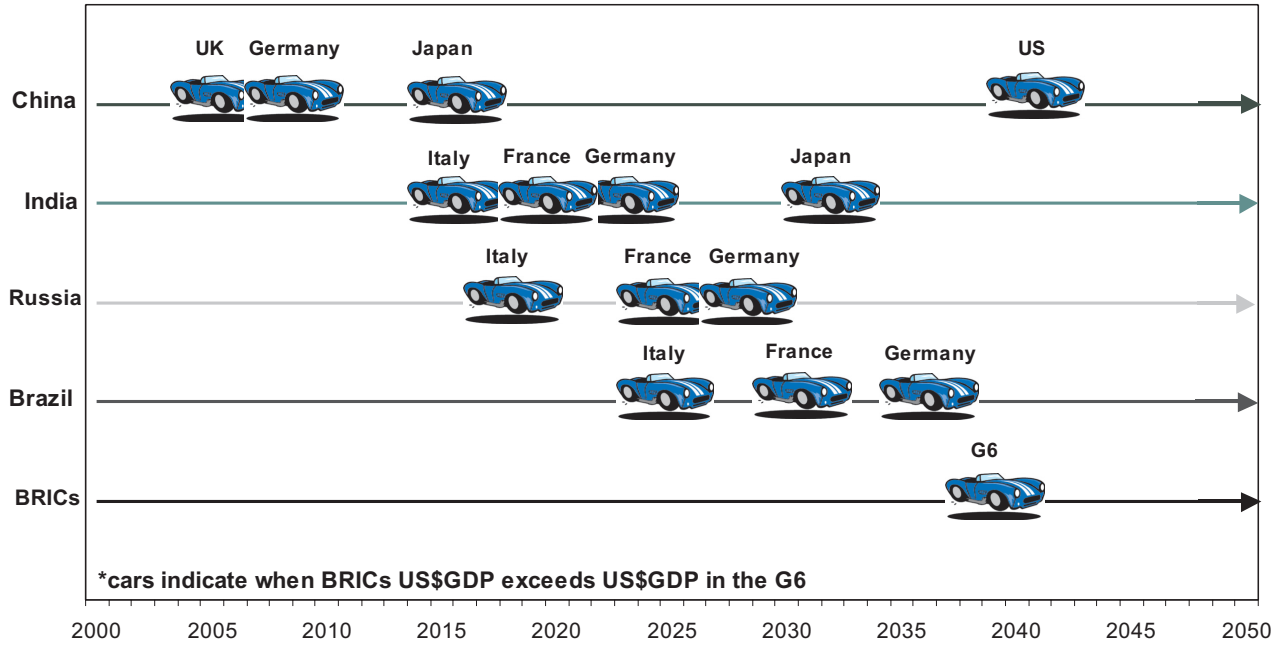
In this piece, we gauge just how large a force the BRICs could become over the next 50 years. We do this not simply by extrapolating from current growth rates, but by setting out clear assumptions about how the process of growth and development works and applying a formal framework to generate long-term forecasts. We look at our BRICs projections relative to long-term projections for the G6 (US, Japan, UK, Germany, France and Italy)[1].

Using the latest demographic projections and a model of capital accumulation and productivity growth, we map out GDP growth, income per capita and currency movements in the BRICs economies until 2050. This allows us to paint a picture of how the world economy might change over the decades ahead.

The results of the exercise are startling. They suggest that if things go right, the BRICs could become a very important source of new global spending in the not too distant future. The chart below shows that India's economy, for instance, could be larger than Japan's by 2032, and China's larger than the US by 2041 (and larger than everyone else as early as 2016). The BRICs economies taken together could be larger than the G6 by 2039.

Our projections are optimistic, in the sense that they assume reasonably successful development. But they are economically sensible, internally consistent and provide a clear benchmark against which investors can set their expectations. There is a good chance that the right conditions in one or another economy will not fall into place and the projections will not be

Overtaking the G6: When BRICs' US$GDP Would Exceed G6



GS BRICs Model Projections. See text for details and assumptions.

1 Any decision to limit the sample of countries is to some extent arbitrary. In focusing on the G6 (rather than the G7 or a broader grouping), we decided to limit our focus to those developed economies with GDP currently over US$1 trillion. This means that Canada and and some of the other larger developed economies are not included. Adding these economies to the analysis would not materially change the conclusions.

realized. If the BRICs pursue sound policies, however, the world we envisage here might turn out to be a reality, not just a dream.

The projections leave us in no doubt that the progress of the BRICs will be critical to how the world economy evolves. If these economies can fulfil their potential for growth, they could become a dominant force in generating spending growth over the next few decades.

A Dramatically Different World

We start with some key conclusions that describe the way the world might change over the next 50 years. The big assumption underlying all of these projections is that the BRICs maintain growth-supportive policy settings. The charts throughout the text illustrate these points. Our conclusions fall under five main topics: 1) economic size; 2) economic growth; 3) incomes and demographics; 4) global demand patterns; and 5) currency movements.

Economic Size

- In less than 40 years, the BRICs' economies together could be larger than the G6 in US dollar terms. By 2025 they could account for over half the size of the G6. Currently they are worth less than 15%.

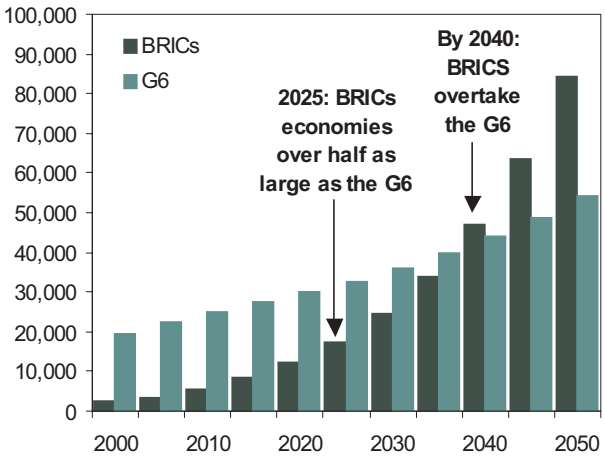
- In US dollar terms, China could overtake Germany in the next four years, Japan by 2015 and the US by 2039. India's economy could be larger than all but the US and China in 30 years. Russia would overtake Germany, France, Italy and the UK.

- Of the current G6 (US, Japan, Germany, France, Italy, UK) only the US and Japan may be among the six largest economies in US dollar terms in 2050.

Economic Growth

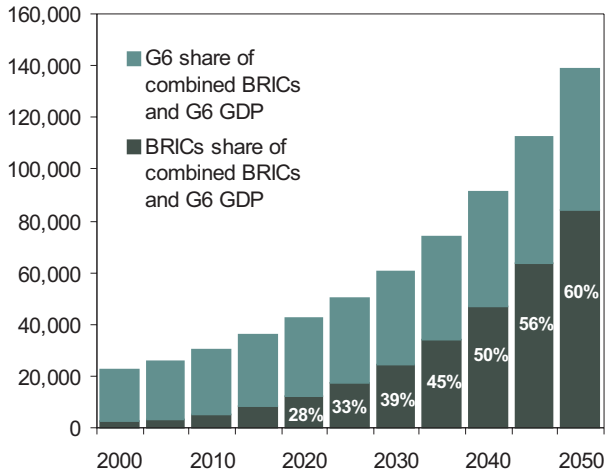
- India has the potential to show the fastest growth over the next 30 and 50 years. Growth could be higher than 5% over the next 30 years and close to 5% as late as 2050 if development proceeds

BRICs Have a Larger US$GDP Than the G6 in Less Than 40 Years



GS BRICs Model Projections. See text for details and assumptions.

BRICs Share of GDP Rises



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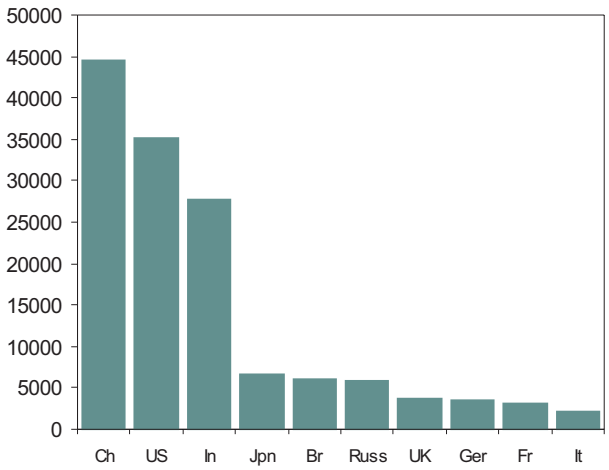
The Largest Economies in 2050



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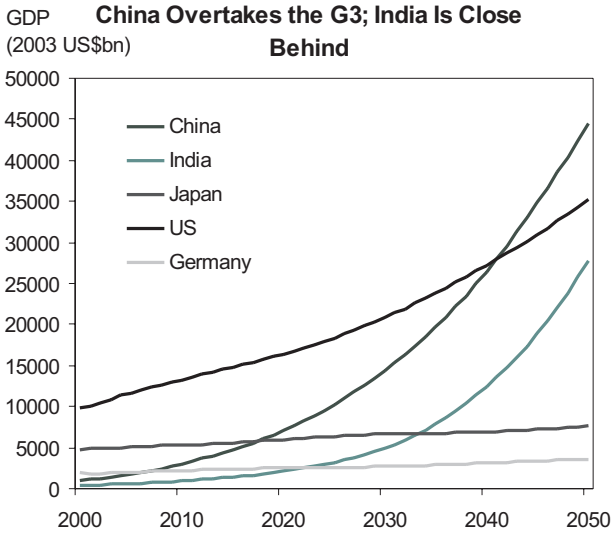
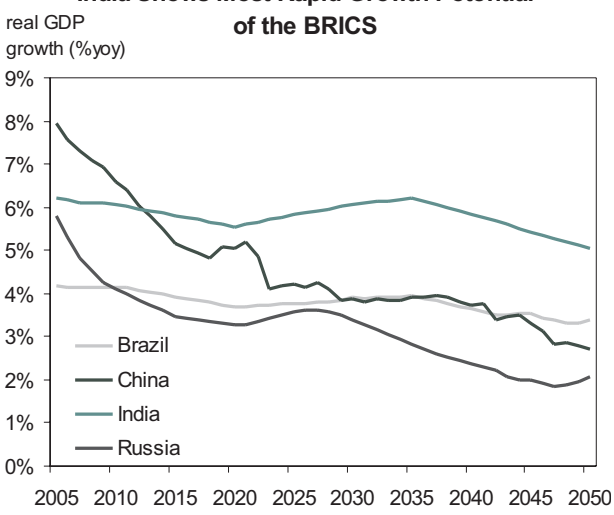
China Overtakes the G3; India Is Close Behind



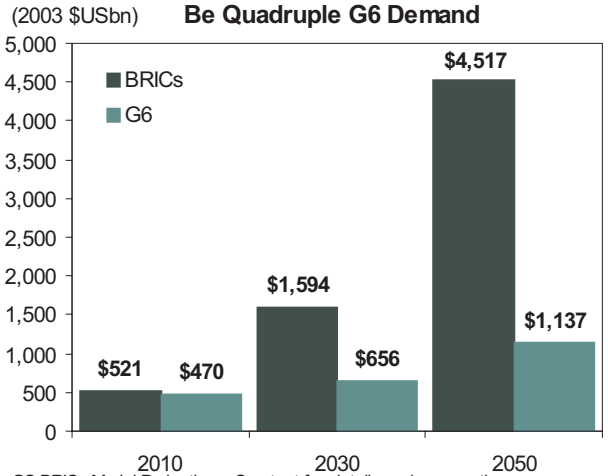
GS BRICs Model Projections. See text for details and assumptions.

India Shows Most Rapid Growth Potential of the BRICS



GS BRICs Model Projections. See text for details and assumptions.

Incremental Demand From the BRICs Could Eventually Be Quadruple G6 Demand



GS BRICs Model Projections. See text for details and assumptions.

successfully.

- Overall, growth for the BRICs is likely to slow significantly over this time frame. By 2050, only India on our projections would be recording growth rates significantly above 3%.

Incomes and Demographics

- Despite much faster growth, individuals in the BRICs are still likely to be poorer on average than individuals in the G6 economies by 2050. Russia is the exception, essentially catching up with the poorer of the G6 in terms of income per capita by 2050. China's per capita income could be similar to where the developed economies are now (about US$30,000 per capita). By 2030, China's income per capita could be roughly what Korea's is today. In the US, income per capita by 2050 could reach roughly $80,000.

- Demographics play an important role in the way the world will change. Even within the BRICs, demographic impacts vary greatly. The decline in working-age population is generally projected to take place later than in the developed economies, but will be steeper in Russia and China than India and Brazil.

Global Demand Patterns

- As early as 2009, the annual increase in US dollar spending from the BRICs could be greater than that from the G6 and more than twice as much in dollar terms as it is now. By 2025 the annual increase in US dollar spending from the BRICs could be twice that of the G6, and four times higher by 2050.

Currency Movements

- Rising exchange rates could contribute a significant amount to the rise in US dollar GDP in the BRICs. About 1/3 of the increase in US dollar GDP from the BRICs over the period may come from rising currencies, with the other 2/3 from faster growth.

- The BRICs' real exchange rates could appreciate by up to 300% over the next 50 years (an average

of 2.5% a year). China's currency could double in value in ten years' time if growth continued and the exchange rate were allowed to float freely.

How Countries Get Richer

Our predictions may seem dramatic. But over a period of a few decades, the world economy can change a lot. Looking back 30 or 50 years illustrates that point. Fifty years ago, Japan and Germany were struggling to emerge from reconstruction. Thirty years ago, Korea was just beginning to emerge from its position as a low-income nation. And even over the last decade, China's importance to the world economy has increased substantially.

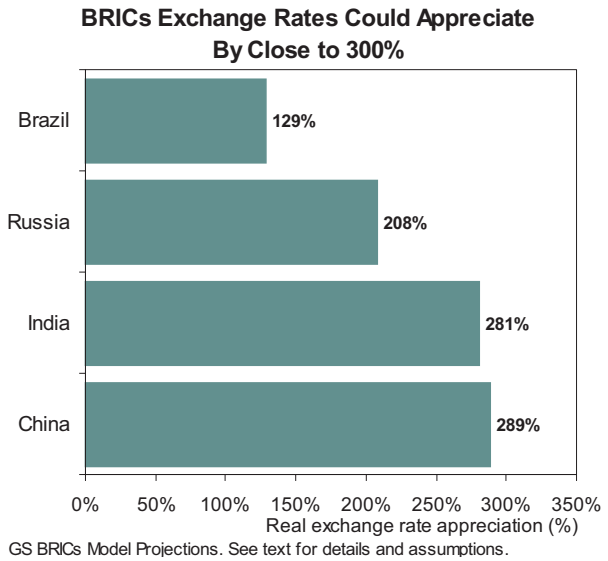
History also illustrates that any kind of long-term projection is subject to a great deal of uncertainty. The further ahead into the future you look, the more uncertain things become. Predictions that the USSR (or Japan) would overtake the US as the dominant economic power turned out to be badly off the mark.

While this makes modeling these kinds of shifts difficult, it is still essential. Over 80% of the value generated by the world's major equity markets will come from earnings delivered more than 10 years away. Developing strategies to position for growth may take several years and require significant forward planning. The best option is to provide a sensible framework, based on clear assumptions.

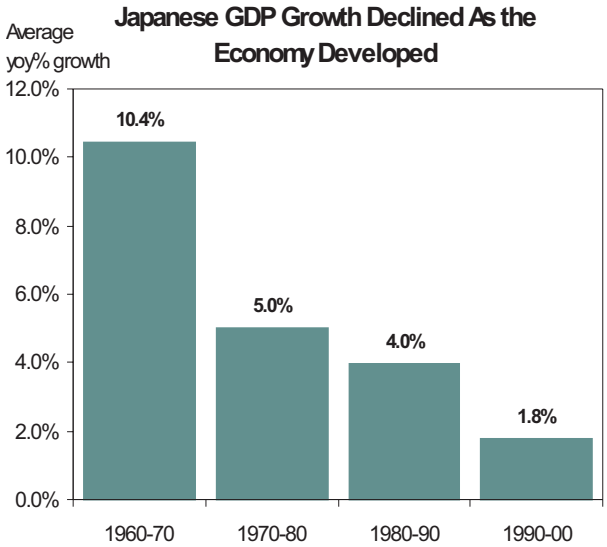
As developing economies grow, they have the potential to post higher growth rates as they catch up with the developed world. This potential comes from two sources. The first is that developing economies have less capital (per worker) than developed economies (in the language of simple growth models they are further from their 'steady states'). Returns on capital are higher and a given investment rate results in higher growth in the capital stock. The second is that developing countries may be able to use technologies available in more developed countries to 'catch up' with developed country techniques.

As countries develop, these forces fade and growth rates tend to slow towards developed country levels. In Japan and Germany, very rapid growth in the 1960s and 1970s gave way to more moderate growth in the 1980s and 1990s. This is why simple extrapolation gives silly answers over long timeframes. As a crude example, assuming that China's GDP growth continued to grow at its current 8% per year over the next three decades would lead to the prediction that China's economy would be three times larger than the US by 2030 in US dollar terms and 25 times larger by 2050.

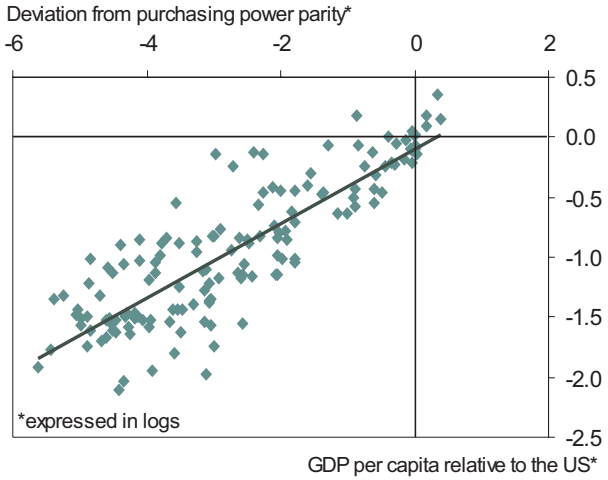
Countries also grow richer on the back of appreciating currencies. Currencies tend to rise as higher productivity leads economies to converge on Purchasing Power Parity (PPP) exchange rates. There is a clear tendency for countries with higher income per capita to have exchange rates closer to PPP. The BRICs economies all have exchange rates that are a long way below PPP rates. These large



GS BRICs Model Projections. See text for details and assumptions.



Higher Income Per Capita Moves Exchange Rates Closer to PPP



differences between PPP and actual exchange rates come about because productivity levels are much lower in developing economies. As they develop and productivity rises, there will be a tendency for their currencies to rise towards PPP. The idea that countries experiencing higher productivity growth tend to appreciate is an important part of both our GSDEER and GSDEEMER models of equilibrium exchange rates.

Breaking Down Growth

To translate these two processes into actual projections, we need to develop a model. The model we use is described in more detail in the Appendix but the intuition behind it is quite simple. Growth accounting divides GDP growth into three components:

- Growth in employment
- Growth in the capital stock
- Technical progress (or total-factor productivity (TFP) growth).[2]

We model each component explicitly. We use the US Census Bureau's demographic projections to forecast employment growth over the long term, assuming that the proportion of the working age population that works stays roughly stable. We use assumptions about the investment rate to map out the path that the capital stock will take over time. And we model TFP growth as a process of catch-up on the developed economies, by assuming that the larger the income gap between the BRICs and the developed economies, the greater the potential for catch-up and stronger TFP growth.

We then use the projections of productivity growth from this exercise to map out the path of the real exchange rate. As in our GSDEER framework, we assume that if an economy experiences higher productivity growth than the US, its equilibrium exchange rate will tend to appreciate.

By varying the assumptions about investment, demographics or the speed of catch-up, we can generate different paths for annual GDP, GDP growth, GDP per capita (in local currency or US dollars), productivity growth and the real exchange rate.

Because both the growth and currency projections are long-term projections, we ignore the impact of the economic cycle. Effectively, the projections can be interpreted as growth in the trend (or potential growth) of the economy and the currencies' path as an equililibrium path. Where economies peg their exchange rates (as in China), it is even more important to view the exchange rate projections as an equilibrium real rate. In practice, real exchange rate appreciation might come about through a combination of nominal appreciation and higher inflation, with different mixes having different implications. We abstract from inflation, expressing all of our projections in real terms (either 2003 local currency or 2003 US dollars).[3]

Generally speaking, the structure of the models is identical across the four economies. We make two minor alterations. We assume that the 'convergence speed' of TFP in Brazil and India is slower than in

2 We do not explicitly allow for increases in human capital (education), which are implicitly picked up in the technical progress/TFP term in our model.

3 Higher inflation in the BRICs would raise nominal GDP forecasts in local currencies and nominal exchange rates, but would not change the forecasts of real GDP or of US dollar GDP under the standard assumption that higher inflation would translate into an offsetting depreciation in the currency.

Russia and China for the first twenty years, largely because of lower education levels and poorer infrastructure (more on these factors below), but gradually rises from 2020 onwards (as these structural problems are addressed) so that all of the BRICs are 'running' at the same convergence speed. We also assume that China's investment rate gradually declines from its current levels of around 36% to 30% (close to the Asian average) by 2015.

We use GS forecasts until 2004 and begin the simulations in 2005.

A More Detailed Look at the BRICs' Potential

We have already highlighted some of the most striking results, though there are many other intriguing aspects. The tables and charts set out the key features of the projections, summarising them in 5-year blocks. They show average GDP growth rates, income per capita in US dollars, the real exchange rate and the main demographic trends.

In each economy, as development occurs, growth tends to slow and the exchange rate appreciates. Both rising currencies and faster growth raise US dollar GDP per capita gradually and the gap between the BRICs and developed economies narrows slowly.

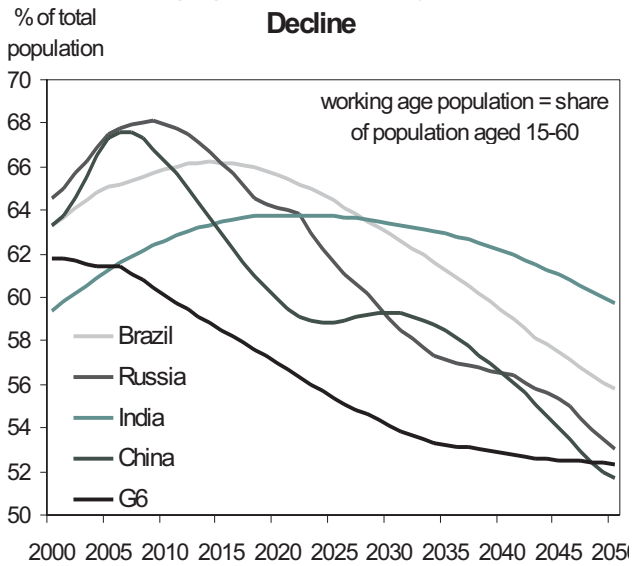
The impact of demographics varies, with labour force growth contributing relatively more to growth in India and Brazil and detracting from growth in Russia, where the US Census projections show the labour force shrinking quite rapidly. Where labour force and population growth is rapid, income per capita tends to rise more slowly as higher investment is needed just to keep up with population growth.

BRICs Real GDP Growth: 5-Year Period Averages

%	Brazil	China	India	Russia
2000-2005	2.7	8.0	5.3	5.9
2005-2010	4.2	7.2	6.1	4.8
2010-2015	4.1	5.9	5.9	3.8
2015-2020	3.8	5.0	5.7	3.4
2020-2025	3.7	4.6	5.7	3.4
2025-2030	3.8	4.1	5.9	3.5
2030-2035	3.9	3.9	6.1	3.1
2035-2040	3.8	3.9	6.0	2.6
2040-2045	3.6	3.5	5.6	2.2
2045-2050	3.4	2.9	5.2	1.9

GS BRICs Model Projections. See text for details and assumptions.

Working Age Population Projected To Decline



To illustrate the shift in economic gravity, we also make comparisons with the G6. To do that, we use a less sophisticated version of the same model to project G6 growth. We assume a common 2% labour productivity growth rate across the G6, so differences in projected GDP growth are purely a function of demographics (and real exchange rates remain roughly stable). A shrinking working age population appears to be the biggest issue in Japan and Italy, whose growth rates are lower than the others, and the smallest issue in the US, which maintains the fastest growth.

Our G6 projections allow us to compare the paths of GDP and GDP per capita in the BRICs with that of the more advanced economies in a common currency. The shift in GDP relative to the G6 takes place steadily over the period, but is most dramatic in the first 30 years. The BRICs overtake the G6 through higher real growth and through the appreciation of BRICs' currencies. About 1/3 of the increase in US dollar GDP from the BRICs over the period may come from rising currencies, with the other 2/3 from faster growth.

We also look explicitly at where new demand growth in the world will come from. While it takes some time for the level of GDP in the BRICs to approach the G6, their share of new demand *growth* rises much more rapidly. Because it is incremental demand that generally drives returns, this measure may be

Projected US$GDP												
2003 $USbn	BRICs				G6							
	Brazil	China	India	Russia	France	Germany	Italy	Japan	UK	US	BRICs	G6
2000	762	1078	469	391	1,311	1,875	1,078	4,176	1,437	9,825	2,700	19,702
2005	468	1724	604	534	1,489	2,011	1,236	4,427	1,688	11,697	3,330	22,548
2010	668	2998	929	847	1,622	2,212	1,337	4,601	1,876	13,271	5,441	24,919
2015	952	4754	1411	1232	1,767	2,386	1,447	4,858	2,089	14,786	8,349	27,332
2020	1333	7070	2104	1741	1,930	2,524	1,553	5,221	2,285	16,415	12,248	29,928
2025	1695	10213	3174	2264	2,095	2,604	1,625	5,567	2,456	18,340	17,345	32,687
2030	2189	14312	4935	2980	2,267	2,697	1,671	5,810	2,649	20,833	24,415	35,927
2035	2871	19605	7854	3734	2,445	2,903	1,708	5,882	2,901	23,828	34,064	39,668
2040	3740	26439	12367	4467	2,668	3,147	1,788	6,039	3,201	27,229	47,013	44,072
2045	4794	34799	18847	5156	2,898	3,381	1,912	6,297	3,496	30,956	63,596	48,940
2050	6074	44453	27803	5870	3,148	3,603	2,061	6,673	3,782	35,165	84,201	54,433

GS BRICs Model Projections. See text for details and assumptions.

Projected US$GDP Per Capita										
2003 US$	BRICs				G6					
	Brazil	China	India	Russia	France	Germany	Italy	Japan	UK	US
2000	4,338	854	468	2,675	22,078	22,814	18,677	32,960	24,142	34,797
2005	2,512	1,324	559	3,718	24,547	24,402	21,277	34,744	27,920	39,552
2010	3,417	2,233	804	5,948	26,314	26,877	23,018	36,172	30,611	42,926
2015	4,664	3,428	1,149	8,736	28,338	29,111	25,086	38,626	33,594	45,835
2020	6,302	4,965	1,622	12,527	30,723	31,000	27,239	42,359	36,234	48,849
2025	7,781	7,051	2,331	16,652	33,203	32,299	28,894	46,391	38,479	52,450
2030	9,823	9,809	3,473	22,427	35,876	33,898	30,177	49,944	41,194	57,263
2035	12,682	13,434	5,327	28,749	38,779	37,087	31,402	52,313	44,985	63,017
2040	16,370	18,209	8,124	35,314	42,601	40,966	33,583	55,721	49,658	69,431
2045	20,926	24,192	12,046	42,081	46,795	44,940	36,859	60,454	54,386	76,228
2050	26,592	31,357	17,366	49,646	51,594	48,952	40,901	66,805	59,122	83,710

GS BRICs Model Projections. See text for details and assumptions.

Projected US$ GDP Per Capita Growth: 5-Year Averages										
Average %yoy	BRICs				G6					
	Brazil	China	India	Russia	France	Germany	Italy	Japan	UK	US
2000-2005	-9.8	9.2	3.7	7.0	2.2	1.4	2.7	1.1	3.0	2.6
2005-2010	6.3	11.2	7.5	10.3	1.5	2.0	1.6	0.9	1.9	1.7
2010-2015	6.4	9.2	7.4	8.1	1.5	1.6	1.7	1.2	1.9	1.3
2015-2020	6.2	7.8	7.2	7.5	1.6	1.3	1.7	1.8	1.6	1.3
2020-2025	4.6	7.3	7.4	6.1	1.6	0.9	1.2	1.8	1.2	1.4
2025-2030	4.7	6.9	8.2	6.2	1.6	0.9	0.9	1.5	1.3	1.7
2030-2035	5.2	6.5	8.9	5.2	1.6	1.7	0.8	1.0	1.7	1.9
2035-2040	5.3	6.3	8.9	4.3	1.9	2.0	1.3	1.2	2.0	2.0
2040-2045	5.0	5.9	8.3	3.6	1.9	1.9	1.8	1.6	1.8	1.9
2045-2050	4.9	5.4	7.6	3.4	2.0	1.8	2.1	2.0	1.7	1.9

GS BRICs Model Projections. See text for details and assumptions.

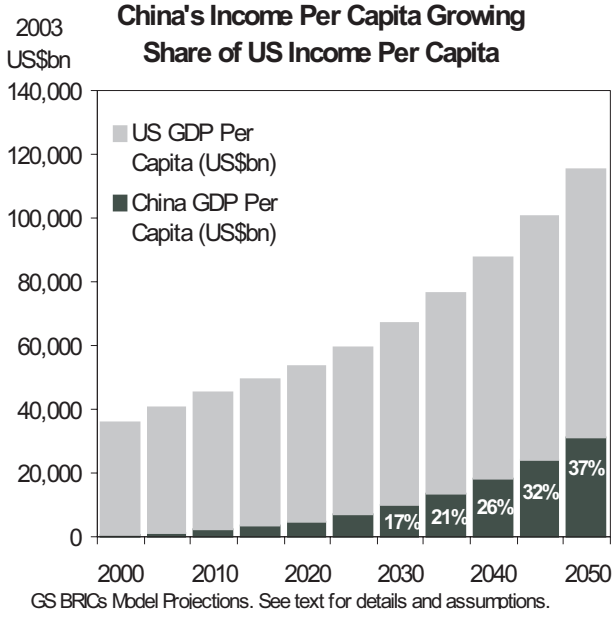
particularly useful to assess the extent of opportunities in these markets. We measure that new demand growth as the change in US dollar spending power in the various economies, so again it incorporates both growth and currency effects. On these measures, the BRICs come to dominate the G6 as a source of growth in spending power within 10 years.

Taking each of the economies in brief:

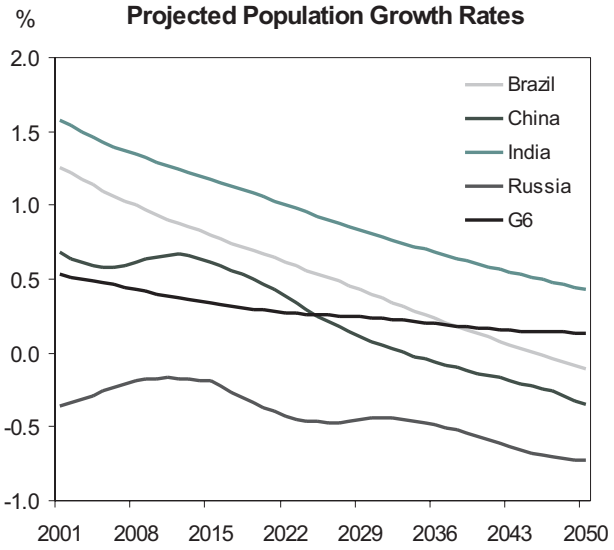
- **Brazil.** Over the next 50 years, Brazil's GDP growth rate averages 3.6%. The size of Brazil's economy overtakes Italy by 2025; France by 2031; UK and Germany by 2036.

- **China.** China's GDP growth rate falls to 5% in 2020 from its 8.1% growth rate projected for 2003. By the mid-2040s, growth slows to around 3.5%. Even so, high investment rates, a large labor force and steady convergence would mean China becomes the world's largest economy by 2041.

- **India.** While growth in the G6, Brazil, Russia and China is expected to slow significantly over the next 50 years, India's growth rate remains above 5% throughout the period. India's GDP outstrips that of Japan by 2032. With the only population out of the BRICS that continues to grow throughout the next 50 years, India has the potential to raise its US dollar income per capita in 2050 to 35 times current levels. Still, India's income per capita will be significantly lower than any of the countries we look at.



GS BRICs Model Projections. See text for details and assumptions.



- **Russia.** Russia's growth projections are hampered by a shrinking population (an assumption that may be too negative). But strong convergence rates work to Russia's benefit, and by 2050, the country's GDP per capita is by far the highest in the group, and comparable to the G6. Russia's economy overtakes Italy in 2018; France in 2024; UK in 2027 and Germany in 2028.

Although we focus on the BRICs, as the four largest developing economies, we do not mean to suggest that development elsewhere is not important. In the box on p11, we look at what our approach says for South Africa and the African region and other larger developing economies could also become important.

Are the Results Plausible?

The projection of a substantial shift in the generation of growth towards the BRICs is dramatic. Is it plausible?

We have looked at three main ways to cross check the forecasts, all of which give us broad comfort with the results.

First, the forecasts for GDP growth in the next 10 years are not out of line with the IMF's assumptions

South Africa and the Challenge for the African Continent

With Asia, Europe and Latin America represented in the BRICs profile, some readers will notice Africa's absence. The BRICs are chosen because they are the four largest developing economies currently. Still, it is interesting and important to look beyond at the potential for Africa, and particularly South Africa, the largest economy in the region, to play a part in the same kind of process.

We have already published a 10-year outlook on South Africa using detailed econometric work to project the same components of growth (employment growth, capital stock growth and technical progress) that underpin our methodology here (see *Global Economics Paper #93, South Africa Growth and Unemployment: A Ten-Year Outlook).* The study showed that South Africa could achieve 5% growth over the next decade if the right policies were put in place. The emphasis on getting the conditions for growth right is one that is important for the BRICs also.

To provide comparison, we applied our projection methods for the BRICs to South Africa. The method is simpler than that in our paper on South Africa, but does provide a longer-term outlook. The table sets out the main results in terms of growth. Projected growth over the next decade is a little lower than the 5% projected in our more detailed study (around 4% here), but the main thrust of the outlook is similar. The differences arise largely because the demographic projections we assume much sharper shrinkage in the labour force (around 1% per year) than did the more detailed exercise. Both in South Africa, and in the region more generally, the challenge of AIDS and the impact it will have on labour force and population dynamics is an important risk and challenge that has no direct counterpart elsewhere.

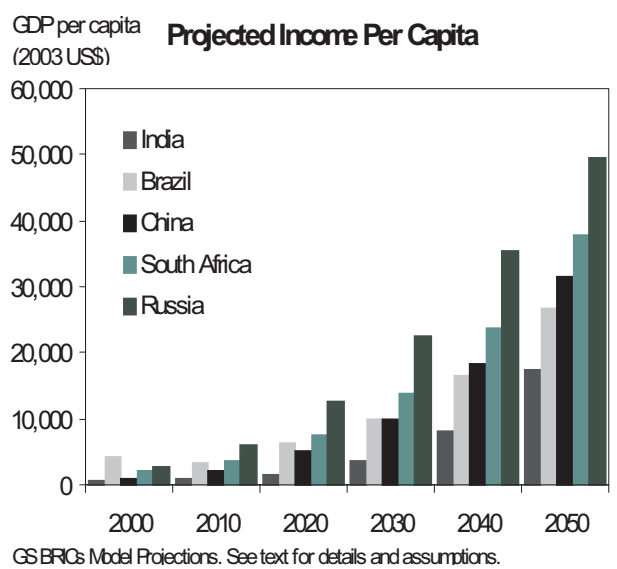
Our longer-term projections show South Africa growing at an average rate of around 3.5% over the next 50 years, comparable to our predictions for Russia and Brazil. With declining population growth rates, per capita incomes under these projections would rise significantly more rapidly. We find under these projections that South Africa's economy would be significantly smaller than the BRICs in 2050 (around US$1.2bn compared to US$5.9bn for Russia, the smallest of the BRICs economies), though its projected GDP *per capita* would actually be higher.

Projected US$GDP Levels

2003 US$bn	South Africa	Brazil	China	India	Russia
2000	83	762	1078	469	391
2010	147	668	2998	929	847
2020	267	1333	7070	2104	1741
2030	447	2189	14312	4935	2980
2040	739	3740	26439	12367	4467
2050	1174	6074	44453	27803	5870

GS BRICs Model Projections. See text for details and assumptions.

GS BRICs Model Projections. See text for details and assumptions.



GS BRICs Model Projections. See text for details and assumptions.

of potential growth in these economies (roughly 5% for Russia, 4% for Brazil, 8% for China, 5-6% for India). With the exception of Brazil, our projected growth rates are also close to recent performance. Brazil's performance would have to improve quite significantly relative to the past.

Second, although the implied changes in GDP and currencies may look dramatic on an absolute basis, they are significantly less spectacular than what some economies actually achieved over the last few decades. In Japan, between 1955 and 1985 real GDP increased by nearly 8 times (from initial levels of income per capita not unlike some of the BRICs) and real industrial production increased tenfold. Between 1970 and 1995—the yen appreciated by over 300% in nominal terms against the US dollar. In the more recent past, Korea's GDP in 2000 increased by nearly 9 times between 1970 and 2000. Next to these experiences our projections look quite tame. Although the projections assume that economies remain on a steady development track, they do not assume 'miracle-economy' growth.

As a final check on our estimates, we applied an entirely different approach to generate long-term growth projections based on cross-country econometric research. We took a well-known existing econometric model from Levine and Renelt (LR) that explains average GDP growth over the next thirty years as a function of initial income per capita, investment rates, population growth and secondary school enrollments[4].

Although the technique employed is very different and a year-by-year path cannot be generated, the model has close parallels to our own approach. Initial income per capita drives our productivity catch-up, investment drives capital accumumulation, and the level of education can be thought of as helping to determine the speed of convergence. Projections using the LR equation are not identical to our own, but close enough to reassure us that we are making sensible assumptions. Our own models are a bit more optimistic about growth prospects in general, but not by much.

Comparing Our Projections With the Levine-Renelt Model

30 year average real GDP growth	Our Projections	Levine-Renelt Model
Brazil	3.7	3.3
Russia	3.9	3.5
India	5.8	5.3
China	5.6	5.8

A Look Back In Time—What Would We Have Said in 1960

We mentioned earlier that the world has changed a lot in the last fifty years. One further check on the plausibility of our projections is to go back in time, apply the same methods that we have used here and look at how our projections of GDP growth then would have compared with subsequent reality.

To do that, we looked at a set of 11 developed and developing countries (US, UK, Germany, France, Italy, Japan, Brazil, Argentina, India, Korea and Hong Kong) starting in 1960 and projecting their GDP growth for the following 40 years (data availability meant we could not easily do a full 50 year projection).

We applied the same methodology, modeling capital stock growth as a function of the starting level of capital and investment and technical progress as a catch-up process on the US. Because we did not have demographic projections for 1960 (as we do now for the next fifty years), we used actual population data for the period as the basis for our labour force growth assumptions (effectively assuming that this part of the exercise was predicted perfectly).

The results of that exercise are generally encouraging. In general, the projected average growth rates over the period are surprisingly close to the actual outcomes. For the more developed countries, where the growth path has been steadier (France, Germany, UK, US, Italy) the differences between projected and actual growth rates are small.

For the developing countries (and Japan, which in 1960 was a developing country that was significantly poorer than Argentina) the range of outcomes is wider. For those countries where policy settings were not particularly growth-supportive—India, Brazil

4 Levine, Ross & Renelt, David, 1992. "A Sensitivity Analysis of Cross-Country Growth Regressions," American Economic Review, Vol. 82 (4) p942-63.

The Conditions for Growth

A set of core factors—macroeconomic stability, institutional capacity, openness and education—can set the stage for growth. Robert Barro's influential work on the determinants of growth found that growth is enhanced by higher schooling and life expectancy, lower fertility, lower government consumption, better maintenance of the rule of law, lower inflation and improvements in the terms of trade. These core policies are linked: institutional capacity is required to implement stable macroeconomic policies, macro stability is crucial to trade, and without price stability a country rarely has much success in liberalizing and expanding trade. We briefly view some of the most recent findings on these ingredients here:

Macro Stability. An unstable macro environment can hamper growth by distorting prices and incentives. Inflation hinders growth by discouraging saving and investment. Accordingly, a key focus is price stability, achieved through fiscal deficit reduction, tighter monetary policy and exchange-rate realignment. Within the BRICs, macroeconomic indicators reflecting policy divergence show wide swings: through the 1990s, Brazil averaged an inflation rate of 548% and a government deficit of 21.2% of GDP, against China's average inflation rate of 8% and government deficit of 2.3% of GDP.

Institutions. Institutions affect the 'efficiency' of an economy much in the same way as technology does: more efficient institutions allow an economy to produce the same output with fewer inputs: Bad institutions lower incentives to invest, to work and to save. 'Institutions' in this broad sense include the legal system, functioning markets, health and education systems, financial institutions and the government bureaucracy. Recent research argues that poor political and economic policies are only symptoms of longer-run institutional factors—a line of reasoning that could help explain the disappointing results of developing countries' adoption of macroeconomic policy reforms in the 1990s.

Openness. Openness to trade and FDI can provide access to imported inputs, new technology and larger markets. Empirical studies of trade and growth fall into three buckets. First, country studies document the economic and political consequences of import-substitution policies and export promoting policies. Second, much work uses cross-section or panel data to examine the cross-country relationship between openness and growth. This has produced mixed evidence, but in general it demonstrates a positive relationship between openness and growth. Third, sector, industry and plant-level studies investigate the effects of trade policy on employment, profits, productivity and output at a micro-economic level. There appears to be a greater consensus here than in the cross-country work about the productivity-enhancing effects of trade liberalization.

Education. As economies grow rapidly, they may face shortages of skilled workers, meaning that more years of schooling are a prerequisite for the next stage of economic development. Enrolment rates have increased dramatically over the past 30 years, on average over 5% per year, particularly in higher education (around 14%). Among the BRICs, India receives low marks for education indicators, particularly at the primary and secondary levels. Many cross-country studies have found positive and statistically significant correlations between schooling and growth rates of per capita GDP—on the order of 0.3% faster annual growth over a 30-year period from an additional one year of schooling.

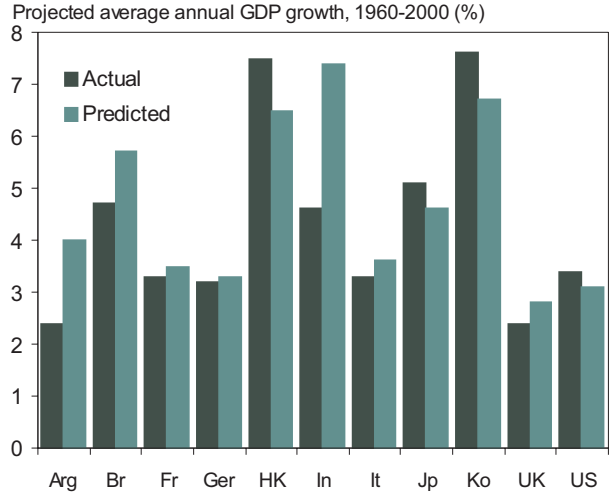
and Argentina—actual growth fell below what we would have projected. But for the Asian economies that had an unusually favourable growth experience, our method would have underpredicted actual growth performance in some cases quite significantly.

Overall, the results highlight that our method of projection seems broadly sensible. For the BRICs to meet our projections over the next fifty years, they do not need 'miracle' performance—though it is important that they stay on the right track in maintaining broadly favourable conditions for growth.

Ensuring the Conditions For Growth

This historical exercise highlights a critical point. For our projections to be close to the truth it is important that the BRICs remain on a steady growth track and keep the conditions in place that will allow that to happen. That is harder than it sounds and is the main reason why there is a good chance that the projections might not be realised. Of the BRICs, Brazil has not been growing in line with projections and may have the most immediate obstacles to this kind of growth. It provides a good illustration of the importance of getting the necessary conditions in place (see box on p.15).

How Our Model Fares in Gauging Growth 1960-2000



GS BRICs Model Projections. See text for details and assumptions.

Research points to a wide range of conditions that are critical to ensuring solid growth performance and increasingly recognises that getting the right insitutions as well as the right policies is important.[5] These are the things that the BRICs must get right (or keep getting right) if the kinds of paths we describe are to be close to the truth. The main ingredients (more detailed discussion of the evidence is provided in the box) are:

- **Sound macroeconomic policies and a stable macroeconomic background.** Low inflation, supportive government policy, sound public finances and a well-managed exchange rate can all help to promote growth. Each of the BRICs has been through periods of macroeconomic instability in the last few decades and some face significant macroeconomic challenges still. Brazil for instance has suffered greatly from the precariousness of the public finances and the foreign borrowing that it brought about.

- **Strong and stable political institutions.** Political uncertainty and instability discourages investment and damages growth. Each of the BRICs is likely to face considerable (and different) challenges in political development over the next few decades. For some (Russia most obviously), the task of institution-building has been a major issue in recent growth performance.

- **Openness.** Openness to trade and foreign direct investment has generally been an important part of successful development. The openness of the BRICs varies, but India is still relatively closed on many measures.

- **High levels of education.** Higher levels of education are generally helpful in contributing to more rapid growth and catch-up. The LR growth estimates above are based on a strong connection between secondary schooling and growth potential. Of the BRICs, India has the most work to do in expanding education.

5 Because of this, the catch-up process is often described as a process of 'conditional convergence' where the tendency for less developed economies to grow more rapidly is only evident after controlling for these conditions.

Brazil: Challenges in Setting the Conditions For Sustained Growth

Of the BRICs, Brazil is the only one where recent growth experience has been significantly lower than our projected growth rates. This suggests that more needs to be done to unlock sustained higher growth in Brazil than is the case elsewhere and that our convergence assumptions for Brazil (though already lower than in China and Russia) may still prove too optimistic without deeper structural reforms.

Over the last 50 years, Brazil's real GDP growth rate amounted to 5.3%, but the chart below shows that growth has been declining sharply since the debt crisis of the 1980s. Following a growth surge between the late 1960s and the early-1970s on the back of economic liberalization, growth rates fell—in part because of a series of external shocks combined with poor policy response amidst of a political transition from a military regime to a democracy.

Over the last decade, real GDP growth amounted to 2.9%, compared to an average of 5.3% since 1950. The excessive reliance on external financing and domestic public debt during the oil crisis and during the Real plan has rendered this adjustment effort particularly difficult, in part explaining the marked drop in growth rates.

The adjustment process has also reduced investment, which contributed to a depreciation of the capital stock, particularly in infrastructure, with important consequences for productivity. Even so, temporary surges in external financing or statistical rebounds may push growth higher temporarily, but for Brazil to break the historical downward trend in GDP growth and attain the kind of path set out in our projections here will take more.

The Lula Administration is making some progress. Macro stabilization is a key precondition of successful reform and is now clearly underway. The result of that stabilization is likely to be an improvement in growth over the next year or two that is reflected in our current forecasts of about 3.5% a year. On its own, though, stabilization will be insufficient to raise and sustain Brazil's growth rate to the kinds of levels that are set out in the projections in this paper. If that goal is to be achieved, substantial structural reforms will also be needed.

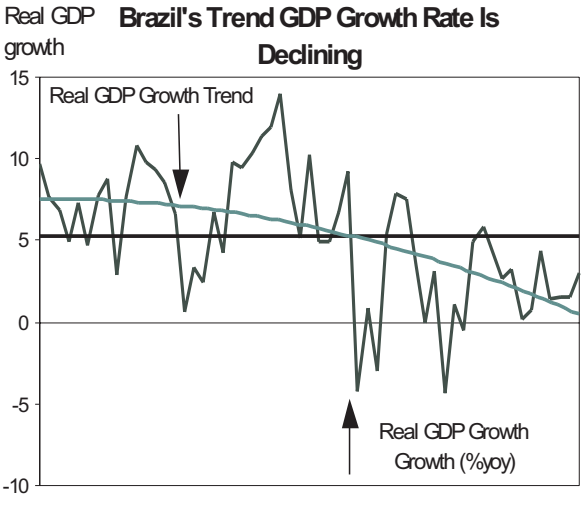
Comparing Brazil with China and the other Asian economies gives a sense of the relatively larger obstacles that Brazil currently faces.

- **Brazil is much less open to trade**. The tradable goods sector in China is almost eight times larger than in Brazil, when measured by imports plus exports.

- **Investment and savings are lower.** Savings and investment ratios are around 18-19% of GDP compared to an investment rate of 36% of GDP in China and an Asian average of around 30%.

- **Public and foreign debt are much higher.** Without a deeper fiscal adjustment and lower debt to GDP ratio (currently at 57.7% of GDP on a net basis and 78.2% of GDP on a gross basis), the private sector is almost completely crowded out from credit markets. China's net foreign debt and public debt are both significantly smaller.

Unless significant progress is made in removing or reducing these obstacles, the projections set out here (which still show much lower growth than Brazil's post-war average) are unlikely to be achievable and the slide in trend growth could continue.



GS BRICs Model Projections. See text for details and assumptions.

How Different Assumptions Would Change Things

In our models, the effect of these conditions for growth can be thought of as operating through our assumptions about the investment rate and the rate of catch-up in TFP with the developed economies. If the BRICs economies fail to deliver the kinds of conditions that are broadly necessary for sustained growth, our assumptions about investment and convergence will prove too optimistic. For Brazil and India, in particular, if they succeed more quickly than we expect, investment rates might actually be higher than our projections and convergence more rapid.

To illustrate in a simple way the point that the assumptions that we have made—and the underlying conditions that determine them—are important, we show briefly what happens if we change them:

- **Catch-up**. Because the convergence rate captures a broad range of factors that determine the ability to 'catch up', altering it can make a significant difference to projections. For example, if we lower China's 'convergence rate' by a third, our projections of average GDP growth rate over the 50-year period fall to 4.3% from 4.8% and our projected 2050 US$GDP level drops by 39%. In our baseline model, rates of convergence are generally slower for India and Brazil than for China and Russia. If we raised our convergence rates in India and Brazil to those of China and Russia, India's 2000-2030 average GDP growth rate would rise to 7.4%, against 5.8% originally. Brazil's GDP growth rate would rise as well: to 4.3% from 3.7%.

- **Investment.** The assumed investment rates are less important, but substantial differences from our assumptions would certainly alter the main conclusions. Lowering our assumptions of China's investment rate by 5 percentage points slightly lowers China's average 2000-2030 GDP growth rate to 5.5% from 5.7%. Cutting 5 percentage points off of investment rates across the BRICS would reduce their GDP levels on average by around 13% by 2050.

- **Demographics.** The demographic assumptions may also turn out to be incorrect. For instance, Russia's demographics might not turn out to be as negative as the US census projections, and declining fertility and rising mortality may turn out to have been a temporary feature of the transition from communism. Shifting demographic trends might also be partly offset by attempts to raise participation or to extend working ages, neither of which we currently capture.

Sensitivity to these kinds of assumptions clearly means that there is significant uncertainty around our projections. The advantage of the framework that we have developed is that we now have the tools to look at these and other questions in much more detail. We also have a clear baseline against which to measure them.

Implications of the BRICs' Ascendancy

Each of the BRICs faces very significant challenges in keeping development on track. This means that there is a good chance that our projections are not met, either through bad policy or bad luck.

Despite the challenges, we think the prospect is worth taking seriously. After all, three of these markets—China, India and Russia—have already been at the top of the growth charts in recent years. They may stay there.

If the BRICs *do* come anywhere close to meeting the projections set out here, the implications for the pattern of growth and economic activity could be very large indeed. Parts of this story—the opportunities in China, for instance—are well understood. But we suspect that many other parts—the potential for India and the other markets and the interplay of aging in the developed economies with growth in the developing ones—may not be.

We will be using the tools developed here to look in detail at different kinds of scenarios and to flesh out the links between our growth projections and investment opportunities, but we set out some brief conclusions here:

- The relative importance of the BRICs as an engine of new demand growth and spending power may shift more dramatically and quickly

than expected under the right conditions. Higher growth in these economies could offset the impact of greying populations and slower growth in today's advanced economies.

- Higher growth may lead to higher returns and increased demand for capital in these markets—and for the means to finance it. The weight of the BRICs in investment portfolios could rise sharply. The pattern of capital flows might move further in their favour and major currency realignments would take place.

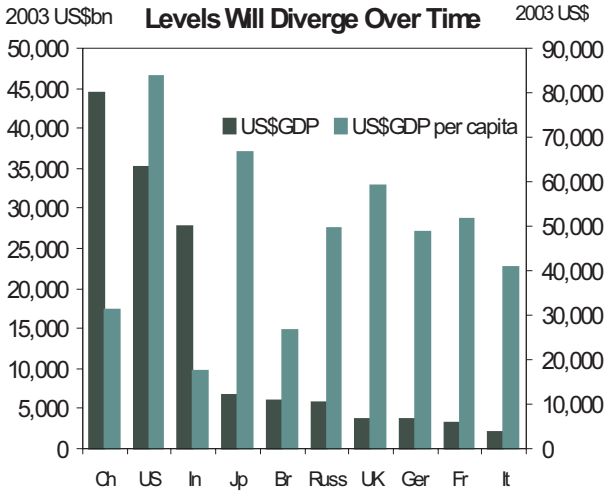
- Rising incomes may also see these economies move through the 'sweet spot' of growth for different kinds of products, as local spending patterns change. This could be an important determinant of demand and pricing patterns for a range of commodities.

- As the advanced economies become a shrinking part of the world economy, the accompanying shifts in spending could provide significant opportunities for many of today's global companies. Being invested in and involved in the right markets—and particularly the right emerging markets—may become an increasingly important strategic choice for many firms.

- The list of the world's ten largest economies may look quite different in fifty years time. The largest economies in the world (by GDP) may also no longer be the richest (by income per capita) making strategic choices for firms more complex.

- Regional neighbours could benefit from the growth opportunities from the BRICs. With three out of the four largest economies in 2050 potentially residing in Asia, we could see important geopolitical shifts towards the Asian region. China's growth is already having a significant impact on the opportunities for the rest of Asia. Sustained strong growth in the other BRICs economies might have similar impacts on their major trading partners.

GDP Size and Relative Income Per Capita Levels Will Diverge Over Time



GS BRICs Model Projections. See text for details and assumptions.

Are you ready?

Dominic Wilson and Roopa Purushothaman

Appendix I: A Long-Term Model of Growth and Exchange Rates

Goldman Sachs

Growth Model

We provide detail on the underlying assumptions of our models. The model relies on a simple formulation of the overall level of GDP (*Y*) in terms of a) labour (*L*) b) the capital stock (*K*) and c) the level of "technical progress" (*A*) or Total Factor Productivity (TFP).

We assume that GDP is a simple (Cobb-Douglas) function of these three ingredients:

$$Y = AK^{\alpha} L^{1-\alpha}$$

where a is the share of income that accrues to capital.

We then need to describe the process by which each of the different components (labour, the capital stock and TFP) change over time.

- For, *L*, we simply use the projections of the working age population (15-60) from the US Census Bureau.

- For *K,* we take the initial capital stock, assume an investment rate (investment as a % of GDP) and a depreciation rate to calculate the growth in the capital stock:

$$K_{t+1} = K_t(1-\delta) + \left(\frac{I_t}{Y_t}\right).Y_t$$

- For *A*, the description of technical progress, we assume that technology changes as part of a process of catch-up with the most developed countries. The speed of convergence is assumed to depend on income per capita, with the assumption that as the developing economies get closer to the income levels of the more developed economies, their TFP growth rate slows. Developing countries can have faster growth in this area because there is room to 'catch up' with developed countries:

$$\frac{A_t}{A_{t-1}} = 1.3\% - \beta \ln\left(\frac{Incomepercapita_{DC}}{Incomepercapita_{US}}\right)$$

where β is a measure of how fast convergence takes place and 1.3% is our assumed long-term TFP growth rate for the US.

The assumptions needed to generate the forecasts are summarised below:

- Labour force and population, from the US Census Bureau projections

- Depreciation rate (δ) assumed to be 4% as in the World Bank capital stock estimates

- Investment rate assumptions based on recent history, for Brazil (19%), for India (22%) for Russia (25%) for China (36% until 2010, declining to 30% thereafter).

- Income share of capital assumed to be 1/3, a standard assumption (α) from historical evidence

- US long-run TFP growth assumed to be 1.33%, implying steady-state labour productivity growth of 2% - our long-run estimate.

- Convergence speed for TFP (β) assumed to be 1.5%, within the range of estimates from academic research.

Exchange Rate Model

Our model of real exchange rates is then calculated from the predictions of labour productivity growth. Specifically, we assume that a 1% productivity differential in favour of economy A relative to the US will raise its equilibrium real exchange rate against the US dollar by 1%, where our long-run assumption for US productivity growth is again 2%.

$$\Delta \ln(e) = \Delta \ln\left(\frac{Y}{L}\right) - 0.02$$

This assumption that the relationship is one-for-one underpins our GSDEER models and the coefficient on relative productivity terms in our GSDEEMER models is generally also clustered around 1. We make the simplifying assumption that over the long term, only productivity differentials play a large role in determining real exchange rates.

Projected US$GDP												
2003 US$bn	BRICs				G6							
	Brazil	China	India	Russia	France	Germany	Italy	Japan	UK	US	BRICs	G6
2000	762	1,078	469	391	1,311	1,875	1,078	4,176	1,437	9,825	2,700	19,702
2001	601	1,157	466	383	1,321	1,855	1,093	4,032	1,425	10,082	2,607	19,808
2002	491	1,252	474	379	1,346	1,866	1,114	4,358	1,498	10,446	2,595	20,628
2003	461	1,353	511	430	1,387	1,900	1,155	4,366	1,565	10,879	2,754	21,253
2004	435	1,529	554	476	1,455	1,966	1,212	4,366	1,647	11,351	2,994	21,998
2005	468	1,724	604	534	1,489	2,011	1,236	4,427	1,688	11,697	3,330	22,548
2006	502	1,936	659	594	1,520	2,059	1,257	4,498	1,728	12,041	3,691	23,104
2007	539	2,169	718	654	1,547	2,102	1,277	4,536	1,762	12,348	4,079	23,572
2008	579	2,422	782	716	1,572	2,141	1,297	4,556	1,797	12,656	4,499	24,019
2009	622	2,699	853	780	1,597	2,178	1,317	4,573	1,836	12,966	4,953	24,466
2010	668	2,998	929	847	1,622	2,212	1,337	4,601	1,876	13,271	5,441	24,919
2011	718	3,316	1,011	917	1,649	2,246	1,358	4,638	1,918	13,580	5,962	25,389
2012	771	3,650	1,100	990	1,677	2,282	1,381	4,683	1,960	13,883	6,512	25,866
2013	828	4,002	1,196	1,068	1,706	2,317	1,403	4,736	2,004	14,184	7,094	26,349
2014	888	4,371	1,299	1,149	1,736	2,352	1,425	4,795	2,046	14,486	7,707	26,840
2015	952	4,754	1,411	1,232	1,767	2,386	1,447	4,858	2,089	14,786	8,349	27,332
2016	1,019	5,156	1,531	1,322	1,799	2,418	1,469	4,925	2,130	15,106	9,028	27,847
2017	1,091	5,585	1,659	1,417	1,832	2,448	1,492	4,999	2,170	15,427	9,752	28,367
2018	1,167	6,041	1,797	1,518	1,865	2,476	1,513	5,074	2,209	15,750	10,524	28,887
2019	1,248	6,538	1,945	1,626	1,897	2,502	1,534	5,146	2,247	16,083	11,357	29,410
2020	1,333	7,070	2,104	1,741	1,930	2,524	1,553	5,221	2,285	16,415	12,248	29,928
2021	1,397	7,646	2,278	1,829	1,963	2,544	1,571	5,297	2,321	16,765	13,150	30,462
2022	1,465	8,250	2,470	1,924	1,996	2,562	1,588	5,372	2,355	17,133	14,109	31,006
2023	1,537	8,863	2,682	2,028	2,029	2,577	1,603	5,443	2,389	17,518	15,110	31,559
2024	1,613	9,517	2,916	2,141	2,062	2,591	1,615	5,509	2,422	17,918	16,187	32,117
2025	1,695	10,213	3,174	2,264	2,095	2,604	1,625	5,567	2,456	18,340	17,345	32,687
2026	1,781	10,947	3,459	2,395	2,128	2,619	1,634	5,641	2,491	18,803	18,582	33,316
2027	1,873	11,732	3,774	2,533	2,163	2,634	1,644	5,696	2,528	19,293	19,913	33,958
2028	1,971	12,555	4,123	2,679	2,198	2,652	1,653	5,740	2,567	19,801	21,327	34,611
2029	2,076	13,409	4,508	2,828	2,233	2,672	1,662	5,778	2,607	20,319	22,821	35,271
2030	2,189	14,312	4,935	2,980	2,267	2,697	1,671	5,810	2,649	20,833	24,415	35,927
2031	2,308	15,260	5,407	3,131	2,300	2,727	1,678	5,835	2,692	21,371	26,107	36,603
2032	2,436	16,264	5,930	3,283	2,333	2,763	1,686	5,851	2,740	21,946	27,911	37,319
2033	2,572	17,317	6,508	3,434	2,367	2,806	1,692	5,861	2,791	22,554	29,830	38,072
2034	2,716	18,428	7,147	3,585	2,404	2,854	1,699	5,869	2,845	23,187	31,877	38,858
2035	2,871	19,605	7,854	3,734	2,445	2,903	1,708	5,882	2,901	23,828	34,064	39,668
2036	3,033	20,845	8,621	3,881	2,490	2,953	1,719	5,902	2,961	24,492	36,380	40,516
2037	3,201	22,152	9,453	4,028	2,535	3,002	1,733	5,930	3,023	25,168	38,833	41,389
2038	3,374	23,522	10,352	4,175	2,580	3,051	1,748	5,961	3,085	25,852	41,423	42,276
2039	3,554	24,949	11,322	4,321	2,625	3,100	1,767	5,998	3,144	26,542	44,147	43,175
2040	3,740	26,439	12,367	4,467	2,668	3,147	1,788	6,039	3,201	27,229	47,013	44,072
2041	3,932	28,003	13,490	4,613	2,711	3,192	1,810	6,086	3,258	27,929	50,038	44,987
2042	4,128	29,589	14,696	4,756	2,754	3,238	1,834	6,136	3,317	28,654	53,171	45,933
2043	4,336	31,257	15,989	4,891	2,801	3,285	1,859	6,187	3,377	29,399	56,473	46,908
2044	4,560	33,003	17,371	5,022	2,849	3,333	1,885	6,239	3,437	30,170	59,955	47,913
2045	4,794	34,799	18,847	5,156	2,898	3,381	1,912	6,297	3,496	30,956	63,596	48,940
2046	5,031	36,636	20,421	5,289	2,946	3,428	1,941	6,362	3,554	31,761	67,378	49,993
2047	5,276	38,490	22,099	5,417	2,995	3,473	1,971	6,431	3,611	32,592	71,281	51,074
2048	5,527	40,420	23,886	5,552	3,045	3,516	2,001	6,506	3,668	33,437	75,385	52,173
2049	5,789	42,408	25,785	5,701	3,097	3,559	2,031	6,586	3,725	34,297	79,684	53,296
2050	6,074	44,453	27,803	5,870	3,148	3,603	2,061	6,673	3,782	35,165	84,201	54,433

GS BRICs Model Projections. See text for details and assumptions.

Projected US$GDP Per Capita										
2003 US$	BRICs				G6					
	Brazil	China	India	Russia	France	Germany	Italy	Japan	UK	US
2000	4,338	854	468	2,675	22,078	22,814	18,677	32,960	24,142	34,797
2001	3,381	910	457	2,633	22,143	22,545	18,895	31,775	23,860	35,373
2002	2,726	979	458	2,611	22,461	22,659	19,224	34,297	25,003	36,312
2003	2,530	1,051	486	2,976	23,047	23,059	19,920	34,322	26,042	37,470
2004	2,364	1,181	520	3,305	24,080	23,856	20,881	34,290	27,333	38,735
2005	2,512	1,324	559	3,718	24,547	24,402	21,277	34,744	27,920	39,552
2006	2,668	1,478	602	4,142	24,968	24,986	21,629	35,292	28,509	40,346
2007	2,835	1,646	647	4,570	25,321	25,512	21,960	35,587	28,986	41,004
2008	3,015	1,827	695	5,013	25,650	25,998	22,300	35,751	29,492	41,655
2009	3,209	2,023	748	5,470	25,975	26,452	22,649	35,917	30,043	42,304
2010	3,417	2,233	804	5,948	26,314	26,877	23,018	36,172	30,611	42,926
2011	3,640	2,453	864	6,453	26,682	27,312	23,407	36,516	31,201	43,550
2012	3,875	2,682	929	6,981	27,069	27,767	23,816	36,942	31,808	44,142
2013	4,124	2,922	998	7,540	27,470	28,224	24,234	37,442	32,413	44,715
2014	4,387	3,171	1,071	8,126	27,892	28,674	24,656	38,016	33,007	45,283
2015	4,664	3,428	1,149	8,736	28,338	29,111	25,086	38,626	33,594	45,835
2016	4,957	3,696	1,233	9,389	28,807	29,534	25,522	39,292	34,161	46,440
2017	5,266	3,981	1,321	10,092	29,282	29,936	25,964	40,032	34,700	47,035
2018	5,594	4,283	1,416	10,845	29,762	30,321	26,407	40,795	35,218	47,630
2019	5,939	4,613	1,516	11,655	30,242	30,678	26,833	41,561	35,731	48,247
2020	6,302	4,965	1,622	12,527	30,723	31,000	27,239	42,359	36,234	48,849
2021	6,562	5,346	1,739	13,212	31,211	31,296	27,628	43,186	36,709	49,496
2022	6,838	5,747	1,867	13,959	31,709	31,572	27,995	44,023	37,154	50,182
2023	7,133	6,153	2,007	14,777	32,208	31,824	28,335	44,845	37,593	50,902
2024	7,447	6,587	2,161	15,674	32,701	32,058	28,628	45,648	38,031	51,652
2025	7,781	7,051	2,331	16,652	33,203	32,299	28,894	46,391	38,479	52,450
2026	8,136	7,542	2,517	17,697	33,718	32,555	29,152	47,287	38,958	53,348
2027	8,514	8,068	2,723	18,809	34,251	32,830	29,413	48,037	39,466	54,306
2028	8,919	8,621	2,949	19,983	34,796	33,135	29,671	48,709	40,013	55,297
2029	9,352	9,198	3,199	21,194	35,339	33,483	29,922	49,350	40,585	56,294
2030	9,823	9,809	3,473	22,427	35,876	33,898	30,177	49,944	41,194	57,263
2031	10,320	10,454	3,776	23,674	36,406	34,378	30,417	50,483	41,823	58,281
2032	10,852	11,138	4,110	24,926	36,938	34,938	30,657	50,966	42,534	59,384
2033	11,421	11,859	4,477	26,191	37,493	35,605	30,884	51,400	43,301	60,560
2034	12,030	12,623	4,882	27,470	38,101	36,332	31,126	51,826	44,124	61,786
2035	12,682	13,434	5,327	28,749	38,779	37,087	31,402	52,313	44,985	63,017
2036	13,364	14,293	5,808	30,030	39,518	37,857	31,730	52,868	45,898	64,292
2037	14,075	15,201	6,326	31,323	40,278	38,628	32,116	53,499	46,858	65,581
2038	14,813	16,157	6,884	32,636	41,049	39,408	32,548	54,180	47,827	66,875
2039	15,576	17,159	7,482	33,966	41,834	40,195	33,036	54,924	48,758	68,165
2040	16,370	18,209	8,124	35,314	42,601	40,966	33,583	55,721	49,658	69,431
2041	17,191	19,315	8,810	36,684	43,363	41,727	34,169	56,591	50,569	70,713
2042	18,037	20,443	9,544	38,057	44,151	42,499	34,787	57,507	51,509	72,040
2043	18,935	21,635	10,326	39,386	44,998	43,291	35,442	58,448	52,470	73,401
2044	19,904	22,892	11,160	40,706	45,893	44,110	36,133	59,419	53,434	74,805
2045	20,926	24,192	12,046	42,081	46,795	44,940	36,859	60,454	54,386	76,228
2046	21,964	25,530	12,988	43,463	47,706	45,759	37,627	61,583	55,331	77,680
2047	23,040	26,891	13,988	44,832	48,640	46,559	38,430	62,774	56,275	79,171
2048	24,152	28,321	15,050	46,280	49,601	47,346	39,237	64,035	57,211	80,677
2049	25,318	29,810	16,174	47,871	50,589	48,142	40,061	65,376	58,169	82,196
2050	26,592	31,357	17,366	49,646	51,594	48,952	40,901	66,805	59,122	83,710

GS BRICs Model Projections. See text for details and assumptions.

Projected Real GDP Growth										
%yoy	BRICs				G6*					
	Brazil	China	India	Russia	France	Germany	Italy	Japan	UK	US
2000	4.2	8.0	5.4	10.0	4.2	2.9	3.3	2.8	3.1	3.8
2001	1.5	7.3	4.2	5.0	2.1	0.6	1.7	0.4	2.1	0.3
2002	1.5	8.2	4.7	4.3	1.2	0.2	0.4	0.1	1.9	2.4
2003	1.1	8.1	5.6	6.1	0.5	0.0	0.6	2.7	1.8	2.7
2004	3.5	8.4	5.9	4.4	2.9	1.9	2.4	1.7	2.9	3.5
2005	4.2	7.9	6.2	5.8	2.3	2.3	2.0	1.4	2.4	3.1
2006	4.1	7.6	6.2	5.3	2.1	2.4	1.7	1.6	2.4	2.9
2007	4.1	7.3	6.1	4.8	1.8	2.1	1.6	0.8	2.0	2.6
2008	4.1	7.1	6.1	4.5	1.6	1.9	1.5	0.4	2.0	2.5
2009	4.2	6.9	6.1	4.3	1.6	1.7	1.5	0.4	2.2	2.5
2010	4.2	6.6	6.1	4.1	1.6	1.5	1.6	0.6	2.2	2.4
2011	4.1	6.4	6.0	4.0	1.7	1.6	1.6	0.8	2.2	2.3
2012	4.1	6.0	6.0	3.8	1.7	1.6	1.6	1.0	2.2	2.2
2013	4.0	5.8	5.9	3.7	1.7	1.6	1.6	1.1	2.2	2.2
2014	4.0	5.5	5.9	3.6	1.8	1.5	1.6	1.3	2.1	2.1
2015	3.9	5.2	5.8	3.5	1.8	1.4	1.6	1.3	2.1	2.1
2016	3.9	5.1	5.8	3.4	1.8	1.3	1.5	1.4	2.0	2.2
2017	3.8	4.9	5.7	3.4	1.8	1.2	1.5	1.5	1.9	2.1
2018	3.8	4.8	5.7	3.3	1.8	1.2	1.5	1.5	1.8	2.1
2019	3.7	5.1	5.6	3.3	1.8	1.0	1.4	1.4	1.7	2.1
2020	3.7	5.0	5.5	3.3	1.7	0.9	1.3	1.4	1.7	2.1
2021	3.7	5.2	5.6	3.3	1.7	0.8	1.2	1.5	1.6	2.1
2022	3.7	4.9	5.7	3.3	1.7	0.7	1.0	1.4	1.5	2.2
2023	3.7	4.1	5.7	3.4	1.7	0.6	0.9	1.3	1.4	2.2
2024	3.8	4.2	5.8	3.5	1.6	0.5	0.7	1.2	1.4	2.3
2025	3.8	4.2	5.8	3.6	1.6	0.5	0.6	1.0	1.4	2.4
2026	3.8	4.1	5.9	3.6	1.6	0.6	0.6	1.3	1.4	2.5
2027	3.8	4.3	5.9	3.6	1.6	0.6	0.6	1.0	1.5	2.6
2028	3.8	4.1	6.0	3.6	1.6	0.7	0.6	0.8	1.5	2.6
2029	3.8	3.9	6.0	3.5	1.6	0.8	0.5	0.7	1.6	2.6
2030	3.9	3.9	6.1	3.4	1.5	0.9	0.5	0.6	1.6	2.5
2031	3.9	3.8	6.1	3.3	1.5	1.1	0.5	0.4	1.6	2.6
2032	3.9	3.9	6.1	3.1	1.4	1.3	0.4	0.3	1.8	2.7
2033	3.9	3.8	6.2	3.0	1.5	1.6	0.4	0.2	1.9	2.8
2034	3.9	3.8	6.2	2.9	1.6	1.7	0.4	0.1	1.9	2.8
2035	3.9	3.9	6.2	2.8	1.7	1.7	0.5	0.2	2.0	2.8
2036	3.9	3.9	6.1	2.7	1.8	1.7	0.6	0.3	2.0	2.8
2037	3.8	3.9	6.1	2.6	1.8	1.7	0.8	0.5	2.1	2.8
2038	3.8	3.9	6.0	2.5	1.8	1.6	0.9	0.5	2.1	2.7
2039	3.7	3.8	5.9	2.5	1.8	1.6	1.0	0.6	1.9	2.7
2040	3.6	3.7	5.8	2.4	1.7	1.5	1.2	0.7	1.8	2.6
2041	3.6	3.8	5.8	2.3	1.6	1.4	1.3	0.8	1.8	2.6
2042	3.5	3.4	5.7	2.2	1.6	1.4	1.3	0.8	1.8	2.6
2043	3.5	3.5	5.6	2.1	1.7	1.4	1.4	0.8	1.8	2.6
2044	3.6	3.5	5.5	2.0	1.7	1.5	1.4	0.8	1.8	2.6
2045	3.5	3.3	5.4	2.0	1.7	1.4	1.5	0.9	1.7	2.6
2046	3.4	3.1	5.4	1.9	1.7	1.4	1.5	1.0	1.7	2.6
2047	3.4	2.8	5.3	1.8	1.7	1.3	1.5	1.1	1.6	2.6
2048	3.3	2.9	5.2	1.9	1.7	1.2	1.5	1.2	1.6	2.6
2049	3.3	2.8	5.1	2.0	1.7	1.2	1.5	1.2	1.6	2.6
2050	3.4	2.7	5.1	2.1	1.7	1.2	1.5	1.3	1.5	2.5

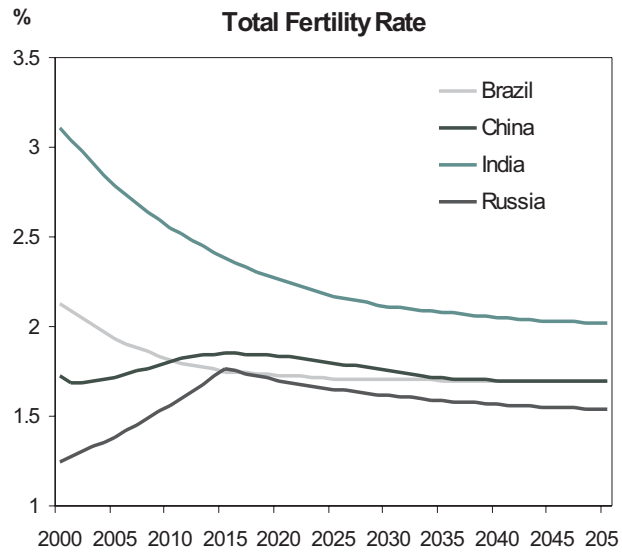
*indicative projections made only on the model assumptions described in the text. Not GS official forecasts.

GS BRICs Model Projections. See text for details and assumptions.

We have used the US census' population estimates, which are based on the cohort component population projection method, which follows each cohort of people of the same age throughout its lifetime according to mortality, fertility and migration.

First, fertility rates are projected and applied to the female population in childbearing ages to estimate the number of births every year (see chart). Second, each cohort of children born is also followed through time by exposing it to projected mortality rates. Finally, the component method takes into account any in-migrants who are incorporated into the population and out-migrants who leave the population. Migrants are added to or subtracted from the population at each specific age.

In setting levels for mortality and fertility, available data on past trends provide guidance. For mortality, information concerning programs of public health are taken into account. For fertility, factors such as trends in age at marriage; the proportion of women using contraception; the strength of family planning programs; and any foreseen changes in women's educational attainment or in their labor force participation are factored into the analysis. Assumptions about future migration are more speculative than assumptions about fertility and mortality. The future path of international migration is set on the basis of past international migration estimates as well as the policy stance of countries regarding future international migration flows.



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