Economics
John Hawksworth and Gordon Cookson

# The World in 2050

Beyond the BRICs: a broader look at emerging market growth prospects

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For more information about this report or related issues, please contact the authors by e-mail at john.c.hawksworth@uk.pwc.com or gordon.p.cookson@uk.pwc.com

# The World in 2050: Beyond the BRICs – a broader look at emerging market growth prospects

## Summary

In March 2006 we published a report highlighting the rapid growth and increasing global significance of what we called the 'E7' emerging economies: the 'BRIC' economies of China, India, Brazil and Russia, plus Mexico, Indonesia and Turkey. In this article, we update our economic growth projections to take into account the latest available data and extend the analysis to include 13 other emerging economies. Together with the 17 largest economies considered in our earlier report, this new 'PwC 30' grouping of countries account for around 85% of world economic output.

In our updated base case projections, the E7 emerging economies will by 2050 be around 50% larger than the current G7 (US, Japan, Germany, UK, France, Italy and Canada). China is expected to overtake the US as the largest economy in around 2025 in these updated projections, while India is now assessed as having the potential nearly to catch up with the US by 2050 (see Table A below). We are now even more optimistic than in our original 2006 report about these two economies given their recent very strong performance.

**Table A: Projected relative size of economies in 2007 and 2050 (US = 100)**

| Country (indices with US = 100) | GDP at market exchange rates in US $ terms | | GDP in PPP terms | |
|---|---|---|---|---|
| | **2007** | **2050** | **2007** | **2050** |
| US | 100 | 100 | 100 | 100 |
| Japan | 32 | 19 | 28 | 19 |
| China | 23 | 129 | 51 | 129 |
| Germany | 22 | 14 | 20 | 14 |
| UK | 18 | 14 | 15 | 14 |
| France | 17 | 14 | 15 | 14 |
| Italy | 14 | 10 | 13 | 10 |
| Canada | 10 | 9 | 10 | 9 |
| Spain | 9 | 9 | 10 | 9 |
| Brazil | 8 | 26 | 15 | 26 |
| Russia | 8 | 17 | 17 | 17 |
| India | 7 | 88 | 22 | 88 |
| Korea | 7 | 8 | 9 | 8 |
| Mexico | 7 | 17 | 10 | 17 |
| Australia | 6 | 6 | 5 | 6 |
| Turkey | 3 | 10 | 5 | 10 |
| Indonesia | 3 | 17 | 7 | 17 |

Source: PricewaterhouseCoopers estimates (using UN population projections)

There are, however, likely to be notable shifts in relative growth rates within the E7, driven by divergent demographic trends. In particular, both China and Russia are expected to experience significant declines in their working age populations between 2005 and 2050. This is in contrast to relatively younger countries such as India, Indonesia, Brazil, Turkey and Mexico, whose working age populations should on average show positive growth over this period, although they too will have begun to see the effects of ageing by the middle of the century.

Our base case projections (see Table A above) also suggest that:

- the Brazilian economy could be larger than the Japanese economy by 2050;
- the Russian, Mexican and Indonesian economies could be larger than the German, French or UK economies by 2050; and
- the Turkish economy could be of similar size to the Italian economy by 2050.

The 13 new emerging economies considered in this report also have the potential to grow significantly faster than the established OECD economies (see Table B below).

**Table B: Projected real growth rates for expanded group of emerging market economies: 2007-50 (%pa)**

| Country | GDP in US $ terms | GDP in domestic currency or at PPPs | Population | GDP per capita at PPPs |
|---|---|---|---|---|
| Vietnam | 9.8 | 6.8 | 0.8 | 6.0 |
| **India** | **8.5** | **5.8** | **0.8** | **5.0** |
| Nigeria | 8.0 | 6.1 | 1.6 | 4.4 |
| Philippines | 7.2 | 5.2 | 1.1 | 4.1 |
| Egypt | 7.1 | 5.1 | 1.1 | 3.9 |
| Bangladesh | 7.0 | 5.1 | 1.1 | 3.9 |
| **China** | **6.8** | **4.7** | **0.1** | **4.6** |
| **Indonesia** | **6.7** | **4.5** | **0.6** | **3.9** |
| Pakistan | 6.4 | 4.9 | 1.4 | 3.5 |
| **E7 average** | **6.4** | **4.5** | **0.5** | **4.0** |
| Malaysia | 5.8 | 4.3 | 1.0 | 3.3 |
| Thailand | 5.7 | 3.6 | 0.1 | 3.5 |
| Iran | 5.2 | 3.8 | 0.8 | 3.0 |
| **Brazil** | **5.2** | **3.8** | **0.7** | **3.1** |
| **Turkey** | **5.1** | **4.1** | **0.7** | **3.4** |
| Argentina | 4.9 | 3.7 | 0.6 | 3.0 |
| South Africa | 4.8 | 3.7 | 0.3 | 3.3 |
| Saudi Arabia | 4.8 | 4.1 | 1.4 | 2.7 |
| **Mexico** | **4.7** | **3.7** | **0.5** | **3.2** |
| **Russia** | **4.3** | **2.5** | **-0.6** | **3.2** |
| Poland | 3.4 | 2.1 | -0.5 | 2.7 |
| **G7 average** | **2.0** | **2.2** | **0.3** | **1.9** |

Sources: PricewaterhouseCoopers GDP growth estimates (rounded to nearest 0.1%), population growth projections from the UN. E7 and G7 averages shown in bold.
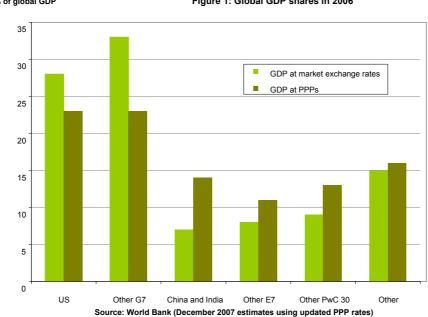
Some of these countries, such as Vietnam, appear to have immediate potential as inward investment locations for manufacturing in particular. Others, such as Nigeria, may appear to be high risk propositions now, but have considerable long-term potential if they can achieve and sustain a greater degree of political stability and economic openness in the longer term.

The general message is that investors with long-time horizons should look beyond the BRICs – there are many other alternatives worth considering depending on the nature of the investment and the risk tolerance of the investor.

# 1. Introduction

In March 2006 we published a report highlighting the rapid growth and increasing global significance of what we called the 'E7' emerging economies: the 'BRIC' economies of China, India, Brazil and Russia, plus Mexico, Indonesia and Turkey. By 2050, we estimated that the E7 economies could be larger than the G7 economies by between 25% and 75% depending on the measure used. We followed this initial analysis with reports looking at the implications of the rapid growth of emerging economies for global energy consumption and carbon emissions (September 2006), the growth of leading city economies to 2020 (March 2007), and global banking (June 2007).

In this paper, we update our economic growth projections to take into account the latest available data (including a new set of United Nations population projections to 2050) and extend the analysis to include 13 other emerging economies that, while smaller than the E7 and so not perhaps in the global premier league, have the potential to be sizeable regional players. Together with the 17 largest economies considered in our earlier report, this new 'PwC 30' grouping of countries accounted for around 85% of world GDP in 2006 (see Figure 1) and is expected to remain similarly dominant for the foreseeable future.

**% of global GDP**                    **Figure 1: Global GDP shares in 2006**



Source: World Bank (December 2007 estimates using updated PPP rates)

The discussion is organised as follows:

- Section 2 – Overview of methodology: key drivers of growth
- Section 3 – Updated GDP projections to 2050 for original 17 countries
- Section 4 – Extension of the analysis to other emerging economies
- Section 5 - Opportunities and challenges for the OECD economies
- Section 6 - Conclusions

The Annex contains further details of the methodology used, including a discussion of alternative measures of relative market size using either market exchange rates or purchasing power parity (PPP) rates. As Figure 1 illustrates, these two methods currently produce markedly different estimates of global GDP shares, although these differences will tend to decline over time.

## 2. Overview of methodology: key drivers of growth

In line with established economic theory and a large number of previous research studies, long-term GDP growth in our model is driven by assumptions on four key factors:

- growth in the physical capital stock, which is determined by new capital investment less depreciation of the existing capital stock;
- growth in the labour force, which we base on the latest available United Nations (UN) projections of working age population growth;
- growth in the quality of labour ('human capital'), which is assumed to be related to current and projected average education levels in the workforce; and
- technological progress, which drives improvements in total factor productivity (TFP).

In applying this approach we take the US as our benchmark economy, as this is assumed at present to be at the 'global frontier' in terms of technology and thus productivity. Other countries are assumed to catch up gradually with US productivity levels over time at rates that vary by country depending on their circumstances (as described further in the Annex, which sets out our key model assumptions in more detail).

In addition, the model also makes assumptions about future trends in real market exchange rates relative to PPP rates. Countries with higher projected productivity growth than the US are assumed to experience rising real exchange rates over time relative to the US dollar[2].

It is important to stress that our model is only intended to produce projections for long-term trend (or potential) growth. It ignores cyclical fluctuations around this long-term trend, which history suggests could be significant in the short term for emerging economies in particular, but which we cannot hope to predict more than a year or two ahead at most. It also ignores the possibility of major adverse shocks (e.g. political revolutions, natural disasters or military conflicts) that could throw countries off their potential growth paths for longer periods of time, but which are inherently impossible to predict. At the same time, our modelling ignores the possibility of a sudden leap forward in the technological frontier due to some major new wave of innovation not yet imagined.

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[2] All references to 'dollars' in this report are to the US dollar, unless otherwise stated.

## 3. Updated GDP projections to 2050 for the original 17 countries

We present our key results below under the following headings:

- projected economic growth rates;
- projected relative economic size; and
- projected relative income per capita levels.

In all cases we look at results at both market exchange rates and PPPs. We then compare these updated results with those from our original March 2006 report and conclude this sub-section by discussing some of the key uncertainties surrounding our projections.

**Projected economic growth rates**

Table 1 summarises our estimates of average annual real GDP growth for 2007-2050 in US $ terms (i.e. including the effect of real exchange rate changes relative to the dollar) and in domestic currency and PPP terms[3], as well as growth rates in living standards as measured by GDP per capita at PPP rates. The 17 countries included in our original study are listed in descending order of GDP growth in US $ terms, although the rankings for GDP growth in domestic currency/PPP terms are very similar.

**Table 1: Projected real growth in GDP and income per capita: 2007-50 (%pa)**

| Country | GDP in US $ terms | GDP in domestic currency or at PPPs | Population | GDP per capita at PPPs |
|---|---|---|---|---|
| India | 8.5 | 5.8 | 0.8 | 5.0 |
| China | 6.8 | 4.7 | 0.1 | 4.6 |
| Indonesia | 6.7 | 4.5 | 0.6 | 3.9 |
| Brazil | 5.2 | 3.8 | 0.7 | 3.1 |
| Turkey | 5.1 | 4.1 | 0.7 | 3.4 |
| Mexico | 4.7 | 3.7 | 0.5 | 3.2 |
| Russia | 4.3 | 2.5 | -0.6 | 3.2 |
| South Korea | 2.9 | 2.2 | -0.3 | 2.5 |
| Australia | 2.6 | 2.4 | 0.7 | 1.9 |
| Canada | 2.4 | 2.4 | 0.6 | 1.8 |
| US | 2.4 | 2.4 | 0.6 | 1.7 |
| Spain | 2.2 | 2.2 | 0.1 | 2.1 |
| France | 2.0 | 2.3 | 0.2 | 2.1 |
| UK | 1.9 | 2.3 | 0.3 | 2.0 |
| Italy | 1.7 | 1.9 | -0.2 | 2.0 |
| Germany | 1.4 | 1.6 | -0.2 | 1.9 |
| Japan | 1.2 | 1.5 | -0.5 | 2.1 |

Sources: PricewaterhouseCoopers GDP growth estimates (rounded to nearest 0.1%), population growth projections from the UN

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[3] Note that, by assumption in our model, real GDP growth is the same in domestic currency and PPP terms.

As would be expected, the emerging economies are generally expected to grow significantly faster than the established OECD economies (excluding newer members such as Turkey, Mexico and South Korea, which have greater growth potential). What might surprise some readers is that India, rather than China, tops our growth league table. This reflects the following factors:

- significantly slower labour force growth in China due in particular to the effects of its one child policy; this will lead to a rapid ageing of the Chinese population over the next 45 years and a projected decline in its working age population, while India's working age population is projected by the UN to continue to grow at a healthy rate (see Figure 2 below);
- the fact that average productivity and education levels across the population are currently lower in India than in China, giving the former greater scope to catch up with the OECD countries in the long run, provided that India can maintain the right kind of institutional policy framework to support economic growth (and also gradually overcome cultural barriers to female education in rural areas of India in particular); and
- China's growth to date has been driven by very high savings and capital investment rates, but experience with Japan and other earlier 'Asian tigers' suggests that such investment-driven growth eventually runs into diminishing returns once income levels approach OECD levels; as China ages, it is also likely that its savings rate will drop as assets are 'cashed in' to pay for the retirement of its ageing population, though we still assume its saving and investment rates remain somewhat above the OECD average in the long run.
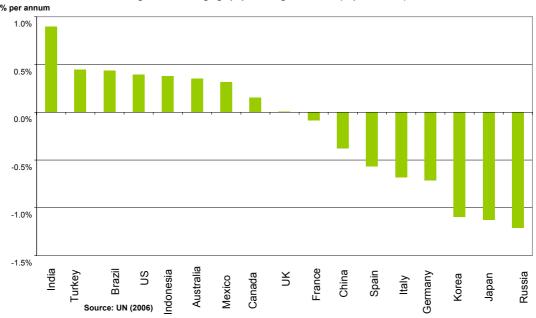


Figure 2: Working age population growth rates (% pa: 2006-50)

Source: UN (2006)

Other emerging economies with relatively young, fast-growing populations include Indonesia, Brazil, Turkey and Mexico. As with India, the key to them

achieving the growth potential indicated by our model will be establishing and maintaining a macroeconomic, legal and public policy environment conducive to trade, investment, increased education levels and hence economic growth. This is by no means guaranteed in any of these economies, but progress over the past 5 years has generally been positive in all of these countries, which gives some grounds for optimism.

Russia and South Korea are in a different category, with relatively strong expected growth in GDP per capita (particularly in Russia given its lower starting point), but declining populations that hold back overall GDP growth (in domestic currency terms – Russia ranks higher when allowing for expected real exchange rate appreciation versus the dollar in the long term).

Growth rates of the established OECD economies (excluding newer members such as Turkey, Mexico and South Korea) are generally projected to be slower, with most of the variation reflecting differences in population growth in our model. In this respect, Australia, Canada and the US are projected to continue to grow at around 2.4% per annum in domestic currency or PPP terms, while countries with shrinking populations such as Italy, Germany and Japan see total GDP growth of only around 1.5-1.9%. Spain, France and the UK are projected to show intermediate long-term growth rates of around 2.2-2.3% in domestic currency or PPP terms. In GDP per capita terms, however, our model suggests much less marked variations in growth rates between the established OECD economies within a 1.7-2.2% per annum range.

It is also interesting to consider the projected profile of growth over time. Figure 3 illustrates these trends for the BRIC economies relative to the US, the UK and Japan (based on GDP growth in domestic currency or PPP terms, rather than at market exchange rates).
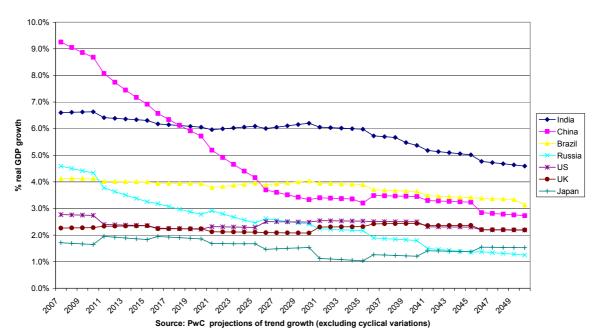
**Figure 3: Projected trend growth rates in key economies**



Source: PwC projections of trend growth (excluding cyclical variations)

We can see from Figure 3 that China is projected to remain the fastest growing BRIC economy for the next few years[4], but is gradually overtaken in terms of growth rates (although not levels of GDP) by India in around 2015 and Brazil in around 2025. The decelerating growth profile in China reflects the factors discussed above, in particular China's rapidly ageing population (the same factor accounts for the marked deceleration in projected growth in Russia over the next 20 years). In contrast, the much younger and faster growing Indian and Brazilian populations are able to sustain a more stable rate of growth up to around 2030, although after that they too experience a gradual deceleration as their populations also begin to age.

**Projected relative economic size**

Table 2 below summarises our estimates of the relative size (at both market exchange rates and PPPs) of each economy relative to the US in 2050 as compared to the current position.

**Table 2: Projected relative size of economies in 2007 and 2050 (US = 100)**

| Country (indices with US = 100) | GDP at market exchange rates in US $ terms | | GDP in PPP terms | |
|---|---|---|---|---|
| | **2007** | **2050** | **2007** | **2050** |
| US | 100 | 100 | 100 | 100 |
| Japan | 32 | 19 | 28 | 19 |
| China | 23 | 129 | 51 | 129 |
| Germany | 22 | 14 | 20 | 14 |
| UK | 18 | 14 | 15 | 14 |
| France | 17 | 14 | 15 | 14 |
| Italy | 14 | 10 | 13 | 10 |
| Canada | 10 | 9 | 10 | 9 |
| Spain | 9 | 9 | 10 | 9 |
| Brazil | 8 | 26 | 15 | 26 |
| Russia | 8 | 17 | 17 | 17 |
| India | 7 | 88 | 22 | 88 |
| Korea | 7 | 8 | 9 | 8 |
| Mexico | 7 | 17 | 10 | 17 |
| Australia | 6 | 6 | 5 | 6 |
| Turkey | 3 | 10 | 5 | 10 |
| Indonesia | 3 | 17 | 7 | 17 |

Source: PricewaterhouseCoopers estimates (using UN population projections)

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[4] Too much attention should not be paid to the precise growth projections in Figure 3, given that our analysis here is focused on long-term trends and does not take account of cyclical variations or other country-specific factors that will influence growth in the short term. In particular, projections for the next 5 years should not be regarded as the best available current forecasts.

This shows that the relative size of the major economies is set to change markedly over the period to 2050, with the emerging markets becoming much more significant:

- China's economy is estimated to overtake the US in around 2025 to become the world's largest economy (see Figure 4) and to grow to around 130% of the size of the US economy by 2050; the latter is true whether Chinese GDP is translated to dollar terms at market exchange rates or PPPs because the difference between these two measures is projected to be eliminated by 2050 due to the expected rise in China's real exchange rate versus the dollar as a result of its much higher projected productivity growth rate, particularly over the next 20 years; as discussed further below, this is significantly different from the projections in our 2006 report;
- India's economy is projected to grow to almost 90% of the size of the US economy by 2050 (as for China, our new projections show the gap between market exchange rates and PPPs closing over this period for India, which was not fully the case in our earlier report); and
- the economies of Mexico, Brazil, Russia, Indonesia and Turkey are projected to grow from only around 3-8% of the size of the US economy at market exchange rates today to around 10-25% by 2050, although they are likely to remain significantly smaller than those of either China or India due to their much smaller populations.
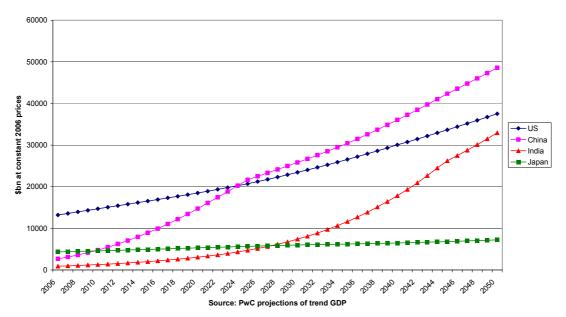
**Figure 4: Projected relative size of major economies (GDP at market exchange rates)**



Source: PwC projections of trend GDP

In contrast, most established OECD economies, with the exception of Canada and Australia, are projected to lose some ground relative to the US economy by 2050 due to their slower population growth. As a result:

- by 2050, the Japanese economy is projected to be somewhat smaller than that of Brazil and not much larger than those of Russia or Mexico, having been overtaken much earlier by China (in around 2010) and India (in around 2025);

- the German, UK and French economies are projected by 2050 to be somewhat smaller than the Russian, Mexican and Indonesian economies; and
- the Turkish economy is projected to be of similar size to the Italian economy by 2050.

We can also note that the UK will have slipped from 4th place in 2004 (and 5th place in 2007 having since been overtaken by China[5]) to 10th place in 2050 at MERs behind China, India, Brazil, Mexico, Russia and Indonesia according to these projections. In PPP terms the UK economy will only be around one tenth of the size of the Chinese economy by 2050.

Of course, as discussed further below, any such long-term projections are subject to great uncertainties, but the broad conclusion of a shift in the balance of the global economy towards what are today regarded as emerging markets seems clear. We can illustrate this further by comparing the size of the G7 economies with the 'E7', which we define here as the four BRIC economies plus Indonesia, Mexico and Turkey. As Figure 5 illustrates, the E7 are currently only just over a quarter of the total size of the G7 based on market exchange rates (MERs), though they are already nearly two-thirds of the size when measured in PPP terms. Looking ahead to 2050, however, our projections suggest that the E7 economies could plausibly be more than 50% larger than the G7, whether MERs or PPPs are used in the comparison.
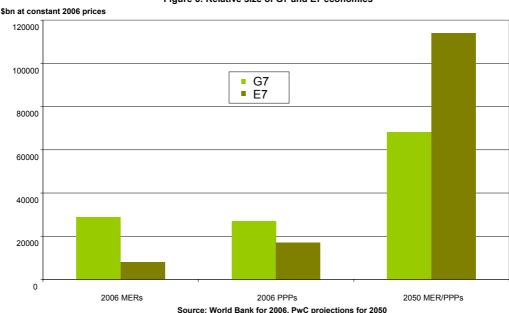
**Figure 5: Relative size of G7 and E7 economies**

$bn at constant 2006 prices



Source: World Bank for 2006, PwC projections for 2050

It should be emphasised, however, that we are only projecting a *relative* decline in the size of the G7 economies. In *absolute* terms, our model suggests that they might grow by around 150% in real terms between 2007 and 2050 and a critical precondition for this growth will be increased demand

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[5] Preliminary estimates suggest that China may have overtaken Germany in 2007 to become the third largest economy based on GDP at market exchange rates (at PPPs, China is already clearly the second largest economy in the world as indicated by Table 2 above).

for their goods and (in particular) services from the E7 economies. While some companies in established OECD economies may see the rise of the E7 as a major competitive challenge, this is likely to bring significant potential benefits at the national economic level. In the long run, we see the growth of the E7 and the G7 as being mutually beneficial and reinforcing rather than competitive, as each will have the opportunity to specialise in its areas of comparative advantage. But, as discussed further in Section 5 below, the transition path may be bumpy for many individuals and companies in the G7.

**Projected relative income per capita levels**

A key factor in the E7 markets becoming more attractive to G7 companies is that their average income per capita levels, and so purchasing power, rises. This is also, of course, an essential development if high poverty levels in many of the countries are to be reduced. In Table 3 below, we therefore present our estimates of income per capita levels in constant 2006 $ terms in 2007 and 2050. As discussed in the Annex, PPPs are generally the best measure to focus on here when comparing living standards, but we also show comparisons at market exchange rates for reference (by 2050 they are identical in most cases in these updated projections).

**Table 3: Projected relative income per capita levels in 2007 and 2050**

| Average income (in 000s of constant 2006 $) | GDP per capita at market exchange rates | | GDP per capita in PPP terms | |
|---|---|---|---|---|
| | **2007** | **2050** | **2007** | **2050** |
| US | 44.4 | 93.3 | 44.4 | 93.3 |
| Canada | 39.2 | 83.3 | 39.2 | 83.3 |
| UK | 39.2 | 77.5 | 33.6 | 77.5 |
| Australia | 38.1 | 79.2 | 35.9 | 79.2 |
| Germany | 35.9 | 72.1 | 32.4 | 72.1 |
| Japan | 34.4 | 70.5 | 29.3 | 70.5 |
| France | 32.3 | 78.3 | 37.0 | 78.3 |
| Italy | 29.6 | 70.0 | 32.1 | 70.0 |
| Spain | 28.7 | 72.4 | 30.1 | 72.4 |
| Korea | 19.3 | 72.3 | 25.0 | 72.3 |
| Mexico | 8.3 | 48.0 | 12.6 | 48.0 |
| Russia | 7.5 | 58.3 | 16.2 | 60.5 |
| Brazil | 5.8 | 39.0 | 10.4 | 39.0 |
| Turkey | 5.7 | 36.3 | 8.7 | 36.3 |
| China | 2.3 | 34.5 | 5.2 | 34.5 |
| Indonesia | 1.7 | 20.9 | 4.1 | 20.9 |
| India | 0.9 | 19.9 | 2.5 | 19.9 |

*Note: GDP per capita at PPP rates is the best indicator of relative living standards, but GDP per capita at MERs may provide a better indicator of relative potential average purchasing power for OECD goods and services.*
Source: PricewaterhouseCoopers estimates (ranked in order of GDP per capita in PPP terms in 2007) based on World Bank estimates of PPP rates and UN population projections.

While these projections suggest that the rankings of countries in terms of income per capita do not change much over time, with the US still at the top and India and Indonesia still at the bottom, there is clearly considerable relative convergence as the E7 economies catch up with the established OECD economies. In PPP terms, average living standards in India or Indonesia in 2050 might not be far behind those in South Korea today. On the same basis, China, Turkey and Brazil might by 2050 be broadly on a par with the UK, French or German economies today (see Table 3).

This clearly has implications for the types of goods and services that consumers in these emerging economies will demand in the long run, which will move much more towards the patterns of demand seen in the leading OECD economies today[6]. The opportunities this will create for OECD companies are discussed further in Section 5 below.

**How have our results changed since 2006?**

As one would expect with such long-term projections, our overall conclusion that there will be a significant shift in the centre of global economic gravity towards the E7 has not changed. Our projections for long-term average growth in the individual advanced economies have changed by no more than 0.1-0.2 percentage points per annum on average over the period to 2050, which is well within the margin of error for such long-term estimates. Projected growth rates in Brazil, Mexico, Russia and Turkey have similarly changed little since our original March 2006 report. Projected real GDP growth in Indonesia has been revised down slightly, but this country still ranks third in our E7 growth league table and so remains a relatively strong performer.

Our projections for China and India have, however, changed more materially as indicated in Table 4 below. There are two main reasons for these changes.

First, major new research led by the World Bank, which was published in December 2007, has for the first time produced official PPP estimates for China[7] and has significantly revised earlier estimates for India. In both cases, the result is to raise estimates of relative price levels in these emerging economies and therefore to reduce significantly the estimated relative size of the Chinese and Indian economies in PPP terms (i.e. in terms of the volume rather than the value of goods and services produced). Thus, as shown in Table 4, China's economy in 2005 was only around half the size of the US based on these new PPP estimates, compared to a previous estimate of around three-quarters, while India's economy is now estimated at 22% of the size of the US in that year as compared to an earlier estimate of around 30%.

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[6] Although cultural differences in demand patterns will remain, and technological advances will mean that the technical capabilities of many of the products (e.g. cars, mobile communications devices, computers) bought by a Chinese or Indian consumer in 2050 will far exceed those of typical products bought by US, Japanese or European consumers today.

[7] Previously Chinese PPP estimates were rough approximations based on academic research dating back to the mid-1980s that were not based on official surveys under the auspices of the International Comparisons Project (ICP) led by the United Nations and the World Bank.

Estimates of the relative value of the output of these economies at market exchange rates are not affected by these changes, so the initial gap between MER and PPP estimates of GDP accordingly shrinks.

**Table 4: Key changes in results since 2006 report – relative size of Chinese and Indian economies compared to the US**

| Key results | China | India |
|---|---|---|
| **1. GDP in 2005 at PPPs as % of US** | | |
| - March 2006 report | 76 | 30 |
| - March 2008 report | 51 | 22 |
| **2. Real GDP growth: 2006-50 (% pa)** | | |
| - March 2006 report | 3.9 | 5.2 |
| - March 2008 report | 4.7 | 5.8 |
| **3. GDP in 2050 at PPPs as % of US** | | |
| - March 2006 report | 143 | 100 |
| - March 2008 report | 129 | 88 |
| **4. GDP in 2050 at MERs as % of US** | | |
| - March 2006 report | 94 | 58 |
| - March 2008 report | 129 | 88 |

Source: World Bank for 2006 estimates; PwC projections for 2050

Second, however, and offsetting this effect in terms of our long-term PPP projections, the Chinese and Indian economies have grown much more strongly over the past two years than our model estimates were originally suggesting and all the indications are that this more rapid rate of 'catch up' will be sustained for at least the next few years. The Chinese investment rate has also been significantly higher in 2006-7 than assumed in our original report and, although this is still expected to slow over time, this may not happen as fast as was originally assumed. Taking these more recent data (and other independent forecasts of Chinese and Indian growth) into account has caused us to revised up significantly our projections for the sustainable growth rate of these economies over the next 10 years, although these effects then fade away in later years (and indeed will be reversed eventually as catch up occurs earlier so the scope for further catch up is reduced in the long run).

Furthermore, faster relative productivity growth also translates into faster expected real exchange rate appreciation over the next 15-20 years. This further boosts projected real growth in the Chinese and Indian economies in dollar terms, although it does not affect projected real growth in domestic currency or PPP terms.

The bottom line effect is that Chinese GDP overtakes US GDP rather later in PPP terms due to its much lower starting point, but overtakes the US much earlier when measured at market exchange rates. The difference between these two measures also disappears by around 2030, rather than persisting to 2050 in our original report. Similarly, Indian GDP is now projected to be well on the way to catching up with US GDP at market exchange rates by 2050, while in our original report this only happened when using GDP at PPP rates.

In summary, we now consider that China and India are likely to have an even greater weight in the world economy in the long term when evaluated at market exchange rates, which is generally the most relevant measure for business purposes for the reasons discussed in the Annex. In PPP terms, the weight of China and India is initially less than previously thought, but returns to close to our original estimates by 2050 due to higher subsequent projected real GDP growth, particularly up to 2025[8].

**Major uncertainties and sensitivity tests**

The sensitivity tests that we have carried out (as discussed in more detail in our original report and replicated for the present study) predictably show that our long-term projections for the relative size of the E7 economies are subject to significant uncertainties. Some model assumptions (US productivity growth, capital shares and initial capital-output ratios) are not all that important, but assumptions on working age population growth, investment rates and trends in education levels are all significant. Probably the most important factor, however, is the speed of catch-up in total factor productivity growth, which will depend on whether the major emerging economies can maintain and further develop growth-friendly political, economic and institutional frameworks. Real exchange rate assumptions are also important for the long-term value of emerging markets to OECD producers.

Combining the various uncertainties discussed above, while allowing for some possible offsets, we have constructed plausible alternative scenarios in which the total GDP of the E7 economies relative to the G7 in 2050 is around 30% higher or lower than our base case projections in PPP terms, with wider divergences possible in terms of market exchange rates.

We still consider our base case projections to be reasonable order of magnitude estimates, however, and in almost any plausible scenario the relative size of the E7 economies compared to those of the G7 is likely to be significantly higher in 2050 than in 2005, even if one or two of the major emerging economies do not fulfil their potential due to local political, economic or environmental problems.

Our conclusion that the three major economies in the world in 2050 are likely to be China, the US and India also seems relatively robust given the huge gap between these three economies and the next largest (Brazil and Japan) in our projections, even if the relative size of these 'Big 3' economies in 2050 is inevitably subject to great uncertainty.

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[8] One downside of this is that carbon emissions from China and India are likely, other things being equal, to be even higher than earlier projected in our September 2006 report on this topic. We will be updating these carbon emission projections and associated conclusions for climate change policy in a separate report to be published later this year.

## 4. Extension of the analysis to other emerging economies

Since publishing our original research on the World in 2050, we have often been asked whether other countries could be added to the analysis. To keep the number of countries in this exercise manageable, we have used a selection process based on the potential size of the economies concerned. We began with a long list of candidates from the World Bank Top 50 GDP rankings and then narrowed these down to a list of the 'PwC 30' based on projections of GDP to 2050 using a simplified version of our full model that was based only on UN total population projections and plausible assumptions on GDP per capita. This produced a short list of 13 additional emerging economies that, while possibly not overtaking any of the E7 by 2050 according to our simplified model, could overtake Australia (which is projected to be the smallest of our original 17 economies by 2050) and might each account for close to 1% of world GDP at PPP exchange rates by 2050.

We then applied our full long-term growth model methodology to these 13 economies to produce the summary growth projections shown in Table 5 below, which also includes the original E7 economies and the G7 average for comparison.

**Table 5: Projected real growth rates for expanded group of emerging market economies: 2007-50 (%pa)**

| Country | GDP in US $ terms | GDP in domestic currency or at PPPs | Population | GDP per capita at PPPs |
|---|---|---|---|---|
| Vietnam | 9.8 | 6.8 | 0.8 | 6.0 |
| **India** | **8.5** | **5.8** | **0.8** | **5.0** |
| Nigeria | 8.0 | 6.1 | 1.6 | 4.4 |
| Philippines | 7.2 | 5.2 | 1.1 | 4.1 |
| Egypt | 7.1 | 5.1 | 1.1 | 3.9 |
| Bangladesh | 7.0 | 5.1 | 1.1 | 3.9 |
| **China** | **6.8** | **4.7** | **0.1** | **4.6** |
| **Indonesia** | **6.7** | **4.5** | **0.6** | **3.9** |
| Pakistan | 6.4 | 4.9 | 1.4 | 3.5 |
| **E7 average** | **6.4** | **4.5** | **0.5** | **4.0** |
| Malaysia | 5.8 | 4.3 | 1.0 | 3.3 |
| Thailand | 5.7 | 3.6 | 0.1 | 3.5 |
| Iran | 5.2 | 3.8 | 0.8 | 3.0 |
| **Brazil** | **5.2** | **3.8** | **0.7** | **3.1** |
| **Turkey** | **5.1** | **4.1** | **0.7** | **3.4** |
| Argentina | 4.9 | 3.7 | 0.6 | 3.0 |
| South Africa | 4.8 | 3.7 | 0.3 | 3.3 |
| Saudi Arabia | 4.8 | 4.1 | 1.4 | 2.7 |
| **Mexico** | **4.7** | **3.7** | **0.5** | **3.2** |
| **Russia** | **4.3** | **2.5** | **-0.6** | **3.2** |
| Poland | 3.4 | 2.1 | -0.5 | 2.7 |
| **G7 average** | **2.0** | **2.2** | **0.3** | **1.9** |

Sources: PricewaterhouseCoopers GDP growth estimates (rounded to nearest 0.1%), population growth projections from the UN. E7 and averages shown in bold.

Figure 6 below shows the projected GDP (at market exchange rates) of these 13 economies in 2050 compared to that of the two smallest E7 economies (Indonesia and Turkey), all measured relative to an index where UK GDP is set at 100 in both years to give an idea of how significant these other emerging economies might become by 2050 if they can fulfil their potential.
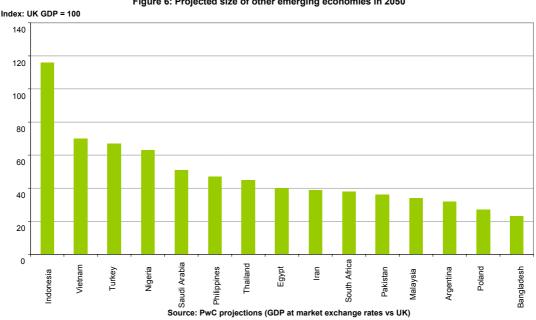
**Figure 6: Projected size of other emerging economies in 2050**

Index: UK GDP = 100



Source: PwC projections (GDP at market exchange rates vs UK)

We can note from these results that **Vietnam** now tops our growth rankings, which in fact mirrors its leading performance in the July 2007 PwC EM20 rankings of emerging market attractiveness to manufacturing sector inward investors. In terms of size, Vietnam has the potential to be of similar scale to Turkey by 2050 (or Italy amongst the G7), although still only around 70% of the projected size of the UK economy at that time (see Figure 6).

**Nigeria** also stands out as having considerable growth potential, not far behind India in terms of projected annual growth, close to Turkey in terms of projected size by 2050 and overtaking Egypt (itself a strong performer in our growth rankings as can be seen from Table 5) and South Africa to become the largest African economy by that date according to these projections[9]. Nigeria is starting from a very low base in terms of GDP per capita, however, and would still be a relatively low income country even by 2050, with GDP per capita of around $11,700 at constant 2006 prices. These projections also assume that the growth-friendly policies that have stimulated strong non-oil GDP growth in Nigeria for the past 5 years are sustained in the longer term, which will represent a major challenge.

As well as **Egypt** as mentioned above, the **Philippines** and **Bangladesh** also have high growth potential, although the latter is still projected to be the

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[9] An important factor here is that Nigeria has the highest projected population growth rate of any of the economies considered according to the UN, with its total population set to rise to around 290 million by 2050, as compared to around 120 million in Egypt and 56 million in South Africa.

smallest of the economies we have considered in 2050 due to its very low starting point in terms of average incomes. For Bangladesh, however, any such projections are contingent on avoiding major natural disasters, notably those associated with long-term rising sea levels due to global warming. **Pakistan** also ranks relatively high in growth terms, due in part to having one of the highest projected population growth rates; as with other countries (notably **Iran**), this assumes that recent political problems do not pose a barrier to fulfilling the country's long-term economic potential. Clearly this is a major downside risk factor at present.

**Malaysia** and **Thailand** have more solid track records of long-term economic growth on which to base our projections than some of the other additional countries considered here. Thailand is notable in relying little on projected population growth, but makes up for this with relatively robust projected GDP per capita growth. **Saudi Arabia**, by contrast, has more modest projected GDP per capita growth, reflecting its relatively high initial average income levels, but one of the fastest projected population growth rates up to 2050 according to the UN.

At the bottom of our emerging market growth rankings are **Russia** and **Poland.** This reflects their much less favourable demographics with UN projections indicating declining, rapidly ageing populations in both countries over the period to 2050. Indeed in domestic currency terms, excluding projected real exchange rate appreciation against the dollar, their growth rates are broadly similar to the G7 average.

In summary, there are many other emerging markets outside the E7 that have considerable growth potential and should not be overlooked by investors and analysts. However, with the possible exception of Vietnam relative to Turkey, this additional analysis does not change our view that the E7 will remain the largest emerging economies over the period to 2050.

## 5. Opportunities and challenges for the OECD economies

The analysis in the previous two sections suggests that a significant shift in the relative balance of power in the world economy is all but inevitable over the next few decades. Some commentators have interpreted this as representing a severe threat to the established OECD economies that will require a significant shift in public policy, although the exact policy prescriptions of those concerned by the rise of the E7 vary from protectionism to fast-track market liberalisation.

Often, however, such 'doomsayers' seem to rely on analogies with business competitiveness that, while valid up to a point[10], need to be interpreted with considerable care when applied to national economies. Our own view is more optimistic, seeing the rise of the emerging market economies primarily as an opportunity for the established OECD economies to boost their absolute standards of living through a combination of cheap imports and growing income from exports and overseas investments, even as their shares of world GDP decline.

At the same time, we recognise that, at the level of many individual workers and companies in sectors where the existing OECD economies are at a comparative disadvantage relative to E7 producers, painful adjustment processes will be required. OECD governments will need to take an active role to facilitate these adjustments and possibly also to smooth out some of the income inequalities that are otherwise likely to result from these adjustments.

Overall, therefore, we would regard the rise of China, India and the other E7 economies as being beneficial to the long-term growth potential and average living standards of the G7 and other established OECD economies. But there will clearly be both winners and losers from the process of adjusting to this new world economic order, as discussed further below.

### Potential winners and losers within the established OECD economies

While the general principle of comparative advantage is clear enough, predicting winners and losers at the sectoral level is notoriously difficult. Certainly it is not sensible to try to do this over the 45 year horizon of our growth model, which as mentioned above is a single good model that does not allow for sectoral disaggregation. Nonetheless, if we adopt a shorter time horizon of, say, ten years, then (as summarised in Table 6) some educated guesses can be made as to the key winners and losers for businesses within the established OECD economies if the emerging economies develop broadly as envisaged in our base case projections over this period.

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[10] As discussed, for example, in Michael Porter's well known book on 'The Competitive Advantage of Nations' (1990), which highlights the importance of specialised sectoral clusters in relative national economic performance.

**Table 6: Potential winners and losers amongst businesses within the OECD economies over next 10 years**

| Potential winners | Potential losers |
|---|---|
| • Retailers (who succeed in penetrating major emerging markets)<br>• Leading global brand owners<br>• Business services<br>• Media companies<br>• Niche high value added manufacturers<br>• Health care and education providers<br>• Financial services companies able to penetrate E7 markets<br>• Energy and utilities companies | • Mass market manufacturers (both low tech and hi tech)<br>• Heavy users of energy and other commodities as inputs<br>• Financial services companies not able to penetrate E7 markets who may become vulnerable in their home markets<br>• Companies that over-commit to key emerging markets without the right local partners and business strategies |

Source: PwC qualitative assessment – for discussion purposes only

*Potential winners*

**Retailers** should be potential winners to the extent that they can benefit from lower cost imports into their OECD markets (though much of this benefit will be passed on to consumers unless retailers enjoy significant market power) while also having the potential to set up new stores in the E7 countries. Other recent research we have done shows the huge potential of these new markets. China, in particular, is likely to be the second largest consumer market in the world by 2020[11], while cities across the leading emerging markets from Shanghai to Mexico City will have rapidly growing middle class populations with the spending power to afford Western consumer goods and services[12].

This is, however, subject to the caveat that retailers need to be able to identify the right business strategies and local partners for such overseas ventures, which has not always been the case for overseas investments by retailers in the past, particularly in culturally unfamiliar territory such as China or India. Companies who enter relatively high risk emerging markets without the right strategies and partners could well end up as major losers, as indicated in the second column of Table 6.

Similar caveats apply to other potential winners such as **business services, energy and utilities, healthcare, educational services, media companies** and **owners of leading global brands**. All of these are, in principle, well placed to benefit from the rapid growth in emerging markets projected by our model, provided they can identify and execute the appropriate business

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[11] As discussed in detail in an article on Chinese consumer spending prospects in the July 2007 issue of UK Economic Outlook.
[12] See our report on 'Consumer Markets beyond Shanghai' (September 2007).

strategies, bearing in mind that strong domestic competitors either already exist or will probably soon emerge in these markets.

The **financial services** sector is one where the likely balance of winners and losers is less clear. On the one hand, the emerging markets of the E7 provide considerable opportunities[13], but on the other hand we can expect large financial services providers to emerge in economies such as China and India that may increasingly seek to play on a global stage, just as Japanese banks have done in recent decades, particularly in serving business customers and operating in wholesale markets. **Sovereign wealth funds** from some emerging economies are already playing an increasing role in global financial markets and their influence may extend further in future.

*Potential losers*

Turning to those OECD-based producers that might be expected to be potential losers, these would clearly include **mass market manufacturers**, many of whom have already suffered from Chinese competition in particular (or have been forced to move their production to China or other low cost economies to compete). As Chinese companies continue to increase the average skill levels of their workforce and adopt the latest OECD technologies, so they will move from low tech to hi tech areas of manufacturing, both to serve their own domestic markets and to export to OECD markets. Unless OECD manufacturers can find viable high value added niches that Chinese companies and those from other E7 economies cannot easily copy because they involve highly firm-specific or readily patentable intellectual property, they will find life increasingly tough.

At the same time, new lower cost competitors such as Vietnam[14] (and perhaps in the longer term India and some African countries if they can create the right political and economic pre-conditions for manufacturing investment) seem likely to displace China gradually as the focus of low cost manufacturing in the global economy.

The long-term trend for manufacturing to make up an ever smaller proportion of OECD GDP will therefore continue, possibly at an accelerated pace. This is not necessarily a problem, however, provided that OECD workers from these adversely affected sectors can be retrained and redeployed to sectors that are either not open to international competition, or where OECD companies have a comparative (although not necessarily an absolute) advantage relative to their E7 rivals.

Other potential losers will include companies (including manufacturers) that are **heavy users of energy and other commodities as inputs**, given the likely upward pressure on the relative prices of these commodities from rapid

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[13] As highlighted in our June 2007 report on 'Banking in 2050', which showed the E7 banking markets overtaking the G7 by 2050 and China overtaking the US some time before that date.
[14] The potential of Vietnam was highlighted above in Table 5 and in our July 2007 report 'Emerging Markets: Balancing Risk and Reward', where it topped our league table of 20 emerging markets in terms of its overall attractiveness for inward investment in manufacturing, narrowly ahead of China.

growth in China and other emerging economies. This effect is already becoming very evident and seems likely to support commodity prices for some time given difficulties in easily or quickly boosting supply in these areas. At the same time, suppliers of these commodities (whether national governments in Russia and the Middle East or private sector companies) may gain, particularly if they have scope to expand their production in response to higher prices. However, substitute products (including nuclear and renewable energy) may also gain from these trends in the long run.

## 6. Conclusions

In our updated base case projections, the leading emerging economies, which we refer to as the 'E7' (i.e. China, India, Brazil, Russia, Indonesia, Mexico and Turkey) will by 2050 be around 50% larger than the current G7 (US, Japan, Germany, UK, France, Italy and Canada) whether measured in dollar terms at market exchange rates or in PPP terms. In contrast, the E7 is currently only around 25% of the size of the G7 at market exchange rates and around 65% of the size in PPP terms.

China is expected to overtake the US as the largest economy in around 2025 in these updated projections, while India is now assessed as having the potential nearly to catch up with the US by 2050 (we are now more optimistic than in our original 2006 report for these two countries).

There are, however, likely to be notable shifts in relative growth rates within the E7, driven by divergent demographic trends. In particular, both China and Russia are expected to experience significant declines in their working age populations between 2005 and 2050. This is in contrast to relatively younger countries such as India, Indonesia, Brazil, Turkey and Mexico, whose working age populations should on average show positive growth over this period, although they too will have begun to see the effects of ageing by the middle of the century.

Our base case projections also suggest that:

- the Brazilian economy could be larger than the Japanese economy by 2050;
- the Russian, Mexican and Indonesian economies could be larger than the German, French or UK economies by 2050; and
- the Turkish economy could be of similar size to the Italian economy by 2050.

We have also now extended our analysis to 13 other emerging economies that, while smaller than those of the E7, also have the potential to grow significantly faster than the established OECD economies. Some of these countries, such as Vietnam, appear to have immediate potential as inward investment locations for manufacturing in particular. Others, such as Nigeria, may appear to be high risk propositions now, but have considerable long-term potential if they can achieve and sustain a greater degree of political stability and economic openness in the longer term. The general message is that investors with long-time horizons should not restrict their attention only to the

BRICs or even the E7 – there are many other alternatives worth considering depending on the nature of the investment and the risk tolerance of the investor.

## Annex: Detailed methodology for long-term GDP projections

Below we described in more detail the key data and assumptions used in our long-term GDP model. In line with many past studies, we assume that the shares of national income going to capital and labour are constant[15]. We consider each of the key drivers of growth in turn: physical capital stock; labour force; human capital and technological progress. We then discuss how real exchange rate movements are projected in our model and review the relative merits of the two alternative measures of GDP (at PPPs and market exchange rates) used in the research.

### Growth in the physical capital stock

We began with estimates[16] of capital-output ratios in 2006, which vary from 0.5 in Nigeria to 4.2 in Japan. Looking forward, we assume in our base case projections that recent average annual investment/GDP ratios, which vary from around 5% in Nigeria to around 45% in China, continue until 2010. Thereafter they are assumed to adjust gradually to long run investment levels after 2025 that vary more narrowly from 15% in some of the African and South Asian countries to 25% in China, Japan and South Korea amongst others (see Table A.1 on the next page for details of these short and long term investment assumptions).

These base case assumptions reflect the view that, with declining marginal returns on new investment over time, the very high investment/GDP ratios seen in China and other Asian emerging markets will tend to decline in the long run as these economies mature (as has happened with Japan since the early 1990s).

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[15] More formally, as described in detail in the full original report, we assume a Cobb-Douglas production function with constant returns to scale. In line with many past academic studies, we assume the share of physical capital in national income is constant at 1/3. This is broadly in line with national income accounts data for OECD countries, although in practice we might expect some rise in the share of human capital over time.

[16] We began from capital-output ratio estimates by King and Levine (1994) for the mid-1980s and then rolled these forward to 2006 using data on investment/GDP ratios from the Penn World Tables (v.6.2) and the IMF.

**Table A.1: Investment rate assumptions**

| Investment as % GDP | 2007-10 | From 2025 |
|---|---|---|
| Japan | 30% | 25% |
| Germany | 22% | 20% |
| UK | 17% | 17% |
| France | 24% | 20% |
| Italy | 22% | 20% |
| China | 45% | 25% |
| Spain | 25% | 20% |
| Canada | 25% | 20% |
| India | 22% | 20% |
| Korea | 32% | 25% |
| Mexico | 20% | 20% |
| Australia | 24% | 20% |
| Brazil | 19% | 19% |
| Russia | 25% | 20% |
| Turkey | 20% | 20% |
| Indonesia | 28% | 22% |
| Philippines | 10% | 15% |
| Pakistan | 14% | 15% |
| Bangladesh | 13% | 15% |
| Iran | 36% | 25% |
| Argentina | 14% | 15% |
| Vietnam | 29% | 25% |
| Thailand | 29% | 25% |
| South Africa | 9% | 15% |
| Egypt | 12% | 15% |
| Saudi Arabia | 11% | 15% |
| Malaysia | 23% | 23% |
| Nigeria | 5% | 15% |
| Poland | 18% | 18% |

Note: Investment rates assumed to adjust smoothly between 2010 and 2025 to long run level shown in final column above, which are constrained to lie within a 15-25% range. These are gross investment rates: the net addition to the capital stock each year is estimated on the assumption that annual depreciation amounts to 5% of the capital stock at the end of the previous year. This is in line with the 4-6% depreciation assumptions generally used in earlier academic studies. The new countries are listed in no particular order in this table.
Source: PricewaterhouseCoopers base case assumptions

**Growth in labour force**

We use the latest UN projections (2006 revision) for the population aged 15-59 as a proxy for labour force growth. Some economies might be able to achieve faster growth here if they can raise their employment rates, but any such effects are difficult to predict and we have therefore not included them in our base case estimates.

## Human capital development

In common with several past academic studies, we have based our estimates of the human capital stock on the data on average years of schooling for the population aged 25 and over from Barro and Lee (2001). We then follow the approach adopted by Hall and Jones (1998), which leads to estimates of the stock of human capital per worker in 2006 as an index relative to the US. We then assume that the average years of schooling of the over-25 population rises over time in each country at rates derived by extrapolating forward from trends over the past 20 years.

## Technological progress

This factor is assumed to be related to the extent to which a country lags behind the technological leader (assumed here to be the US) and so has the potential for 'catch-up' through technology transfer, conditional upon levels of physical and human capital investment (as set out above) and other more institutional factors such as political stability, openness to trade and foreign investment, the strength of the rule of law, the strength of the financial system and cultural attitudes to entrepreneurship. These latter institutional factors are not readily quantifiable through a single index, but are reflected in our assumptions on the relative speed of technological catch-up in each country.

In some cases (e.g. Indonesia, Pakistan, Bangladesh, Iran and Nigeria) we assume a slow rate of technological progress in the short term, but assume that the pace of catch-up accelerates in the longer term as these countries strengthen their institutional frameworks. For China, we assume a more rapid pace of catch-up in the short term, reflecting recent very strong growth. In the longer term, the rate of catch-up in all emerging economies is assumed to converge to an annual rate of 1.5% of the total factor productivity gap with the US, which is in line with the results of past academic research[17] suggesting typical long-term catch-up rates of around 1-2% per annum.

## Real exchange rate trends

In addition to modelling GDP growth in constant domestic currency terms using the above approach, we have also attempted to model how the real level of market exchange rates evolves over time. For this purpose we adopt the same simplifying assumption as Wilson and Purushothaman (2003), namely that the real exchange rate for emerging market economies rises relative to the dollar proportionately to labour productivity growth differentials relative to the US in each year, subject to the market exchange rate not moving above its PPP level. This seems a reasonable simplifying assumption, although it should be recognised that any such real exchange rate assumptions are subject to significant uncertainties.

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[17] As summarised, for example, in Chapter 6 of *Macroeconomics and the global business environment* by David Miles and Andrew Scott (John Wiley & Sons, 2004). See also Barro (1997).

This methodology leads to projections of significant rises in real market exchange rates for the major emerging market economies, converging with PPP rates in the long run in most cases. For the OECD economies, we also assume that real exchange rates converge very gradually to their PPP rates at a steady pace over the period from 2007 to 2050. This is consistent with academic research[18] showing that purchasing power parity does hold in the long run, at least approximately, but not in the short run.

**Alternative measures of relative economic size**

There are two main methods of comparing the relative size of economies with different currencies: GDP at market exchange rates (MER) and GDP at purchasing power parities (PPP). For economies at a similar level of development, these methods tend to give broadly similar answers, but they can lead to radical differences when looking at emerging market economies, as Table 2 in the main text above illustrates.

We can see from this table that, while estimated PPPs do not vary by more than 20% from MERs for the established advanced economies (i.e. the G7 plus Spain and Australia, which we refer to in this article as the 'established OECD' group of economies) and could be either higher or lower than MERs, PPPs are systematically higher than MERs for all of the emerging economies, although there are three distinct sub-groups:

- for relatively new OECD members such as Korea, Mexico and Turkey, where the economic development process is well-advanced and long-established but income per capita levels are still clearly below average OECD levels, PPPs are around 30-50% above MERs;
- for emerging economies at an intermediate level of development, such as Russia and Brazil, PPPs are around 80-120% above MERs; and
- for the lowest income per capita economies (China, Indonesia and India), PPPs range from around 240-300% of MERs, although these estimated divergences have been significantly reduced in the latest World Bank estimates for China and India, as discussed in Section 3 above.

The reason for the large differences between PPPs and MERs in emerging economies is that, while prices of readily tradable goods and services would be expected to show a reasonable degree of convergence across countries due to the pressures of international competition[19], the same is not true of the prices of non-tradable goods and, in particular, services. The prices of the latter are likely to be much lower in emerging economies such as China and India due to lower labour costs. PPPs attempt to correct for these differences by identifying the exchange rates that will equate the value of a representative basket of goods and services produced/consumed in each country.

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[18] As discussed in Miles and Scott, *op cit.*

[19] In practice, tariff and non-tariff trade barriers and imperfect competition may mean that tradable goods prices do vary across countries. Different goods and services will also have varying degrees of 'tradability'.

As indicated by the different sub-groups of emerging economies discussed above, the relationship between PPPs and MERs will vary as productivity rises over time in the emerging economies (reflecting high returns on capital investment from a lower initial capital stock and their ability to import the latest technology and productive techniques and business processes from more advanced economies). Higher productivity will tend to push up labour costs in the long run and, as a result, non-tradable prices will converge. This will generally be associated with rising real exchange rates for emerging economies over time (the so-called Balassa-Samuelson effect) and a consequent narrowing of the gap between PPPs and MERs as economic development proceeds. As discussed above, this needs to be taken into account in any long-term projections of relative GDP levels at MERs.

It is quite common now to find statements in economic articles and official documents to the effect that using PPPs is the preferred method for comparing and aggregating GDP and GDP per capita levels across economies. In practice, however, this rather depends on the purpose of, and intended audience for, the exercise (see Table A.2 for details).

**Table A.2: How should GDP be compared for different purposes?**

| Purpose | Preferred measure | Why? |
|---|---|---|
| 1. Compare living standards across countries | GDP per capita at PPPs | Living standards depend on relative price levels in each country |
| 2. Project volume of outputs or inputs (e.g. Chinese energy demand or carbon emissions) | Projected levels of GDP at PPPs | PPPs provide the best measure of volumes of outputs (or inputs required to produce these outputs) |
| 3. Estimate current value of market demand (e.g. for a US or EU company considering exporting to China) | Current level of GDP at MERs | MERs indicate current value of demand in Western currency terms |
| 4. Estimate future level of market demand (for longer term business planning and investment appraisal purposes) | Projected level of GDP at MERs allowing for expected future real exchange rate appreciation | Allows for tendency of MERs to rise towards PPPs for emerging economies as incomes rise over time |

Source: PricewaterhouseCoopers

In particular, MERs are best for judging the size of markets for Western investors and exporters, while PPPs are best for comparing living standards and volumes of outputs and inputs. In this article we have therefore looked at projected GDP and GDP per capita levels in both MER and PPP terms. PPP exchange rates are assumed to remain constant in real terms, while market exchange rates for the emerging market economies are assumed to rise in real terms over time towards their PPP levels as relative productivity levels rise, which is in line with historic experience.

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## Other relevant PricewaterhouseCoopers economic research

The World in 2050: How big will the major emerging economies get and how can the OECD compete? (March 2006)

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This report was written by John Hawksworth and Gordon Cookson of the PricewaterhouseCoopers LLP economics group in London. In addition to macroeconomic analysis of the kind contained in this report, this practice provides a wide range of services covering competition and regulation issues, litigation support, bids and business cases, public policy and project appraisals, financial economics, brand economics, the economics of sustainability and business forecasting.

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| **Tim Ogier** | **Thomas Hoehn** | **John Hawksworth** |
|---|---|---|
| Partner | Partner | Head of Macroeconomics |
| +44 (0)20 7804 5207 | +44 (0)20 7804 0872 | +44 (0)20 7213 1650 |
| tim.ogier@uk.pwc.com | thomas.hoehn@uk.pwc.com | john.c.hawksworth@uk.pwc.com |

pwc.com