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Financial Crisis of 2008 and Shifting Economic Power Is there Convergence

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Abstract: This paper analyses shifts in economic power over the last almost five decades. Developing countries and regions have increased their share of incremental world income and incremental world exports over this period. However, there is very little shift in the relative rankings according to size of GDP of the 25 largest economies in 2011 over these five decades. The economies of Korea and Brazil have become relatively much larger; the other changes have been minor. The rank correlations between the ranks over the years are very large showing that there has been little change in the rankings. Also, the GDP and GDP per capita of other countries and regions have increased relative to the US but this increase has been slow, particularly after 1982. The GDP of most of the large developing countries has increased relative to that of the US but far fewer have increased their relative per capita GDP suggesting slow rates of growth of productivity and limited structural change of shift in economic activity from low productivity to high productivity sectors. We also aggregated 20 indicators to form an index of economic power. Again we see that there has been little change in the rankings according to this index. We also measured the distance of individual countries from the US on the basis of these indicators. We find that most countries had been converging on the US but very slowly. There is no evidence that the 2008 financial crisis has resulted in a hastening of the decline of the US.

Key words: Financial Crisis, Economic Power, Changing Economic Power, Convergence.

Introduction

There is a vigorous debate about shifting economic power in the world system. It is believed that the developed countries and in particular the US are losing their predominance in the world economy and the so-called emerging economies (EEs) are becoming more important.[1] In particular, attention is focused on the rise of China and when it will overtake the US as

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the largest economy. But the changes in the world economy are complex and the nature of the shifts depends on what is being measured. This paper extends the analysis of the earlier paper (Agarwal 2011) which had looked at shifts in economic power till 2005 to the period after the 2008 financial crisis. Rapid growth in many emerging economies (EEs) both before the 2008 financial crisis and since has resulted in these countries accounting for a rising share of the increase in world income as discussed in Section 1. Also developing countries, in general, and EEs in particular are supplying more of the world's exports, and are also becoming an important source of capital particularly for other developing countries. This increasing importance of EEs is seen by many analysts as presaging a shift in economic power away from the erstwhile developed economies. This analysis seems vindicated by the formation of the G-20 which includes a number of these EEs as the premier forum for economic cooperation, a role which was earlier played by the G-7. Also the EEs are forming various groups to try to coordinate their policies in international bodies and meetings and to increase cooperation.[2] We see in Section 2 that shifts in relative economic size occur very slowly. Only Korea has seen a large increase in its relative size. It has risen steadily from being the 22nd largest economy in 1965 to being the 10th largest economy in 2011. Brazil has also improved its position by 6 ranks but most of this increase occurred before the 1980s. Other economies have raised their relative position only slightly. We then, in Section 3, compare the GDP of many developed and developing economies with that in the US and find that there has been only a small increase in the size of these economies relative to that of the US. But when we compare per capita GDP in these economies relative to that in the US we find that fewer developing countries have been able to improve their relative position than were able to increase their relative GDP. Whatever shift in power to EEs has been occurring has been doing so only very slowly. EEs have to be aware of this as a misplaced feeling of power would be counter-productive just as the attempt to negotiate a New International Economic Order in the 1970s on the basis of presumed commodity power ended in failure. In Section 4 we go beyond GDP as a basis of economic power and include a number of other economic indicators. We aggregate these different indicators using the Nagar- Basu method. A comparison of the values of this index for 1990 and 2005 and

for 2009 is then undertaken. Such a comparison enables us to discuss how economic power in a broader sense than merely GDP may have shifted between these years, and bears out the analysis of Section 2 that very little shift of economic power seems to have occurred. This index is an ordinal one and so does not tell us whether there has been a convergence in power, namely whether the EEs are becoming more powerful as compared to the developed countries and may expect to overtake them in the near future. We undertake this analysis in Section 5 by measuring the difference in terms of the indicators between individual countries and the US, which is the most powerful country, both in 1990, 2005 and 2011, and whether the gap in power between the US and these other countries is narrowing or increasing. We analyse further the relative distance of China and India with respect to the US.

1. Increasing Role of Developing Countries in the World Economy

In this section we examine the role that developing countries play in the functioning of the world economy. Developing countries and various groups within them are providing a rising share of the increase in world's income, with all incomes measured at constant 2000 US dollars[3], and of the increase in world exports.

The share of the additional world income provided by developing countries (DCs) has been increasing over time. Whereas DCs provided less than 13 per cent of additional world income in the period 1965-73 this had increased to almost a quarter in the 1980s and remained at this level during the 1990s (Table 1). The share of DCs in additional world income increased further to 40 per cent in the period 2000-07 (Table 1), and, since the 2008 financial crisis, DCs have accounted for almost all the incremental world income.

East Asia and Pacific (EAP) is the principal region contributing more to the world's increased income with Latin America and the Caribbean (LAC) and South Asia (SA) also having a significant share of the incremental world income. The share of the non-OECD members of the G-20[4] increased from

about 8.5 per cent of the additional world income in the period 1965-73 to about 25 per cent in the period 2000-07, and over 55 per cent in the period 2008-11. The share of BRICSAM has also increased very substantially. On the other hand the share of the high income countries has decreased mainly because the share of the G-7 countries fell substantially as these countries grew sluggishly.[5] Among the G-7 countries the largest declines in shares of incremental income have occurred in the largest economies, namely, the US, Japan and Germany.[6,7]

Table 1: Share of Major Countries in Increase in World GDP (in per cent)

	1965-73	1973-82	1982-90	1990-2000	2000-07	2007-10
High Income Countries	87.4	80.3	74.3	76.7	59.9	2.7
of which (o.w.) G-7 Total	82.6	61.1	69.6	57.7	41.4	-3.2
Canada	2.1	2.3	2.1	2.3	1.8	1.2
France	5.1	4.8	3.2	3.0	2.3	0
Germany	21.8	4.9	5.1	4.2	2.5	2
Italy	4.2	4.4	3	2	1.3	-2.2
Japan	20.9	19.5	21.5	6.3	6.3	-6.4
UK	4.4	1.6	4.2	4.1	4.4	-1.1
US	24.1	21.6	30.5	35.8	22.8	3.3
Other Developed Countries	4.8	19.2	4.7	19	18.5	15.9
o.w. Australia	1.1	1.3	1.1	1.5	1.4	2
Austria	0.7	0.6	0.4	0.6	0.4	0.2
Belgium	0.3	0.7	0.5	0.6	0.4	0.3
Netherlands	1.2	0.9	1	1.3	0.7	0.1
Norway	0.4	0.7	0	0.6	0.9	0
Spain	2.3	1.3	1.7	1.8	2	-0.8
Sweden	0.7	0.5	0.6	0.6	0.7	0.5
Switzerland	0	4.7	0.7	0.3	0.5	0.6
Developing Countries	12.6	19.7	25.7	23.3	40.1	87.3
EAP	2	4.6	5.7	12	19.3	49.7
ECA	-	-	13.5	-1.6	4.9	4.1
LAC	7.3	9.9	2.9	7.1	7.3	15

Table 1 continued...

Table 1 continued...

MNA	1.4	2	0.9	1.7	2	3.1
SA	0.8	1.9	2.1	3.3	4.9	12
SSA	1.1	1.3	0.6	0.9	1.7	3.4
BRICSAM	6.8	11.7	13.8	15.8	26.5	61.3
Brazil	2.9	3.6	1.4	1.8	2.2	5.2
China	1	2.3	3.8	9.5	16.3	43.7
India	0.6	1.3	1.6	2.5	4.1	10.3
Mexico	1.8	3.9	0.6	2.1	1.4	1.2
Russia			6.2	-1.6	1.9	0.9
South Africa	0.5	0.6	0.2	0.3	0.6	0
Other G-20 Countries	4.5	5.3	4	6.6	1.9	9.9
Argentina	0.9	0.4	-0.1	1.3	-3.7	0
Indonesia	0.3	0.7	0.7	0.7	0.9	2.4
Korea	0.9	1.7	2.6	3	2.6	3.9
Saudi Arabia	1.7	1.6	0	0.6	0.7	1.6
Turkey	0.7	0.9	1	1	1.4	2

Note: The regions are as defined by the World Bank. EAP is East Asia and Pacific, ECA is Europe and Central Asia, LAC is Latin America and Caribbean, MNA is Middle East and North Africa, SA is South Asia and SSA is Sub-Saharan Africa

Source: http:// databank.worldbank.org/data/home/aspx

World Development Indicators, World Bank, Washington D.C.

Similarly, the share of developing countries in the increase in world exports has risen, while the share of the developed countries, particularly the G-7 countries, has decreased (Table 2). Again the share of most of the developing regions in incremental world exports has increased. But the share of regions other than Asia, both EAP and SA, decreased till the period of the 1990s and has increased only since then. The share of BRICSAM in incremental world exports has increased steadily. But the share of a number of countries has fluctuated. However, the share of large developing countries has increased since the 1990s except for Indonesia and Korea. For these two countries the share in incremental world exports declined in 2000-07 as compared to 1990-2000, but then increased substantially in the period 2007-10.

Table 2: Share of Major Countries in Increase in World Exports (in per cent)

	1965-73	1973-82	1982-90	1990-2000	2000-07	2007-10
High Income Countries	86.8	84.6	81.4	76.4	60.1	37.8
o.w. G-7 Total	55.6	48.5	53.9	39.4	36.4	21.0
Canada	4.4	3.5	3.4	4.8	2.1	1.0
France	7.2	5.6	6.7	3.1	3.9	1.2
Germany	14.3	7.5	12.1	5.4	11.7	5.3
Italy	4.2	4.4	6.0	2.1	4.0	0.4
Japan	7.2	8.2	7.6	5.2	3.2	2.7
UK	5.3	6.1	5.4	4.4	4.4	0.8
US	13.0	13.2	12.7	14.4	7.1	9.6
Other Developed Countries	31.2	36.1	27.5	37.2	23.7	16.4
o.w. Australia	1.2	1.2	1.0	0.9	1.1	2.7
Austria	1.3	1.1	1.8	0.7	1.6	0.4
Belgium	3.9	2.3	3.7	1.2	2.5	1.2
Netherlands	5.0	3.7	3.9	2.8	3.9	2.5
Norway	1.2	1.2	1.0	0.8	1.2	0.7
Spain	1.9	1.6	2.4	2.2	2.7	1.3
Sweden	2.2	1.4	1.9	1.1	1.6	0.7
Switzerland	-0.9	2.6	2.4	0.8	1.6	0
Developing Countries	13.2	15.4	18.6	23.6	39.9	62.6
EAP	3.3	3.5	3.8	12.2	18.8	33.6
ECA	-	-	8.9	2.0	7.4	9.0
LAC	4.4	5.3	3.9	5.8	5.9	9.8
MNA	2.1	2.9	0.4	1.4	2.8	2.5
SA	0.6	0.9	0.8	1.4	2.7	4.9
SSA	2.8	2.8	0.8	0.8	2.3	2.8
BRICSAM	6.8	11.7	13.8	15.8	26.5	61.3
Brazil	1.1	1.0	0.8	0.7	1.5	2.5
China	0.7	1.3	1.6	5.9	13.2	21.1
India	0.4	0.6	0.5	1.0	2.4	4.3
Mexico	0.7	1.5	1.1	3.5	1.4	1.7
Russia	-	-	4.4	0.5	3.5	4.1
South Africa	1.0	1.0	0.3	0.3	0.7	0.6
Other G-20 Countries	4.5	5.3	4.0	6.6	1.9	9.9
Argentina	0.5	0.3	0.3	0.4	0.4	0.7

Table 2 continued...

Table 2 continued...

Indonesia	0.8	1.4	0.2	1.0	0.7	2.1
Korea	0.8	1.5	2.3	3.3	2.9	4.1
Saudi Arabia	3.9	4.4	-1.4	0.9	2.1	2.3
Turkey	0.3	0.4	0.6	0.9	1.1	0.9

Source: http:// databank.worldbank.org/data/home/aspx
World Development Indicators, World Bank, Washington D.C.

Furthermore, an increasing share of developing countries exports is going to other developing countries. This share which had increased gradually till the 2008 crisis surged after that. The share of DC exports destined for other DCs had increased from 42.6 per cent in 1995 to 46 per cent in 2005 but then shot up to over 55 per cent in 2011. Among the larger emerging economies, Mexico had in 2011 the lowest share of its exports destined for DCs, only 11 per cent, followed by Russia at 22 per cent and Turkey at 31 per cent . The other large emerging economies had 50 per cent or more of their exports destined for DCs with Argentina having the largest share at almost 70 per cent (Agarwal 2013). Asia was the leader in this with almost 60 per cent of exports going to other developing countries.

A similar picture emerges regarding capital flows. DCs have been increasing their share of world foreign direct investment (FDI) inflows and this has continued even during the current financial crisis because the decrease in FDI inflows has been less in the case of DCs (UNCTAD 2010). The share of DCs in FDI inflows increased from 26.9 per cent in 2007 to 42.9 per cent in 2009. Their share of FDI outflows has also increased rapidly though these shares still are much smaller than the share of the developed countries. The share increased from under 10 per cent in 2007 to 20.3 per cent in 2009. Most of the regions increased their share of inward and outward flows of FDI. This is also true for BRICSAM.

The decrease in the share of the G-7 countries in world income, world exports and FDI flows raises obvious questions about the ability and the legitimacy of the G-7 in coordinating actions for better governance of the world economy.

2. Changing Economic Size

To analyse whether there has been a significant change in the economic importance of countries we chose the 25 largest countries by GDP in 2011 and looked at their relative size over the previous almost five decades (Table 3). We find that despite differences in economic performance, there has not been very much change in the relative ranking of the top 25 countries by size of GDP between 1965 and 2007. The Spearman's rank correlation between their rank in 1965 and in 2007 is 0.88[8], which is highly significant as it is more than four times the standard deviation (Kendall and Stuart 1968). Except for Brazil (rose by 5 ranks), Korea (rose by 9 ranks) and Turkey[9] few countries changed their rank by more than a couple of positions.

Table 3: Countries Ranked by Size of Economy

Countries	2011	2007	1990	1981	1965
U.S.	1	1	1	1	1
Japan	2	2	2	2	5
Germany	5	3	3	3	2
China	3	4	10	8	6
UK	4	5	6	5	3
France	6	6	4	4	4
Italy	7	7	5	6	7
Spain	13	8	8	11	11
Canada	11	9	7	7	8
Brazil	9	10	9	10	15
India	8	11	13	13	9
Mexico	12	12	14	9	13
Korea	10	13	15	21	22
Australia	14	14	11	12	10
Netherlands	15	15	12	14	14
Turkey	16	16	22	23	19
Switzerland	18	17	17	18	17
Sweden	17	18	16	16	12
Belgium	21	19	18	17	16
S. Arabia	20	20	23	15	23
Indonesia	19	21	20	19	21
Norway	23	22	21	22	20
Austria	22	23	19	20	18

Source: http:// databank.worldbank.org/data/home/aspx
World Development Indicators, World Bank, Washington D.C.

Korea, however, steadily raised its rank from 22nd in 1965 to 13th in 2007, and Turkey rose from 23rd in 1981 to 16th in 2007. Interestingly, China the sixth largest economy in 1965 only improved to the fourth largest in 2007[10], and India actually slipped from ninth in 1965 to eleventh in 2007.[11] The US was the largest economy in 1965, and remained the largest in 2007. A significant change was the rise of Japan from the 5th rank in 1965 to the 2nd by 1981.[12] Sweden and Austria slipped significantly in their relative importance dropping by 6 and 5 ranks respectively.

When we analyse the effect of the 2008 financial crisis we find that Korea improved its position further between 2007 and 2011 by 3 ranks, and India also improved its position by 3 ranks. Among the developed countries Spain dropped by 5 ranks and Belgium and Germany dropped by 2 ranks. But the rank correlation between the ranks in 2007 and 2011 is 0.97. Even the rank correlation between the ranks in 1965 and 2011 is 0.83. Also the Spearman's rank correlation between the ranks for any two years is about 0.9, which is over four times the standard deviation. The high rank correlations show that changes in the relative sizes of economies occur but very slowly and any significant shift would take decades.

3. GDP and GDP Per Capita Relative to that in the US

We next look at per capita GDP and the GDP of the large economies relative to that in the US. We find three phases in the evolution of relative per capita incomes. In the first phase till the early 1980s countries and regions raised their per capita incomes relative to that in the US. In the second phase of the later 1980s and 1990s per capita income in most other parts of the world remained constant as a share of US per capita income or declined. In the third phase, the years of this century, the relative share of per capita incomes in other parts of the world is again increasing. Only in EAP does relative per capita income rise fairly steadily and among the large economies this is true for China, India, Indonesia and Korea.

Table 4: GDP Per Capita in Constant 2000 US Dollars (per cent of US GDP per capita)

	1965	1973	1982	1990	2000	2007	2011
High Income Countries	62.5	69.1	73.0	73.5	71.8	72.8	73.5
Canada	71.3	73.7	69.1	67.2	67.8	68.5	68.8
France	65.0	71.8	66.2	62.1	60.7	61.0	61.1
Germany	65.1	70.9	69.3	65.4	65.3	68.1	69.5
Italy	51.8	59.6	58.7	55.3	52.4	50.7	50.3
Japan	96.7	109.6	121.0	106.3	105.5	107.1	105.0
UK	71.9	70.5	71.0	71.4	75.6	75.6	74.9
Average	70.3	76.0	75.9	71.3	71.8	71.8	71.6
Other Developed Countries	67.0	79.5	75.5	74.1	75.7	77.0	77.1
o.w. Australia	64.6	67.4	62.0	61.9	64.1	68.2	68.0
Austria	62.6	71.1	67.8	68.3	69.8	71.4	72.3
Belgium	64.3	69.8	66.2	64.7	64.7	65.8	72.3
Netherlands	68.7	69.4	66.6	68.9	69.7	71.0	70.7
Norway	83.0	101.0	97.5	106.8	108.2	107.1	106.2
Spain	39.7	39.4	40.1	41.1	42.2	41.3	41.0
Sweden	86.2	88.0	83.0	79.4	85.9	87.4	89.3
Switzerland	-	129.7	120.9	101.6	100.7	104.0	103.9
Developing Countries	3.3	3.4	3.8	3.3	3.3	4.2	4.9
EAP	0.9	1.0	1.3	1.7	2.7	4.3	5.6
ECA	-	-	-	7.6	5.1	7.0	7.4
LAC	14.4	15.0	15.9	12.1	11.1	12.6	12.7
MNA	5.0	5.7	6.0	4.6	4.5	4.9	5.4
SA	1.3	1.1	1.1	1.1	1.3	1.7	2.0
SSA	2.9	2.7	2.5	1.8	1.4	1.5	1.7
Brazil	12.9	14.5	11.8	10.5	11.1	12.6	12.7
China	0.7	0.9	1.4	2.7	4.8	6.5	7.0
India	1.0	1.1	1.1	1.3	1.7	2.2	2.2
Mexico	18.9	23.3	17.3	16.6	16.4	16.4	16.7
Russia	-	-	9.2	5.1	7.5	7.8	8.0
South Africa	15.8	15.5	11.1	8.6	9.6	10.1	10.1
Argentina	34.0	29.4	19.7	21.9	-	-	-
Indonesia	1.3	1.8	2.1	2.2	2.6	3.1	3.2
Korea	11.6	16.6	24.4	32.3	39.0	43.4	44.3
Saudi Arabia	60.7	57.6	31.6	26.8	24.2	25.4	26.3
Turkey	11.4	11.8	12.2	11.9	13.8	14.3	15.2

Source: http:// databank.worldbank.org/data/home/aspx
World Development Indicators, World Bank, Washington D.C.

When we compare the GDP of other countries with that of the US we find a similar pattern. Initially till the 1990s, GDP of other countries increases relative to that of the US; then it decreases and finally it again increases.

Table 5: GDP in Constant 2000 US Dollars (per cent of US GDP)

	1965	1973	1982	1990	2000	2007	2011
Canada	7.0	7.5	8.0	7.7	7.3	7.4	7.6
France	14.6	16.3	17.3	15.5	13.4	12.9	12.8
Germany	-	24.2	24.0	22.0	19.1	17.8	18.2
Italy	12.0	13.4	14.6	13.3	11.2	10.3	9.8
Japan	35.6	49.3	56.0	59.9	47.8	44.7	43.1
UK	19.4	19.1	17.1	16.3	14.9	15.6	15.1
Average	17.7	21.6	22.8	22.4	18.9	18.1	17.8
Other Developed Countries							
o.w. Australia	3.8	4.1	4.4	4.2	4.2	4.5	4.9
Austria	2.1	2.2	2.3	2.1	1.9	1.9	2.0
Belgium	2.8	3.0	3.0	2.6	2.4	2.3	2.3
Netherlands	4.1	4.4	4.3	4.0	3.9	3.8	3.8
Norway	1.5	1.6	1.8	1.7	1.7	1.7	1.7
Spain	5.4	6.5	6.5	6.2	5.9	6.3	6.1
Sweden	3.5	3.3	3.2	2.8	2.5	2.6	2.7
Switzerland	-	-	3.6	3.3	2.6	2.5	2.6
Developing Countries	3.3	3.4	3.8	3.3	3.3	4.2	4.9
EAP	4.6	5.6	8.2	11.0	17.4	27.6	38.0
ECA	-	-	-	11.9	7.2	9.4	10.1
LAC	18.3	21.5	25.5	21.2	20.8	22.5	25.5
MNA	2.9	3.7	4.6	4.2	4.4	5.1	5.7
SA	4.1	3.9	4.7	5.3	6.3	8.6	11.1
SSA	3.9	4.1	4.4	3.8	3.4	4.0	4.7
Brazil	4.2	6.3	8.0	7.1	6.5	7.0	8.0
China	2.3	2.8	4.1	6.3	12.1	21.1	30.2
India	3.0	2.9	3.4	3.9	4.8	6.8	8.9
Mexico	4.2	5.1	7.2	5.9	5.9	5.9	6.1
Russia	-	-	-	5.5	2.6	3.5	3.7
South Africa	1.7	1.8	1.9	1.6	1.3	1.5	1.6
Argentina	4.1	4.1	3.7	2.6	2.9	-	-
Indonesia	0.6	0.8	1.2	1.5	1.7	2.0	2.5
Korea	1.2	1.9	2.8	4.2	5.4	6.3	7.1
Saudi Arabia	-	1.9	2.8	2.0	1.9	2.0	2.4
Turkey	1.8	2.0	2.4	2.6	2.7	3.2	3.6

Source: http:// databank.worldbank.org/data/home/aspx
World Development Indicators, World Bank, Washington D.C.

The behaviour of total GDP and per capita GDP differs between the developed economies and the developing economies. As far as total GDP is concerned nine developed economies had relative to the US a lower GDP in 2011 than in 1965 and five had a higher GDP whereas among the developing countries eight had a higher GDP and three a lower one. But in terms of per capita GDP, 10 developed economies had relatively to the US a higher one in 2011 than in 1965 whereas four had a lower one. But only five developing economies had a relatively higher per capita GDP in 2011 than in 1965 and six had a lower one. Most of the countries catching up to the US are in Asia.

The developed economies are catching up to the US in terms of per capita income but not in terms of total GDP. This is partly a reflection of the slower growth of population in nine of the advanced economies as compared to the US. On the other hand, population in the developing countries is usually growing faster than in the US and this enables their GDP to catch up to that in the US. But productivity in many of them is not growing very rapidly so there is less of a narrowing of the gap in per capita income.

In brief, DCs are accounting for an increasing share of incremental world income and exports over the years. But whether the US or other richer countries have suffered a decline in their power is not clear. The relative ranking of the GDP of the largest economies is very stable as the rank correlation coefficient is very high. Furthermore, few developing countries have caught up with the US in terms of per capita income. Many of the developed economies were catching up till the mid-1980s but this process has slowed down. Many large developing countries also were catching up till the mid -1980s and again the process slowed down after that.

4. Indicators of Economic Importance

GDP, however, may not be a good indicator of economic power. In economic theory power usually means the ability to influence the working of the market and is usually measured by the ability to influence the price of a good because of monopoly or monopsony power. But there is an extensive literature on the concept and measurement of power in political science (Friedberg

1988). Broadly speaking there are two schools of thought, one believing that power can be measured and the other whether a country is powerful is one of perception (Morgenthau 1948; Kissinger 1994). There is also the question of how one deals with different components of power, economic power military power, soft power etc., and the interrelations between the different concepts of power. Many proponents believe that economic power is an important component of power if not the predominant component as the ability to develop one's military power depends itself on economic power (Gilpin 1987; Kennedy 1988). The faster growth of the US and Germany at the end of the 19th century was taken as a sign of the declining power of the UK. Similarly, faster growth in Germany and Japan after the Second World War was seen as a sign of declining US power. More recently more rapid growth in China and India particularly is seen to herald a shift in power.[13]

Without getting into a detailed discussion of these issues we chose a number of indicators which could reflect economic power and we aggregated them to derive an index of overall economic power. We aggregate the different indicators into one index using the Nagar-Basu method (2002).[14]

4.1 The Nagar-Basu method

The Nagar-Basu methodology, in contrast to other methods used such as to calculate the Human Development Index, constructs the index as a weighted sum of a normalised version of the identified indicators, where the weights are the outcome of multivariate statistical analysis of principal components.

Principal components (PC) have special statistical properties in terms of *variances*. The first PC is the linear combination that accounts for the maximum variance of the original indicators. The second PC accounts for the maximum of the remaining variance, and so on. Maximising variances helps us to maximise information involved among the set of indicators. There are two alternatives methods to get the standardised indicators that can be used in the analysis:

(i) $X_k = \frac{x_k - \overline{x}_k}{S_{x_k}}$ where $\overline{x}_k$ is the arithmetic mean and S_{x_k} is the standard deviation of observations on x_k ; and

(ii)
$$X^*_k = \frac{x_k - \min x_k}{\max x_k - \min x_k}$$

We use the first method in the analysis below.

The index is an abstract conceptual variable and is supposed to be linearly dependent on a set of observable indicators plus a disturbance term capturing error.

Let $Index = \gamma + \beta_1 X_1 + ... + \beta_k X_k + e$ ……...……..(1)

where $X_1, X_2, ...X_k$ is the set of indicators used to capture the phenomenon of interest. The total variation in the Index is composed of two orthogonal parts: a) variation due to the set of proposed indicators, and b) variation due to error.

Each of the indicators is standardised and the correlation matrix R is computed from the standardised indicators. Then the determinantal equation $|R - \lambda I| = 0$ is solved for λ the eigenvalues. If R is a $K \times K$ matrix, this equation provides a K^{th} degree polynomial equation in λ and hence K eigenvalues.

Next we arrange the λ's in descending order of magnitude, and corresponding to each λ, we calculate the eigenvector α. Each vector is normalised by the condition that $\alpha'\alpha = 1$. Now if X_1, X_2,..X_k are the K indicators used to construct the index then we weight these by the components of the eigenvectors to generate the principal components.

$$P_1 = \alpha_1 X_1 + \ldots + \alpha_{1k} X_k$$

$$P_k = \alpha_{k1} X_1 + \ldots + \alpha_k X_k$$

The Ps are the successive principal components and are constructed by weighting the individual indicators by the elements of the eigenvetors. For instance, the first principal component is calculated by multiplying the first

indicator by the first element of the first eigenvector, the second indicator by the first element of the second eigenvector and so till the k^{th} indicator is multiplied by the first element of the k^{th} eigenvector, and these products are then all added. Similarly, the second principal component is calculated by multiplying the indicators by the second element of the eigenvector. We estimate the index as weighted average of K principal components, where the weights are the eigenvalues of the correlation matrix R.

Thus, the index is:

$$\hat{I}_i = \frac{\lambda_1 P_1 + \lambda_2 P_2 + \ldots\ldots\ldots\ldots\ldots + \lambda_K P_K}{\lambda_1 + \lambda_1 + \ldots\ldots\ldots\ldots\ldots + \lambda_K}$$

where i=1, 2,…n (# of countries).

4.2 The Indicators Used

The indicators used reflect the different dimensions of economic power such as the standard of living measured by GDP per capita and access to education, health and water and sanitation facilities. They also reflect the country's importance in the world economy as well as the vulnerability this imposes because of fluctuations of the world economy. A number of indicators measure the potential of the economy for productivity growth. The indicators used were : 1. GDP per capita (PPP $), 2. population density (people per Sq. Km.), 3. net inflows of foreign direct investment (per cent of GDP), 4. trade (per cent of GDP), 5. world trade share, 6. current account balance (per cent of GDP), 7. Reserves (per cent of GDP), 8. net energy imports (per cent of total energy use), 9. food imports (5 of merchandise imports), 10. public expenditure on health (per cent of GDP), 11. public expenditure on education (per cent of GDP), 12. under 5 mortality (per 1000 live births) 13. internet users (per1000 people), 14. patents granted to residents (per million persons), 15. expenditures on R&D (per cent of GDP), 16. Researchers in R&D (per million people), 17. population using an improved water source (per cent of population), 18. military expenditures (per cent of GDP), 19. tertiary enrolment (per cent of relevant age population) and 20. mobile users (per 100 persons).

Some of the indicators are expected to reflect strength, e.g. GDP per capita, share of world trade, current account balance or social expenditures on education, health or population using an improved water source. Others such as military expenditures may have a positive or negative effect, though they are usually a drain on resources, people often talk of a peace dividend and military expenditures usually have a smaller multiplier than civilian expenditures. A country's share of world trade should reflect its ability to influence international agreements and rules to serve its national interest while the share of trade in GDP reflects its vulnerability to instability in the world economy.

4.3 Results of Aggregation of Indicators

The greatest contribution to economic power seems to be in terms of human capital (Tables 6 and 7). Patents granted, researchers in R&D, R&D expenditures and tertiary enrolment contribute almost half to the index, 49.8 per cent in 1990 and 43.1 per cent in 2005. Within these categories of human capital, tertiary enrolment has become more important and patents granted less important.[15] Internet and mobile phone users contributed 27.4 per cent and 17.4 per cent to the index in 1990 and 2005 respectively. Social services such as expenditures on health, education and an improved water supply contributed 19.4 and 16.9 percent in 1990 and 2005 respectively. Interestingly, while share of world trade had a large positive contribution in both years, share of trade in GDP had a negative contribution showing that this creates vulnerability. Similarly, share of food imports in total imports and energy imports in total imports in 1990 have a negative sign indicating vulnerability. But in 2005 they have a positive sign, though small.[16] Surprisingly, the current account balance and foreign exchange reserves have negative signs in 1990, but small positive signs in 2005. This might be because the more developed countries have small current account surpluses and small reserves as they can borrow more easily in the international capital market.[17] High levels of population density, trade as a percentage of world trade, FDI and under five mortality have a negative effect on economic power. The negative sign on FDI is surprising as FDI has a very positive effect on growth, the coefficient on FDI is usually about four times the coefficient on domestic investment in cross country growth regressions (Barro and Sal-i-Martin 2004).

Table 6: Contribution to Index, 1990

Percentage Contribution of the Indicators in the INDEX		
1	Patents granted to residents (per million people)	16.8
2	Internet users (per 1,000 people)	16.7
3	World trade share	16.3
4	Researchers in R&D (per million people)	13.3
5	GDP per capita (PPP US$)	11.7
6	Mobile phone subscribers (per 100 people)	10.7
7	Research and development expenditure (per cent of GDP)	10.2
8	School enrollment, tertiary (per cent gross)	9.5
9	Public expenditure on health (per cent of GDP)	8.8
10	Military expenditure (per cent of GDP)	8.5
11	Public expenditure on education (per cent of GDP)	7.3
12	Energy imports, net (per cent of energy use)	6.9
13	Population using an improved water source (per cent)	3.3
14	Population density (people per sq. km)	-2.8
15	Trade as percentage of GDP	-4.9
16	Under-five mortality rate (per 1,000 live births)	-5.9
17	Foreign direct investment, net inflows (per cent of GDP)	-6.3
18	Food imports (per cent of merchandise imports)	-6.4
19	Reserves total (per cent GDP)	-6.8
20	Current acc balance (per cent GDP)	-7.1

Source: Authors' Calculations.

Table 7: Contribution to Index 2005

Percentage Contribution of the Indicators in the INDEX		
1	School enrollment, tertiary (per cent gross)	12.4
2	Researchers in R&D (per million people)	12.3
3	World trade share	12.0
4	Research and development expenditure (per cent of GDP)	11.1
5	GDP per capita (PPP US$)	9.9
6	Internet users (per 1,000 people)	9.3
7	Mobile phone subscribers (per 100 people)	8.1
8	Public expenditure on health (per cent of GDP)	7.9

Table 7 continued...

Table 7 continued...

9	Patents granted to residents (per million people)	7.3
10	Military expenditure (per cent of GDP)	7.0
11	Armed forces (thousands)	5.9
12	Population using an improved water source (per cent)	5.0
13	Public expenditure on education (per cent of GDP)	4.0
14	Food imports (per cent of merchandise imports)	2.4
15	Current acc balance per cent GDP	2.1
16	Energy imports, net (per cent of energy use)	1.0
17	Reserves total (per cent GDP)	0.6
18	Trade as percentage of GDP	-2.4
19	Population density (people per sq. km)	-3.1
20	Foreign direct investment, net inflows (per cent of GDP)	-3.6
21	Under-five mortality rate (per 1,000 live births)	-9.2

Source: Authors' Calculations.

The overall ranks are given in the next two tables (Tables 8 and 9). The rank correlation between the rank in 1990 and 2005 is 0.91, highly significant, and there has not been very much change in the relative power of the countries. The major gainers have been China, 9 ranks; Korea and Israel, 4 ranks. The major losers are Canada, 5 ranks; and Mexico and Pakistan, 4 ranks.

Table 8: Rank of Countries, 1990

Rank	Country	Index
1	United States	3.24
2	Japan	2.16
3	Canada	1.85
4	Germany	1.10
5	France	1.08
6	United Kingdom	0.66
7	Russian Federation	0.53
8	Israel	0.39
9	Italy	0.35
10	Saudi Arabia	0.12
11	Korea (Republic of)	-0.05
12	Brazil	-0.30
13	Argentina	-0.53

Table 8 continued...

Table 8 continued...

14	Mexico	-0.55
15	Turkey	-0.64
16	Iran (Islamic Republic of)	-0.69
17	India	-0.75
18	Pakistan	-0.86
19	South Africa	-0.88
20	China	-1.04
21	Indonesia	-1.13
22	Egypt	-1.44
23	Nigeria	-2.22

Source: Authors' Calculations.

Table 9: Ranks of Countries, 2005

Rank	Country	Index
1	United States	2.40
2	Japan	1.69
3	Germany	1.15
4	Israel	1.15
5	France	1.06
6	United Kingdom	0.86
7	Korea (Republic of)	0.85
8	Canada	0.81
9	Italy	0.70
10	Russian Federation	0.54
11	Saudi Arabia	-0.14
12	Argentina	-0.38
13	China	-0.41
14	Turkey	-0.54
15	Brazil	-0.62
16	Iran (Islamic Republic of)	-0.68
17	South Africa	-0.75
18	Mexico	-0.76
19	Egypt	-0.94
20	India	-1.26
21	Indonesia	-1.43
22	Pakistan	-1.57
23	Nigeria	-1.76

Source: Authors' Calculations.

We then compute the power index for 2009 to examine the effect of the 2008 financial crisis. But we had to use a more restricted set of indicators as we could not get from the World Bank Development Indicators site data on researchers in R&D per million people, armed forces in thousands and world trade share. We calculated the index and also the ranks for 1990 with the smaller set of indicators. The ranks for 1990 using the two different indicators were somewhat different, but the rank correlation between the two sets of ranks was high, 0.71. The main differences in the ranks were for Saudi Arabia, South Africa and Israel. The ranks for these three were respectively 19, 8 and 10 with the full set of indicators but were respectively 10, 18 and 21 with the smaller set of indicators. The rank correlation according to the new ranks is 0.65 for ranks between 1990 and 2000 and 0.81 for ranks between 2000 and 2009, and 0.87 for ranks in 1990 and 2009. The rank correlations are very high with the new calculation suggesting that there was no significant shift in the power ordering. The rank correlation between the ranks for 2005 using the larger set of indicators and 2009 using the smaller set of indicators was 0.84 again not supporting the hypothesis of a big shift in the power ordering because of the financial crisis.

5. Are Countries Converging on the US?

The absolute values of the index calculated above have no meaning; only the ranks matter. So the values of the index do not allow us to judge whether the countries are converging in terms of economic power or whether they are diverging. To judge this issue we measure the distance of these countries from the US in terms of the indicators

5.1 Convergence with the US

We measure convergence by the distance between the US and other countries, in terms of the indicators. Table 10 (a) gives the distance from the US in 1990 and 2005 for the full set of indicators. Table 10 (b) gives the distance from the US in terms of the smaller set of indicators.

Table 10 (a): Distance from the US

	1990	2005	Ratio (C/B)
Developing Countries			
Argentina	57.6	44.8	0.78
Brazil	54.4	45.6	0.84
China	72.3	70.9	0.98
Egypt	89.0	83.7	0.94
India	77.8	72.9	0.94
Indonesia	79.4	80.8	1.02
Iran	71.6	55.8	0.78
Israel	66.5	53.5	0.80
Korea	58.9	45.3	0.77
Mexico	64.2	50.9	0.79
Nigeria	133.9	103.2	0.77
Pakistan	75.4	78.6	1.04
Russia	42.9	49.6	1.16
Saudi Arabia	59.6	42.3	0.71
South Africa	88.8	93.0	1.05
Turkey	64.8	48.9	0.75
Developed Countries			
Canada	19.8	22.4	1.13
France	30.6	15.8	0.52
Germany	33.7	18.0	0.53
Italy	27.9	24.7	0.89
Japan	34.8	45.3	1.30
UK	42.4	31.6	0.75

Source: Authors' Calculations.

Table 10 (b): Distance from the US[18]

Developing Countries	1990	2009	Ratio	
Argentina	47.3	19.6	0.42	(1)
Brazil	50.3	25.2	0.50	(2)
China	69.2	37.8	0.55	(4)
Egypt	82.3	58.9	0.72	(10)
India	70	63.4	0.90	(14)

Table 10 (b) continued...

Table 10 (b) continued...

Indonesia	71.8	60.4	0.84	(13)
Iran	63.8	32.1	0.50	(2)
Israel	57	31.5	0.55	(4)
Korea	54.8	39.7	0.72	(10)
Mexico	51.6	36.2	0.70	(8)
Nigeria	133.9	95.7	0.71	(9)
Pakistan	67	62.7	0.93	(15)
Russia	53.6	43.2	0.81	(12)
Saudi Arabia	80.5	93.3	1.16	(16)
South Africa	50.5	28.7	0.57	(6)
Turkey	54	30.9	0.57	(6)
Developed Countries				
Canada	12.7	15.1	1.19	
France	28.3	13.9	0.49	
Germany	34.2	21.5	0.63	
Italy	39.7	20.8	0.52	
Japan	51.6	19.9	0.39	
UK	38.9	22.7	0.58	

Source: Authors' Calculations.

The two sets of distances paint a somewhat common picture; but there are surprising differences also. First both estimations show that most countries whether developing or developed have moved closer to the US (Tables 10(a) and 10(b)). However, their relative ranks haven't changed much, with the rank correlation for 1990 and 2005 being 0.95. Rank correlation for ranks in 1990 and 2009 with the smaller set of indicators is 0.91. In terms of the ranks from the extended set of indicators, Saudi Arabia has improved its position and Russia and Japan have lost position. Japan has lost the most ground with respect to the US and even ranks below two of the developing countries, Argentina and Korea. Among the developing countries the only one with a large movement away from the US is Russia, though South Africa, Pakistan and Indonesia have also lost ground. Among the developed countries both Canada and Japan, particularly the latter, have moved away from the US. The continental European countries, particularly

France and Germany, have moved much closer to the US. This might imply that France and Germany could challenge the hegemonic position of the US and it could be seen as a sign of increasing multipolarity. Developed countries such as Canada and Japan which have lost relative power have been at the forefront of opposing the moves of the US to expand the G-7/8 to the G-20. The very fast convergence of the European countries, all of whom are members of the G-7 may have made the US feel outweighed in the G-7 in the current financial crisis, particularly as the US was being blamed for the crisis. The US administrations might then have championed the inclusion of the larger developing economies to counterbalance the European ones.[19] This could have interesting implications for international cooperation.

The developing countries are becoming more similar to the US and this may mean that they may have similar interests as the US. But China and India have shown the least movement towards the indicators of the US. This is mainly because they were so far from the US (Table 11) that movement towards the US still leaves them very far from the US.

The picture with the smaller set of indicators is similar . Most developing and developed countries are moving closer to the US, namely closing the gap between themselves and the US. Among the developed countries Canada again has moved away. The European economies especially France, Germany and Italy have moved closer to the US. An important difference, however, is that Japan now shows the greatest convergence towards the US. Among developing countries Saudi Arabia now shows that it is moving away from the US whereas in the full set of indicators it showed the greatest convergence. The smaller set of indicators shows a greater convergence. It is difficult to judge whether the differences there are because the situation changed after the crisis or because a smaller set of indicators is being used.

5.2 China, India and the US

To see why the position of China and India has not increased very substantially relative to the US between 1990 and 2005, we look at the differences in values for individual indicators (Table 11). We see that while

for both China and India the gap in internet users has decreased considerably in this period this is compensated by increases in some other variables. In the case of China the increase in the gap in the case of international reserves which have increased considerably in the case of China, almost matches the decrease in gap in internet users.

Table 11: Distance from the US (Contribution of the Individual Indicators)[20]

	China		India	
	1990	**2005**	**1990**	**2005**
GDP PC	9.32	8.08	9.26	9.67
Pop Density	0.63	0.62	4.7	6.09
FDI	0.03	2.23	0.86	0.0
Trade	0.62	5.01	0.07	0.8
World Trade share	9.2	2.27	11.61	12.98
CAB (per cent of GDP)	1.09	2.24	0.03	0.33
Reserves (per cent of GDP)	3.26	13.05	0.11	2.51
Energy Imports	0.02	0.88	0.0	0.01
Food Imports	0.19	0.02	0.16	0.4
Pub Expd: Health	3.1	6.99	0.72	1.93
Pub Expd: Education	3.21	4.38	4.84	6.07
Under 5 Mortality	0.41	0.46	3.81	1.56
Internet Users	17.83	5.98	17.83	6.66
Patents Granted	1.34	0.56	1.64	0.64
R&D Expd.	1.89	1.16	1.95	2.53
Researchers in R&D	8.84	5.32	6.77	7.05
Improved Water Access	4.9	3.51	4.9	1.3
Military Expd.	0.49	0.82	0.32	0.31
Armed forces (000s)	8.82	1.88	8.04	0.12
Tertiary Enrollment	9.47	6.65	9.48	9.16
Total	72.33	70.86	77.86	72.92

Source: Authors' Calculations.

Furthermore, the gap between China and the US has increased in the case of public expenditures on health and education. In the case of India there is no large increase in the gap in any single indicator but increases in

a number of them, e.g. public expenditure in health and education, R&D expenditures and foreign exchange reserves.

Will China or India catch up faster with the US in future? We have seen that the most important factors in determining economic power are various aspects of human capital. In all the four aspects of human capital, tertiary enrolment, patents granted, researchers in R&D and R&D expenditures, China has reduced the gap with respect to the US. India has only significantly reduced the gap in the case of a number of patents granted. There has been very little increase in tertiary enrolment in India as compared to China. With respect to the other two indicators India's gap with the US has increased. These relative movements in the indicators of human capital suggest that India is unlikely to rapidly close the gap with the US and this is in contrast to China's prospects. This suggests that it might be more difficult for India to sustain a high rate of growth as productivity increases are essential for this and these human capital indicators are necessary for rapid technical progress. Also because of lagging behind China in these indicators India might not be able to project power as successfully.

6. Conclusions

Developing regions and countries are contributing an increasing share of incremental world income, exports and capital flows. However, their increasing importance may not be indicative of their increasing economic importance as their GDP and more importantly their GDP per capita is so much smaller than that of the developed countries. The largest economies do not exhibit any large shift over the previous almost five decades in relative economic size as measured by their GDP. Also while other large economies both developed and developing are converging to the GDP and GDP per capita levels of the US this increase has been very gradual, seemingly almost stalling since 1982. Furthermore, while the developing countries are converging to the level of the US in terms of GDP fewer countries are converging in terms of GDP per capita. An index of economic power formed by aggregating 20 indicators also shows little sign of convergence of economic power even after the 2008 financial crisis. Even China and India show little convergence as the initial distance of the indicators from that in the US is very large.

Endnotes

1. There is no universally agreed definition as to which are the EEs. The Goldman Sachs' report which was one of the first to deal with this question considered Brazil, Russia, India and China (BRIC) to be EEs. Others would include South Africa and Mexico, making it BRICSAM, whereas still others would include Indonesia or Turkey. We do not try to resolve this issue and provide a definition, but carry out the analysis in terms of the 25 largest economies, largest in terms of their GDP measured at current exchange rates. We use current exchange rates rather than purchasing power parity (PPP) exchange rates as using the latter would require us to forecast PPP exchange rates in the future when relative incomes would have changed as PPP exchange rates are sensitive to income levels (Samuelson 1964; Balassa 1964).
2. For instance, there is the Shanghai Cooperation Organisation consisting of China, Russia and many central Asian states with expansion perhaps to include India, Iran, Pakistan, etc. IBSA with India, Brazil and South Africa, trilateral of Russia, India and China which Brazil has been joining and may be further extended to include South Africa. Leaders of Brazil, Russia, India, China and South Africa have announced the formation of a South Bank and a Contingent Reserve Fund for balance of payments support to developing countries.
3. GDP at PPP rates are available from the World Bank site from 1982 only, and so do not enable analysis over a longer time period. But trends are very similar since 1982 whether one uses the PPP series or the series in constant US 2000 dollars.
4. These are Argentina, Brazil, China, India, Indonesia, Russia, Saudi Arabia, South Africa and Turkey.
5. The share of the non-G-7 high income countries increased till the period 1990-2000, but has declined since then.
6. This suggests that some convergence may be occurring. Also some income gaps between the developed and developing countries may be narrowing.
7. This may be considered ironic as these economies were considered by many analysts in the 1980s to be the leaders and drivers of the world economy, and, perhaps, vying for hegemony in the world economy.
8. We had to exclude Poland and Russia from the comparison as we could not get data on their GDP for the earlier years. Also there were a number of small European countries who were in the top 25 for four decades, but have now dropped out. We took the top 25 countries in 2011 and then ranked them in the previous years.
9. Turkey's rank declined by 4 between 1965 and 1981 and it then rose by 7 by 2007. The net rise was, however, only 3.
10. Since then it has further raised its rank, seemingly becoming number 2 in 2010.
11. This was because of poor performance in the late sixties and early seventies, partly because of exogenous shocks as the poor harvests in 1965- 67, the oil price increases in 1973-4, the cost of feeding the refugees who came over from Bangladesh, then east Pakistan, and the later war with Pakistan, and the adjustment to cut-off of aid from the US and the world bank in the mid-sixties. The cut-off of US aid persisted whereas that of the World Bank was later reversed.

12. It seems to have slipped to number 3 in 2010.
13. The German and Japanese challenge, particularly the latter seems to have petered out and should serve as a caution for projecting past growth rates into the future.
14. For a discussion of the different methods that have been used in the literature see Agarwal (2011).
15. It is unclear whether this is because of the stricter intellectual property right laws which some theoretical models predict would lower the rate of innovative activity (Helpman 1993)
16. This shifting importance and the small size of the coefficients suggest that these are not very significant in explaining economic power.
17. Reserves as a percentage of imports or GDP have remained constant for the developed countries but risen for developing countries.
18. The distance function is calculated on the basis of the smaller set of indicators
19. There are some indications now that the US may like to keep the G-8 intact. The G-8 summit at Toronto was supposed to be the last for the G-8 and that also after a strong plea by Canada. But now there will be a G-8 summit in France in the spring of 2011.
20. For each indicator it is the square of the difference between the value of the indicator for the US and for that country for that year.

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