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**THE ECONOMIC BASIS OF GLOBAL POWER:
VIP² A SIMPLE INDEX OF NATIONAL POWER POTENTIAL**

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NOVEMBER 2005



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TABLE OF CONTENTS

	Page
FOREWORD	I
1 INTRODUCTION	1
2 ECONOMIC STRENGTH AND NATIONAL POWER	2
2.1 Commercial and Strategic Technology	3
2.2 Productive Capability	3
3 INDEX OF POWER	4
3.1 Aggregate Production Function	4
3.2 Power Potential: VIP ²	5
3.3 Actual Power: VIP	6
4 GLOBAL VIP² S	8
5 REGIONAL POWERS AND VIP² S	9
5.1 Europe	9
5.2 Asia	11
5.3 Other Regions	11
6 SENSITIVITY OF VIP² TO PARAMETER	12
7 THE HISTORICAL EVOLUTION OF POWER	13
7.1 Multi-polar Centuries	13
7.2 Bipolar or Uni-polar Century	14
8 THE FUTURE: POTENTIAL GLOBAL POWERS	17
9 GLOBAL POWER & UNSC	20
10 CONCLUSION	20

11	REFERENCES	23
12	APPENDIX I: VIP² OF 112 COUNTRIES	24

Table of Contents (continued)

Page

TABLES

TABLE 1: GLOBAL VIP ² S IN 2005	8
TABLE 2: GLOBAL RANKING OF EUROPE REGION VIP ² S	10
TABLE 3: GLOBAL RANK OF OTHER REGIONAL VIP ² S	10
TABLE 4: ELASTICITY OF VIP ² WITH RESPECT TO A	12

FIGURES

FIGURE 1: POWER POTENTIAL OF EUROPEAN POWERS IN 19 TH CENTURY	15
FIGURE 2: POWER POTENTIAL OF THE USSR AND THE SOVIET VIRTUAL STATE	15
FIGURE 3: GLOBAL IMBALANCE; GDP SHARE – POPULATION SHARE	18
FIGURE 4: INDIA, AN EMERGING GLOBAL POWER	19

Foreword

Though Paul Kennedy and other scholars of National Security, Diplomacy and Foreign relations have emphasized the importance of the economy in National Power, not many economists have taken an interest in such issues. The current paper is an attempt to bridge the divide. Economists, including those at ICRIER have worked both on matters of economic growth and on those of international economic relations. The present paper shows how the basic building blocs of growth theory, the aggregate production function, factor productivity and technical change can be used to define a simple index of global 'power potential' (VIP²). The index was first presented in an ICRIER working paper in December 2004, but the current paper has refined the concept and spells out the economic logic more clearly. It also comes to grips with the military aspects of power by defining another index, the index of (actual) power (VIP) that combines the index of power potential with a measure of defense and related capability.

The index of Power Potential is then used to measure the power potential of over 100 countries. The index is used to analyse the *Bipolar past*, the present '*Uni-polar world with a multi-polar fringe*' and the emerging *Tripolar future*. The paper provides a relatively objective measure of a when a country can be classed as a (potential) 'global power,' a 'regional power' or a regional VIP². The paper shows that India, which is currently merely a regional power, will become a global power within the next 20 years. It also analyses how this affects India's case for permanent, veto-bearing membership of the UN security council.

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1 Introduction*

The USA is often referred to as the most powerful Nation on Earth, particularly since the collapse of the USSR in 1990. It is well known that the US economy is the largest in the world. But does the size of an economy measure a Nation's power in a global context? During the cold war between the US and NATO and the USSR and Soviet Bloc the World was treated as being bi-polar, i.e. the two countries USA and USSR were recognized to be the two most powerful in the World of the time. The most visible part of their competition was in Space, Nuclear, Defense and other technology. The possession of advanced military equipment such as ICBMs, submarines, aircraft carriers, bombers and fighters was also an element of the relative power of these two nations. Since then complex models have been built to define and measure a Nation's Global Power. Economic and Technological factors play a major role in these models[see e.g. Tellis et al(2000)]. Other factors are natural resources, education & skills and investment in R&D and technology development.

State power is the “extent that (one) effects others more than they affect [one]”[Waltz (1979)]. It is therefore a “combination of its capacity to resist the unwelcome influence of others and conversely to influence others to behave as it wants them to.” International relations experts have been divided on the relative importance of economic strength and military might in the global power of a nation. We resolve this conflict by decomposing national power into two elements: (a) The ‘power potential’ of a country, which depends on economic strength and general technological capability, and (b) Military capability. This includes defense and strategic equipment and specific technologies needed for attaining military superiority. Together these define the Actual power of a country. International ambition and determination, the ‘Will to power’ play a role in transforming the ‘power potential’ into ‘actual power.’

Virmani (2004, 2005) proposed a simple index of ‘power potential’. In this paper we present the index (christened VIP^2), discuss its rationale and calculate the value of this index for all the medium & large countries in the World. We also define an index of actual power (VIP) based on VIP^2 , which requires a separate measure of Military capability.

The next section discusses the economic basis of national power. Section 3 defines the VIP^2 (Virmani index of power potential). This index is then calculated for about 110 countries (appendix). Sections 4 and Section 5 present and discuss the results for the Global and Regional Powers. Section 6 gives a sensitivity analysis on the key parameter used on the index. Section 7 delves into the past century by constructing the VIP^2 index for the USSR and the UK and analyzing how this matches with the general perceptions about the decline of British power and the emergence of a bipolar World. It suggests that the basic conditions for bipolarity disappeared a decade before the break-up of the USSR. Section 8 discusses the likely (future) evolution of the VIP^2 clubs. Section 9 analyses the implications for permanent, veto bearing membership of the UN Security Council. Section 10 summarizes the conclusions of the paper, suggesting that the current situation could perhaps be described as one of a ‘*Uni polar World with a Multi-polar fringe*’.

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2 Economic Strength and National Power

An appreciation of the role of economic size and technological potential on the Global Balance of Power has grown since the Second World War. Prof. Paul Kennedy, in his Foreign Affairs article and subsequent book, 'The Rise and Fall of Great Powers' gave economics considerable weight in the evolution of the Global balance of power. He made the following points:

- Traditional Field of International Relations has not fully appreciated the role of economic strength, with the role of economic factors relatively neglected!
- Military power rests on and is sustained by economic power.
- The rise and fall of great powers can be traced to the change in their economic strength.
- Relative rather than absolute economic strength is the relevant variable.
- There may be leads and lags between the change in economic power, Military power and National Power.

Economic Power is the foundation of National Power. Economic Strength is the only sustained and sustainable basis for national power and Relative Economic Power is the basis for National Power. Even though military power disproportionate to economic power can be used to enhance national power for a certain period of time, this is not sustainable over long periods. This was illustrated by the break-up of the USSR, where the Military and Strategic competition could not be sustained by a declining economy. The role of economic factors in International Affairs is, likely to be much greater in the 21st century than it has been in previous centuries. With the growth of communication and the increased mobility of goods & services, labor, capital and technology, much technical knowledge is becoming the common heritage of mankind in reality. General technological capability is increasingly part and parcel of economic evolution, and 'economic factors,' therefore, encompasses this technology. The process of modernization and global economic integration has expanded the gains from economic co-operation between states, reduced the gains to the winner from war, and increased the potential losses to third parties from active war between states. The lags between the rise or decline of economic power and the rise or decline of great powers are also likely to shorten during the 21st century.

Tellis et al (2000) have developed a comprehensive and complex model for measuring power in terms of the ability of a State to achieve and sustain global hegemony. In their model military capability is the outcome of an interaction between national resources and national performance. National resources consist of five building blocks of power, technology, enterprise, human resources, financial/capital resources and physical resources. National performance contains three factors, infrastructural capacity, ideational resources and ideational resources that augment or detract from the utilization of these natural resources.

The factors mentioned in the Tellis model are all inputs into the productive capacity of an economy, though their economics nomenclature and definition may be different. Thus a country's natural resource (e.g. oil), physical capital stock (including the stock of infrastructure), human capital (education & skills) and technology (including management, marketing and entrepreneurship) are all inputs into the production of national output and are formally included in the aggregate production function of the economy (section 2.3). The Gross Domestic Product of a country, which is the output produced by all these inputs, given the external (e.g. technology denial) and internal (e.g. quality of governance, social

divisions/conflicts) constraints facing economic agents, is therefore a summary index of its 'national resources' and 'national capacity.' Even more broadly the growth of a country's GDP and the level it has reached reflects both the strengths and weakness of its Society (Social capital, religion, culture, family) and Institutions (Political, market regulating, Non-profit organisations, civil) in addition to the its National Policies.¹

2.1 Commercial and Strategic Technology

There is need to distinguish between two categories of Technology; Commercial and Strategic.² Commercial technology is part and parcel of normal trade, financial flows and movement of managers and skilled personal between open economies. FDI normally bundles two or more of these together. Any specific commercial technology (not available at a given time in the country) can therefore either be purchased from global markets or be attracted to the country through FDI (joint ventures etc.).

Strategic technologies are the technologies of power. They include military related technologies as well as nascent technologies that may play a critical role in future defense systems. Because of the uncertainty inherent in forecasting the future, less developed technologies may at one stage be classed as 'commercial' and at another stage as 'strategic.' By definition strategic technologies are critical to national power and are not traded on commercial considerations. General technological capability forms the foundation of strategic technology, but its development requires specific and focused attention. It has either to be developed through national effort or acquired through strategic/military alliances.

General technological capability therefore has a dual role: It is the foundation of the productive capability of the economy and also the foundation for the development of specific strategic technologies. Thus in the real world in which nations guard their strategic technological knowledge, those with higher technological capabilities have a greater ability to develop strategic technology and therefore greater power potential.

2.2 Productive Capability

The economic capacity of a country at any point in time is measured by its Gross Domestic Product (GDP). This represents its output of Goods and Services during the year. The same economy can produce different goods and service in different amounts, with the actual pattern of output depending on the pattern of demand. In general two economies can differ not only in their productive capacity but also in the pattern of demand. So how do we know that one economy is larger than another i.e. has greater productive capacity? The only way to compare the size of different economies is by valuing all goods and services produced in each, by using a common set of relative prices. Such a measure of a country's economy is referred to as Gross Domestic Product at Purchasing Power Parity (Y).³

The technological capability of an economy depends on many factors. Virmani (2004) has used the principle of OCCAM's razor to define technological capability in the simplest possible way. This is done by using the familiar concept of an aggregate production

¹ The quality of institutions is an important determinant of growth. Social capital and related variables are also found to be significant.

² "Dual use technologies" represent the overlap between the two types.

³ If the economy is open and competitive it also follows that it is producing things in which it has a comparative advantage and importing those which others produce relatively efficiently. If the policy distortion prevent this from happening the economy's productive capacity will be reduced and this will be reflected in GDP at PPP.

function.⁴ When viewed from the perspective of productive capacity an economy consists of different productive resources such as unskilled labor, stocks of physical capital, human capital in the form of education & skills, natural resources such as oil & minerals dis-embodied technology (organizations) and technological capabilities embodied in capital goods and human beings. The aggregate production function shows how these resources can be combined to produce output i.e. it summarizes the productive capacity of the economy. The aggregate production function and the related concept of aggregate factor productivity can be used to define the general technological capability of an economy.

The concept of total factor productivity growth (TFPG) is commonly used in economics to measure technological change in an economy. Conceptually the level or value of total factor productivity (TFP) could represent the technological capability of a country. Its operationalisation, however, requires the assumption that technology is dis-embodied and neutral.⁵ As we have indicated, technology is often embodied in capital and labor i.e. it is inseparable from the physical capital or the laborer/employee.⁶ In addition, historically we observe that capital intensity (capital per unit of labor input k), the education/skill level of the labor force (human capital per person h) and technology (T) move broadly in tandem as an economy develops. In other words, for new/better technology to be translated into higher output per person an appropriate compliment of better skills and more capital per person is also needed i.e. they form a package that together produces a higher level of productivity. Labor productivity or output per unit of labor is a summary measure of the level and quality of this package of technology, capital intensity and skill intensity. As it is much easier to define and measure than TFP, it is operationally a more useful measure of an economy's technological capability than TFP.⁷ Per capita Gross Domestic Product at purchasing power parity or GDP per person ($y = Y/L$, with L = population) can therefore be used as a summary measure of the 'general technological capability' of an economy. This is illustrated more formally below.

3 INDEX OF POWER

3.1 *Aggregate Production Function*

At the heart of the modern theory of economic growth and development is the (aggregate) production function of an economy. The aggregate production function summarises the supply capability of the economy that is its ability to produce a host of goods and services. The mix of goods and services actually produced depends on the pattern of domestic demand. The simplest algebraic representation of the aggregate production function is as follows:⁸

$$Y = T F(K, H, L)$$

⁴ Familiar to economists and particularly macro-economists.

⁵ See section 3.1 below

⁶ Section 3.1

⁷ Section 3.1

⁸ Each of the variables will change over time i.e. $T(t)$, $a(t)$, $b(t)$, $K(t)$, $H(t)$, $L(t)$, $Y(t)$. For visual simplicity we have dropped the time subscript from all the variables.

where Y is GDP, T is the level of technology or total factor productivity, F is a function of different factors of production such as K the stock of physical capital, H the stock of human capital (education & skills) and L the size of the labor force. Here T represents the technological capability of the economy, assuming that technology is neutral and disembodied. Given this assumption the aggregate production function can be estimated for any group of economies and used to derive the level of technology for each country. This has indeed been done by many economists. This production function can be re-arranged to obtain per capita GDP:

$$y = T f(k, h)$$

where $y = Y/L$ is the per capita GDP, $k = K/L$ is the amount of physical capital per person and $h = H/L$ is the average level of human capital.⁹

From the perspective of the current paper namely to define and measure economic power, this assumption of neutral technical change and disembodied technology is highly restrictive and unnecessary. We therefore propose to use a more general and complicated representation of the aggregate production function that paradoxically simplifies the measurement of economic power:¹⁰

$$Y = T F(aK, bH, L) \text{ and on re-arrangement } y = T f(ak, bh)$$

Where a and b represent biased technical change. In addition technology is often embodied in capital, which makes the determination of K itself quite complicated. In this case, which is more realistic from our current perspective it is not only very difficult to measure T , but T no longer fully captures the level of technology of a country. In this case, y captures all the relevant aspects of knowledge and technological capability, whether embodied in physical capital or existing in the brains of workers/professionals (i.e. education and learned skills). Thus it is the simplest and best available index of general technological capability of an economy, in that per capita GDP across countries is highly (but not perfectly) co-related with the technological capability of countries.¹¹

3.2 Power Potential: VIP^2

A Nation's power potential (NPP) can therefore be defined as the multiple of the size of its economy measured by the GDP at purchasing power parity (Y) and its technological capability measured by its Per Capita GDP (y):

$$NPP = Y * y^\alpha, \quad y = Y/L,$$

L is the population and α is a parameter that can have a value between 0 and 1. If we substitute $Y = y * L$ in the above equation and put $\beta = 1 + \alpha$, we obtain;

⁹ This requires an additional assumption of constant returns to scale that has been widely shown to be prevalent.

¹⁰ Another dimension of complication would be to include a term for natural resource stocks, i.e. $Y = T F(K, H, R)$, where R represents natural resources (e.g. oil, minerals). This can be an important element of economic power for major oil exporters like Russia and Saudi Arabia.

¹¹ Our guess would be that differences in per capita GDP capture at least 90% of the difference in technological capability.

$NPP = L * y^\beta$ where β is a parameter that can have a value between 1 and 2.

The *Virmani Index of Power Potential (VIPP)* or **VIP²** in short, is the power potential of a country (as defined above) relative to the USA:

$$(1) VIP^2 = (Y/Y_{usa}) * (y/y_{usa})^\alpha, \text{ where } 0 \leq \alpha \leq 1$$

Or equivalently as

$$(2) VIP^2 = (L/L_{usa}) * (y/y_{usa})^\beta, \text{ where } 1 \leq \beta \leq 2$$

A number of conclusions follow from these equations;

If $\alpha = 0$ ($\beta = 1$) then

(a) The power potential of a country is measured by its GDP (at purchasing power parity) relative to that of the USA. A country with a higher GDP is potentially more powerful than one with lower GDP. Implicitly population and per capita income (GDP) have equal weight.

If α is non-zero, then

(b) If two countries have the same GDP but one is richer than the other (higher per capita income/GDP)¹² the richer country will be potentially more powerful. As per capita income is an indicator of general technological capability, this multiplies the power potential of a given GDP. Overall it also means that technology (per capita income) has a greater weight in determining power potential than population (number of people). In applying this index to measure the relative power of countries we assume that $\alpha = 0.5$ ($\beta = 1.5$).¹³ The power potential of all countries with a GDP at purchasing power parity of more than \$ 15 billion in 2002 (WDI 2004) is estimated using this index.

3.3 Actual Power: VIP

‘Actual power’ will however depend (among other things) on the proportion of national resources spent on developing these strategic technologies and in translating them into weapons systems. As both these items are classified as Public goods the difference between actual and potential power will depend on the allocation of expenditure on public goods as a whole as well as on the allocation to different types of public goods. Strategic alliances with a more powerful country can achieve the same objective at lower resource cost if the more powerful country transfers strategic technology to the less powerful one. Clearly the more powerful country will only do this if the less powerful one is able to enhance its Power or Welfare in some other way (e.g. provision of bases, supply of soldiers/guerilla fighters, oil contracts, help in anti-terrorist operations).¹⁴

¹² The other country therefore has a large population.

¹³ For this set of medium-large countries we estimated for 2002 the relationship between Per capita GDP measured at current exchange rate x and Per capita GDP at purchasing power parity y . On running a cross section regression for 2002 data we find the following relationship: $x = A y^{0.5}$. This was one of the reasons for selecting $\alpha = 0.5$ after simulating the index for a range of α values from 0.25 to 0.75.

¹⁴ 48th ranked Pakistan has been one of the most successful users of formal and informal alliances (in the last 50 years) to enhance its actual power way above its ‘power potential’ (lower than Algeria’s 47).

In the national accounts expenditure on public goods like defense and strategic technology, is treated as current expenditure valued at current cost. From the perspective of national power it is more like an investment in capital equipment. Further as it is not a commercial tradable good or technology its value is not equal to the cost or notional price at which it is acquired. The shadow price of a strategic good for a country that does not have the capability to produce it is much higher than the cost expended by the country which has already produced it. If we are to compare the diverse range of investments by different countries we must use the same shadow price for all countries.¹⁵ If the value of this investment over time can be correctly cumulated into a stock of strategic technology and equipment this would explain a substantial part of the difference between “potential” and “actual” power.

Formally this can be written as,

$$K_t^s = p_t E_t - \delta K_{t-1}^s ,$$

where at time t , K_t^s is the stock of strategic technology t , E_t is the expenditure on this technology valued at the shadow price p_t and δ is the rate of depreciation of the stock. The Virmani index of actual power (VIP) could then be defined as, a function (G) of VIP^2 and the relative strategic capability or capital stock of the country:¹⁶

$$VIP = G(VIP^2, K^s / K_{us}^s) \text{ or simply}$$

$$VIP = VIP^2 * K^s / K_{us}^s, \text{ assuming that the } VIP^2 \text{ are 'separable.'}$$

The former USSR spent a lot of resources on strategic technologies & goods (E) and thus attained a level of VIP that was much greater than its VIP^2 .¹⁷ This level of expenditure on one public good perhaps led to the neglect of others. The USSR was ultimately unable to sustain such high levels of public expenditures on strategic technology given its declining economy. The accumulated strategic knowledge (K^s) though it has deteriorated over time has not been lost. Though the economy of Russia is much smaller than the USSR and the Warsaw pact, the reduction in the ‘power potential’ was greater than the reduction in the strategic capability (K^s). Therefore the gap between its ‘power potential’ and its ‘actual power’ remains much larger than is usually observed among normal nation states.

Conversely, Japan after its defeat in World War II became a pacifist nation, which deliberately reduced expenditure on strategic technology, defense systems and forces. It also gave up any ambitions of being an independent power in Asia. Its ‘actual power’ is therefore lower than its ‘power potential.’ Post war Germany also has some of these characteristics. In addition some very small economies with low power potential (e.g. Israel, Pakistan) have skillfully used formal or informal alliances to attain a level of actual power far in excess of

¹⁵ This will be higher than the highest cost incurred by any country.

¹⁶ The first, general form allows for complementarities/synergy between economic and military/strategic elements (e.g. investment in strategic technology that has positive spin-off on the civilian economy) or substitutability (allocation of given funds between building roads and buying defense equipment).

¹⁷ Further its power potential was related not just to the economic size of the USSR but to economic size of the Warsaw pact which was more like a Soviet empire. The Warsaw pact was in the context of power more integrated than the current EU.

their power potential. In general, however, country expenditure on such technology/systems is highly correlated with GDP, and consequently so is actual power and power potential.

4 Global VIP² s

After calculating the Index of power potential for each country in the world for which GDP and population data is available in the World Bank WDI for 2003, we rank them from most powerful to weakest. We also use the IMF GDP data for 2004 and its projections till 2006, to calculate the index for all medium-large countries for 2005(appendix). For selected countries we extend the forecast up to 2008 and beyond.¹⁸ We define the Global VIP²s by using a cut-off value of the index of 5%.¹⁹ This gives us 13 global VIP²s and one borderline case (table 1).

Table 1: GLOBAL VIP² s IN 2005

Economy	VIP ² Rank							GDP Rank			Index of Power: VIP ²						
	2003	2005	2007	2010	2012	2016	2023	2003	2005	2007	2003	2005	2007	2010	2012	2016	2023
Global Powers																	
United States	1	1	1	1	1	1	1	1	1	1	100%	100%	100%	100%	100%	100%	100%
Japan	2	2	3	3	3	3	4	3	3	4	28%	27%	26%	25%	24.8%	23.7%	21.8%
China	3	3	2	2	2	2	2	2	2	2	22%	25%	29%	34%	39%	48%	67%
Regional Powers																	
Germany	4	4	4	4	4	5	5	5	5	5	18%	17%	16%	15%	14.8%	14.1%	13.2%
France	5	5	5	5	7	7	7	6	6	6	13%	12%	12%	12%	11.7%	11.3%	10.8%
United Kingdom	6	6	6	6	6	6	6	7	7	7	13%	12%	12%	12%	11.7%	11.6%	11.3%
Italy	7	7	7	8	8	8	11	8	8	9	12%	11%	11%	10.2%	9.8%	9.2%	8.2%
India	9	8	8	7	5	4	3	4	4	3	7.8%	8.5%	9.3%	10.8%	11.9%	14.9%	22.3%
Canada	8	9	9	9	9	10	10	11	11	11	8.0%	7.8%	7.9%	8.0%	8.1%	8.2%	8.2%
Russia	11	10	10	10	10	9	8	10	9	8	6.0%	6.5%	6.9%	7.4%	7.7%	8.5%	9.7%
Spain	10	11	11	11	12	12	12	13	13	13	6.5%	6.4%	6.4%	6.5%	6.5%	6.6%	6.6%
Brazil	12	12	13	13	13	13	13	9	10	10	5.7%	5.8%	5.7%	5.7%	5.7%	5.5%	5.1%
Korea, Rep.	13	13	12	12	11	11	9	14	14	14	5.5%	5.5%	5.9%	6.4%	6.7%	7.4%	8.5%
Australia	14	14						16	17		4.8%	4.7%	4.8%	4.8%	4.9%	5.0%	5.0%

According to our index, China is now the third strongest power in the World and will displace Japan in second place in the next few years. The larger rich countries of Europe, Germany, France, UK and Italy are long time members of the global VIP² club and will remain more powerful than India for some time even though the latter's economy is the fourth largest in the world.²⁰ India has just moved into 8th rank in the global VIP² club displacing G7 member Canada. Its GDP will become larger than Japan's in the next three years, and its power will exceed that of Italy a year or so later (see below). Its power potential is greater than that of Russia, which is in 10th place behind Canada. As noted earlier Russia's actual power is greater than its 'power potential' because of the historical legacy of the Soviet empire. The other members of the global power club are Spain, Brazil and South Korea. S. Korea's power potential is rising relative to that of Spain and Brazil and is likely to exceed it in the next five years.

¹⁸ These are based on forecasts of growth rates of countries that assume that the global economy evolves smoothly and that there are no large global or national shocks such as existential energy or water crisis

¹⁹ The alternative would be to take the top 10 or 15.

²⁰ In GDP at PPP, the only way to compare the size of two economies. Their GDP converted at the current exchange rate is much larger than India's.

The set of global VIP² s is not necessarily identical to the set of global powers. The latter would constitute a sub-set of the former. Countries with a VIP² of less than 10% cannot lay claim to being global powers and a cut-off value double this appears reasonable. The benchmark could therefore be 20%. By this criterion only China and Japan qualify today (in addition to the USA). Germany which was a potential global power till a decade ago is no longer one.

5 Regional Powers and VIP² s

The academic debate and general discussion of international relations often refers to regional powers. Is there any way of objectively defining these regional powers. We can use our index with a cut-off percentage of 1.5% to first define the set of Regional VIP² s i.e. the members of the regional VIP club. These are given in tables 2 and 3 below. Among the different regional groupings, unsurprisingly, Europe has the largest number of regional VIP²s (14), followed by Asia with 9 (including global powers). Latin America & Caribbean (LAC) and N. Africa & Middle East have only three Regional VIP²s each, while Sub-Saharan Africa has only one.

The 'regional powers' constitute a sub-set of the regional VIP² s. One sub-set that comes naturally to mind are those members of the global VIP² club whose Index is below the benchmark for a 'Global power' (table 1). By this criterion there are six regional powers in Europe, two in Asia and one each in North America and Latin America.²¹

5.1 Europe

Twelve of Europe's fourteen regional VIP²s are the known rich countries of Western Europe. Poland and Russia are the only two regional VIP²s from Eastern Europe. Russia has been placed in Europe because much of its GDP arises in that continent, even though much of its physical area lies in Asia. Germany, France, UK, Italy and Spain along with Russia can be classed as regional powers in Europe. The last could perhaps also be categorized as a regional power in Asia also.

If all the members of the EU including the regional powers listed above had surrendered their entire power to the EU (voluntary emasculation), they would no longer be regional VIP²s. The EU would thereby become a 'virtual state' with a VIP² of about 80% i.e. a global power second only to the USA. The World would then be bipolar (neither uni-polar nor multi polar).²²

If EU member States surrendered half their power to an elected EU govt. with complete and unfettered right to exercise these powers, EU would be a global power with the second highest VIP² (about 40%). But the individual power of Germany, France, UK & Italy would become less than that of Canada and India, though it would still be more than that of Brazil and S. Korea (except for Italy's).

²¹ Leaving aside the three global powers, USA, China and Japan.

²² A common stand on WTO negotiations or a common tariff should not be confused with being a 'virtual state.' Any group of independent Nations can have a common stand on one or more issues (G8, G4, G20, G5). Even though the EU's stand may have a greater degree of permanence because they are institutionalized, there is no EU govt. deciding on or acting on these issues without the approval of member States.

Table 2: Global Ranking of Europe Region VIP² s

Country	VIP² Rank		GDP rank		VIP²	
	<u>2003</u>	<u>2005</u>	<u>2003</u>	<u>2005</u>	<u>2003</u>	<u>2005</u>
Regional Powers						
Germany	4	4	5	5	18%	17%
France	5	5	6	6	13%	12%
United Kingdom	6	6	7	7	13%	12%
Italy	7	7	8	8	12%	11%
Russia	11	10	10	9	6.0%	6.5%
Spain	10	11	13	13	6.5%	6.4%
Other regional VIP²s						
Netherlands	17	17	19	24	3.9%	3.7%
Poland	21	19	24	23	2.2%	2.3%
Belgium	18	20	29	30	2.3%	2.4%
Austria	22	26	33	34	2.0%	2.0%
Sweden	27	27	34	35	1.9%	1.9%
Switzerland	26	28	36	37	1.9%	1.9%
Norway	30	31	42	42	1.6%	1.6%
Greece	31	32	37	36	1.5%	1.5%

Table 3: Global Rank of Other Regional VIP² s

Region/Country	VIP² Rank		GDP rank		VIP²	
	<u>2003</u>	<u>2005</u>	<u>2003</u>	<u>2005</u>	<u>2003</u>	<u>2005</u>
ASIA						
Global Powers						
Japan	2	2	3	3	28%	27%
China	3	3	2	2	22%	25%
Regional Powers						
India	9	8	4	4	7.8%	8.5%
Korea, Rep.	13	13	14	14	5.5%	5.5%
Australia	14	14	16	17	4.8%	4.7%
Other VIP²s						
Taiwan, China	16	15	17	16	4.0%	4.5%
Thailand	24	22	21	19	1.9%	2.2%
Indonesia	23	25	15	15	2.0%	2.1%
Hong Kong, China	32	30	41	40	1.4%	1.6%
Latin America & Carribean						
Brazil(regnl power)	12	12	9	10	5.7%	5.8%
Mexico	15	16	12	12	4.2%	4.2%
Argentina	19	18	23	22	2.3%	2.5%
Sub-Saharan Africa						
South Africa	20	21	20	21	2.3%	2.4%
N Africa & Middle East						
Turkey	25	23	18	18	1.9%	2.1%
Iran (IR)	28	24	22	20	1.8%	2.1%
Saudi Arabia	29	29	28	28	1.6%	1.7%

5.2 Asia

Though Asia has nine members in the regional VIP² club, one of these is politically a part of China and another is claimed by it. This leaves only seven countries in the club, almost half the number in Europe. Among the seven, four countries are also members of the global VIP² club.

Of these China and Japan are potential global powers. India is clearly a regional power, while S. Korea is also a potential regional power. The other three members of the Asian regional VIP² club are Australia, Thailand and Indonesia. Of these three, Australia could also be considered a regional power as its Index was only marginally less than the cut-off level for the global VIP² club and is likely to exceed the cut-off in a few years.²³

As ASEAN's economic integration is minimal compared to the EU it would be highly premature to discuss its possible emergence as a regional power, even though its VIP² would be above the benchmark we have set (i.e. about 6.5%).

5.3 Other Regions

The LAC region has a total of three nations who qualify as members of the regional VIP² club, of which one, Brazil is a member of the global club. The other two are Mexico and Argentina, with the former a competitor of Brazil. Brazil's power potential is, however, currently half that of Italy's and 68% of India's. It is projected to be half that of India in about six years (& more than half of Italy's). The only reason for considering Brazil for permanent membership would be if it represents the whole of LAC instead of itself.

South Africa is the sole member of the Sub-Saharan Africa regional VIP² club with an Index less than that of Argentina. The index for the three members of the middle-east regional club, Turkey, Iran and Saudi Arabia have an even smaller power potential index than South Africa. One noteworthy fact is that two countries, often mentioned as regional powers, Egypt and Nigeria do not meet even the less stringent criterion of membership in the regional VIP² club. Nor does Nigeria, whose power potential index is a small fraction of that of S. Africa. Talk of Nigeria being a permanent member of the UNSC therefore appears to be divorced from reality.

Brazil is the only regional power in LAC, while Africa and the Middle East have no countries that meet the regional power threshold of a VIP² of 5%. South Africa's power potential is 2/5th that of Brazil's. There is thus even less justification for South Africa to have a permanent seat on the UNSC than there is for Brazil. If it was representing the whole of Africa or at least Sub-Saharan Africa a case could be made.

²³ Pakistan's power potential is less than Egypt's and neither country meets the benchmark for being classed as regional VIP². The low rank of Pakistan (48), below Egypt (46) and Algeria (47) and just above Vietnam (51) and Bangladesh (52) suggests that it has enhanced its actual power above its 'potential,' through the use of alliances. Similarly Egypt's importance to the USA/West increased with its peace treaty with Israel.

6 Sensitivity of VIP² to Parameter

The choice of the value of 0.5 for the technology weighting parameter is based on judgment. It is therefore use full to test the sensitivity of our results on the VIP². We do this by measuring the impact of a change in α from 0.5 to 0.55 (i.e. by 10%) on the VIP² for the set of Global VIP²s. The results are summarized in Table 4. The elasticity of VIP² with respect to the parameter α is given in column 2 and the per capita GDP at purchasing power parity in column 3. It is seen that the elasticity is inversely related to the per capita GDP. The elasticity is negative up to a threshold level of income (around 2/3rd of US income) and positive above it. Thus VIP² decreases/increases with α below/above the threshold. Thus below the threshold, if α is raised above 0.5 (as assumed), the VIP² of poorer countries will fall proportionately more than for richer countries. Among the set of global VIP² s India's relative position worsens (improves) most as α increases (decreases), followed by the relative position of China and Brazil.

Another way of looking at the same results is as follows. The elasticity for high income countries is fairly small with most falling in the range of 0 to - 0.18. The elasticity is significantly lower for middle income countries, ranging from -0.2 to -1. The elasticity in the case of low income countries is below -1. This suggests that the band of uncertainty in measuring power potential using our index VIP² is considerably higher in the case of low income countries and this uncertainty declines as a country's per capita income rises.

Table 4: Elasticity of VIP² with respect to α

Country	Elasticity VIP ² wrt α 2005	Per capita GDP (relative to USA)	Population (relative to USA)	Per capita GDP at PPP	Pop 2005
Canada	-0.11	80%	0.1	31865	32.2
Australia	-0.12	78%	0.1	31006	20.3
Netherlands	-0.14	73%	0.1	28906	16.4
Japan	-0.16	75%	0.4	29807	127.9
Germany	-0.17	71%	0.2	28392	60.2
France	-0.17	72%	0.3	28433	82.6
UK	-0.17	71%	0.2	28365	59.7
Italy	-0.18	69%	0.1	27390	22.7
Taiwan	-0.18	70%	0.2	27792	57.8
Spain	-0.26	59%	0.1	23392	41.9
Korea, S	-0.35	49%	0.2	19316	48.4
Russia	-0.64	27%	0.5	10535	142.1
Mexico	-0.69	24%	0.4	9610	104.9
Brazil	-0.76	21%	0.6	8216	181.4
China	-0.91	14.8%	4.4	5897	1304.6
India	-1.18	8.1%	3.7	3216	1096.9

Given the higher uncertainty in the measure of power potential of poorer countries, we hypothesize that alliances, formal or informal, can make much more difference to their actual power than they do for high income countries.

7 THE HISTORICAL EVOLUTION OF POWER

Though formal testing of the proposed index is not possible it is useful to see how well the Index tracks the evolution of power relations in the past two centuries. As official data on GDP at purchasing power parity from the World Bank and IMF is only available from 1975 onwards, we use the Kham-Geary purchasing power indices constructed by Angus Maddison (2003) for this purposes. These indices are however available only for selected years till 1950 after which annual data is available.²⁴ These are used to construct the Power Potential Index.²⁵

The industrial revolution gradually made much of China's and India's strategic assets obsolescent vis-à-vis the strategic assets of the European countries in which the industrial revolution was taking place. Thus, even though India's (China's) power potential (VIP²) was 3.2 (3) times that of France (the strongest power) in 1700 and 1.7 (3.7) times that of UK in 1820, India's (China's) actual power (VIP) became much smaller than that of many European nations. The failure of China and India to adopt the industrial revolution, resulted in a sharp drop in the real value of their strategic capital, which dropped to a fraction of that of these countries, thus opening a massive gap between their power potential (VIP²) and their actual power (VIP). We therefore leave out these two countries from the analysis based on VIP².

More generally in the 18th and 19th centuries when the European powers were willing to conquer, colonize and subjugate non-white people and treat them as an intermediate species, the role of military might was much greater than it is today. Thus the index of power potential VIP² would be less useful relative to the index of actual power VIP in the colonial era than it is today.

In the globalised world of the 21st century the importance of economic factors is much greater than it was in earlier centuries and the VIP² rankings are highly co-related with the VIP rankings. With conquest of Eastern Europe by the USSR at the end of the second World War, the Warsaw pact consisting of the USSR and Eastern Europe become what may be termed a 'Virtual State.' Though consisting of ostensibly separate nation states, it acted in its external dealings as well as among its members as a single state. The power potential of such a 'virtual state' can be approximated by treating it as a single State.

7.1 Multi-polar Centuries

Figure 1 shows the power potential of the major European powers as measured by the index VIP². The UK is taken to be the benchmark power, so that the power potential is measured relative to it (i.e. it has a index value of 1 or 100%). The broad picture that emerges is that France had the strongest global power potential in the 18th century and the UK in the 19th century. The second fact that emerges is that even at the height of British power around the middle of the 19th century, both the declining power France and the rising power, the USA had between 70% and 75% of the power potential of the UK. Similarly in the 18th century the second ranked power had between 70% and 80% of its power potential

²⁴ The data for the year 1760 and 1800 (1880) has been constructed by using the growth rate from 1700 to 1820 (1870 to 1913) to interpolate.

²⁵ These may not match for the WDI data. For instance the average VIPP for UK for 1975-1990 calculated using Madison data is 2% (1/50th) less than that using WDI data.

(though the country in second position changed). Third, the power potential index indicates that the World was inherently multi-polar for much of these two centuries, with even the 5th ranked power having between 55% (45%) and 65% of the power potential of the most powerful country in the 18th (19th) century. Balance of power strategies and diplomacy were therefore essential to stability and security in Europe as emphasized by Henry Kissinger. Further, establishment of British predominance required exploitation of the economic resources (including labor & human capital) of the Empire and particularly of India. Agreements regarding 'spheres of influence' outside Europe may also have contributed to the colonial conquest of Asia, Africa and Latin America, whose strategic assets had become obsolescent.

7.2 Bipolar or Uni-polar Century

In 1913 at the start of the 20th century the USA was clearly the dominant power before the start of the first World War (figure 1). The UK however still ranked second with Germany nipping at its heels at third rank after growing rapidly between 1880 and 1913. The USSR (3rd) and France (4th) had almost the same power potential, with Italy bringing up the rear (figure 1). The US rise between 1880 and 1913 was meteoric with its power potential more than doubling relative to the UK.

The USA has therefore clearly been the predominant power since the beginning of the 19th century. It is therefore interesting to note that the USA's share of World GDP was only 8.9% in 1870 and had risen to 19% in 1913. It rose to a peak of 28% in 1951 and declined thereafter to about 21% in 1975. It has been fairly stable between 21% and 22% between 1975 and 1990.

Figure 2 shows the power potential measured by VIP² with the USA as the benchmark²⁶. The United Kingdom was still the second most powerful nation in the World in 1913 with a power potential about 42% of that of the USA. Combining the Indian economy (The Jewel of the Crown/British Empire) with that of the UK and treating the two as a 'Virtual State' results in a power potential of 49% (not shown). In other words a subjugated India contributed about 7% points or 1/6th to the power potential of the UK.²⁷ It has been noted by strategic analysts that the UK was perhaps the first power in history to yield its dominant position without a war. In the light of the rapid fall in its power potential (as measured by the VIP²) till 1913 and its subsequent decline to 20% by 1950, the UK seems to have acted very wisely.

²⁶ These may not match for the WDI data. For instance the average VIPP for UK for 1975-1990 calculated using Madison data is 2% (1/50th) less than that using WDI data.

²⁷ This is not shown in the figure below.

Figure 1: POWER POTENTIAL OF EUROPEAN POWERS IN 18th and 19th Century

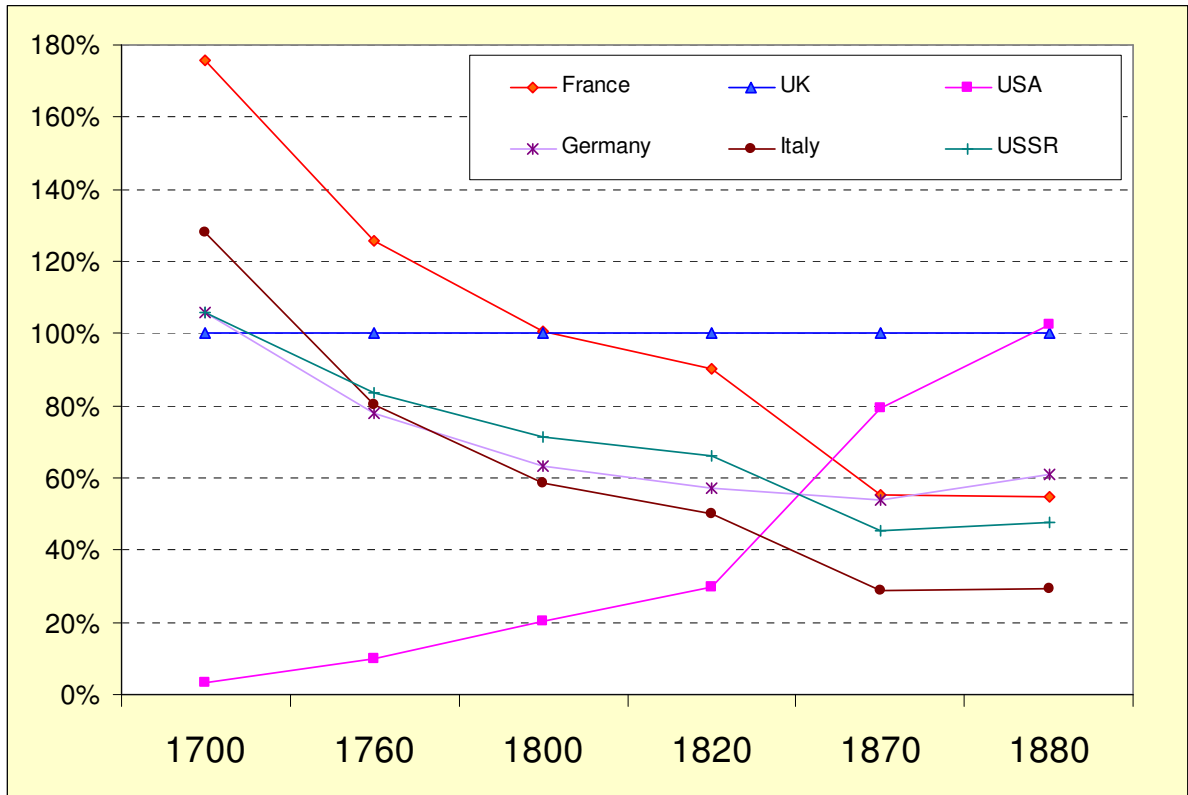
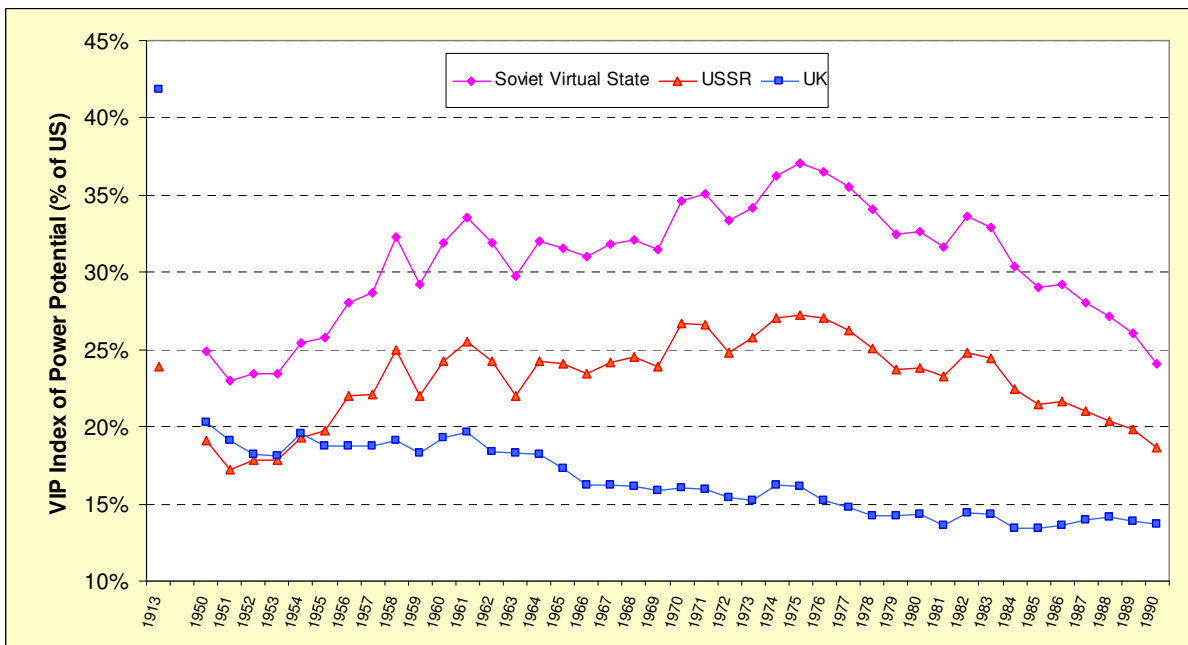


Figure 2: POWER POTENTIAL OF THE USSR AND THE SOVIET VIRTUAL STATE



The power potential of the USSR in 1913, in contrast, was only 24%, enough to classify it as a Great Power. As a result of the two world wars its power potential had fallen to 17% by 1950 (figure 2). This would have lowered its status to a regional power, if it had not in the meantime acquired an 'empire' by incorporating Eastern Europe under the guise of the Warsaw Pact. Measured in terms of VIP² the power potential of the Soviet virtual state (USSR+EE) was 25% in 1950 allowing it to retain its status as a great power second only to the USA. The power of the Soviet Virtual state (USSR) was on a rising trend till 1975 when it peaked at 37% (27%) in 1975. At this point Eastern Europe contributed 10% points or over 1/4th of the power potential. Historical evidence suggests that the rising power of the USSR from 1950 to 1975 led to greater assertiveness. As the USSR's own power potential and that of Eastern Europe started declining after 1975, the former's hold over the latter also weakened gradually. As disaffection grew among the people of Eastern Europe their contribution to the strength of the empire would in any case have declined from 10% towards zero (even if USSR had remained at 27%).

Figure 2 also shows that the power potential of the USSR (the Soviet Empire) declined continuously since the mid-seventies to reach less than 20% (25%). Thus, using our earlier definition and purely in terms of power potential the USSR had ceased to be a 'Great Power' at the time of its break up in 1990. Post-1990 economic research has shown that the Soviet economy was declining (relatively and perhaps absolutely in later stages) because of dis-functional "socialist" policies of autarchy and centralized party/bureaucratic control. The USSR accelerated this decline by trying to maintain the illusion of bipolarity and strategic (near) parity with the USA, through excessive public investment in strategic technology. This helped maintain its actual power way above its 'power potential' but accelerated the decline in power potential.²⁸

From this we reach several tentative conclusions. (a) That a challenger must have a power potential of at least 35% to be credible and sustained rival of the predominant power. (b) A nation state with a power potential of 40% could well be a serious challenger to the dominant power. (c) A rising power can be more assertive and credible than is perhaps warranted by the level of its power potential. (d) A power potential of less than 40% for the number two power is not enough to convert a uni-polar world into a bipolar world.

²⁸ Analysts of Empire such as Neil Fitzgerald have concluded that the existence (non-existence) of a financial market helped the UK (and hindered France) in its quest for Empire. India's developed capital market is an advantage, but this is offset by China's heritage of socialist ownership of assets and dictatorial control over financial intermediaries (Banks).

8 The Future: Potential Global Powers

To outline the shape of the emerging future we return to the information presented in earlier tables.²⁹ A comparison of Table 1 and 4 also brings out clearly that India and China are still relatively poor countries and their high rank in the global power club is due to their large population (relative to the USA & other countries) and despite their relatively low per capita income. The other side of this coin is that they have the greatest potential for increasing power, by raising their per capita income. For instance, if Russia's and Brazil's per capita income was raised to the level of the USA, their 'power potential' would still be 50% and 60% that of the USA respectively. In contrast China and India's power potential would equal that of the USA if their per capita income was **about 50%** of that of the USA **today**.

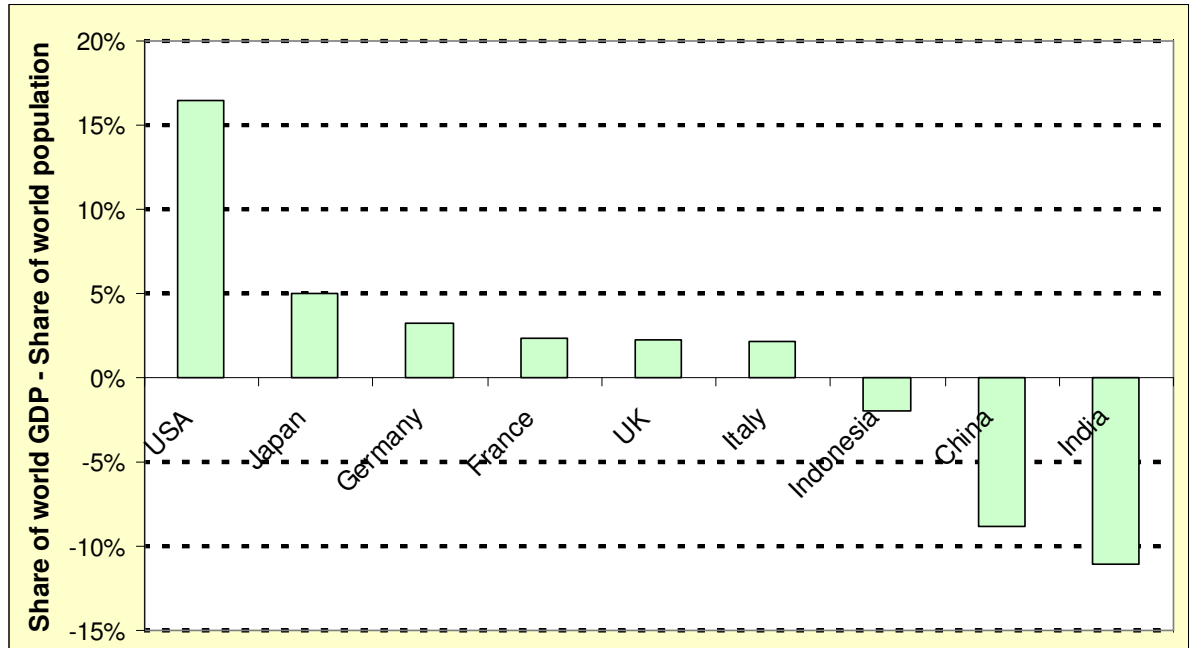
The potential for closing the power gap is illustrated in Figure 3, which shows all countries with the greatest gap between their share of world GDP at purchasing power parity and their share of World population. India, China and Indonesia have the largest negative gap, while USA, Japan and Germany have the largest positive gap followed by France, UK and Italy. The other countries in the global power club such as Russia and Brazil have negligible gaps and are consequently not shown here. Indonesia is still not a member of the global power club, and will only become a serious contender once it reaches there in the next two decades or so. Among the members of the global power club, India and China have the greatest gap (table 4 & figure 3) and therefore the greatest opportunity for closing it.

Population changes slowly over time and UN population projections till 2050 do not show major changes in relative population, with the exception of Russia and Japan whose population will decline by 25% and India whose population will increase to equal that of China. Thus the major increases in power potential will come only through increases in per capita income relative to USA's. China and India have been among the ten fastest growing countries in the world for the past 25 years. Virmani (1999a b) had forecast that that they are likely to be among the 3-5 fastest growing economies in the next two decades. Thus, the current unipolar world can only become bipolar or tripolar over the next 25 to 50 years if either or both of these countries continue to grow at a much faster rate than the USA. Otherwise it will remain unipolar, as there are few signs of the European Union turning into a virtual State that could act as another pole. The reason is that the larger countries of the EU would have to emasculate themselves in the process of transferring power to the EU virtual State and the people of these countries are not likely agree to do so in the next few decades.

Table 1 (also) gives the projected evolution of the Power Potential of members of the global VIP² club. The growth rate assumptions are primarily those used in Virmani (2005). A few minor corrections are made for the period 2006 to 2008 because new data is available from WDI and IMF WEO. As noted China will become the second strongest global power and continue to catch up with the USA, reaching about 50% of the USA's power potential by 2025.

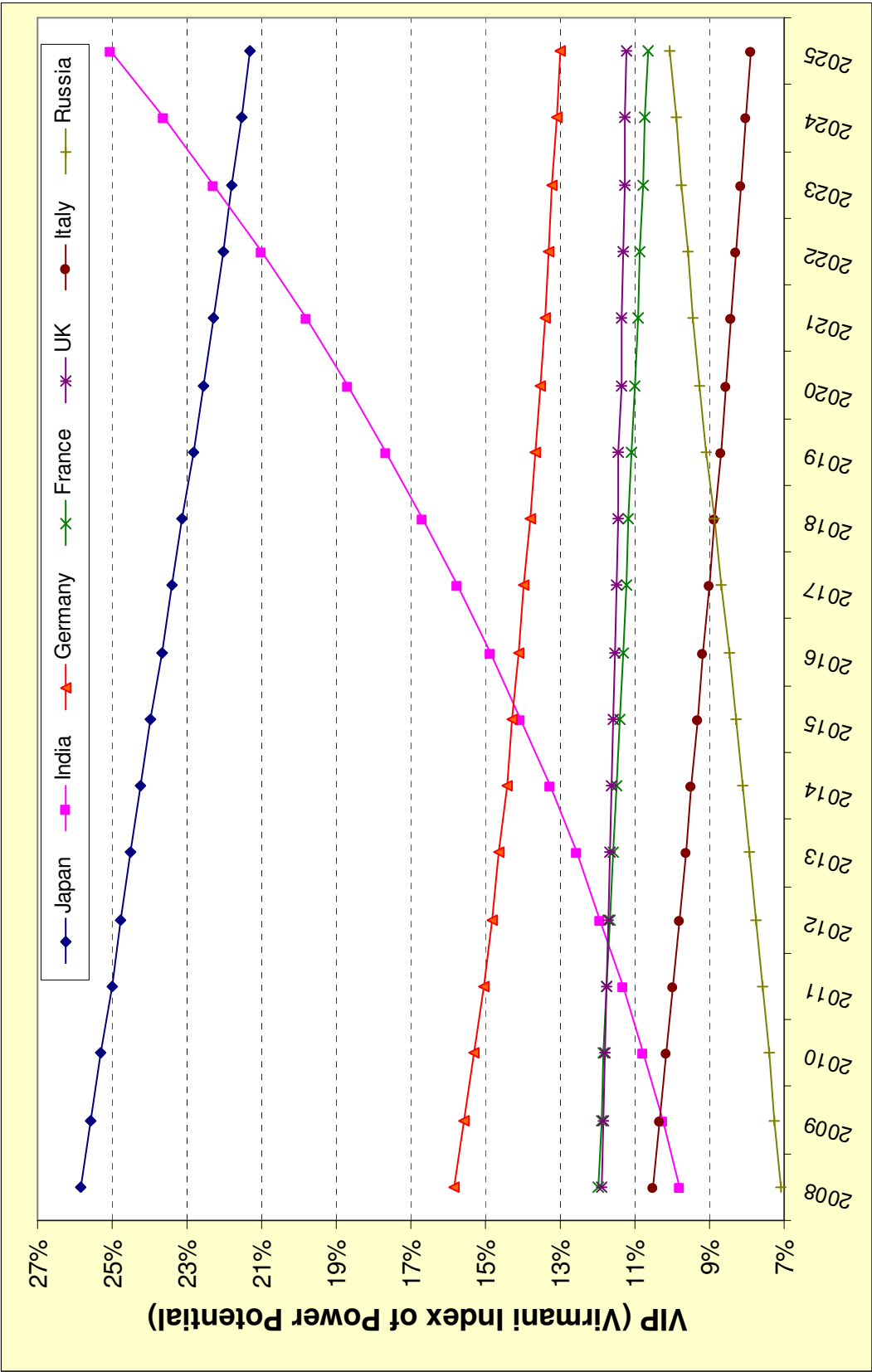
²⁹ Factors such as demographic change are taken into account in a qualitative way in making growth forecasts.

Figure 3: GLOBAL IMBALANCE; GDP SHARE – POPULATION SHARE



The other noteworthy change is the projected rise in India's power ranking over the next 25 years. India will become more powerful than Italy in about **five** years, and France and UK in about **seven** years. In about **10 years (2016)** it is projected to become more powerful than Germany. **By 2022** India's power potential will exceed 20%, making it a (potential) global power along with China and Japan (in addition to the USA). As shown in Virmani (2005b) and reflected in our projections, no other country has the potential to join the ranks of global powers over the next 25 years. **Within 20 years** India's power potential will exceed that of Japan (figure 4).

Figure 4: INDIA, AN EMERGING GLOBAL POWER



9 Global Power & UNSC

Virmani (2004) has argued that the ‘natural balance of power’ as measured by relative size of GDP (at PPP) or ‘power potential’ is a possible basis for reform of the UN Security Council. In principle either the VIP² or GDP (at purchasing power parity) could be used as benchmark or criterion for membership of the UNSC. As Permanent veto yielding membership of the security-council at the time the UN was formed was based on victory in WW II, VIP² would appear to be the favored criterion. The inclusion of China in the original UNSC and recent calls for regional representation in an expanded UNSC on the other hand imply that population should get greater weight. This suggests the use of the GDP criterion, which gives greater weight to population.

To be considered for *UNSC permanent membership with veto power*, either a country’s GDP (at PPP) or its VIP² or both must be greater than the GDP/ VIP² of the lowest ranked member of the current UNSC, namely Russia. Using the data for 2005, only four countries, Japan, Germany, Italy and India, satisfy both criteria. Canada’s VIP² is higher than Russia’s but its GDP is lower.

If the current (2005) power potential and GDP is the basis for veto bearing permanent membership of the UN Security Council, Japan has the strongest case, given that it has the highest power potential and largest GDP. Germany has a stronger case than India or Italy because its power potential is much higher, even though its GDP is lower than India’s. Among the last two India has a better case than Italy, given its significantly higher GDP and only one rank lower power potential. UNSC reform does not however occur very frequently.

The issue of UNSC reform has come up after fifty years and choices made today could remain in place for another 25 years or more. Therefore any additions to the UNSC must take account of the likely evolution of power potential over this period. As shown by the projections in figure 4 (and table 1), India’s claim to permanent membership of the UNSC is stronger than that of Germany’s as its GDP is already larger than Germany’s and its power potential will exceed Germany’s in [about 11 years](#) and Japan’s in [about 18 years](#). . India’s GDP will become larger than Japan’s in [the next few years](#) and is projected to be 1.5 times Japan’s in 10 years. Given a time horizon of [20 years](#), India has a stronger case than Japan. India’s case becomes even stronger if giving representation to the poor of this world is an additional criterion, as India with about half the World’s poor is in the best position to represent them. This is partly offset for Japan if reward for UN contributions is given weight.³⁰

10 Conclusion

In this paper we presented a simple index of Power Potential, the VIP² © that can be easily applied to any one of the 200 or so countries for which GDP and population data is available. The index measures potential power relative to the USA, which is therefore has an index value of 100%. We specify benchmark values of the index for a country to be

³⁰ China is highly likely to veto Japan’s permanent membership (with veto power) and be neutral/abstain in the case of India. The other veto bearing members would probably not veto either country (if only the two were being considered for veto power).

considered a global power (20%) or a regional power (5%). We find that there are currently two potential global powers, China and Japan in addition to the undisputed & unique USA. Germany, which was a potential global power till a decade ago, is no longer one.

As expected the largest number of regional powers are found among the rich countries of Europe, namely Germany, France, UK, Italy and Spain (somewhat more surprisingly). Canada another rich country meets the grade, while Australia just misses it today but is likely to meet it in a few years. Asia is clearly a rival to Europe in that it now has two global powers and three regional powers, India, S. Korea and Australia. Brazil is the sole regional power in Latin America, while no country in Africa or middle –east meets the criterion.

Projecting into the future, the number of global powers will increase from three to four in less than 20 years, with the addition of India. At that point China's power potential would be about 65% of the USA's while the sum of Japan and India's power potential would be 3/4th of China's. Virmani (2005) forecast that the world would become bipolar by 2025 and tripolar by 2050.³¹ Recent developments in US-India relations suggest that the US will support faster economic and technological development of India, so that India's rise to global power is accelerated. This will delay the onset of a bipolar world and accelerate the arrival of a tripolar one. In other words the period of bi-polarity will be shortened, an outcome that is in the mutual interest of both the USA and India.

Thus the bold decision of President Bush to remove restrictions on the flow of commercial nuclear technology to India and to facilitate the flow of Dual use and Strategic technology could transform power relations in Asia and the World just as President Nixon's opening to China did.³² It must be remembered, however, that after the first opening, it took China 10 years to emerge from its isolation, 20 years to make its mark in the global economy and 30 years to become a global power. During this period it did not let future power go to its head and worked modestly and diligently to acquire the economic and technological where withal from every country including the USA.³³

The paper also shows that in terms of power potential the World ceased to be bipolar sometime between 1975 and 1985. Thus the World can in our view currently be best described as “*uni-polar with a multi-polar fringe*” constituted by the middle powers such as UK, France, Germany, Russia, Japan, China and India (by analogy to the market structure, ‘monopoly with a competitive fringe’). This situation is likely to last for another fifteen to twenty years. Therefore this constrained uni-polarity will have prevailed for forty-fifty years before a bipolar world emerges.

The emergence of China and India on the global scene may force the residents of the large countries of the EU to reconsider their stand on EU integration. Twenty years from now

³¹ A game theoretic approach suggests other possibilities. For instance one speculative scenario could be for India and Japan to unite in an alliance to make the World Tripolar in 2025. If we add Russia and S Korea to this alliance, the aggregate power potential almost equals that of China. Such an alliance is even more fanciful. There is little likelihood of this scenario fructifying, however, as long as Japan remains closely tied to the USA, in the US-Japan defense pact. Another even more speculative scenario could be for China, Japan and India to combine to challenge US power in Asia. This scenario is even less likely as long as China remains a one party communist party ruled state that nurses strong historical grievances against Japan.

³² This will in my view, be one of the decisions that mark President Bush's (and his Indian counterpart Dr Man Mohan Singh's) place in history.

³³ There is a lesson in this for India. Size gives it an advantage that smaller less populated countries do not possess, but the large number of poor people reduce the influence & respect that it enjoys. Though projections indicate that size will increase and poverty as currently defined will be eliminated in 15 to 20 years. Analysts should be realistic, remembering both the strength and weakness.

they may decide to constitute an EU government, based on direct elections by EU citizens, with complete powers to act on all matters connected with international relations (Defense, foreign affairs). Such an EU would be a global power and the world would be tripolar in 2025 and quadri-polar in 2050.

The following Policy implications emerge from the analysis of the paper:

- 1) Maximization of economic growth will maximize Power Potential.³⁴ Since Deng's market revolution, China's Leninist ruling party has absorbed this lesson fully and has been acting on it. India's democratic ruling elite has for too long ignored this lesson. Further, acceleration of economic growth in India will not only increase its power but also (unlike in China) eliminate poverty faster (Virmani(2005c)).
- 2) Investment in Strategic Technology must be commensurate with the Power Potential of the Economy so as to convert the 'potential' into actual power.³⁵ Too little investment will result in the potential remaining unrealized and aggressive powers will be tempted to exploit this weakness. Excessive investment can raise actual power in the short run but can undermine long term power potential by diverting funds from other essential public goods & services.
- 3) Alliances (formal or informal) with a country having a large, high quality stock of strategic capital can be highly beneficial to a relatively poor country with a lower level of general technological capability and strategic capital stock. Such a partnership can lower the financial and time cost (for the poor country) of building strategic capital and improving its quality. The growth of strategic capital can therefore be accelerated resulting in faster rise of VIP.
- 4) The previous point has two implications for India:
 - a. A strategic partnership with the US, the dominant power (uni-pole), can be highly beneficial to India if it gives India access to US strategic technology. A US spokesman's statement on March 25, 2005 in Washington that the USA would "...help India become a Great Power," has a value for India iff it means that the USA is willing to *supply India the Strategic technology to ensure that India's actual power (VIP) matches or exceeds its growing power potential (VIP²)*.³⁶ This is not, however, a commercial transaction where financial price equals marginal revenue. The US president has authorized such a statement because he perceives a strategic benefit to the USA from having a natural and stable balance of power in Asia.³⁷ Indian diplomacy must convince the US Congress & intellectual elites that a more powerful India is in US interest.
 - b. A strategic partnership with each member of the *democratic, multi-polar fringe* (Japan, UK, Germany, France, Russia) can also be beneficial to India, particularly if it involves joint R&D and production. This is because these countries' strategic assets, though inferior to that of the USA, are superior to India's. They also have

³⁴ To find an answer to the question of how to do this in India please see Virmani(2005c).

³⁵ The global balance emerging from such a policy by all countries would result in a "natural balance of power" (Virmani(2004)) Such an equilibrium among the major powers is therefore likely to be more stable.

³⁶ President Bush's commitment to supply the requisite technology to India is confirmed by informed strategic analysts in Washington as is the resistance of the bureaucracy.

³⁷ As stated by Secretary of State, Condoleezza Rice in Sophia.

some technologies that match those of the USA in quality and/or cost and are therefore competitive. Increasing the number of competitors benefits the buyer.

- 5) The dominant power will try to reduce the flow of strategic technology from it to the potential challenger. As shown in Virmani (2004 and 2005a) China will be strong enough to challenge US power by 2025. The US government has therefore taken steps over the last few years to stop such flows from the US, EU and Japan. In response China has been emphasizing that it is a middle-income country whose per capita income will not equal the USA's for 50 years or more.³⁸ This paper shows that as for global power relations are concerned the relevant comparator is either the power potential VIP² or the actual Power VIP, not the relative per capita income.
- 6) As long as the EU does not become a "virtual state" it is not a global power and its incentive for stopping the flow of strategic technology to China will be much lower than that of the USA. On the other hand if the EU becomes a "virtual state" it will be a rival of China and its incentive to restrict the flow of strategic technology to China will rise sharply.³⁹

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³⁸ The unsaid word is 'in per capita income,' which may well be so. The unstated assumption is that China cannot be a threat to the USA if its per capita income is 50% (say) of the USA. But the

³⁹ In a way this can be used as one indicator of whether it is a 'virtual state' or not.

12 Appendix I: VIP² of 112 Countries

Table A1: Global Ranking by the Virmani Index of Power Potential (VIP ²)								
	VIP ² rank		GDP rank		VIP ²		GDP, PPP(mi)	
	2003	2005	2003	2005	2003	2005	2003	2005
<u>N America</u>								
USA	1	1	1	1	100%	100%	10923376	11780533
Canada	8	9	11	11	8.0%	7.8%	970326	1027421
<u>Europe</u>								
Germany	4	4	5	5	18%	17%	2291007	2346285
France	5	5	6	6	13%	12%	1654018	1712405
United Kingdom	6	6	7	7	13%	12%	1610579	1693698
Italy	7	7	8	8	12%	11%	1563332	1582092
Russia	11	10	10	9	6.0%	6.5%	1323839	1497208
Spain	10	11	13	13	6.5%	6.4%	920292	979184
Netherlands	17	17	19	24	3.9%	3.6%	476454	487945
Poland	21	19	24	23	2.2%	2.5%	434626	507713
Belgium	18	20	29	30	2.3%	2.4%	294001	323570
Austria	22	26	33	34	2.0%	2.0%	243458	266116
Sweden	27	27	34	35	1.9%	1.9%	239576	265706
Switzerland	26	28	36	37	1.9%	1.9%	224557	245233
Norway	30	31	42	42	1.6%	1.6%	171850	190290
Greece	31	32	37	36	1.5%	1.6%	220148	247535
Ireland	34	33	47	47	1.4%	1.5%	150725	174166
Denmark	33	34	43	45	1.4%	1.5%	169508	186303
Portugal	35	37	40	41	1.2%	1.2%	189303	206075
Finland	37	39	49	51	1.1%	1.2%	143951	159573
Ukraine	41	40	31	29	0.9%	1.2%	265534	332741
Czech Rep	40	41	44	43	1.0%	1.1%	166877	187241
Hungary	43	43	48	48	0.8%	0.9%	147705	166531
Romania	50	49	46	46	0.6%	0.7%	158234	183257
Slovak Republic	55	56	58	59	0.4%	0.4%	72730	83443
Luxembourg	58	58	87	87	0.3%	0.3%	27910	31167
Kuwait	60	60	72	73	0.3%	0.3%	43248	47783
Slovenia	62	62	75	76	0.2%	0.3%	38204	43407
Croatia	63	63	67	68	0.2%	0.3%	49249	55883
Belarus	65	64	64	62	0.2%	0.3%	59803	70518
Lithuania	68	65	73	72	0.2%	0.2%	40420	48616
Latvia	76	77	93	91	0.1%	0.1%	23836	28266
Estonia	80	79	101	101	0.1%	0.1%	18318	21457
Cyprus	81	83	106	109	0.1%	0.1%	14874	16656
Bosnia, Herzegovin	83	85	92	90	0.1%	0.1%	24703	28327
Iceland	90	90	113	113	0.1%	0.1%	9029	10428
Macedonia, FYR	102	101	109	110	0.1%	0.1%	13922	15899
Albania	105	103	107	106	0.0%	0.1%	14526	17179

Table A1: Global Ranking by the Virmani Index of Power Potential (VIP²)								
	VIP² rank		GDP rank		VIP²		GDP, PPP(mi)	
	<u>2003</u>	<u>2005</u>	<u>2003</u>	<u>2005</u>	<u>2003</u>	<u>2005</u>	<u>2003</u>	<u>2005</u>
<u>Asia</u>								
Japan	2	2	3	3	28%	27%	3567804	3697387
China	3	3	2	2	22%	25%	6446033	7693663
India	9	8	4	4	7.8%	8.5%	3078024	3527323
Korea, Rep.	13	13	14	14	5.5%	5.5%	861042	934875
Australia	14	14	16	17	4.8%	4.7%	589116	629856
Taiwan	16	15	17	16	4.0%	4.5%	545437	629858
Thailand	24	22	21	19	1.9%	2.2%	470992	558941
Indonesia	23	25	15	15	2.0%	2.1%	721533	802314
Hong Kong	32	30	41	40	1.4%	1.6%	185250	217541
Malaysia	39	35	35	33	1.1%	1.2%	235662	280258
Philippines	38	38	25	25	1.1%	1.2%	352191	405532
Singapore	46	44	55	55	0.8%	0.9%	104046	124111
Pakistan	48	48	26	26	0.7%	0.8%	311258	368273
New Zealand	49	50	57	57	0.6%	0.7%	90538	101085
Vietnam	53	51	38	38	0.5%	0.6%	202502	243545
Bangladesh	52	52	32	32	0.5%	0.5%	244402	286447
Kazakhstan	56	55	56	56	0.4%	0.5%	99254	123307
Sri Lanka	67	67	59	58	0.2%	0.2%	72654	84144
Turkmenistan	77	78	85	84	0.1%	0.1%	28881	34896
Azerbaijan	86	81	84	82	0.1%	0.1%	29782	38024
Bahrain	87	86	111	112	0.1%	0.1%	12888	15044
Uzbekistan	84	87	71	71	0.1%	0.1%	44638	49265
Nepal	98	99	78	79	0.1%	0.1%	35015	39820
Cambodia	100	100	88	88	0.1%	0.1%	27856	31091
<u>Latin America & Carribean</u>								
Brazil	12	12	9	10	5.7%	5.7%	1375756	1555413
Mexico	15	15	12	12	4.2%	4.2%	937836	1058063
Argentina	19	18	23	22	2.3%	2.4%	445148	520588
Colombia	36	36	27	27	1.2%	1.1%	298799	339492
Chile	45	45	45	44	0.8%	0.8%	162067	186926
Peru	51	53	51	50	0.5%	0.5%	142791	163760
Venezuela	54	54	53	52	0.4%	0.5%	126279	153908
Dominican Rep	64	68	65	65	0.2%	0.2%	59622	64007
Costa Rica	70	71	74	75	0.2%	0.2%	38469	43414
Guatemala	72	73	66	67	0.2%	0.1%	51056	56732
Uruguay	75	76	86	86	0.1%	0.1%	27987	33471
El Salvador	79	82	83	85	0.1%	0.1%	31237	34307
Panama	87	87	98	98	0.1%	0.1%	20452	23460
Paraguay	84	88	89	89	0.1%	0.1%	26430	29064
Trinidad,Tobago	93	92	107	107	0.1%	0.1%	14132	16759
Bolivia	100	101	95	95	0.1%	0.1%	22800	25977
Honduras	106	106	99	101	0.0%	0.0%	18572	21060

Table A1: Global Ranking by the Virmani Index of Power Potential (VIP²)								
	<u>VIP² rank</u>		<u>GDP rank</u>		<u>VIP²</u>		<u>GDP, PPP(mi)</u>	
	<u>2003</u>	<u>2005</u>	<u>2003</u>	<u>2005</u>	<u>2003</u>	<u>2005</u>	<u>2003</u>	<u>2005</u>
<u>Sub-Saharan Africa</u>								
South Africa	20	21	20	21	2.3%	2.4%	474137	528279
Nigeria	66	66	50	49	0.2%	0.2%	143238	165749
Equatorial Guinea	82	70	112	100	0.1%	0.2%	12599	22267
Sudan	74	74	61	61	0.1%	0.2%	64088	77205
Ecuador	73	75	69	69	0.1%	0.1%	47362	54536
Ghana	78	80	70	70	0.1%	0.1%	46253	53670
Angola	92	84	82	78	0.1%	0.1%	31701	42776
Cameroon	91	92	80	80	0.1%	0.1%	34077	39428
Mauritius	95	95	110	111	0.1%	0.1%	13795	15847
Ethiopia	99	96	68	66	0.1%	0.1%	48780	60423
Uganda	96	97	77	77	0.1%	0.1%	36827	43350
Botswana	97	98	105	107	0.1%	0.1%	15010	17096
Congo, Dem. Rep.	106	104	76	74	0.0%	0.1%	37026	44240
Kenya	104	105	81	83	0.1%	0.1%	33099	36849
Zimbabwe	103	106	90	97	0.1%	0.0%	25335	25700
Cote d'Ivoire	108	108	91	92	0.0%	0.0%	24857	27696
Mozambique	110	109	98	98	0.0%	0.0%	20984	25520
Guinea	109	110	104	105	0.0%	0.0%	16582	18538
Senegal	111	111	103	103	0.0%	0.0%	16875	19869
Tanzania	112	112	97	94	0.0%	0.0%	22300	26523
<u>N Africa & Middle East</u>								
Turkey	25	23	18	18	1.9%	2.1%	478891	565189
Iran (IIR)	28	24	22	20	1.8%	2.1%	464394	547111
Saudi Arabia	29	29	28	28	1.6%	1.7%	297967	336845
Israel	42	42	52	53	0.9%	0.9%	133981	150959
Egypt (EAR)	44	46	30	31	0.8%	0.9%	266853	303825
Algeria	47	47	39	39	0.7%	0.8%	194389	222727
Morocco	57	57	54	54	0.4%	0.4%	120578	135682
Tunisia	59	59	60	60	0.3%	0.3%	70863	82522
Bulgaria	61	61	63	64	0.3%	0.3%	60483	70313
Oman	69	69	79	81	0.2%	0.2%	34960	38960
Syrian Arab Rep	71	72	62	63	0.2%	0.2%	62165	70384
Lebanon	89	91	95	95	0.1%	0.1%	22820	26177
Jordan	93	94	94	93	0.1%	0.1%	22929	26809
Yemen, Rep.	113	113	102	104	0.0%	0.0%	17044	18897

Data Sources: For GDP at purchasing power parity and population or Per capita GDP: World Bank, World Development Indicators, 2005 (2003 data) and IMF WEO, April 2005 (for 2005 projection). Rest of the data is from Virmani (2005) and authors calculations.