

“Experiences and Challenges in Measuring National Income and Wealth in Transition Economies,”
International conference organized by the International Association for Research in Income and Wealth (IARIW)
and the National Bureau of Statistics (NBS) of China.

Friendship Hotel in Beijing, China September 18-21, 2007,

Plenary Session 1: *Issues for National Accounting in Countries in Transition*

Paper 3.

International Comparison Programme 2005

Issues for Transition Countries in Asia

Derek Blades, July 2007

Introduction

When GDP is compared from year to year for a single country, the standard practice is to use **constant prices** so that changes in prices can be separated from changes in the underlying volumes of output. When the GDPs of different countries are compared for a single year, exactly the same logic applies. The comparisons must be made using a **common set of prices** so that the differences in price levels between countries can be separated from the differences in the underlying volumes of output. Purchasing Power Parities (PPPs) convert a country's GDP expressed in its own currency into a common currency, while at the same time eliminating differences in price levels between countries. In effect the comparisons between countries are being made using a common set of prices. The International Comparison Programme (ICP) is an international undertaking to estimate PPPs.

This paper first explains how the ICP 2005 differed from previous rounds of the ICP. It then looks in more detail at how the comparisons were made for the Asia Pacific (AP) Region. This was a particularly diverse region both in terms of the size of the countries covered – China *versus* Bhutan - and their very different levels of economic development – Nepal *versus* Singapore. In addition, the AP region includes a number of countries that are “in transition” from central planning to more market oriented economic systems. This diversity required the regional organisers – the Asian Development Bank – to devise some special procedures that are explained below.

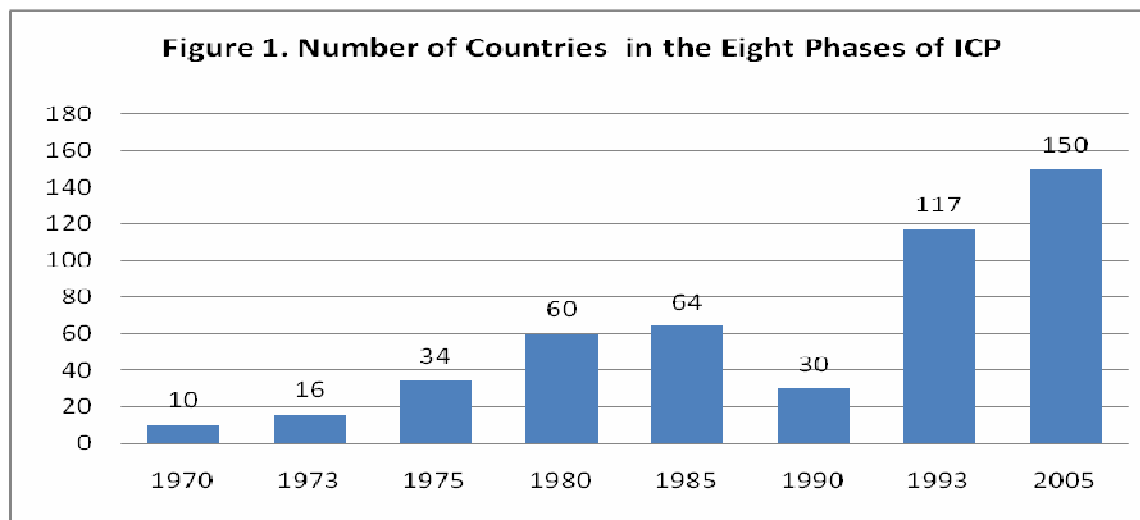
Finally the paper gives some main results of the AP comparison for 2005. These refer only to comparisons within the region because, at the time of writing, the links between the AP and other regions of the world had not yet been calculated.

Background

The International Comparison Programme started in 1970 and there have been several “rounds” since then. Figure 1 shows the number of countries that have participated in each round. ICP 2005 is the most ambitious round and covered 150 countries¹ out of the 192

¹ A few of the 150 countries were not able to calculate PPPs for total GDP. In the AP region, for example the Maldives Islands were only able to provide price and expenditure data for household consumption expenditure and for individual consumption expenditure of government.

countries currently recognised by the United Nations. ICP 2005 did not cover any Caribbean islands or Central America, and Fiji was the only Pacific island state included. Afghanistan, Algeria, Iraq, Libya, Myanmar, and North Korea were the main continental countries that did not take part in ICP 2005.



Up to 1993, the ICP had mainly involved the developed countries and the 1993 round was the first time that efforts were made to obtain global coverage. This round was only partially successful both because of insufficient funding and because the difficulties of comparing countries at very different levels of economic development had not been fully understood. In the event, the regional comparisons carried out in 1993 were never combined into a full “official” global comparison although independent researchers have used the results to make their own world comparisons. The best known of these are the PPP estimates included in the *Penn World Tables* published by the University of Pennsylvania and which are used by the World Bank and other international agencies.²

The ICP 2005 was preceded by a careful study of the lessons from the failure of the 1993 round of the ICP and from the successful international comparisons that had been carried out for several years by the OECD and the European Union for their own member states. As a result a number of new features were incorporated into ICP 2005 to improve both administrative and technical aspects of the work.

New features of the ICP 2005

Greater country participation

For ICP 2005 a management structure was introduced that emphasised the role of participating countries. Overall responsibility for the programme resides in the Executive Board which is made up of statisticians from participating countries. Within the regions, Regional Advisory Boards, again consisting of heads of national statistical offices, work with the Regional Co-ordinators to ensure that the work proceeds in a timely fashion and that quality standards are maintained. Most important, country statisticians select the products to

² Alan Heston, Robert Summers and Bettina Aten, *Penn World Table Version 6.2*, Center for International Comparisons of Production, Income and Prices at the University of Pennsylvania, September 2006.

http://pwt.econ.upenn.edu/php_site/pwt_index.php

be priced, meet regularly to review expenditure weights and prices, and to review PPPs and volume measures before publication.

Manuals

The “Global Office” at the World Bank has issued two manuals – an *Operational Manual* explaining the administrative structure and the responsibilities of the countries, the regional coordinators and the global manager, and a technical *Handbook* on the calculation of expenditure weights, product definitions, collection and editing of prices, calculation of elementary PPPs and their aggregation. These manuals provide both a record of how ICP 2005 was planned and executed and a valuable guide for countries participating in future rounds of ICP.³

Regional comparisons and Ring comparison

For ICP 2005 countries were grouped into six regions:

- Africa;
- Asia and the Pacific;
- Latin America;
- West Asia;
- Member states of the Commonwealth of Independent States; and
- OECD-Eurostat (not a region in the geographical sense) covering all countries belonging to, or seeking membership of, the European Union and the OECD.

Comparisons are first made at the regional level because there is a greater homogeneity of products, prices and weights, and there are also practical advantages in terms of common language and geographical proximity.

The results for each region will be linked together to provide a global comparison through a separate comparison of a “Ring” region consisting of 19 countries selected from each region. The Ring countries are included in the comparisons within their respective regions but make a separate comparison among themselves using an agreed list of products. The results of the Ring comparison will be used to establish the relative positions of each region to produce a global comparison. The results of the regional comparisons will remain “fixed” as regards the relative position of each country within their respective region.

Products defined using Standard Product Descriptions (SPDs)

For ICP 2005, the Global Office designed a set of forms – SPDs – to be used by all regions for specifying the goods and services to be priced by the countries in each region. SPDs list the quantities and characteristics of products and, where relevant, the type of outlet, type of packaging and conditions of sale. SPDs were developed by the Global Office for household consumption, construction goods, machinery and equipment, and compensation of government employees.

Within each region the SPDs for household consumption and for machinery and equipment were converted to *Product Specifications* (PS) by the country statisticians in collaboration with the regional coordinators. Together they selected the characteristics of each item to be priced by the countries in the region. The SPDs for construction and for compensation of

³ These two publications, together with related technical documents are available at the World Bank ICP website: <http://web.worldbank.org/WBSITE/EXTERNAL/>

government employees were converted to PSs by the Global Office and were the same for all regions.

Countries did not have to report prices for all the products defined by the PSs but they were asked to price all the products that are commonly purchased in their own countries – plus some that are available in their countries even though they are not commonly bought by most people. This is necessary to enable price comparisons to be made with other countries in their region.

Quality control of expenditure weights and prices

The special software developed for ICP-*ToolPack* – incorporates two sets of analytic tables designed to detect “outliers” – i.e. data points that fall outside the expected range.⁴ It was recognized, however, that it is not advisable to rely too heavily on the mechanical screening of outliers because only large errors can be detected this way. Smaller errors remain undetected if the resulting price observations remain within the specified bounds of acceptability. Data providers in participating countries were required to use the same quality control methods as when they compile their consumer price indices.

Construction goods

Collecting comparable prices for construction goods is a major problem for international comparisons because no two buildings or civil engineering projects are exactly alike. The OECD-Eurostat comparisons use a method described as “Standard Models” in which *bills of quantities* are drawn up by quantity surveyors for a number of standard construction projects such as a multi-storey car-park, a single family dwelling, 500 metres of airport runway, etc. For ICP 2005 the OECD-Eurostat group have continued to use the Standard Model method but a new method was developed by the Global Office for other regions described as the “Basket of Construction Components” (BOCC). Countries were asked to estimate the cost of a number of construction activities such as erecting a round structural column of a given height, diameter and strength, plastering a ceiling of a given size with plaster of a given thickness and quality, building a masonry interior wall of a given height, length, and thickness. Different countries use different mixes of inputs to construct these components depending on the relative prices of labour, capital and building materials. Prices reported by the different components therefore reflect the different mix of inputs in each country.

Aggregation Methods

For international comparisons, price ratios are calculated between the same products in each country and are aggregated to higher level groups and eventually to GDP. For the first level of aggregation – known as “Basic Headings”- the OECD-Eurostat and CIS groups use the *EKS* method. All other regions use the *Country Product Dummy (CPD)* method, which has been used for previous ICP rounds. (Both EKS and CPD give very similar results in most cases.) To aggregate the PPPs for Basic Heading to obtain PPPs for GDP, the *Geary-Kharmis* method was used in previous rounds of ICP. It was found, however, that this had the disadvantage of overstating GDP in the poorer countries – a phenomena referred to as the “Gerschenkron effect”. For ICP 2005, all regions except Africa will use the EKS method which avoids the Gerschenkron effect. Africa will use the *Iklé* version of the Geary-Kharmis

⁴ Two analytic tables are included in *ToolPack* for this purpose: “Dikhanov Tables” developed by Yuri Dikhanov of the World Bank Global Office for ICP 2005, and the “Quaranta Tables” developed by Vincenzo Quaranta of the Italian Statistical Office and which have been used for several years in the OECD-Eurostat comparisons.

method; this can be described as a de-weighted version of Geary-Kharmis. It reduces the Gerschenkron effect without eliminating it completely.⁵

Asia Pacific Region: Special Features

Transition countries

The AP region of 23 developing countries included several kinds of “transition” countries.

- The People’s Republic of China, Vietnam, and the Lao People’s Democratic Republic are governed by communist parties but over the last several years they have been progressively relaxing the central government’s control over the economy. They are moving to what is described in China as a “social market” economy
- Cambodia and Mongolia have both had central planning in the recent past but have now opted for Western-style democracy and are creating the conditions for a market economy to function.
- India has followed a socialist economic model since independence in 1947. This involved a substantial degree of central control over major industries and limits on inflows of foreign investment. During the last decade India has been moving towards an open market economy.

Two particular problems were encountered in making comparisons between the relatively poor transition countries and much richer countries such as Singapore, Hong Kong, Macau, Thailand, Malaysia and Taipei, China which have had very open, competitive, (and successful) market economies for several years. The two problems were the measurement of housing services and of government consumption expenditure.

Housing services

Expenditure on housing services is an important component of GDP and usually accounts for between 5% and 10% of total final expenditure. The standard method for calculating PPPs for housing services is to compare rents paid in the different countries for broadly similar types of dwellings. “Broadly similar” refers to the age of the dwellings, floor space, number of rooms and facilities such as electricity, inside toilets, and climate control. This proved impossible for the AP region because in many countries – particularly the transition countries - dwellings are either owned by their occupiers or are rented at very low, subsidized prices.

Because of this it was originally planned that PPPs for housing services would be estimated using the “quantity approach”. The quantity approach requires countries to provide detailed information on the numbers and characteristics of dwellings. This information is used to calculate volume relatives between countries and these are divided into expenditure relatives to obtain PPPs. Despite the best efforts of the countries and the ADB regional office, it proved impossible to apply the quantity approach because several countries did not have comprehensive and up-to-date information about their housing stocks. Therefore, a “reference” method was used. A “reference” method usually means the use of a reference **PPP**⁶. However, for this basic heading, a reference **volume relative** was used. This was

⁵ EKS is a method for converting bilateral PPPs to a multilateral basis; CPD is a regression method for estimating multilateral PPPs. Technical details of the EKS, CPD, Geary Kharmis and Iklé methods are given in Chapters 11 and 12 of the ICP Handbook.

⁶ PPPs are not calculated for all components of final expenditure. For some components a PPP that has been calculated for a related item is used instead. These substitute PPPs are referred to as “reference PPPs”.

done because the expenditure shares estimated by countries for housing rentals were judged to be particularly unreliable. If a reference PPPs had been used, the volume relatives indirectly obtained by dividing the reference PPPs into the expenditure relatives, would have included all the inconsistencies in countries' estimates of expenditures on rentals for housing. It was considered more important to have good volume relatives than good PPPs.

The reference volume relatives used here were for *Individual Consumption Expenditure by Household (excluding rentals for housing)*. This is a "neutral" approach in that it does not affect the volume relative for household consumption expenditure. An additional advantage is that it makes the plausible assumption that the volumes of housing services consumed in each country rise in line with the volumes of total consumption expenditures by households.⁷

Government consumption expenditure

Government consumption expenditure is equal to the compensation of government employees plus intermediate consumption required to produce government services such as health, education, defense, public order, tax collection, border control and general administrative services. In all countries, this is a difficult area for ICP because labour productivity in government varies greatly between countries. For the OECD-Eurostat, CIS and Latin America regions it was decided to ignore these differences because they were judged to be sufficiently small that ignoring them does not invalidate the comparisons. But it would be difficult to do this in the Asian region because the 23 participating countries are at very different levels of economic development and these differences are reflected in great variations in the levels of government compensation. For example, average compensation (based on exchange rates) in the government health sector in Hong Kong is about 120 times higher than in Lao PDR. If no productivity adjustment is made, transition countries like Vietnam, Cambodia, or Lao PDR, where government salaries are very low, would be seen as having very high real consumption of government services – and hence very high real GDP – compared with countries like Hong Kong and Singapore where government salaries are relatively much higher.

In the poorer Asian countries, government employees are paid so little that they could not possibly support their families if they relied only on their government salaries. In Cambodia the average salary for employees of the statistical office is around \$35 per month. (Virtually the famous one dollar a day). It is therefore accepted that employees in many government departments will spend part of their official working hours doing something else such as teaching in a university, driving a taxi or helping a spouse run a shop. At the other extreme it is probable that the well-paid government employees in Hong Kong or Singapore work more hours than the rules strictly require. They do this just because they want to keep their well-paid jobs.

In collecting government compensation data for Asia, the ADB asked countries to report the number of *hours actually worked* in the hope that this information could be used to make some productivity correction. In practice all countries reported the official work hours - usually round 40 per week - and did not deduct hours actually worked in a secondary occupation

⁷ For more details on the method used for housing services, see Chapter VIII of the Preliminary Report on ICP-Asia: <http://www.adb.org/Documents/Reports/ICP-Purchasing-Power-Parity/Main-Report.pdf>

The solution adopted by ADB was to adjust government compensation – and hence government consumption expenditure and GDP – by assuming that the productivity of government employees depends on their access to capital equipment. Capital equipment used in government includes office buildings, schools, hospitals, equipment such as science laboratories in schools and universities, medical equipment in hospitals, high-speed communications networks, and office equipment. Cobb-Douglas functions of the form $Y = L^\alpha K^{1-\alpha}$ were estimated where Gross Domestic Product (Y) is a function of the amount of labour (L) and the capital stock (K), with labour and capital coefficients being α and $(1-\alpha)$, respectively. Capital stocks were estimated by the perpetual inventory method over a twenty-year period and the labour coefficient was set at 0.7 for high income countries and 0.5 for the remainder. The table below is taken from the preliminary report on ICP Asia 2005 and shows the effects of the adjustment. The adjustment factor for China was 0.26 meaning that, compared with Hong Kong, per capita consumption of government services in China was reduced to about a quarter of what it would have been in the absence of any adjustment; the reduction is even larger for Vietnam and Lao PDR.⁸

Adjustment factors for labour productivity applied to per capita real consumption of government services in ten Asian countries	
Hong Kong, China	1.00
Taipei, China	0.89
Malaysia	0.55
Thailand	0.37
Bhutan	0.28
China, People's Republic	0.26
Mongolia	0.24
India	0.22
Vietnam	0.19
Lao PDR	0.19

People's Republic of China

China did not participate in any previous rounds of the ICP. PRC agreed to participate in the ICP 2005 but only to the extent of providing prices and expenditure weights for 11 major cities. The ICP Global Office (Washington) and the Asian Development Bank (Manila) have converted the 11 city results into a national PPP estimate. This conversion has been done in consultation with staff of China's National Bureau of Statistics (NBS), but the 2005 PPP that is now available for China will not be an officially approved figure but an ADB/World Bank estimate.

Both rich and poor cities were included in the 11 cities chosen by NBS so that the prices and expenditure weights can be considered as broadly representative of China as a whole. Moreover, each of the 11 cities included not only densely populated areas but also substantial parts of the surrounding country-side, and NBS reported prices separately for the urban and rural parts of each cities. The ICP Global Office, the ADB and experts from the Australian Bureau of Statistics consulted with NBS staff to determine how the data for the 11 cities could be used to obtain national PPPs. This is the procedure that was followed:

⁸ For more details of the adjustment, see Appendix D of the Preliminary Report on ICP-Asia: <http://www.adb.org/Documents/Reports/ICP-Purchasing-Power-Parity/Main-Report.pdf>

- For household expenditures, national expenditure weights were estimated separately for urban and rural areas using data from the urban and rural household income and expenditure surveys. Urban and rural prices, averaged over the 11 cities were then used to calculate PPPs.
- For government consumption expenditure, the data on compensation of government employees that had been provided by NBS for the 11 cities were somewhat higher than those published in the NBS *China Statistical Yearbook*. ADB considered that the *Yearbook* figures were more representative for all China and the latter were used in estimating PPPs for both individual and collective consumption. National expenditure weights were obtained in consultation with NBS.
- For gross fixed capital formation, prices for construction goods and for machinery and equipment were averaged over the 11 cities and used with all China weights to obtain PPPs.

Islamic Republic of Iran

In the figures in the next section, Iran is shown as having the third largest economy in the region after China and India, and just ahead of Indonesia. This is partly explained by Iran's large export earnings from oil, steady GDP growth of between 6 and 7% for several recent years and by its large and well-educated population of nearly 70 million. An additional reason however, is that the government has pursued a policy of using oil revenues to keep the prices of cereals, housing, fuels and other basic commodities very low⁹. This is done partly through subsidies paid by government to producers so that they can sell their output at low prices, and partly by government controls that limit or prevent price increases. The low relative price level in Iran could be seen as artificially inflating the relative volume measure of its GDP. The rules of the ICP are clear however. PPPs compare the actual market prices in the participating countries and these prices are determined by taxes and subsidies on products and production as well as by the underlying costs of producing and distributing them. Several other countries in the region also subsidise some basic necessities; Iran's subsidies are larger and more widespread than in other countries but that does not in any way invalidate the results for Iran. Its prices and volumes are being compared on level terms with the other 22 countries.

Some results for the Asia Pacific Region

The Asia Pacific Region includes four Member countries of the OECD - Japan, South Korea, Australia and New Zealand. These countries took part in the OECD-Eurostat comparisons. The 23 countries participating in the AP comparisons are here referred to as "Developing Asia".

⁹ The following is from *The Economist* magazine, July 21 2007: "... the government [or Iran] operates a vast, price-distorting system of subsidies for food, energy, housing, bank credit and much else. According to the IMF, energy subsidies alone reached 17.5% of GDP in 2005-06, and total subsidies amounted to 25% of GDP. A Consumer and Producer Protection Organisation keeps price controls on cereals, sugar, baby milk, fertilisers and pharmaceuticals, paper and agricultural machinery. This edifice of subsidies places huge demands on public spending and would collapse if it were not for the oil revenues."

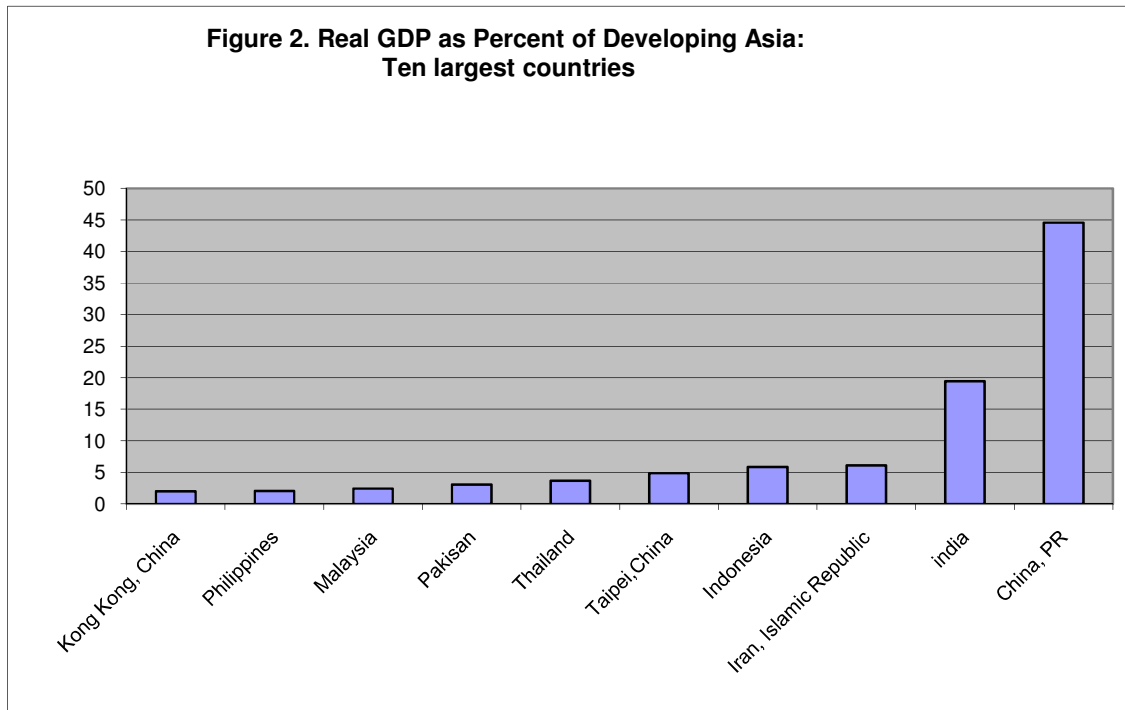
<http://www.tmcnet.com/usubmit/-iran-economy-big-squeeze-/2007/07/21/2802283.htm>

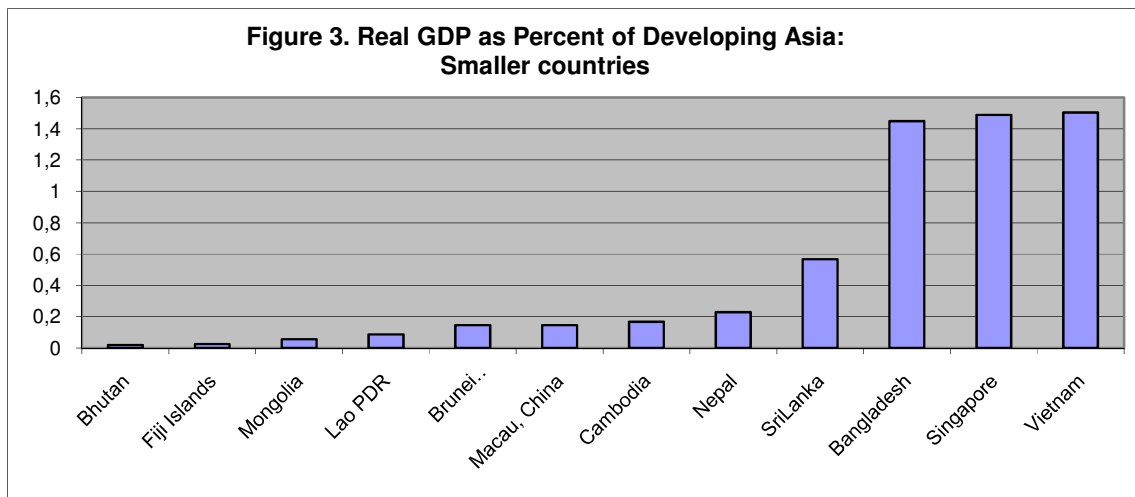
Note the emotive term "price-distorting". Subsidies change prices just as product taxes do, but whether the prices are distorted is a matter of opinion.

Size of countries as measured by Real GDP

Figures 2 and 3 show the shares of GDP in Developing Asia. (These figures show only 22 countries because the Maldives Islands only calculated PPPs for household consumption and not for total GDP)

- China's real GDP is more than twice as large as the second country, India.
- The Iran and Indonesia are the next largest followed by Taipei, China. In view of the likely statistical errors, the real GDP of these three are about equal.
- Among the smaller countries shown in Figure 3 Vietnam, Singapore and Bangladesh have approximately equal shares in Developing Asia's total GDP – each around 1.5%.

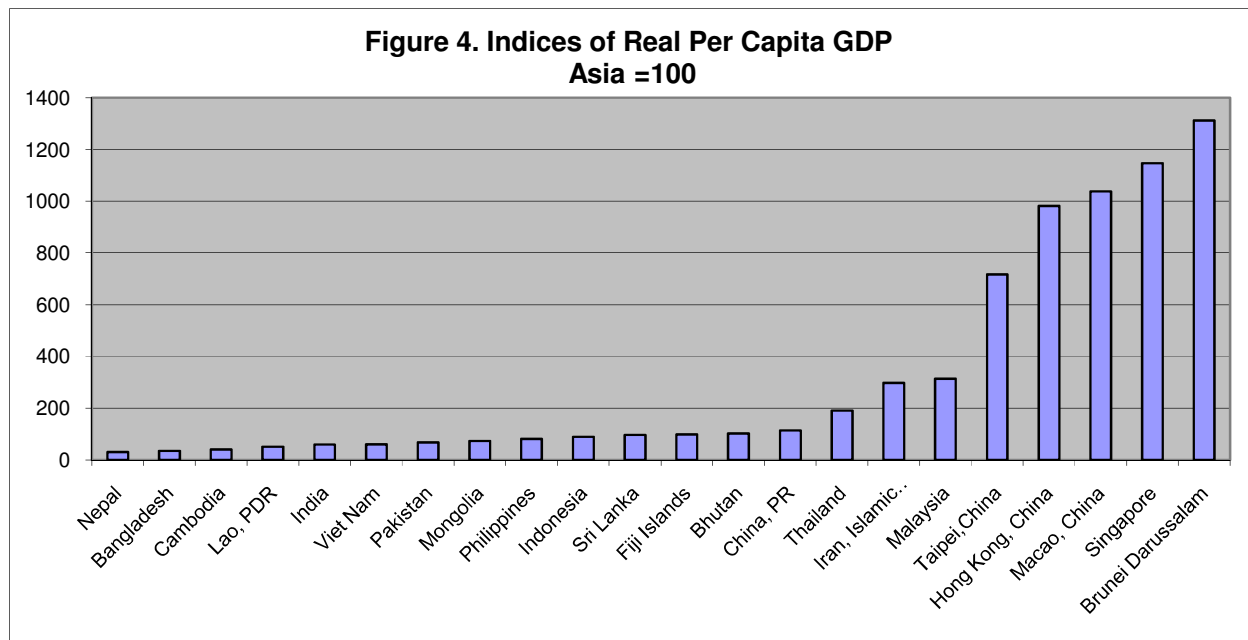




Rich and poor countries in Developing Asia

Figure 4 shows per capita real GDP for 22 countries. Note that small differences in country rankings are not significant as they may be due to statistical errors in either the PPPs or the GDP estimates.

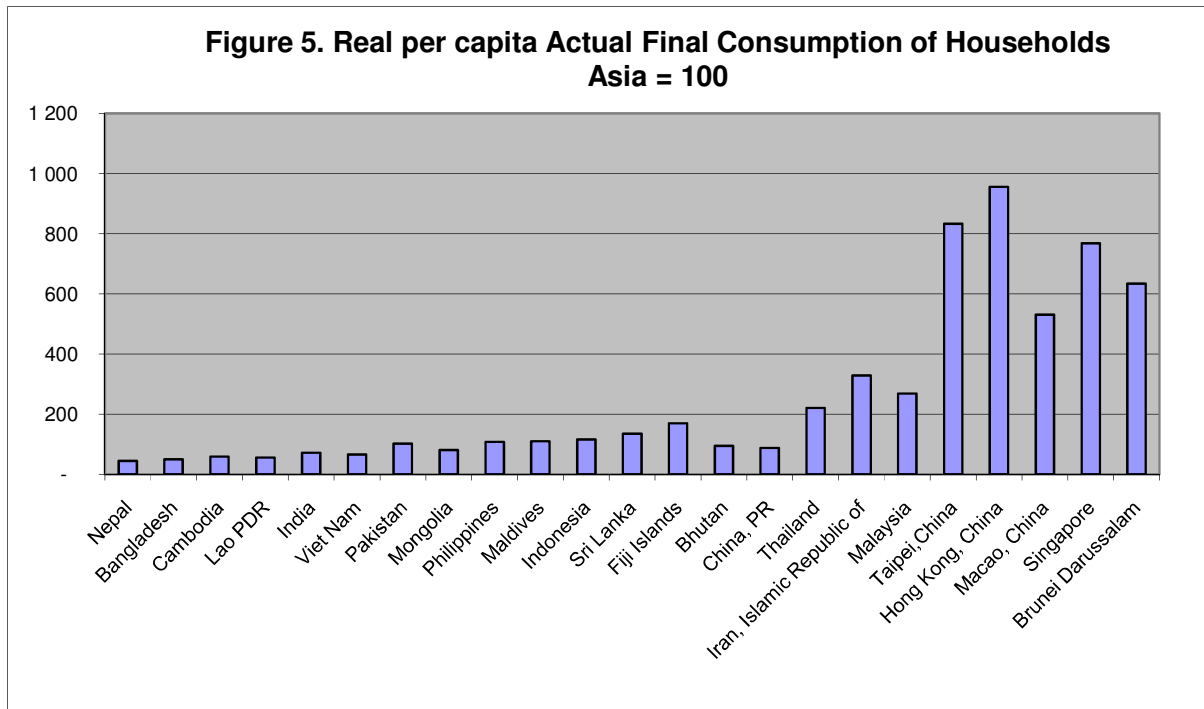
- There are five rich countries. In ascending order these are: Taipei,China, Hong Kong, Macau, Singapore, and Brunei Darussalam. This last has per capita GDP more than 13 times the average for Developing Asia.
- Malaysia, Iran, and Thailand all have per capita GDP between two and three times the average for Developing Asia.
- Per capita GDP in China and Bhutan are both just above the average for Developing Asia, while all other countries are below the Developing Asian average. These include Pakistan (67), Vietnam (61), and India (59).
- The differences within the Developing Asia region are very striking, with per capita GDP in the richest country, Brunei Darussalam, over forty times higher than in the poorest country, Nepal.



Where are people better off?

While per capita GDP is the standard way of distinguishing between rich and poor countries, a better measure of **welfare** is obtained by comparing household consumption. Figure 5 shows “Actual Final Consumption of Households” (AFHC). This is the total of household expenditure on consumer goods and services plus expenditures by government on education and health services provided to households. It is thus a measure of what households actually **consume** - including both what they buy themselves and what they get free from government.

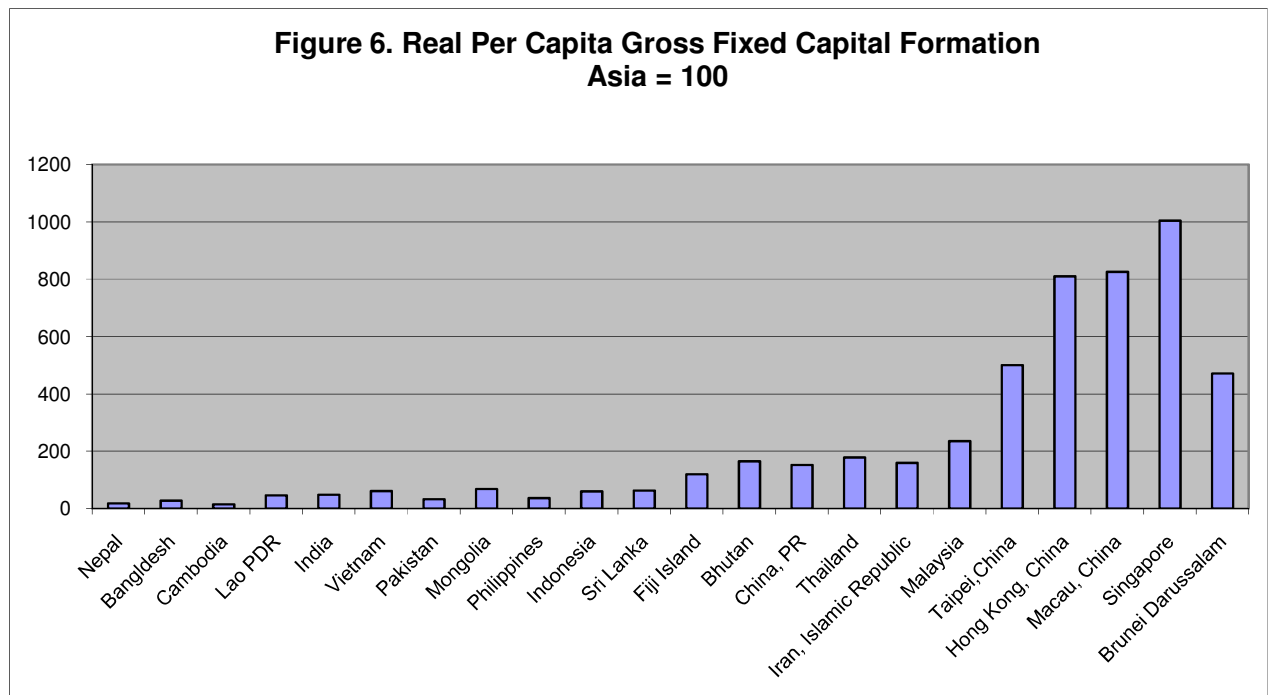
- The countries are shown in ascending order of real per capita GDP – as in Figure 4 above. Note that some countries that were “GDP rich” are now seen to be “consumption poor”.
- Bhutan has a relatively low per capita AFHC because capital formation was a large share of GDP in 2005. The China, Brunei Darussalam and Macau also have relatively low per capita AFHC because they have large net exports – of consumer goods, petroleum products and tourism services respectively.
- India’s per capita AFHC is below the average for Developing Asia. It is just above the level in Vietnam but below per capita AFHC in Pakistan and Mongolia.
- The differences in per capita AFHC between countries are much less than is the case with per capita GDP. Per capita AFHC in the highest country, Hong Kong, is only twenty times greater than in the lowest country, Nepal. (Differences in per capita GDP are twice as large.)



Investing for the future

Gross fixed capital formation (GFCF) consists of investment in residential and other buildings, roads, bridges, railways, electricity networks and the like, and purchases of machinery and equipment. GFCF is important because it enhances a country's potential for future growth. Figure 6 shows real GFCF per capita with the countries again arranged in ascending order of per capita GDP.

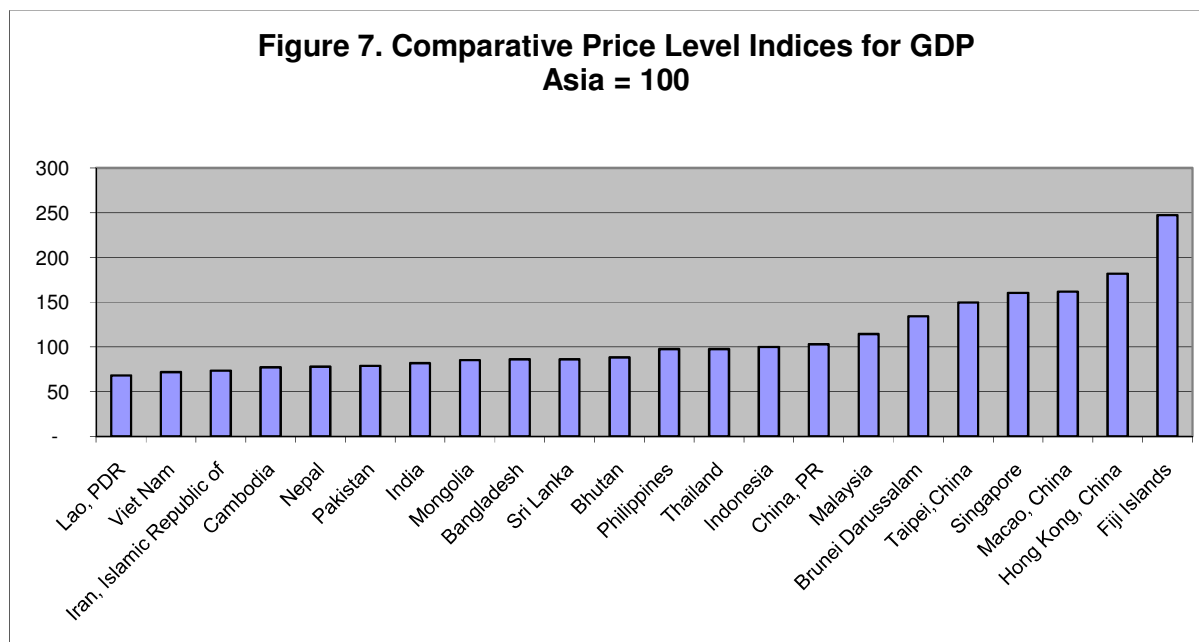
- Richer countries invest more on a per capita basis than poorer countries. That is partly why they are richer!
- Other countries with above average per capita GFCF are Malaysia, Thailand, Iran, Bhutan, China and Fiji Islands.
- All other countries were below the Developing Asian average with particularly low per capita GFCF in Cambodia, Nepal and Bangladesh.
- Per capita GFCF in India was also quite low – higher than in Lao PDR and Pakistan but less than in Vietnam.



Price levels

Another important use of PPP is to compare price levels between countries. The ratio of the PPP to the exchange rate (times 100) is called the “Comparative Price Level Index” or PLI. The PLIs for GDP shown in Figure 7 are based on Developing Asia = 100. An index of 100 means that the price level in that country is exactly the same as the average for Developing Asia; a higher (lower) index means that the price level is above (below) the average. If you live in a country with a high PLI you will be pleasantly surprised at how cheap things are when you visit a country with a low PLI.

- Countries with a high per capita GDP are expected to have high PLIs and this is generally the case in Developing Asia. Hong Kong, Macau, Singapore; Taipei, China; and Brunei Darussalam all have price levels well above the average.
- But there are exceptions. Fiji Islands has a very high PLI even though it has only a mid-level per capita GDP. This is probably because many goods are imported from distant locations.
- At the other extreme Iran, which is a relatively rich country in terms of per capita GDP, has the third lowest price level. As noted above this is due to a widespread system of subsidies.
- Price levels in Philippines, Thailand, Indonesia and China are very similar and are close to the Asia average.
- Price levels in the other countries are below the Asian average with particularly low price levels in Lao PDR and Vietnam.



Conclusion

The ICP 2005 is the most ambitious round of the ICP so far and it has built on the experience of earlier rounds to achieve what appear, at the time of writing, to be high quality results for most of the 150 countries taking part in this round. Some caution is necessary because although the underlying price and expenditure data have been carefully defined, collected and edited, and the within-region results now available look plausible, the final crucial stage is yet to come. This is the linking process using the *Ring Comparison* to obtain the world-level comparisons. How do the Asian giants compare with the major OECD economies? Where are the poor countries of the world? What is Africa's share in world GDP? Which countries have the highest/lowest price levels? Answers to these questions will only be known when ICP 2005 is closed out with the publication of the global results which are expected towards the end of 2007. At the time of writing there are still some problems in bringing the Ring Comparison to a successful conclusion.

The heterogeneity of the 23 countries that participated in the ICP-Asia comparison presented the ADB Regional Co-ordinator and the Global Office with challenges they had not expected. Other regions, too, have certainly encountered problems not foreseen at the outset, but that is the nature of the ICP. It is a work in progress and this round of the ICP has made a substantial advance over earlier rounds. The challenge now is to keep the momentum going for Round Nine.