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A Survey of National Accounts in Asia for Cross-country Productivity Comparisons

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November 2008

Abstract

This paper collates country practices on compilation of national accounts in 18 Asian countries, based on the metadata gathered from a survey conducted by the Asian Productivity Organization (APO) in joint research with Keio Economic Observatory (KEO), Keio University, between April and July 2008. The paper was prepared as a first step towards the construction of an international database for productivity comparisons among Asian countries.

Our observations are summed up as follows. First, although most countries are 1993 SNA compliant, the extent of compliance in terms of coverage still varies. The treatment of FISIM and software is far from standard in this country group, and methods to align GDP coverage need be considered for any cross-country comparisons. Second, employment data are more fragmented and countries are more likely to have a manufacturing census than a census on services. Third, most countries have detailed benchmark supply-use/input-output tables which can be used to supplement their national accounts. Our judgment is that GDP per worker as a labor productivity volume should be feasible for this country group, whereas GDP per hour worked will be more of a challenge due to data limitations. Industry comparative analysis of labor productivity should be feasible; but comparing total factor productivity performance, which requires capital stocks and services estimates, is feasible for only a handful of countries at the whole-economy level.

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A Survey of National Accounts in Asia for Cross-country Productivity Comparisons

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November 2008

1 Introduction

Understanding data comparability is essential for the construction of an international database. Broadly speaking, cross-country data inconsistency can arise from variations in one or more of the three aspects of a statistic: definitions, coverage and methodology. The international definitions and guidelines work to standardize countries' measurement efforts, but country data can deviate from international best practice and vary in terms of omissions and coverage achieved. Last but not least, countries can also vary in their estimation methodology and assumptions, which may account for part of the differences we observe in the data and interfere with comparisons of countries' underlying economic performance. The metadata of data series therefore help illuminate these data inconsistencies and their potential impact on international comparisons, and highlight areas where adjustments may be needed.

The Asian Productivity Organization (APO) aspires to create an international productivity database of its 20 member countries, with non-member countries in Asia like the People's Republic of China serving as the reference countries. In September 2007 APO launched the Productivity Database Project as a joint research effort with Keio Economic Observatory (KEO), Keio University, Tokyo. In this project, we constructed an *APO questionnaire on national*

[†] This study was implemented as a part of the APO Productivity Database Project, a joint project of APO and KEO, Keio University. The authors thank Mukesh D. Bhattarai and Yasuko Asano (Research and Planning Department, APO) for their support and Soyuen Myung (Graduate School of Keio University) for her assistance. We would like to give special thanks to the national experts in our project, who provided the metadata information on the System of National Accounts and other statistics for the APO member countries. The details of data comparability were discussed at a coordination meeting held in Dhaka, Bangladesh, on 20–23 May 2008, and examined at Keio University after the meeting. The national experts who provided metadata information are:
Sabila Khatun, Bangladesh Bureau of Statistics
Keo Chettra, National Institute of Statistics, Ministry of Planning, Cambodia
Jia-yuan Mei, Bureau of Statistics, Directorate-General of Budget, Accounting and Statistics, ROC
Nilima Usharani Lal, Fiji Islands Bureau of Statistics
Kolathupadavil Philipose Sunny, National Productivity Council, India
Wachyu Winarsih, Indonesian Statistic/Analysis and Development Statistic Directorate
Hamid Azarmand, Central Bank of Islamic Republic of Iran
Geonwoo Lee, Korea Institute for Industrial Economics and Trade
Salika Chanthalavong, Department of Statistics, Ministry of Planning and Investment, Lao PDR
Syahron Helmy Binti Abdullah Halim, Department of Statistics, Malaysia
Bibish Oyunsuren, National Statistics Office, Mongolia
Rajesh Dhital, Central Bureau of Statistics, Nepal
Noor Shahid, Federal Bureau of Statistics, Pakistan
Elsie B. Solidum, National Statistics Office, the Philippines
Patabendige Gunasena Jayasooriya, Central Bank of Sri Lanka
Wannapa Khlaisuan, National Economic and Social Development Board, Thailand
Nguyen Thi Viet Hong,General Statistics Office, Vietnam.

accounts and conducted a survey on the national accounts and other statistical data required for international comparisons of productivity among the APO member countries between April and July 2008 (hereafter the *APO NA Survey 2008*).

The aim of this paper is to present the first results of these metadata gathered from the survey of the APO member countries and to draw preliminary implications for international comparisons of productivity, which should be useful to general users. To ensure quality, country responses to the questionnaire have been cross-checked with other national and international references. Any inconsistencies have been followed up with the national experts involved. The results presented in this paper are judged to be reasonably reliable.

There are some international studies on metadata of countries' national accounts. For example, the Asian Development Bank (ADB) and UN Economic and Social Commission for Asia and the Pacific (ESCAP) organized workshops for linking and rebasing national accounts data in the Asia Pacific region in 2000 and 2001. The OECD, ADB and ESCAP also organized a meeting for improving quarterly gross domestic product in Asia in 2001. Conference volumes such as ADB (2002) and OECD (2001) provide useful information on Asian countries' national accounts. Furthermore, the IMF's Dissemination Standards Bulletin Board administers the *Special Data Dissemination Standard* (SDDS) and the *General Data Dissemination System* (GDDS) sites. In their websites, metadata information on official statistics of the countries participating in SDDS or GDDS is provided.[1] These references are used to supplement official documents and publications provided by national statistical agencies, which give more detailed information on country practices, constraints and limitations.

The main observations from the *APO NA Survey 2008* are as follows.

1. Most APO member countries are 1993 SNA compliant; the extent of compliance in terms of coverage may still vary, and the challenge is in splicing series to form a long, consistent time series.
2. The treatment of FISIM (financial intermediation services indirectly measured) is still less than standard in Asian countries.
3. In comparing the coverage of GDP, most Asian countries make provisions to include agricultural production by households for their own final consumption.
4. Most countries have detailed industry and commodity data from their supply-use

[1] See SDDS's website (http://dsbb.imf.org/Applications/web/sddshome) and GDDS's website (linked from the SDDS website). SDDS was established in 1996 to guide countries that have access to international capital markets in disseminating economic and financial data to the public. GDDS was established in 1997 to guide countries in the provision to the public of comprehensive, timely, accessible and reliable economic, financial and socio-demographic data. Its site provides information on data produced and disseminated by member countries that participate in GDDS. The appendix of this paper provides a summary assessment by the IMF's Reports on the Observance of Standards and Codes (ROSC) based on the Data Quality Assessment Framework (DQAF) for Asian countries.

tables/input-output tables (SUT/IOT). Comprehensive data on institutional units are not as readily available, however.

5. Most countries based their GDP estimates on the production side, and fixed-based Laspeyres is still the most common aggregation method used.

6. Within the national accounts, GFCF (Gross Fixed Capital Formation) by asset type is available for the whole economy but not for industry or institutional sectors. Only a handful of countries offer GFCF by industry in the national accounts.[2]

7. Countries which have capitalized software are in the minority. Price indices with quality adjustment are also not the common practice in the countries surveyed.

8. Labor volume is denominated in number of persons worked rather than jobs in nearly all the countries surveyed. Gross value added (GVA) per person should therefore be feasible for all countries. GVA per hour worked is likely to be available for only a sub-set of the countries, however.

9. Most countries have a comprehensive survey for manufacturing but not for the service sector, confirming the discrepancy of data quality and availability between manufacturing and services.

10. All countries have a population census, which can be a potential source of socio-economic data needed to measure labor quality.

The rest of the paper is divided into three sections. Section 2 presents information from our metadata survey on the Systems of National Accounts in Asian countries, focusing on statistics required for productivity measurement. Section 3 covers other related statistics, e.g. benchmark supply-use and input-output tables, population censuses, price statistics and so on, some of which are not directly used for productivity calculations at this stage but are useful as background information to help judge data quality. Section 4 concludes.

2 System of National Accounts

2.1 1993 SNA Compliance

The current international standard for the framework of compiling country national accounts is provided in 1993 SNA recommended by the United Nations (1993). Since there are differences between the 1993 SNA and its predecessor (1968 SNA) in some concepts and coverage, it is important to know in which year in the data series definitions and classification started to switch over, so as to identify breaks in time series. Countries can differ in their year of implementation, the extent of compliance and backward estimates available.

[2] Note that, in countries' benchmark SUT/IOTs, estimates by more detailed types of asset are available (based on product classification).

Table 1: 1968 and 1993 SNA Compliance of Annual National Accounts

	Year of first implementation of 1968 SNA	First year national accounts based on 1968 SNA are available (including backward estimates)	Last year national accounts based on 1968 SNA are available	Year of first implementation of 1993 SNA	First year national accounts based on 1993 SNA are available (including backward estimates)
Bangladesh	1973	1972/73	1997/98	2000	1979/80
Cambodia	1993	1993	2007	NA (Some definitions of 1993 SNA are introduced.)	NA
ROC	1988	1951	2005	2005	1951
Fiji	1982	1968	2002	2003	1995
India	1978	1950/51	2007/08	2007	1999/2000
Indonesia	1970	1950	2007	NA (Some definitions of 1993 SNA are introduced.)	NA
Iran	1981	1959	2007	2006	1988
Japan	1978	1955	1998	2000	1980 (Some data are available since 1996.)
Korea	1986	1970	1997	2004	1970
Laos	NA (Before 1993 SNA is introduced, country's own system of national accounts is available for 1990–2006.)			2002	2006 (It is planned to issue backward estimates since 1997.)
Malaysia	1969	1960	2006	2007	2000
Mongolia	NA (Before 1993 SNA is introduced, Material Product System was used.)			1999	1995
Nepal	1975	1974/75	2004/05	2006	2000/01
Pakistan	1981	1987	2001	2000	1999/2000
Philippines	1985	1946	2006	Planned for 2008	1991 (Not officially released.)
Sri Lanka	1975	1975 (Statistics based on the guidance of SNA (not 1968 SNA) is available since 1968)	2001	2001	1998
Thailand	1975	1972	2007	Planned for 2009	2000
Vietnam	NA (Before 1993 SNA is introduced, Material Product System was used.)			1996	1986

Table 1[3] summarizes the timing of the switchover in each country and the first year when consistent time series start in the annual national accounts (ANA). As seen in this table, most APO member countries are currently 1993 SNA compliant, although for some this has only been a recent development. The exceptions are the Philippines[4] and Thailand, which will switch over in 2008 and 2009 respectively. Although Cambodia and Indonesia are the only two countries that have not adopted 1993 SNA as the basic framework for ANA, they follow 1993 SNA in some areas. In Cambodia COICOP, which is the international classification of individual consumption recommended by 1993 SNA, has been implemented. In Indonesia the production and asset boundaries have been influenced by 1993 SNA.[5]

The starting year of the official 1993 SNA-compliant time series varies a great deal across countries, reflecting the difference in availability of backwards estimates. The longest consistent

[3] Figures 1 and 2 show when countries introduced 1968 SNA and 1993 SNA in more intuitive way.

[4] The National Statistical Coordination Board (NSCB) is currently undertaking an overall revision of the Philippine system of national accounts (PSNA) for the period 2000–2006.

[5] IMF (2005b) indicates "The production boundary is generally in line with the 1968 SNA. However, the 1993 SNA concepts of own-account production of all goods for own final consumption, and output of goods for own-account fixed capital formation have already been implemented. The asset boundary is also generally in line with the 1968 SNA. However, the 1993 SNA concepts of defense-related assets that could be used for civilian purposes and valuables have already been implemented. The other 1993 SNA changes will be implemented in due course."

time series are available for the Republic of China (ROC) from 1951, followed by Korea from 1970. Countries which have consistent time series from the 1980s are Japan,[6] Iran, Bangladesh and Vietnam, and from the 1990s Fiji, Mongolia, Sri Lanka and the Philippines (targeted). The remaining six countries, with a starting year from 2000 onwards, are India, Lao PDR, Malaysia, Nepal, Pakistan and Thailand (targeted).

However, depending on the data series, it is possible that time series which go back further may be available but are not released officially. For Korea, data based on 1968 SNA or 1993 SNA are available only after 1970. Korea implemented 1953 SNA before 1968 SNA. The Korean system of national accounts (KSNA) based on 1953 SNA is available for the years 1953–1970. Before the introduction of 1993 SNA, Mongolia and Vietnam had adopted Material Product System (MPS), which was theoretical manuals prepared in the Soviet Union in 1940. This was the system which socialist countries used to follow. The biggest difference between MPS and SNA is that MPS excludes production and sales of many services from its production boundary.[7]

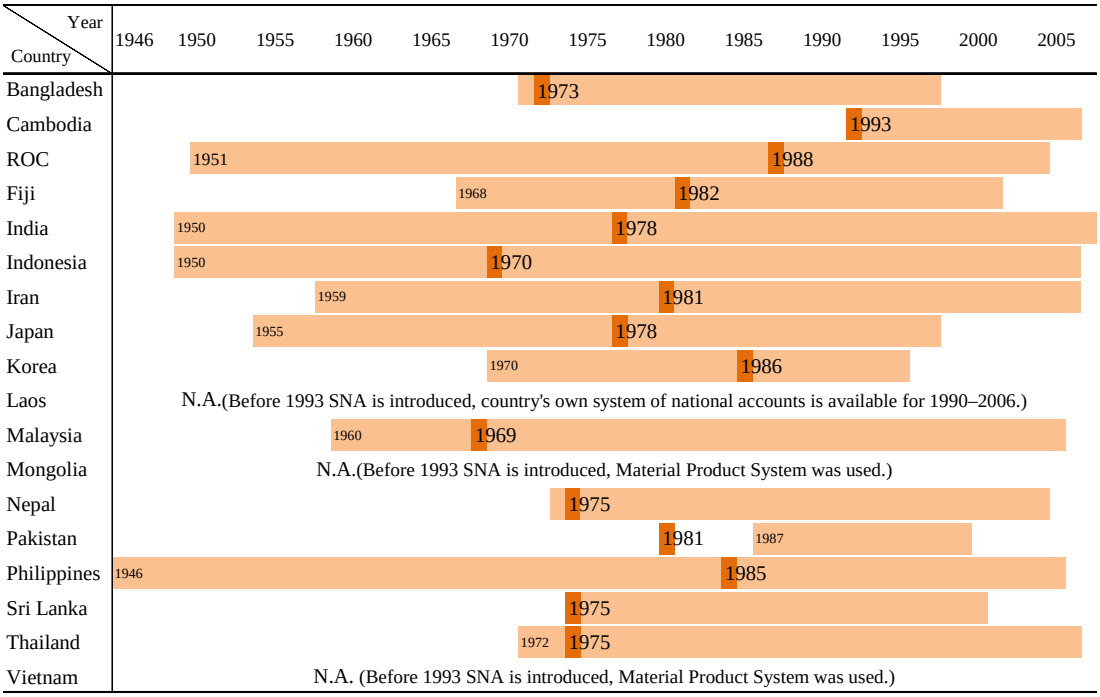

Figure 1: Implementation of 1968 SNA

[6] The Economic and Social Research Institute (ESRI), Cabinet Office, Japan is currently undertaking the time-series revision of the Japan's system of national accounts (JSNA) from 1955.
[7] See Jansen (1973) for the differences between MPS and SNA.

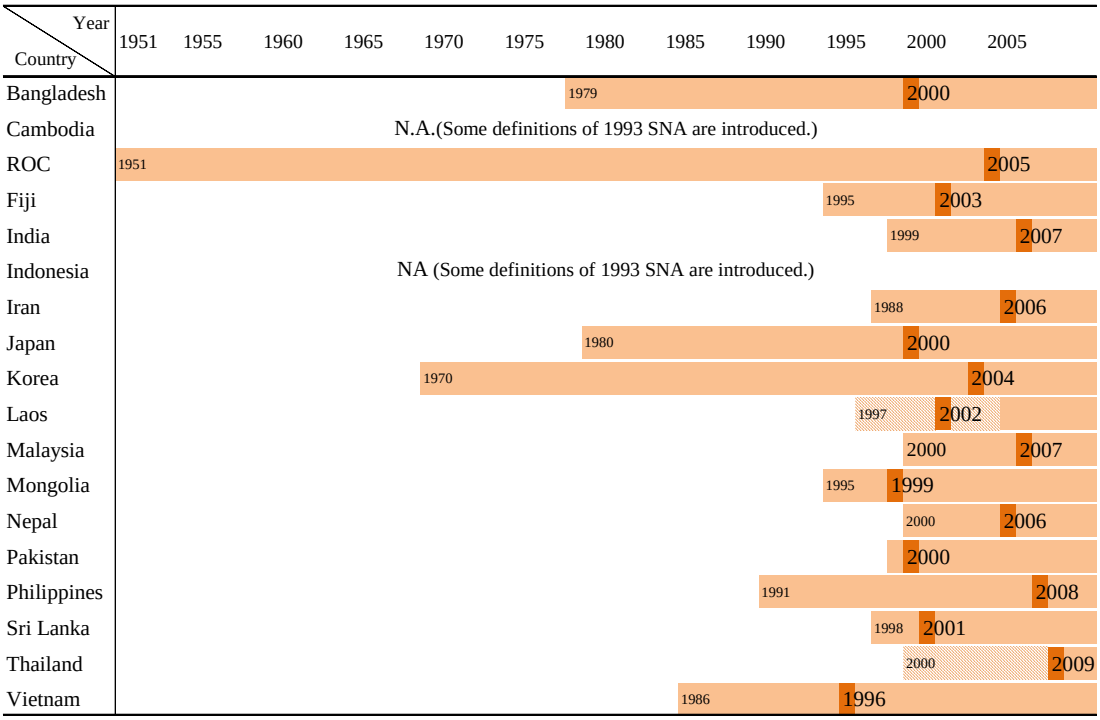

Figure 2: Implementation of 1993 SNA

2.2 Coverage of GDP

Countries may have adopted 1993 SNA as the framework for their national accounts, but the extent of compliance in terms of coverage may still vary. This section focuses on six areas where compliance may be less than standard.

Five of these areas stem from own-account production of goods and services by households, which according to 1993 SNA (paragraph 4.148) are part of GDP for the whole economy and thus should be included in GDP. These areas are construction of dwellings by households for their own use; production of agricultural goods by households for their own use; production of household goods by households for their own use; imputed service of owner-occupied dwellings; and production of domestic services by employing paid staff for their own consumption. Since the goods and services produced by households for their own use are not traded in the market, their prices have to be imputed in order to calculate their contribution to GDP. This gives rise to measurement difficulties, and may hamper their inclusion in country national accounts.

Another area which gives rise to divergent practice is the treatment of FISIM (financial intermediation services indirectly measured). FISIM captures the wedge between the interest rates charged to borrowers and those paid to depositors by banks and other financial institutions. It represents a significant part of value added in the financial sector. The divergence is in the 1993 SNA recommendations that FISIM should be allocated to users (individual industry,

households and overseas). This is in contrast to the 1968 SNA, where the imputed banking services were allocated exclusively to the business sector. Instead of allocating the imputed banking services to each industry, the common practice has been to create a notional industry which buys the entire service as an intermediate expense and generates an equivalent negative value added. As such, the imputed banking services have no impact on GDP.

If the 1993 SNA recommendation is fully implemented, the allocation of FISIM to its users will impact industry GDP and the overall GDP for the total economy (by the part of FISIM allocated to households, government and overseas). It is therefore important for analysts to note the divergent practice with regards to FISIM in countries' national accounts.
Table 2 shows the extent to which countries have incorporated these six areas in their national accounts. The treatment of FISIM is less standard in this group of countries.

Table 2: Coverage of GDP

	Construction of dwellings by households for their own use	Production of agricultural goods by households for their own final consumption	Production of household goods by households for their own use (e.g. cloth, furniture)	Imputed service of owner-occupied dwellings	Production of domestic services by employing paid staff for their own consumption	Financial intermediation services indirectly measured (FISIM)
Bangladesh	Yes	Yes	No	Yes	Yes	No
Cambodia	Yes	Yes	Yes	Yes	Yes	No
ROC	Yes	Yes	Yes	Yes	Yes	Yes
Fiji	Yes	Yes	Yes	Yes	No	No
India	Yes	Yes	No	Yes	Yes	Yes
Indonesia	Yes	Yes	Yes	Yes	Yes	No
Iran	No	No	No	Yes	No	Yes
Japan	No	Yes	No	Yes	No	No (Trial estimates are available.)
Korea	Yes	No	No	Yes	Yes	Yes
Laos	Yes	Yes	Yes	Yes	Yes	No (Trial estimates are available.)
Malaysia	No	No	No	Yes	No	Yes
Mongolia	Yes	Yes	Yes	Yes	No	No
Nepal	Yes	Yes	No	Yes	No	Yes
Pakistan	Yes	No	No	Yes	Yes	Yes
Philippines	Yes	Yes	Yes	Yes	No	No
Sri Lanka	Yes	Yes	Yes	Yes	Yes	No
Thailand	Yes	Yes	Yes	Yes	No	No (Trial estimates are available.)
Vietnam	Yes	Yes	Yes	Yes	No	No

Most have not allocated FISIM to final demands,[8] although three (Japan, Lao PDR and Thailand) have trial estimates available. The impact of the allocation of FISIM to final demands is always to raise GDP. For those countries which have implemented the 1993 SNA recommendation, the impact on GDP ranges from 1.3 percent to 3.8 percent. Figure 3 compares the time trend of the

[8] Although seven APO member countries incorporated FISIM, only three counties allocated it to final demands. Other countries, like Iran, allocate it only to intermediate demands, thus it has no impact on GDP.

impact of FISIM in ROC, India, Japan, Korea and the U.S.[9]

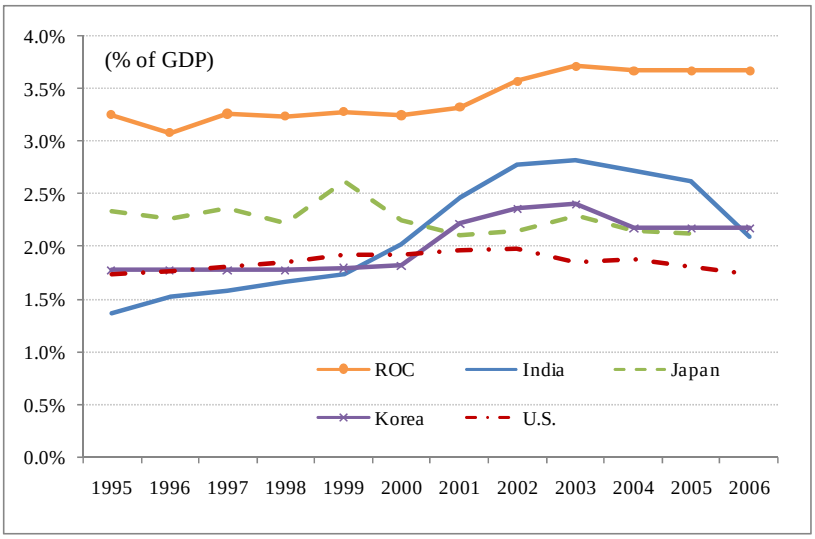

Figure 3: Comparison of the Impact of FISIM Inclusion on GDP

All countries have included the imputed service of owner-occupied dwellings. In many countries its volume is significant. Figure 4 compares its contribution to GDP in India, Iran and Japan over time. The shares of the imputed service of owner-occupied dwellings in GDP are significant in these countries. For international comparisons of productivity in the business economy, the value added in the imputed service of owner-occupied dwellings should be excluded from GDP.

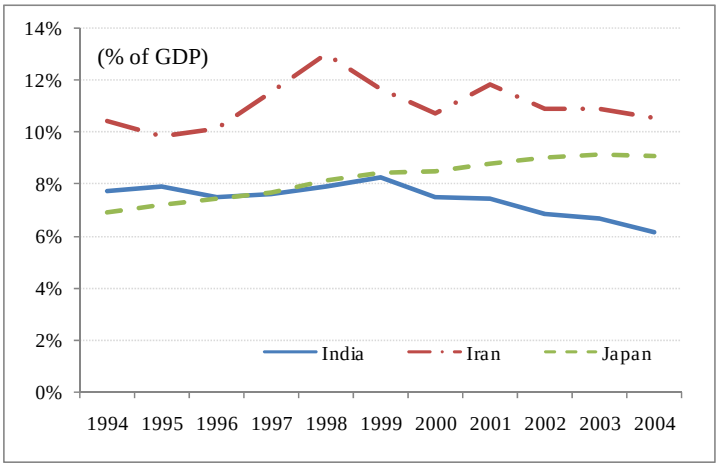

Figure 4: Comparison of Imputed Services of Owner-Occupied Dwellings

[9] For ROC and Korea, the allocations of FISIM estimates are not available in their official national accounts. In Figure 1, the impact of FISIM inclusion on GDP for these two countries is tentatively estimated by using the average of Japan's proportions of FISIM allocated to final demand.

Compared with the imputed service of owner-occupied dwellings, country experience is more varied in other areas of own-account production by households. Construction of dwellings by households for their own use has been included in all the countries surveyed except Japan, Iran and Malaysia. Most countries have also incorporated production of agricultural goods by households for their own consumption. For instance, "The estimate of the gross domestic product of Nepal is based on production approach. Agricultural GDP is estimated on the basis of production flow. Therefore, the estimates of agriculture GDP in principle, covers all types of production. In case of non-agriculture part, production of own account goods produced by households are not properly included in the estimates because of data gaps on such types of production" (Nepal Central Bureau of Statistics, 2007). Given that agricultural employment still averages 45 percent of total employment in Asia, this is encouraging, as otherwise underestimation of a country's GDP could be significant.

It should be noted that the informal sector poses another problem for GDP coverage. Not only is it by definition difficult to measure, but its nature and boundary keep evolving with the wider economy, making it even more elusive to capture. For example, Mohammad (2007) observes that in Malaysia, globalization has impacted on the informal sector in two ways. First, as in the formal sector, the existing informal sector is experiencing technological deepening to diversify the commodities and services offered as a response to globalization. The traditional formal/informal demarcation with respect to the level of technology employed is being challenged. Secondly, in order to utilize global changes to expand production and lower labor costs, certain forms of subcontracting and outworking have become important informal activities. As such, the informal sector is expanding beyond the traditional confines of the non-agricultural activities of those who have migrated to escape from poverty in rural areas.

Lack of coverage of the informal sector and the non-observed economy in general would result in biases in levels and trends of GDP and cause imbalances in the internal consistency of economic transactions. Depending on the relative size of the informal sector, it could ultimately pose a real challenge to the credibility of national account estimates. The Department of Statistics, Malaysia (DOSM) has invested in studying the issue. Having identified and gathered some information on informal activities, DOSM launched a pilot survey for this sector in August 2006. As a start, the informal activities covered include those associated with street vendors, shops opened during festival seasons and night-market operators. The information from the survey will be used in the compilation of GDP in Malaysia.[10] While some countries are making an effort to improve GDP coverage insofar as the informal sector is concerned, researchers should beware of the different progress achieved by countries – which is a source of cross-country data incomparability in itself.

[10] See Mohammad (2007) for details.

2.3 Industry and Institutional Sectors

In order to understand the dynamics in an economy, it is informative to investigate the changes in structure and productivity performance at industry level. It is at the industry level that we can see more clearly where the strengths and weaknesses of an economy lie. Countries may have similar overall economic growth rates and productivity growth performance, but can differ a great deal in their compositions, reflecting different growth paths and implying a different set of risk factors. This is why there is always a huge interest in industry productivity analysis, and the demand for more and more detailed analysis is relentless. In this section we investigate the comparability of countries' industry GDP data and compare the level of detail at which they are available officially.

Production units (i.e. establishments) are classified by their production activities. The classification of production activities used by 1993 SNA is ISIC revision 3. There are four levels of ISIC, referred to as 1-digit to 4-digit levels, with the 1-digit level giving the broadest categories, rising up to the most detailed in the 4-digit level. At 1-digit level there are around 17 industry sectors. ISIC further breaks down manufacturing into 23 sub-sectors at 2-digit level. This framework enables more robust and detailed data to be collected for manufacturing. In comparison, the breakdown for service industries is far less comprehensive. The different treatment of manufacturing and services in ISIC does not reflect the relative importance of the sectors, but the relative difficulty in measuring and defining the sectors.[11]

Table 3 shows the level of industry detail that appears on countries' national accounts. It by no means rules out that more detailed information can be available outside the national accounts, for example in the input-output tables. As shown in Table 3, industry data are available at close to 1-digit level for most countries, and manufacturing data are also comprehensive.

[11] The current framework of the APO Productivity Database has a breakdown to 10 sectors and 6 manufacturing sub-sectors.

Table 3: Level of Industry Detail

	Number of main industries	Number of sub-industries in manufacturing	Industry classification (relashionship with ISIC)
Bangladesh	15	39	BSIC (ISIC Rev. 2 up to the 4-igit level)
Cambodia	16	12	ISIC Rev. 3
ROC	15	24	SIC. 2001 version (ISIC Rev. 3 up to the 1-digit level)
Fiji	17	21	FSIC. (ISIC Rev. 3 up to the 4-digit level)
India	17	23	NIC. 1998 (ISIC Rev. 3 up to the 4-digit level.) and NIC 2004 (ISIC Rev. 3.1.)
Indonesia	9	11	ISIC. Revision 2005 (ISIC Rev. 3)
Iran	9	20	ISIC Rev. 3
Japan	10	13	JSIC. 2002 version (ISIC Rev. 3)
Korea	13	11	KSIC. 2000 version (ISIC Rev. 3)
Laos	14	23	ISIC Rev. 3 (Data available in the 1-digit level only)
Malaysia	10	24	MSIC. 2000 version (ISIC Rev. 3)
Mongolia	14	3	ISIC Rev. 3.1
Nepal	15	1	NSIC (ISIC Rev. 3)
Pakistan	14	3	PSIC. 1970 version (ISIC Rev. 2)
Philippines	12	20	1994 PSIC (ISIC Rev. 3)
Sri Lanka	11	4	ISIC Rev. 3
Thailand	16	22	TSIC (It corresponds to ISIC Rev. 3)
Vietnam	20	1	VSIC. 1993 version (ISIC Rev. 3) VSIC. 2007 version 3 (ISIC Rev. 4)

Besides the industry breakdown, it is not uncommon that productivity analysis sometimes focuses on the performance of the market sector. The reasons for the interest in this sector are twofold: by excluding the public sector, which produces largely non-marketed services, output and inputs of the market sector can be more accurately and independently measured, and in turn give rise to better-quality productivity estimates; and, arguably, it is the sector which holds the key to the dynamics of productivity growth in any economy.

Strictly speaking, the market sector should be defined in terms of institutional units, which 1993 SNA defines as units that are capable of owning goods and assets, incurring liabilities and engaging in economic activities and transactions with other units in their own right. SNA provides a classification of five mutually exclusive sectors: non-financial corporations; financial corporations; government units, including social security funds; non-profit institutions serving households (NPISHs); and households. The outputs of government units and NPISHs are mainly non-market outputs that are provided free or at economically insignificant prices. SNA makes provision for a complete set of flow accounts and balance sheets to be compiled for each sector as well as for the total economy. Separate flow accounts and balance sheets for each sector are very useful in our attempt at productivity analysis.

Our survey includes a question on data availability by institutional sector. However, we feel that a simple yes/no answer does not capture the variation across countries in the extent to which each country introduces these sectors into its national accounts. For example, in Korea, Nepal and the Philippines, NPISHs are included in the household sector. In the Republic of China, for

non-financial corporations and households, only outlay and income account is implemented. On the other hand, Vietnam implements production accounts and outlay and income accounts for all the five mutually exclusive institutional sectors.[12] The survey results are deemed insufficient in distinguishing between these practices, and thus are not presented in this paper.

2.4 Valuation, Estimation and Aggregation Methods of GDP

GDP can be valued using different price concepts: market prices, factor cost and basic prices. Valuation concerns the decision to include or exclude indirect taxes and subsidies in the prices of output. The nominal GDP can differ in size depending on the price concept used. If countries are using different price concepts to value their GDP, this in turn will interfere with the level comparisons of GDP-related indicators across countries.

For analysis at the whole-economy level, GDP at market prices can be used and is available for all APO member countries, as shown in Table 4. In comparing GDP by industry, a more appropriate concept is one based on factor cost, which excludes all indirect taxes on production and includes all subsidies, and has been used in many countries. However, factor cost is not explicitly used in 1993 SNA; rather it recommends using the concept of basic price, which is intended to measure the amount actually retained by the producer.[13] Bangladesh, Cambodia, Malaysia and Vietnam are the only four countries which have no other GDP measures except at market prices. Other countries have GDP available at either basic prices or factor cost in addition to market prices. GDP at basic prices is available in four countries, while GDP at factor cost is found in nine countries. Nepal switched over to basic prices in 2005, with backwards estimates from 2000/01.

[12] See ADB (2002).

[13] Market price measures the amount actually expended by the purchaser to acquire a particular good or service at a specific time and place; basic price excludes “taxes on products” payable on goods and services when they are produced, delivered, sold, transferred or otherwise disposed of by their producers, but includes “other taxes on production”, consisting mainly of taxes on the ownership or use of land, buildings or other assets used in production or on the labor employed, or compensation of employees paid.

Table 4: GDP Estimates

	Approaches to GDP Estimation			Price Concept			Index Number for Real GDP
	Production approach	Expenditure approach	Income approach	GDP at market price	GDP at basic price	GDP at factor cost	
Bangladesh	Yes (Base estimate)	Yes	No	Yes	No	No	Fixed-base Laspeyres
Cambodia	Yes (Base estimate)	Yes	No	Yes	No	No	Fixed-base Laspeyres
ROC	Yes (Base estimate)	Yes	No	Yes	No	Yes	Fixed-base Laspeyres
Fiji	Yes (Base estimate)	Yes	No	Yes	No	Yes	Fixed-base Laspeyres
India	Yes (Base estimate, depending on sectors)	Yes	Yes (Base estimate, depending on sectors)	Yes	No	Yes	Fixed-base Laspeyres
Indonesia	Yes (Base estimate)	Yes	No	Yes	No	Yes	Fixed-base Laspeyres
Iran	Yes (Base estimate)	Yes	No	Yes	Yes	No	Fixed-base Laspeyres
Japan	Yes	Yes (Base estimate)	No	Yes	No	Yes	Chain-linked Laspeyres
Korea	Yes (Base estimate)	Yes	No	Yes	Yes	No	Fixed-base Laspeyres
Laos	Yes (Base estimate)	Yes	No	Yes	Yes	No	Fixed-base Laspeyres
Malaysia	Yes (Base estimate)	Yes	No	Yes	No	No	Fixed-base Laspeyres
Mongolia	Yes (Base estimate)	Yes	No	Yes	Yes	No	Fixed-base Laspeyres
Nepal	Yes (Base estimate)	Yes	No	Yes	Yes (Since 2000/01)	Yes (Before 2000/01)	Fixed-base Laspeyres
Pakistan	Yes (Base estimate)	Yes	No	Yes	No	Yes	Fixed-base Laspeyres
Philippines	Yes (Base estimate)	Yes	No	Yes	No	Yes	Fixed-base Laspeyres
Sri Lanka	Yes (Base estimate)	Yes	No	Yes	No	Yes	Fixed-base Laspeyres
Thailand	Yes	Yes	Yes	Yes	No	Yes	Fixed-base Laspeyres
Vietnam	Yes (Base estimate)	Yes	No	Yes	No	No	Fixed-base Laspeyres

Besides valuation, another aspect of GDP is how it is estimated. There are three approaches used to measure GDP: production, expenditure and income. In theory, they are accounting identities and should sum up to the same GDP level. But in reality we do not have perfect information, and GDP estimates based on different approaches do not necessarily converge. Choosing between these estimates, one approach may have more reliable and accurate data sources than the others and may become the "base estimate" of GDP in some countries. Yet in other countries the practice may be to confront the three approaches with each other as a standard procedure, giving rise to one consolidated GDP estimate after balancing adjustments have been made.[14]

Our survey results in Table 4 show that the base estimates of GDP for the APO member countries are predominantly derived from the production approach. In Fiji, for example, "The production approach plays a lead role in the estimation of the GDP. The expenditure approach is compared with the production approach and adjusted as far as possible, mainly on private final consumption,

[14] In the Australian system of national accounts (ASNA), GDP estimates based on three approaches have been integrated with annual balanced supply and use tables. As integration with these tables ensures that the same estimate of GDP is obtained from the three approaches, annual estimates using the income, expenditure and production approaches are identical for the years for which these tables are available (Trewin, 2000).

and then on gross fixed capital formation. However, there is a residual discrepancy between the two approaches, which is separately identified beside the final expenditures. The income approach is adjusted to the same total as the GDP from the production approach. The adjustment is imputed to the net operating surplus" (IMF, 2007a).

Japan is the only country which relies on the expenditure side to give its GDP base estimate.[15] India is another exception: it utilizes information from different approaches to estimate GDP of different sectors. Industry GDP is estimated from either the production approach or the income approach based on industries' characteristics.[16]

Only two out of the 18 countries have independent GDP estimates based on the income approach in their national accounts, although this approach is highly valued as a direct method to estimating a time series of value added by industry in the counties that have high-quality source income data like the USA.[17] For most countries in Asia, net operating surplus is not independently estimated, but derived as residuals.[18]

Another aspect of GDP estimation where countries can have diverse practices is the method of aggregation. Indices are required in aggregating heterogeneous goods and services in GDP. The results are sensitive to the specific index number formula chosen. The most widely used index number formulae are the Laspeyres and Paasche indices (the former uses based-period weights while the latter uses the current-period weights), the Fisher index (a geometric average of the Laspeyres and Paasche indices) and the Törnqvist index (a weighted geometric average of its components).

An important distinction between index numbers is whether they draw chain- or fixed-base comparisons. Fixed-based Laspeyres indices, for example, tend to overestimate growth by

[15] Based on the first draft of the Basic Plan published in October 2008 by Statistics Commission in Japan, Economic and Social Research Institute (ESRI), the Cabinet Office of Japan plans to integrate two measures of GDP estimates based on expenditure and production approaches under the framework of supply and use tables until 2015. Development of income approaches to measure GDP will be another challenge for ESRI, to be investigated until 2015.

[16] ADB (2002) explains "GDP estimates for agriculture, forestry and logging; fishing; mining and quarrying; organized manufacturing (establishments registered under Factories Act/ Workers act); and construction are based on production approach. For electricity, gas and water supply; trade, hotels and restaurants; transport, storage, and communication; banking, insurance, real estate, ownership of dwellings and business services; public administration and defense; and other services; the GDP is estimated following the income approach."

[17] In the national income and product accounts (NIPAs) estimated by the Bureau of Economic Analysis, the measures of value added in its GDP-by-industry accounts are derived from the industry distributions of the components of GDI from NIPAs, which in turn are based on establishment-based data from the Bureau of Labor Statistics and enterprise-based annual tax return and administrative record data from the Internal Revenue Service. For more information see Lawson et al. (2006).

[18] TFP measurement requires information from the income account to derive weights for the factor inputs. It is not estimated in two countries, Bangladesh and Malaysia (in progress).

placing too much weight on items for which relative prices have fallen and too little weight on items for which relative prices have risen. The reverse is true for fixed-base Paasche indices. The further away the current year is from the base year, the bigger this substitution bias. But by updating the weights to last year's prices as the base for comparisons each year, chain indices minimize the substitution bias found in fixed-base indices. In so doing, chain indices also reduce the Laspeyres-Paasche spread, making the choice of index formula less consequential than in the case of fixed-base indices.

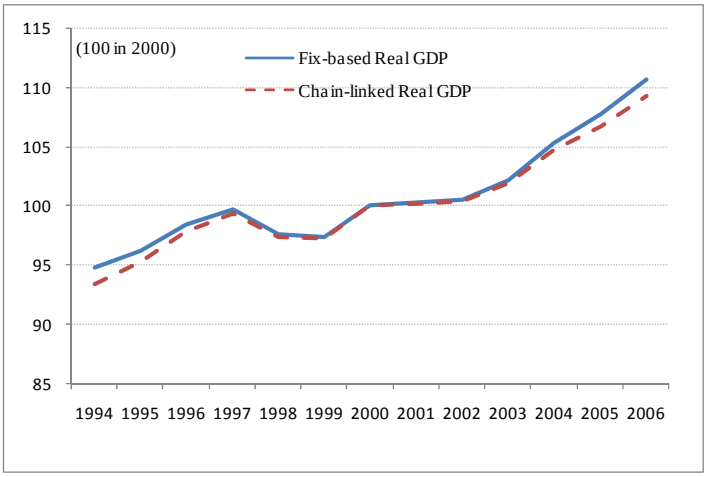

Figure 5: Comparison of Fixed-based and Chain-linked Real GDP in Japan

The international standard has now moved on from fixed-base Laspeyres to chain-linked indices. But, as shown in Table 4, most countries surveyed are still using fixed-base Laspeyres. Japan is the only country which has moved to chain-linked indices. In the Japanese system of national accounts published by the Economic and Social Research Institute (2008), there are two series of real GDP: one based on a fixed-base Laspeyres quantity index and the other on a chain-linked Laspeyres quantity index. Figure 5 compares the two series, and the upward bias of the fixed-base GDP can be seen to have accumulated to 1.5 percent over six years. In 2006 the fixed-base real GDP had grown by 10.7 percent and the chain-linked real GDP by 9.2 percent compared with their levels in 2000. In comparing countries' economic performance, researchers should be mindful of this divergence if countries are using different index numbers to aggregate their real GDP estimates.

2.5 GFCF and Capital Stock

Investment enables capital upgrade, and in turn technological transfer to technologically backward economies to spur growth. Investment data are collected as gross fixed capital formation (GFCF) in the national accounts, based on which capital services will be estimated for productivity analysis. Investment is not homogeneous, but differentiated by asset type. In the capital services methodology, the heterogeneity of different assets is accounted for. Breakdown

by asset type will allow quality change in capital through changes in its composition to be adjusted for properly. As such, the finer the breakdown by asset type, the better we can take care of asset heterogeneity and the more accurate the capital services estimates will be. Capital services measurement is not yet a standard requirement of the 1993 SNA and hence is not readily estimated in the national accounts. Some international databases, however, publish their own estimates of capital services for countries.

According to the SNA classification, there are 15 types of produced fixed assets (seven types of tangible fixed assets, four of intangible assets and four of inventories) and 10 types of non-produced assets (six types of tangible non-produced assets and four of intangible non-produced assets). Each country adopts different asset classification. It is useful for researchers to know the practice in each country should they want to compile their own estimates and need to draw up the detailed methodology for capital services.

The 1993 SNA recommends the capitalization of intangible assets, which are classified into four categories: mineral exploration, computer software, entertainment, literary or artistic originals, and other intangible fixed assets. The purchase of these intangible assets used to be considered as intermediate consumption, and thus GDP does not properly reflect their characteristic of a capital with production capacity beyond the current period.

In capitalizing intangible assets, each country faces different data limitation problems. Further complications surface for the capitalization of computer software, which includes custom software, own-account software and pre-packaged software. There may be great variations in the degree of implementation across countries. The capitalization of intangible assets changes not only the size of capital input but also the size of GDP. Information on the capitalization of intangible assets is required in order to standardize output and input concepts for our analysis.

Table 5 presents the detail level available for GFCF and capital stock in the national accounts. All countries collect GFCF data for the whole economy but the number of asset type available varies from one to 13. Six countries have three asset types or fewer; six countries have six asset types. Mongolia has nine while Indonesia has 13. Nine countries have GFCF available also by institutional units and six have GFCF by industry; most of them do not further disaggregate into asset type. Of course, more detailed breakdown may be found outside the national accounts, for example in the input-output tables (see section 3.1).

Table 5 also shows a great variation in the capitalization of intangible assets. Ten countries capitalize mineral exploration, but only the ROC, Korea and Mongolia capitalize all three types of software. In India, Japan, Malaysia, Mongolia and Pakistan, software capitalization excludes own-account software, whereas in Indonesia only custom software is capitalized. This variation in coverage can pose problems for international comparisons of productivity. Before drawing up

a solution, an understanding of the order of magnitude of the problem will be helpful.

Table 5: GFCF and Capital Stock

	Gross Fixed Capital Formation			Capitalization of Intangible Assets				Capital Stock		
	Number of types of asssets for the whole economy	Number of types of assets by institutional sector	Number of types of assets by industy	Mineral exploitation	Computer software (custom)	Computer software (pre-packaged)	Computer software (own-account)	Net	Gross	Number of types of assets
Bangladesh	8	NA	NA	Yes	No	No	No	NA	NA	NA
Cambodia	3	NA	NA	No	No	No	No	Yes	NA	NA
ROC	8	NA	6	Yes	Yes	Yes	Yes	NA	NA	NA
Fiji	6	NA	6	Yes	No	No	No	Yes	Yes	6
India	2	2	2	Yes	Yes	Yes	No	Yes	Yes	2
Indonesia	13	4	4	Yes	Yes	No	No	Yes	NA	6
Iran	2	1	2	No	No	No	No	NA	Yes	2
Japan	6	1	NA	Yes	Yes	Yes	No	Yes	NA	6
Korea	6	1	1	Yes	Yes	Yes	Yes	No (National Wealth Survey)		NA
Laos	3	3	NA	No	No	No	No	NA	NA	NA
Malaysia	6	Yes	NA	Yes	Yes	Yes	No	Yes	Yes	5
Mongolia	9	No (Planned for 2008)	NA	Yes	Yes	Yes	No	NA	NA	NA
Nepal	1	NA	NA	No	Yes	Yes	No	NA	NA	NA
Pakistan	5	1	NA	Yes	Yes	Yes	No	NA	NA	NA
Philippines	4	NA	NA	No	No	No	No	Yes	Yes	4
Sri Lanka	6	NA	NA	No	No	No	No	NA	NA	NA
Thailand	6	2	NA	No	No	No	Yes (Only public institutes)	Yes	Yes	6
Vietnam	1 (4 for 1996–1999)	NA	NA	No	No	No	No	NA	NA	NA

Methods of GFCF estimation can be based on supply-side or demand-side information, or a mixture of both. In Nepal, for example, only one aggregate GFCF is available, and it is a case of using a mixture of information. Nepal largely uses a supply-side approach, except for the value of software which is based on expenditure data reported by establishments/industries in benchmark surveys. Annual estimates of intangible assets/computer software are derived using the growth rate of corporate sector value added (for details, see Nepal Central Bureau of Statistics, 2007).

Besides the changes in capital composition, another source of quality change is within the asset group, which needs to be reflected in the deflator for the asset group under concern. For example, prices for computers of constant quality have been falling rapidly. If computers are not properly deflated to reflect the quality improvement, the volume of computers will be underestimated. In the case of computers it makes a huge difference in the volume index depending on whether one uses a deflator with quality adjustment or not. If countries are treating computers differently from each other, we may have to standardize the treatment. Quality adjustment by hedonics is an exception rather than the norm among the countries studied. Only three countries have quality-adjusted price indices: Iran, Japan and Korea. Prices are deflated for personal computers but not for software (see Table 11).

Capital services are derived from the productive capital stock, which is the stock of assets surviving from past investment and corrected for its loss in productive efficiency (deterioration). The figure is directly related to the capacity aspect of capital. Estimates constitute an intermediate step towards the measurement of capital services to provide an appropriate measure of capital as a factor of production. It is therefore important to distinguish the concept of capital stock as measured in countries' national accounts. The information will guide in deciding what adjustments are needed for which country.

The concepts used in the national accounts are gross capital stock and net (or wealth) capital stock. Gross capital stock is the stock of assets surviving from past investment and revalued at the purchaser's prices of new assets in the current period. Net (or wealth) capital stock is the stock of assets surviving from past investment and corrected for depreciation. It is valued as if the assets were acquired on the date to which a balance sheet relates, reflecting the value of capital stock.

Gross capital stock can be estimated either by survey (National Wealth Survey: NWS)[19] or using the perpetual inventory method (PIM) based on investment data, assumptions about asset life-lengths and an initial stock. The latter is the more frequently used approach in the national accounts. Table 5 shows that measuring capital stock is not a common practice among the countries studied. Out of the 18 countries, eight estimate net capital stock and six estimate gross capital stock, of which five estimate both measures: Fiji, India, Malaysia, the Philippines and Thailand. Cambodia, Indonesia and Japan estimate only net capital stock while Iran estimates only gross capital stock. For Korea, a comprehensive national wealth survey has been conducted every 10 years from 1968 to 1997. Thus, gross and net capital stock are available outside national accounts.[20]

2.6 Labor

The 1993 SNA recommends the inclusion of labor input variables in national accounts "in order to examine productivity" (paragraph 17.1). Here the consideration is not just whether labor input variables appear in the published national accounts but also if they are suitable for confronting with the value-added data to produce productivity estimates. Given the diverse data sources for labor volume, it is possible that even if labor data are published alongside the national accounts, they are not necessarily integrated. In other words, one should not automatically assume the suitability of labor data in national accounts for productivity estimates.

[19] The NWS directly investigates the past investment (gross book values) of the assets surviving at the period of investigation, owned by corporations, government and households. It was implemented in Japan 12 times from 1905 to 1970 by different ministries of the Government of Japan and the Bank of Japan. In particular, two large-scale surveys were conducted in 1955 and 1970 by the Economic Planning Agency (the predecessor of ESRI). The current JSNA use the 1970 NWS as their benchmark.

[20] In Korea, net and gross capital stock are available for the years 1968, 1977, 1987 and 1997–2006. The number of assets is 20 in 1968, 21 in 1977, 22 in 1987 and 20 in 1997–2006.

Data on labor volume come from two main statistical sources: business surveys and/or the Labor Force Survey (LFS). Each has its strengths and weaknesses. The key strength of the former is in their accuracy and consistency in industry classification with national accounts, but coverage is limited by what companies are required to gather for administrative purposes. Labor volume based on business surveys therefore normally needs a raft of adjustments to improve its coverage. In contrast, the key strength of the LFS is its coverage (including, for example, information about the self-employed and multiple job holders, and a direct measure of average actual hours worked). Its structure is based on ILO definitions. As such, its definitions are independent of changes in business administrative requirements. It also offers rich socio-economic data about the workforce, which are very valuable. But its weakness is in its data accuracy and inconsistent industry classification with national accounts, as answers are based on respondents' recollections and perceptions. The fragmentation of labor market statistics has meant that it is difficult for researchers to make good judgments on which to use for productivity calculations without expert advice from the country concerned.

In some of the countries surveyed, the LFS has only been recently implemented. Sri Lanka is an example of how a country makes the best use of its data sources to enrich and extend employment statistics. In Sri Lanka employment has traditionally been estimated based on the Annual Employment Survey, which is an establishment survey conducted by the Department of Labor since 1971 using postal questionnaires. This survey is designed to collect information on employment by industry and occupation, covering establishments with five or more paid employees engaged in production, distribution and commercial activities in both the private and public sectors. More specifically, the survey provides information on the distribution, change and gender distribution of employment among major industries. The reference period is 30 June of the survey year. The non-availability of a complete list of establishments and a high non-response rate are the main drawbacks in its coverage.

In 1990 Sri Lanka started collecting employment data through the quarterly LFS. The data are derived from household interviews obtained from a sample of the population 10 years of age and older. The survey provides comprehensive information on the labor force, the employed and the unemployed, and includes such characteristics as age, sex, occupation and industry attachment. It also provides information on hours worked, and reasons for unemployment and non-participation in the labor force.

Data sources aside, standardization of the definition of the labor input measure is another aspect which is very important in international comparisons of productivity performance. Labor input can be measured in three counting units: number of persons in employment, number of filled jobs and total hours actually worked. Total actual hours worked is seldom observed directly but derived from multiplying the first concept of labor input by average hours worked per person or

the second concept by average hours worked per job. Given the variations in working patterns and employment legislation both over time and across countries, total hours worked, if accurately measured, offers the most time-consistent and internationally comparable concept of labor input.

The breakdown of total employment into employees, self-employed and family workers is needed for imputing the compensation to self-employed labor in order to split the mixed income in the national accounts into return to labor and capital respectively. This is required in the calculation of total factor productivity as weights.

Two-thirds of the countries we surveyed do not publish any labor data in their national accounts, as shown in Table 6. Of the six countries which do, all have labor volume denominated in number of persons rather than jobs, except Japan. All six countries cover employees (in terms of either jobs or persons). Mongolia has no data on the self-employed, meaning that it has incomplete coverage. India and Mongolia have no hours worked data presented in the national accounts, whereas Malaysia, Thailand, Japan and Bangladesh have no hours worked for the self-employed.

Table 6: Number of Jobs/Persons and Hours Worked in the National Accounts

	Labor data as a part of national accounts	Number of jobs/persons	Number of jobs/persons for employees	Number of jobs/persons for self-employed and family workers	Number of jobs/persons by industry	Hours worked for employees	Hours worked for self-employed and family workers	Hours worked by industry
Bangladesh	No	NA	NA	NA	NA	NA	NA	NA
Cambodia	Yes	Persons	Yes	Yes	Yes	Yes (Average hours worked)	Yes (Average hours worked)	Yes (Average hours worked)
ROC	No	NA	NA	NA	NA	NA	NA	NA
Fiji	No	NA	NA	NA	NA	NA	NA	NA
India	Yes	Persons	Yes	Yes (Only self-employed)	Yes	No	No	No
Indonesia	No	NA	NA	NA	NA	NA	NA	NA
Iran	No	NA	NA	NA	NA	NA	NA	NA
Japan	Yes	Jobs	Yes	Yes	Yes (Only employees)	Yes	No	Yes (Only employees)
Korea	No	NA	NA	NA	NA	NA	NA	NA
Laos	No	NA	NA	NA	NA	NA	NA	NA
Malaysia	Yes	Persons	Yes	Yes	Yes	Yes	No	Yes (Only employees)
Mongolia	Yes	Persons	Yes	No	Yes (Only employees)	No	No	No
Nepal	No	NA	NA	NA	NA	NA	NA	NA
Pakistan	No	NA	NA	NA	NA	NA	NA	NA
Philippines	No	NA	NA	NA	NA	NA	NA	NA
Sri Lanka	No	NA	NA	NA	NA	NA	NA	NA
Thailand	Yes	Persons	Yes	Yes	Yes	No	No	No
Vietnam	No	NA	NA	NA	NA	NA	NA	NA

Table 7 shows what data are available for each country from the LFS. All countries have labor data from their LFS. The challenge for researchers is to decide how best to use all available information on labor data. One could argue that labor data in the national accounts could still be

superior to single-sourced data from the LFS, on the assumption that the former would incorporate the strengths of all available data sources on labor statistics.

If the target is to measure labor volume in terms of total actual hours worked, combining information from Tables 6 and 7, the following data gaps are identified: no self-employed data for Mongolia; no hours worked data (both employees and self-employed) for India, Iran, Lao PDR, Mongolia, Sri Lanka and Vietnam; and no self-employed hours for Korea and Thailand. The basic labor productivity measure of gross value added (GVA) per person worked should be available for all countries, whereas GVA per hour worked will be feasible only for a sub-set of the countries.

Table 7: Labor Statistics

	Number of jobs/persons			Hours worked			Frequency
	Employees	Self-employed and family workers	Number by industry	Employees	Self-employed and family workers	Hours worked by industry	
Bangladesh	Yes	Yes	Yes	Yes	Yes	No	Every 2 years
Cambodia	Yes	Yes	Yes	Yes	Yes	Yes	1997, 2000, 2001
ROC	Yes	Yes	Yes	Yes	Yes	Yes	Monthly
Fiji	Yes	Yes	Yes	Yes	Yes	Yes	Occasional (So far 1982, 2004/05)
India	Yes	Yes	Yes	No	No	No	Every 5 years (Large sample), annual (Small sample)
Indonesia	Yes	Yes	Yes	Yes	Yes	Yes	Annual
Iran	No	No	No	No	No	No	Quarterly
Japan	Yes	Yes	Yes	Yes	Yes	Yes	Monthly
Korea	Yes	Yes	Yes	Yes (Only regular employees)	No	Yes	Monthly
Laos	No	No	No	No	No	No	No
Malaysia	Yes	Yes	Yes	Yes	Yes	Yes	Monthly
Mongolia	Yes	No	Yes (Only employees)	No	No	No	Every 4–5 years
Nepal	Yes	Yes	Yes	Yes	Yes	Yes	Every 5 years (So far 1998/99, 2007/08)
Pakistan	Yes	Yes	Yes	Yes	Yes	Yes	Annual
Philippines	Yes	Yes	Yes	Yes	Yes	Yes	Quarterly
Sri Lanka	Yes	Yes	Yes (Only employees)	No	No	No	Quarterly
Thailand	Yes	Yes	Yes	Yes	No	Yes	Annual, monthly (First month started from January 2002)
Vietnam	Yes	Yes	Yes	No	No	No	Annual

3 Non-NA Statistics

3.1 Benchmark Input-Output Table

Supply-use tables and/or input-output tables (SUT/IOT) are derived as an analytical framework of tables describing the interrelationships among producers and users in a market economy. The

rich information and data in SUT/IOT make it possible for us to understand the interdependence of industry sectors better and further investigate how the structure of an economy changes over time. Furthermore, more detailed information than in the national accounts is often available in the SUT/IOT, providing an excellent alternative raw data source to refine capital services estimates. As they have been found to be powerful tools for compiling production accounts in national accounts, they have been integrated into SNA since 1968.

Table 8 shows the availability of SUT/IOT and their dimensions in the countries surveyed, and offers promising results.[21] Among the 18 countries surveyed, only four do not construct SUT or IOT: Cambodia, Lao PDR, Nepal and Sri Lanka. For most countries, the details are far richer than those available in the national accounts and the feasibility of extracting investment data by asset from these tables for capital services measurement looks promising. The tables are constructed at five-year intervals.

Table 8: Benchmark Input-Output Table

	Use Table	Supply Table	Commodity-commodity Table	Starting year	Frequency
Bangladesh	For 1993-94, 79 (Commodity) × 79 (Industry), for 2002, 94 (Commodity) × 86 (Industry)	For 2002, 86 (Industry) × 94 (Commodity)	NA	1986/87	Every 5 years, but this is not strictly followed due to resource constraints (1986/87, 1992/93, 1993/94, 2002)
Cambodia	NA	NA	NA	NA	NA
ROC	No	No	For 2001, 610 (Commodity) × 162 (Commodity)	1961	Every 5 years (For years ending in 1 and 6)
Fiji	For 2002, 37 (Commodity) × 35 (Industry)	For 2002, 35 (Industry) × 37 (Commodity)	NA	1972	1972, 1981, 2002
India	For 1989/90 and 1993/94, 115 (Commodity)×115 (Industry)	For 1989/90 and 1993/94, 115 (Industry) × 115 (Commodity)	For 1989/90 and 1993/94, 115 (Commodity) × 115 (Commodity)	1968/69	Every 5 years
Indonesia	Exercise	Exercise	For 1995, 172 (Commodity) × 172 (Commodity)	1971	Every 5 years (Since 1975)
Iran	For 2001, 119 (Commodity) × 58 (Industry)	For 2001, 58 (Industry) × 119 (Commodity)	No	1962	Every 5 years
Japan	NA	For 2000, 121 (Industry) × 121 (Commodity)	For 1995, 519 (Commodity) × 405 (Commodity), for 2000, 517 (Commodity) × 405 (Commodity)	1951	Every 5 years (Since 1960)
Korea	For 2000 and 2003, 21 (Commodity) × 22 (Industry)	For 2000 and 2003, 21 (Industry) × 22 (Commodity)	For 2000 and 2003, 404 (Commodity) × 404 (Commodity)	1960	Every 5 years
Laos	NA	NA	NA	NA	NA
Malaysia	For 1983 and 1987, 60 (Commodity) × 60 (Industry), for 1991, 92 (Commodity) × 92 (Industry), and for 2000, 94 (Commodity) × 94 (Industry)	For 1983 and 1987, 60 (Industry) × 60 (Commodity), for 1991, 92 (Industry) × 92 (Commodity), and for 2000, 94 (Industry) × 94 (Commodity)	For 1983 and 1987, 60 (Commodity) × 60 (Commodity), for 1991, 92 (Commodity) × 92 (Commodity), and for 2000, 94 (Commodity) × 94 (Commodity)	1960	Every 5 years
Mongolia	NA	127 (Industry) × 298 (Commodity)	NA	1963	1963, 1966, 1970, 1977, 1983, 1987 (Material Product System), 1997, 2000, 2005
Nepal	NA	NA	NA	NA	NA
Pakistan	NA	For 1999/2000, 80 (Industry) × 80 (Commodity)	For 1999/2000, 80 (Commodity) × 80 (Commodity)	1974/75	1974/75, 1989/90, 1999/2000 (Work on 1999/2000 is in progress)
Philippines	For 2000, 240 (Commodity) × 240 (Industry)	For 2000, 240 (Industry) × 240 (Commodity)	For 1988, 230 (Commodity) × 230 (Commodity), for 1994, 229 (Commodity) × 229 (Commodity), for 2000, 240 (Commodity) × 240 (Commodity)	1961	Every census year or depending on availability of budgetary resources (Recently, 2000 IO)
Sri Lanka	NA	NA	NA	NA	NA
Thailand	No (It has trial estimates)	No (It has trial estimates)	For 1995 and 2000, 180 (Commodity) × 180 (Commodity)	1975	Every 5 years
Vietnam	NA	NA	For 1989, 54 (Commodity) × 54 (Commodity), for 1996, 97 (Commodity) × 97 (Commodity), for 2000, 112 (Commodity) × 112 (Commodity)	1989	1989, 1996, 2000. (Planned to be constructed every 5 years from 2008)

[21] In Japan the Director-General for Policy Planning (Statistical Standards) (2006) conducted a survey on the compilation of SUT/IOT all over the world.

3.2 Population Census

A population census is a valuable source of socio-economic data on the population in its own right. It also provides the benchmark for the LFS, which is seldom revised except when benchmarked to the latest census results. A population census is often conducted at an interval of every five or 10 years. Mid-year population estimates are projections of census results based on a continuous population register or on the balance of births, deaths and migration. Census years give researchers an anticipation of when labor statistics based on the LFS may be revised, in turn affecting productivity estimates.

If countries have not developed the sophisticated socio-economic profiles of their workforce needed for the construction of a quality-adjusted labor input measure, data from the population census can be used as an alternative. Table 9 shows that all participating countries have a population census. It is a decennial exercise except in Japan, Indonesia and Korea, where it is quinquennial.

Table 9: Population Census

	Year of the first census	Year of the last census	Frequency
Bangladesh	1974	2001	Every 10 years
Cambodia	1998	2008	Every 10 years
ROC	1956	2000	Every 10 years
Fiji	1881	2007	Every 10 years
India	1901	2001	Every 10 years
Indonesia	1961	2005	Every 5 years
Iran	1956	2006	Every 10 years
Japan	1920	2005	Every 5 years
Korea	1925	2005	Every 5 years
Laos	1985	2005	Every 10 years
Malaysia	1911	2000	Every 10 years
Mongolia	1918	2000	Every 10 years
Nepal	1911	2001	Every 10 years
Pakistan	1951	1998	Every 10 years
Philippines	1903	2007	Every 10 years
Sri Lanka	1891	2001	Every 10 years
Thailand	1909	2000	Every 10 years
Vietnam	1979	Planned for 2009	Every 10 years

3.3 Business Survey

If an industry sector is covered by a census, this implies quality data and the availability of comprehensive and reliable data for that sector. Countries vary in their practices. Some may have a consolidated economic census, covering both manufacturing and services, and usually conducted at a frequency of every five years. Alternatively, countries like the UK may have an annual consolidated business survey covering both manufacturing and services for benchmarking purposes. A unified approach has the advantage of consistency and coherence in the

survey/census framework, covering all sectors. A few countries implement a comprehensive census/survey covering all sectors: Lao PDR (economic census), Mongolia (census of establishment), Pakistan (economic census) and Vietnam (establishment census).

Table 10: Survey of Manufacturing

	Year of the first survey	Year of the last survey	Frequency
Bangladesh	1972/73	2004/05	Every 2 years
Cambodia	1993	2006	Depends on available budget (mostly from donors)
ROC	1979	2005	Annual (except the years ending in 1 and 6, when Industry, Commerce and Service Census (ICSs) were conducted)
Fiji	1969	2004	Annual
India	1951/52 (Annual Survey of Industries)	2004/05 (Annual Survey of Industries), 2007 (Survey on Unorganized Manufacturing Enterprises)	Annual (Annual Survey of Industries (for the registered)), every 5 years (Survey on Unorganized Manufacturing Enterprises (for the unregistered))
Indonesia	1975	2006	Annual (1975–2006), quarterly (1986–2006), monthly (2000–2006)
Iran	1972	2007	Annual (Census), quarterly (Survey)
Japan	1909	2005	Annual (surveys in years whose last number is 0, 3, 5 and 8 have larger scale than in other years)
Korea	1955 (Census), 1968 (Survey)	2003 (Census), 2006 (Survey)	Every 5 years whose last number is 3 and 8 (Census), annual except years whose last number is 3 and 8 (Survey)
Laos	2006	2006	Plan to conduct the 2nd Economic Census in 2011
Malaysia	1959 (Census), 1960 (Survey)	2005 (Census), 2006 (Survey)	Every 5 years (Census), annual (Survey)
Mongolia	1991 (Census)	2006 (Census), 2007 (Survey)	1991, 1994, 1998, 2006 (Enterprise Census), annual (Enterprise Survey)
Nepal	1964/65 (Census), 1972/73 (Survey)	2006/07 (Census), 1999/2000 (Survey)	Every 5 years (Census), every 10 years (Survey)
Pakistan	1959/60	2005/06	Every 5 years
Philippines	1961 (Census), 1976 (Survey)	2006 (Census), 2005 (Survey)	Every 5 years or depending on availability of budgetary resources (Census of Philippine Business and Industry), in between censal year or depending on availability of resources (Annual Survey of Philippine Business and Industry– covering all sectors)
Sri Lanka	1946	2003/04	Scheduled to be held in every 10 years
Thailand	1998 (Survey)	2006 (Survey)	Every year
Vietnam	1995 (Census), 1998 (Survey)	2007	Every 5 years (Establishment Census since 2002), annual (Industrial Enterprise Survey)

Yet another group of countries may not have consolidated their benchmarking surveys or census into one, but have separate surveys/census for different segments of the economy; this is the current practice in Japan, although the first economic census is planned for 2010.

As can be seen in Table 10, a manufacturing census covering all establishments in this sector is more common than a census covering the service sector; 14 out of the 18 countries surveyed have a manufacturing census, and half of these countries have an annual census. This suggests a rich data source on manufacturing, and offers potential for further and more in-depth productivity analysis of manufacturing and its sub-sectors.

The same cannot be said about the service sector. Few countries implement a unified, comprehensive survey, but many conduct several surveys covering different parts of the service sector. For example, Fiji Islands Bureau of Statistics conducts a number of separate surveys covering social and related community services, restaurants and hotels, real estate and business services, and distributive trades. For benchmarking purposes, the National Accounts section of the Nepal Central Bureau of Statistics has been conducting various census/surveys from 2003/04

onwards: restaurant and catering services, land transportation services, travel, trekking and rafting services, freight services, postal services, cable TV activities, real estate activities, communication services, renting services, Internet service activities, legal activities, auditing services, trade warehouses, private health services, and private education activities and similar.[22]

3.4 CPI and PPI

Price indices underlie the construction of volume indices in the national accounts. Their methods of construction directly affect national accounts statistics in real terms. The consumer price index (CPI) is the representative indicator of cost of living. It aggregates prices of different commodities using weights. Knowing the price of each commodity is indispensable for calculating the GDP deflator. Among the issues related to measuring CPI, the serious problem of bias induced by quality change and new goods is widely recognized. Hedonics is one of the useful tools for controlling quality change. It has been used for commodities which experience rapid technological improvement.

Table 11: CPI and PPI

	Consumer Price Index (CPI)				Producer Price Index (PPI) or Wholesale Price Index			
	Year of the first survey	Frequency	Index number	Quality adjustment by hedonics	Year of the first survey	Frequency	Index number	Quality adjustment by hedonics
Bangladesh	1973	Monthly	Fixed-base Laspeyres	No	1988/89	Quarterly	Fixed-base Laspeyres	No
Cambodia	1994 (CPI for Phnom Penh) and 2000 (Urban Cambodia	Monthly	Fixed-base Laspeyres	No	2003	2003, 2007	Fixed-base Laspeyres	No
ROC	1959	Monthly	Fixed-base Laspeyres	No	1952 (Wholesale Price Index)	Monthly	Fixed-base Laspeyres	No
Fiji	1968	Monthly	Fixed-base Laspeyres	No	NA	NA	NA	NA
India	1949	Monthly	Fixed-base Laspeyres	No	1939 (Wholesale Price Index)	Weekly	Fixed-base Laspeyres	No
Indonesia	1953	Monthly	Fixed-base Laspeyres	No	NA	NA	NA	NA
Iran	1936	Monthly	Fixed-base Laspeyres	Yes	1990	Monthly	Fixed-base Laspeyres	Yes
Japan	1946	Monthly	Fixed-base Laspeyres (Chain-linked Laspeyres is prepared as a reference)	Yes (PC and Camera)	1897 (Wholesale Price Index)	Monthly	Fixed-base Laspeyres (Chain-linked Laspeyres is prepared as a reference)	Yes (PC, digital camera, video camera, copy machine, printer)
Korea	1949	Monthly	Fixed-base Laspeyres	Yes (PC)	1910	Monthly	Fixed-base Laspeyres	Yes (PC)
Laos	1987	Monthly	Fixed-base Laspeyres (Its weight is updated every 5 years)	No	NA	NA	NA	NA
Malaysia	1959	Monthly	Fixed-base Laspeyres	No	1973	Monthly	Fixed-base Laspeyres	No
Mongolia	1991	Monthly	Fixed-base Laspeyres (Chain-linked Laspeyres is prepared as a reference)	No	No (Planned for 2008)	No	No	No
Nepal	1972	Monthly	Fixed-base Laspeyres	No	1982	Quarterly	Fixed-base Laspeyres	No
Pakistan	1956/57	Monthly	Fixed-base Laspeyres	No	1960 (Wholesale Price Index)	Monthly	Fixed-base Laspeyres	No
Philippines	1957	Monthly	Fixed-base Laspeyres	No	1980	Monthly	Fixed-base Paasche	No
Sri Lanka	1952	Monthly	Fixed-base Laspeyres (Monthly chain-linked)	No	NA (Wholesale Price Index)	Monthly	Fixed-base Laspeyres	No
Thailand	1988	Monthly	Fixed-base Laspeyres	No	1988	Montly	Fixed-base Laspeyres	No
Vietnam	1998 (Before 1998 a detailed sales index is available)	Monthly	Fixed-base Laspeyres	No	1995	Quarterly	Fixed-base Laspeyres	No

[22] Even countries which conduct comprehensive surveys for service industries are likely to conduct supplementary surveys in order to capture service sectors which are not covered by the comprehensive survey.

Our survey results show that quality adjustment is still not commonplace (Table 11). Only three of the countries surveyed have quality adjustment in their price indices: Japan, Korea and Iran. Chain linking is not standard, either; Japan is one of the few to adopt chain linking in its price indices.

3.5 Productivity Statistics

Table 12 presents our survey results regarding the availability of official productivity statistics, which indicates if the national statistical offices house expertise on productivity estimates and their data requirements. Only the ROC, Iran, Malaysia, Mongolia and Thailand are publishing productivity estimates at least annually. This, of course, does not mean that other productivity estimates from other sources or research do not exist.

Table 12: Productivity Statistics

	Labor Productivity		Total Factor Productivity	
	Starting year	Frequency	Starting year	Frequency
Bangladesh	NA	NA	NA	NA
Cambodia	NA	NA	NA	NA
ROC	Labor Productivity by Value Added started in 1986, Labor Productivity by Production started in 1972	Quarterly (Labor Productivity by Value Added), Monthly (Labor Productivity by Production)	1981	Annual
Fiji	NA	NA	NA	NA
India	NA	NA	NA	NA
Indonesia	NA	NA	2001	Incidental
Iran	1996	Annual	1996	Annual
Japan	NA	NA	NA	NA
Korea	NA	NA	NA	NA
Laos	NA	NA	NA	NA
Malaysia	1980 (Using 1987 based year), 2000 (Using 2000 based year)	Annual	1990 (Using 1987 based year), 2000 (Using 2000 based year)	Annual
Mongolia	2000	Annual	2000	Annual
Nepal	NA	NA	NA	NA
Pakistan	NA	NA	NA	NA
Philippines	NA (Some estimates by NSCB (Philippine National Statistical Coordination Board), and NWPC (National Wages and Productivity Commission))	NA	NA	NA
Sri Lanka	NA	NA	NA	NA
Thailand	1982 (by the National Economic and Social Development Board)	Annual	1982	Annual
Vietnam	NA	NA	NA	NA

In the ROC two types of labor productivity are released on a regular basis. The Directorate-General of Budget, Accounting and Statistics (DGBAS) began to prepare labor productivity indices for manufacturing and electricity, gas and water industries in 1972, the so-called Labor Productivity by Production. This indicator is constructed by dividing the industrial production index by hours worked. Since comparison of this type of productivity between industries is impossible, a new indicator, the so-called Labor Productivity by Value

Added, has been released since 1986. This indicator is constructed by dividing industry GDP by hours worked; by using it, we can compare labor productivity across industries.

4 Conclusion

This paper collates countries' data availability and practices in data compilation to shed light on the extent of cross-country data comparability for productivity analysis. The information presented is based on metadata gathered in a survey on national accounts and other required statistical data, conducted by the Asian Productivity Organization (APO) between April and July 2008, covering APO member countries. As the statistical systems are still maturing in many of the countries studied, while others seek to improve theirs, the systems reported on in this paper are far from stable but subject to continual incremental upgrades. In light of this, the metadata survey will be updated annually under the APO Productivity Database Project. Likewise, this paper will be updated with new changes and improvements on an annual basis to reflect countries' effort.

Furthermore, we look to extend the scope of the paper in the near future to include additional measures which are relevant to more sophisticated productivity analysis. Two such measures in the pipeline of the APO Productivity Database Project are on land as a capital and a quality-adjusted labor input measure. The APO metadata survey will be adapted to provide information on their data availability and feasibility.

Appendix 1: Quarterly National Accounts (QNA)

Up to this point, the focus of this paper has been on data availability and feasibility for *annual* productivity estimates. To extend to short-term estimates, we asked a couple of questions on countries' quarterly national accounts (QNA). QNA face more data limitations than annual estimates. It is not possible to implement the same comprehensive approach used in the annual estimates for the quarterly estimates. As a result, the short-term indicators are likely to be based on whichever of the three approaches has timelier data.

Short-term indicators are used for their timeliness. Subsequent to their first release (usually around one month after the end of the reference period), they are subject to a short-term revision cycle to incorporate new data as they emerge. Ultimately they will be benchmarked to, and brought consistent with, the annual estimates when they are available. The project team is particularly interested in the timing of the first release of the quarterly estimates and the time when the set of quarterly estimates consistent with the annual accounts is first made available.

As can be seen from Table 13, 13 out of 18 countries have constructed QNAs and most countries base them on the production approach, with the expenditure approach available alongside. The General Statistical Office of Vietnam recently compiled quarterly estimates of GDP by the expenditure approach at current and constant prices. This is one of the current improvements of Vietnam's national accounts.

Table 13: Quarterly National Accounts

	Implementation of QNA	Approaches to GDP Estimation		
		Production approach	Expenditure approach	Income approach
Bangladesh	No	NA	NA	NA
Cambodia	Yes	Yes (Base estimate)	Yes	No
ROC	Yes	Yes (Base estimate)	Yes	No
Fiji	No	NA	NA	NA
India	Yes	Yes (Base estimate, depending on sectors)	Yes	Yes (Base estimate, depending on sectors)
Indonesia	Yes	Yes (Base estimate)	Yes	No
Iran	Yes	Yes (Base estimate)	Yes	No
Japan	Yes	No	Yes	No
Korea	Yes	Yes (Base estimate)	Yes	No
Laos	No	NA	NA	NA
Malaysia	Yes	Yes (Base estimate)	Yes	No
Mongolia	Yes	Yes (Base estimate)	No	No
Nepal	No	NA	NA	NA
Pakistan	No	NA	NA	NA
Philippines	Yes	Yes (Base estimate)	Yes	No
Sri Lanka	Yes	Yes	No	No
Thailand	Yes	Yes (Base estimate)	Yes	No
Vietnam	Yes	Yes (Base estimate)	Yes	No

Appendix 2: IMF Data Quality Assessment for Asian Countries

In this paper, our focus is on countries' data compilation practices and data availability. We do not assess data quality. Thus we believe it is informative to introduce readers to a data quality assessment framework and summarize how some of the participating countries in our survey fare against it.

The IMF has developed its own comprehensive data quality assessment framework (DQAF) in order to assess data quality of countries participating in its General Data Dissemination System (GDDS). IMF assessments of individual countries are published in its series of *Reports on the Observance of Standards and Codes* (ROSC). In this appendix we attempt to summarize IMF data quality assessments for 10 Asian countries which overlap with the participating countries in our survey: Bangladesh (evaluation in 2003), India (2002), Indonesia (2003), Japan (2003), Korea (2001), Mongolia (2003), Pakistan (2003), the Philippines (2003), Sri Lanka (2001) and Thailand (2003).

The IMF's DQAF is defined by five dimensions. They are:

Quality Dimensions	Elements
0. Prerequisites of quality	0.1 Legal and institutional environment
	0.2 Resources
	0.3 Relevance
	0.4 Other quality management
1. Assurances of integrity	1.1 Professionalism.
	1.2 Transparency
	1.3 Ethical standards
2. Methodological soundness (if elements are in accord with international standards, guidelines, or good practices)	2.1 Concepts and definitions
	2.2 Scope
	2.3 Classification/ sectorization
	2.4 Basis for recording
3. Accuracy and reliability	3.1 Source data
	3.2 Assessment of source data
	3.3 Statistical techniques
	3.4 Assessment and validation of intermediate data and statistical outputs
	3.5 Revision studies
4. Serviceability	4.1 Periodicity and timeliness
	4.2 Consistency
	4.3 Revision policy and practice
5. Accessibility	5.1 Data accessibility
	5.2 Metadata accessibility
	5.3 Assistance to users

IMF country assessment is based on six datasets against these five dimensions of data quality: System of National Accounts (SNA); Consumer Price Index (CPI); Producer Price Index (PPI);

Government Finance Statistics (GFS); Monetary Statistics; and Balance of Payments Statistics (BOP).

The IMF scoring system is made up of four grades: O (practice observed), LO (practice largely observed), LNO (practice largely not observed) and NO (practice not observed). To aggregate IMF scoring, we assign numerical scores of 1, 2/3, 1/3 and 0 to IMF scoring of O, LO, LNO and NO, respectively. The aggregated scores for each dataset and each data quality dimensions are presented in Figures 6 and 7 respectively.

For our purpose, the data quality of national accounts for most countries shown is judged as high, with scores ranging from 0.72 to 0.93. Sri Lanka is the exception, with a score of 0.58. Japan is the country with the highest average score for all six datasets, followed by Korea. For countries which have price indices, the quality is quite high, except for Sri Lanka. In terms of the data quality dimensions (Figure 7), Japan has the highest data quality overall, followed by Korea, Thailand and the Philippines. India, Indonesia, Pakistan and Mongolia have similar data quality, while Sri Lanka has the lowest overall score. For these 10 countries as a group on average, assurance of integrity is their strength, whereas data quality dimensions of methodological soundness and accuracy and reliability prove to be more challenging for them.

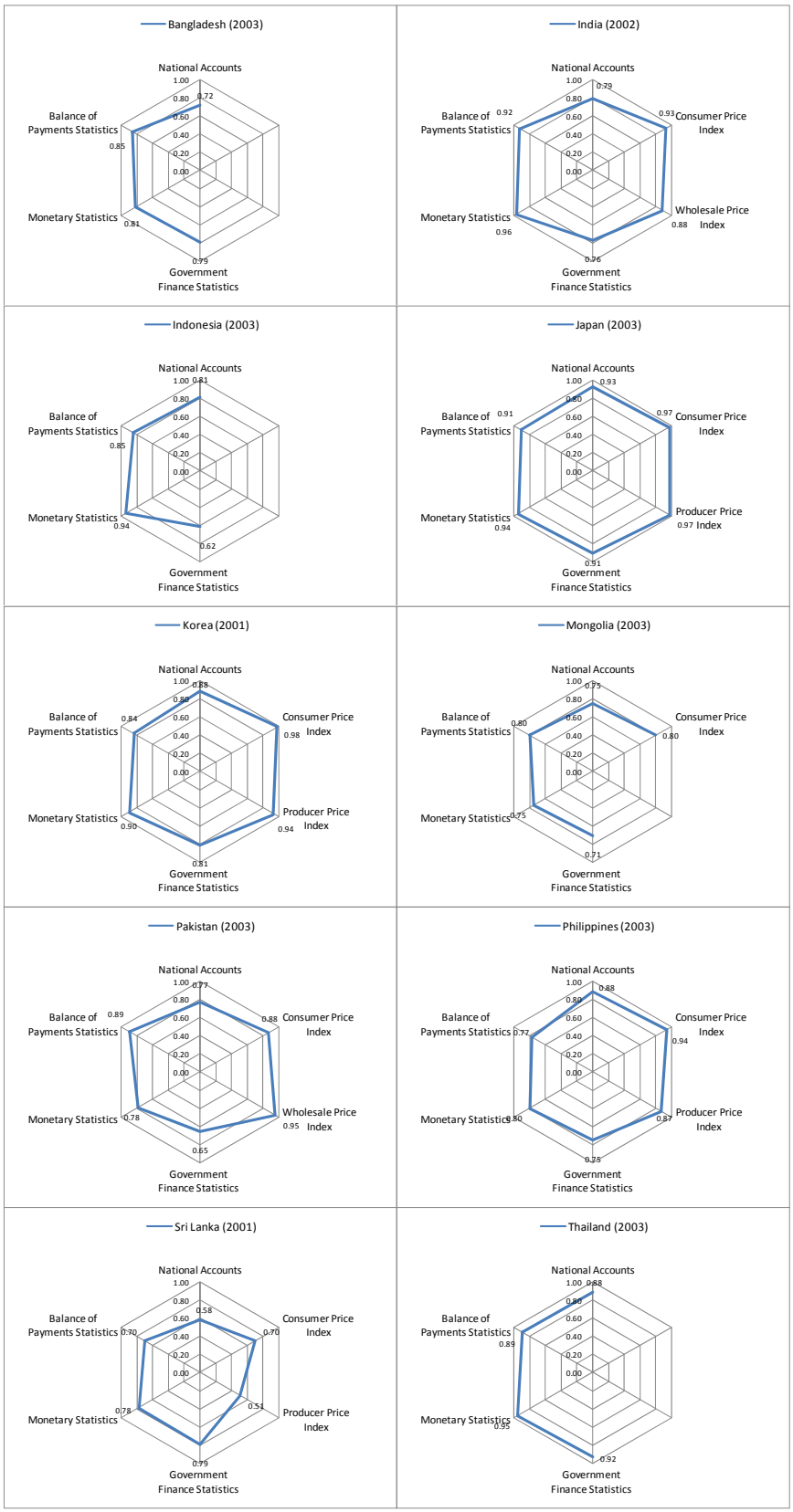

Figure 6: IMF Assessment of Six Datasets for Asian Countries

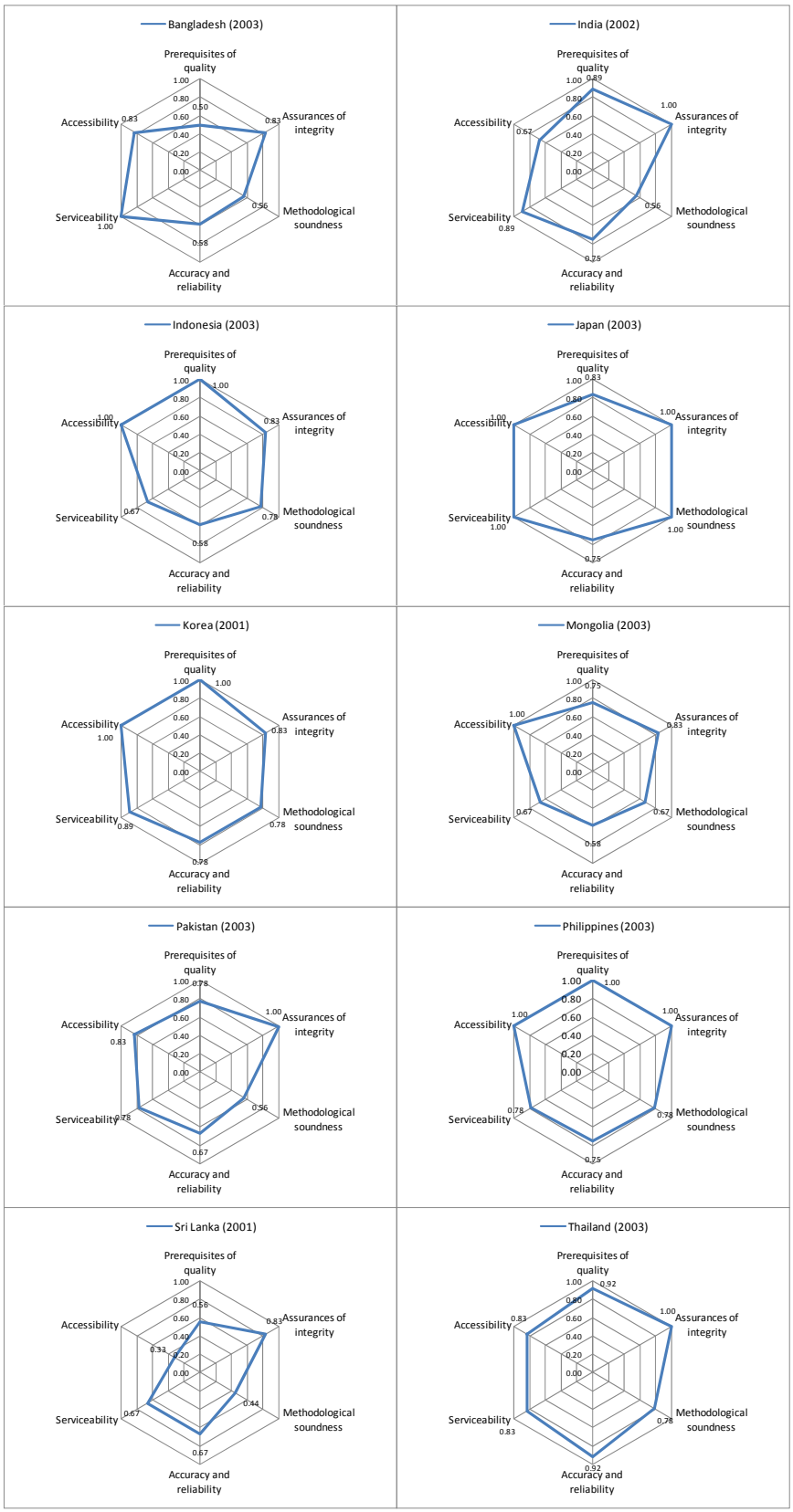

Figure 7: IMF Assessment of Data Quality for Asian Countries

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