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Accounting frameworks for Constant Price Measures

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ACCOUNTING FRAMEWORKS FOR CONSTANT PRICE MEASURES

Introduction

1. In recent years the development and use of supply-use tables within national statistical offices has increased considerably. This process was given extra momentum with the introduction of SNA93, and, for European Countries with the advent of ESA95 and the incorporation of supply-use tables in the EU transmission programme. The change over these years has been considerable. Whereas, not so long ago, relatively few countries developed or used supply-use tables, today many do, certainly the majority of (nearly all) OECD countries.

2. This transformation is of course no accident. The value of supply-use tables in describing the inter-relationships between consumers and producers has long been recognised. But the development of cheaper and faster software has brought the additional benefit of supply-use tables as tools to balance the national accounts (GDP) within affordable and cost-effective reach. Many statistical offices have taken advantage of this by redesigning their compilation systems so that supply-use tables are at the heart of the accounting framework in current and constant prices and for quarterly as well as annual data. And many other statistical offices are in the process of redesigning their systems at this time. This reflects the now widely accepted view that supply-use tables provide the theoretically best framework in which to balance the national accounts.

3. In what follows we give an overview of supply-use tables and the key benefits that they can provide when integrated into the heart of a statistical compilation system, particularly when, at the very heart of the system lie constant price supply-use tables. Readers should note that this paper is not intended to be a manual, describing exactly how such a system could be developed, and, so, for example, does not discuss how software systems should be specified. Rather it looks at the key methodological and statistical issues that need to be considered in developing such a system

Supply-Use tables explained

4. A full description on what Supply-Use tables are as well as how best to compile/present them is presented in Section 15 of SNA93. Briefly, Supply-Use tables consist of two main parts. The Supply table,

which traditionally shows industries (n) as columns and the products (m) these industries produce as rows, and the Use table, which shows purchases of these products by industries and final users. The number of industries (n) and products (m) do not have to be the same. In many countries the number of products (m) exceeds (n) by a considerable amount, reflecting the greater availability in these countries of data at the product level.

Valuation

5. Valuation of activities and transactions is an important consideration. It is recommended that the Supply table shows the activities of producers at basic prices with additional information on imports, taxes, and subsidies providing the link to purchasers' prices; the price basis usually used to illustrate transactions in the Use table. Table 1, below, provides a simple presentation of the Supply table at basic prices and Table 2 shows the Use table at Purchasers' prices.

The Supply Table

6. In the Supply table the output of industries broken down by products, (1) in Table 1 below, is known as the Make matrix. Column (3) is generally known as the import matrix and columns 5 and 6 the Valuation matrix.

Table 1: Supply table at basic prices

prices: current and constant

		Industries 1 . . n	Total (1)	Imports cif by product fob for total	Total supply at basic prices	Trade and transport margins	Taxes less subsidies on products	Total supply at purchasers' prices
		(1)	(2)	(3)	(4)=(2)+(3)	(5)	(6)	(7)=(4)+(5)+(6)
Products	1 2 : : (1) : : m	Output by product and by industry at basic prices						
Total (1)	(2)	Total output by industry at basic prices						

The Use table

Table 2: Use table at purchasers' prices

prices: current and constant

		Industries 1. . . . . n	Total of (1)	Final uses a) b) c) d) e) f) g)	Total Final uses at purchasers' prices	Total use at Purchasers prices (2) + (4)
		(1)	(2)	(3)	(4)	(5)
	1			Final uses at purchasers' prices		
	2					
	:			Final consumption expenditure:		
Products	:	Intermediate consumption at		a) by households		
	:	purchasers' prices by product		b) by NPISH		
	:	and by industry		c) by government		
	:					
	:			Gross capital formation:		
	:			d) gross fixed capital formation		
	:			e) changes in inventories		
	:			f) valuables		
	:			g) Exports:		
	m					
Adjustment items						
Total (1)		Total intermediate consumption by industry		Total final use by type		Total use
- Compensation of employees						
- Other net taxes on production		Components of value added				
- Consumption of fixed capital		by industry				
- Operating surplus, net						
		Value added by industry				
		Output by industry at basic prices				

7. The Use table can be broken down into 8 categories. Intermediate consumption by industries, household final consumption, non-profit institutions serving the household sector, general government final consumption, gross fixed capital consumption, changes in inventories, valuables and exports, each broken down by product.

Accounting Identities

8. Within this framework, the total supply of any particular product at purchasers' prices is equal to total demand at purchasers' prices (the same is true irrespective of the valuation basis). Equally, for each industry, total output by industry in the Make matrix (domestic supply) is equal to the sum of intermediate consumption plus value-added. These are the first two important accounting identities of the Supply-Use framework. The third concerns gross value-added and GDP.

9. In current prices gross value-added is shown in the Use table as the difference between total output at basic prices minus total intermediate consumption at purchasers' prices and, at the same time, as the sum of all value-added components, such as operating surplus, compensation of employees etc. By adding to these estimates of gross value-added, taxes and subsidies on products, GDP is derived (the first approach is commonly referred to as GDP using the production approach, and the second, GDP using the income approach). GDP can also be derived as the sum of all final demand categories minus imports; GDP by the expenditure approach.

Double-deflation[1]

10. At constant prices the income approach to GDP estimation is not relevant, as operating surplus can not be deflated directly. Constant price estimates of gross value-added are therefore often called double-deflated, as, to arrive at these estimates by industry, one needs to deflate output and take away from this deflated intermediate consumption. Again, constant price value-added must equal constant price final demand minus constant price imports minus constant price taxes and subsidies.

11. In this way it can be seen that the supply-use framework presents all of the information used to compile estimates of GDP, whatever the approach, be it income, expenditure or production, and, so, it can also be seen that the framework lends itself perfectly to confronting the data sources implicit in these three independent methods to arrive at a single measure of GDP or gross value-added. Moreover, not only does the framework produce a consistent estimate of GDP but it also ensures that coherence is ensured at the micro or mesa level. For example it ensures consistency between total supply and demand of agricultural products say.

Benefits of Supply-Use

12. The preceding paragraph briefly described some of the benefits supply-use tables can provide if used to balance GDP. Before proceeding we summarily list here the totality of the main benefits.

- The most efficient way to incorporate all basic data – aggregated or detailed – into the national accounts framework in a systematic way.

[1] Theoretically, double-deflation is the best way in which to estimate constant price value-added by industry. However for practical purposes other methods, for example the single indicator method, may be preferable depending on the industry. Where intermediate consumption is significant proportion of gross output, small errors in deflators for intermediate consumption and output may result in very significant errors for value-added. As such double-deflated estimates of value-added at time t in t-1 prices should always be thoroughly scrutinised. Comparisons of changes in value-added to output ratios for each industry at time t (in t-1 prices) and at time t-1 should form the central part of this scrutiny, as well as an investigation of growth rates of value-added and output at time t (in t-1) prices.

- An effective way to ensure consistency at a detailed level and thereby improve the overall quality of the national accounts.
- Integration of GDP calculations.
- Efficient confrontation of different primary sources.
- Identification of gaps in primary sources.
- Ideal framework for different value concepts (basic prices, purchaser prices).
- Best framework for calculation of variables at constant prices providing coherent deflation of GDP and its components.
    - Constant price tables provide double-deflated estimates of GDP, with inputs being separately deflated from outputs.
- A framework to analyse industry production and cost functions with constant price tables allowing the extension of productivity analysis beyond the more conventional assessment of labour productivity.
- With a time series of tables, constant and current price supply-use tables provide a full description of how supply-demand relationships have evolved over time.
- Linkages to symmetric input-output tables.

Creating an Integrated Framework

13. One of the most difficult and important issues concerning supply-use tables is how to make best use of them in the compilation process. In this context one should recall that the data sources required for supply-use tables are fairly intensive and that annual supply-use tables are typically not available until two years after the date to which they refer. In some countries however, for example the Netherlands, the data sources are sufficient to produce quarterly supply-use tables in constant and current prices a couple of months after the quarter to which they refer. Later on we describe how the supply-use approach can be used as part of the quarterly GDP complication even where not all data, such as estimates of intermediate consumption, are available. In the section that follows we concentrate on annual statistics.

Annual Statistics

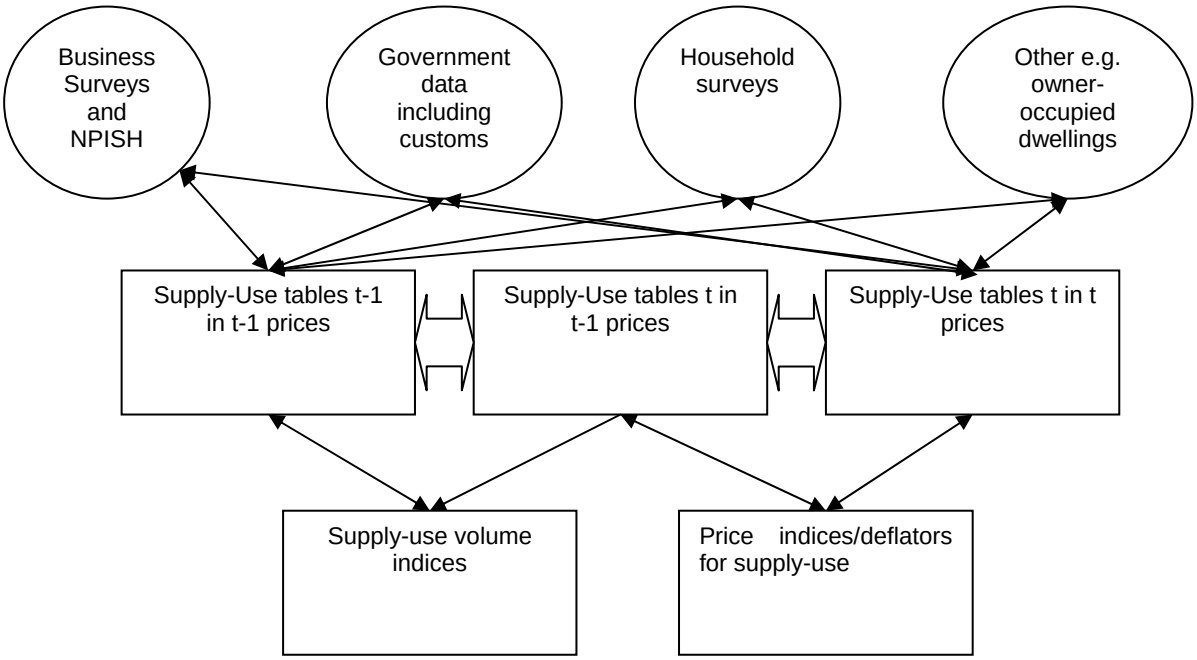
14. The necessary first step is current price supply-use tables. In isolation and as part of an integrated compilation system these tables can be used to balance GDP and introduce coherence for all components within that year. A number of countries use this approach, for example the United Kingdom. However integrating current price tables is only part of the story. The full benefits from using supply-use tables can only be appreciated if current and constant price tables are produced at the same time; since constant price tables not only guarantee coherence at constant prices but they also provide a mechanism to compare

estimates of real growth (by comparing concurrent tables) and to determine how much production structures have changed over time in constant prices by looking at changes in intermediate consumption to output ratios.

15. This latter point is particularly important because it can often reveal significant changes in these ratios. This may occur for a number of legitimate reasons but significant changes may also reveal problems in the current price source data that could not be identified merely by looking at current price supply-use tables. The standard assumption invoked in this regard is that, over small periods of time, intermediate consumption to output ratios are unlikely to change significantly without good explanation. In other words, if constant price balances reveal significant unexplainable changes in intermediate consumption to output ratios they may indicate problems in the original current price source data or price indices/deflators used. As such, it can be seen that constant price supply-use tables offer the potential to inform the current price supply-use balances, and current price data sources as much as they are informed by/derived from it. Indeed in the UK where investigative work has been on-going for a number of years to introduce constant price supply-use tables into the accounts, experimental tables demonstrated their potential in this regard. (Ahmad, 1999)

16. The diagram below illustrates in relatively simple terms how an accounting framework for annual statistics might be developed. It shows how supply use tables at current prices are based on the same data sources that are used to compile the national accounts, and as shown above, using the same aggregates used in the national accounts, such as households' final consumption. Further it shows a two way interaction between the data sources and the supply-use tables. For example current price data on the supply of a particular product may not match that shown for demand, which are likely to be based on independent data sources. The inconsistency reveals that one of the estimates is likely to be incorrect. This may be because the original source data is at fault or because the allocation of source data to a particular product classification may itself be incorrect.

17. Constant price estimates in the flow diagram below are shown at prices of the previous year. A system could be specified such that prices were specified in the prices of some base or other reference year, however, prices in previous years are the generally preferred measure for constant prices. This is especially so in this context because constant price supply-use balancing makes significant use of comparisons with the base year (t-1, if previous year's prices are used) and relies heavily on the assumption that the relationships exhibited in the current year are unlikely to have changed significantly, in constant prices, from the base year. The further back the base year the less likely this is to be true, so, limiting the quality of this 'checking' process.



18. Further, the diagram illustrates how the constant price supply-use tables for year t in prices of t-1 can be used to inform both balances at t-1 and balances at t. This is an important feature. Without the constant price balances at the heart of the system, produced at the same time as the balances for t, and with the ability to allow revisions in time t, it is possible that balancing adjustments made to t result in implausible growth rates for the components of GDP and gross value-added.

19. For example, in many countries, the balancing of current price supply-use tables often results in adjustments to intermediate consumption. Consider, for example, the scenario where estimates of output are systematically affected by an inability to adjust turnover for changes in inventories. If in t-1 estimates of turnover included significant sales of inventories that were not corrected for in determining output, total estimated supply would be significantly higher than demand. Further, if the supply-demand balance was reconciled by making adjustments to intermediate consumption, these estimates of intermediate consumption would be too high. Assume now that at time t, turnover was broadly equal to output, since the levels of inventories unwound, was very small. Balancing supply and demand would be easier since they would, all other things being equal, be broadly equal. Constant price balances of t in t-1 prices would be able to illustrate the problems implicit in the t-1 balance since the changes made to intermediate consumption estimates would show up as significant and unexplainable increases in the ratio of intermediate consumption to output in t in t-1 prices compared to t-1 in t-1 prices, or, as

implausibly high growth rates of intermediate consumption in the supply-use volume indices table, leading to a revised scrutiny of the balancing adjustments made at t-1.

Simultaneous or Sequential balancing

20. In some statistical offices the balancing process is largely sequential. That is, current price balances are determined and the constant price balances follow. The obvious problem with this approach is that the feedback gains that come from the constant price balancing are not utilised: that is, information from constant price balancing does not inform the current price balance. Obviously, this approach to balancing is not as effective as simultaneous balancing, which allows feedback from the constant price balances to the current price balances. There are two key reasons however why some offices adopt this approach. The first reflects the fact that constant price supply-use tables may not in any case be produced. The second reflects the fact that the balancing process is necessarily longer when simultaneous balancing is used. These points aside however, there is little disagreement that, in theory, simultaneous balancing is superior to sequential balancing.

Revisions Policies – Growth versus levels versus deflators

21. How well constant price balances inform the current price balancing process is intimately linked to revisions policies. In the example above, the correct treatment (changing estimates of supply in t-1 to reflect sales of inventories) was possible because the revisions window for t-1 was open. Quite often this is not the case, in practice, and, so, NSOs are forced to make a choice between changing the levels of output at time t (to preserve the correct growth rates in output) or keeping the levels of output at time t at the correct levels but distorting growth or price indices. The choice is not a simple one. However, usually, the current price levels are forced to change in order to preserve the correct estimates of growth.

22. In the example given above, estimates of gross value-added and GDP were unaffected, since the adjustments made to compensate over-estimated output were made to intermediate consumption. This reflects the strength of the accounting framework, namely, that supply-use tables often deliver better estimates of total economy GDP and gross value-added than they do sub components. That is not to say however that estimates of GDP or gross value-added cannot be incorrectly estimated. They can be. In these circumstances the resolution of errors in GDP estimates of earlier years is significantly constrained by revisions practices.

Classification Systems

23. Almost a pre-requisite of the entire framework is the development, use, or availability of classification systems for industries, products, and final demand components that are comparable. For example final demand components such as HHFC estimates are compiled using the COICOP classification in many countries. This is, of course, different to the product classifications generally in use to identify the products used or produced by domestic industries or imported but it is possible to link the two, at least loosely. The inability to have clear concordance relationships for products between the different categories of the supply-use tables can greatly affect the reliability of the supply-use estimates.

Benchmarking

24. Implicit in the supply-use integrated framework is the fact that annual estimates are benchmarked to constant and current price supply-use annual balances.

Deflation

25. A full description of price indices is beyond the scope of this paper. For example a comprehensive definition would require a discussion, of for example, hedonic indices, (OECD 2004) service prices indices etc. Indeed a paper that discussed the general principles of deflation and the types of deflators used in the accounts was presented at earlier NBS-OECD meeting (Roberts, 1997) as was a paper that dealt with specifically with the problems faced in constructing deflators for services (Ahmad, 2003). It is worth however saying a few general words on deflation in this context.

26. Annual deflators are often constructed by taking the average of price movements over the course of the year, for example, by taking the average price indices per month divided by twelve. This, however, is also a source of, possibly significant, error. The deflator must correctly reflect the activity or expenditure undertaken during the course of the year. So, for example, if higher expenditure on a particular commodity occurred towards the end of the year, the last quarter say, the weights used to construct the average price index for the full year however should reflect this. This is particularly important where the benchmarking of quarterly estimates to annual totals is concerned since, without correctly accommodating for this, errors may be inadvertently introduced into the quarterly profiles as well as the annual constant price figures.

27. More generally, deflation should occur at the most detailed level possible (as homogenous as possible). This is an important consideration when deciding on the levels of industries and products intended for use in the supply use framework.

28. Another discussion point concerns the type of deflator used. Different index formulae can be applied using different weighting schemes. It is beyond the scope of this paper to discuss in depth the theoretical and practical considerations with respect to this choice. (A more detailed discussion can be found in Diewert, 2004). However economic theory suggests that, in general, an index formula that assigns equal weight to the current year and the base year is to be preferred. Among others this is why the SNA shows a preference for so-called superlative indexes, like Tornqvist and Fisher. However this preference is not strongly marked. Although superlative indexes have a number of attractions, it should be noted that they also have some disadvantages: They are

- demanding in their data requirements.
- less easy to understand than Laspeyres and Paasche indexes.
- not additively consistent; which is a serious constraint when applied in an accounting framework. This even holds for the most elementary case of year to year changes.

29. From a practical point of view a number of requirements can be imposed on the index numbers:

- The applied index formulae should be a good approximation of the actual changes as expressed by the superlative indexes.
- A change in value must be divided into a price change and a volume change without residual.
- Values at constant prices for aggregates should equal the sum of values at constant prices of constituent parts, applying the same index formulae.

30. Imposing these requirements limits the type of index chosen. The most widely applied approach is to use a Laspeyres volume and Paasche price index. In this context one should note that (annually) chained Laspeyres volume indices (and Paasche price indices) are good approximations to superlative volume indices, such as Fisher, and this is another reason why chain-linked estimates of volume are generally preferred to estimates based on a fixed reference year.

31. It is not, of course, impossible to produce constant price supply-use tables using superlative indexes but it is certainly more demanding. Constant price supply-use tables based on the Fisher approach could be developed by first calculating tables based on Laspeyres and Paasche price indices, since a Fisher price index is merely the geometric mean of Laspeyres and Paasche indices. However one should note that the resulting constant price supply-use tables based on this approach will not be additive.

Quarterly Estimates

32. This section describes how supply-use tables can be used to inform GDP balancing in those quarters not yet subject to benchmarking to supply-use annual balances. In those countries where the totality of information used to estimate the annual supply-use balances is available the procedure is the same as that for the annual process.

33. However, having the totality of data used for annual statistics available in recent quarters is rarely the case. More commonly, information on intermediate consumption fro example is not available. This is where the supply-use input-output relationships from annual balances and the interaction of constant and current prices estimates play an important role.

34. In many countries, without quarterly supply-use balances, estimates of quarterly (and recent) GDP are based on some assumptions. The most important of these is used in estimating gross value-added using a production approach. This generally assumes that estimates of gross value-added in constant prices can be estimated by deflating current price estimates of output and that the ratio of value-added to output is unchanged compared to the most recent year where supply-use balances are available (assuming annual chain-linking). Constant price estimates of GDP from the expenditure and output approach (and, often, the income approach, using the GDP deflator from the expenditure side) are then compared.

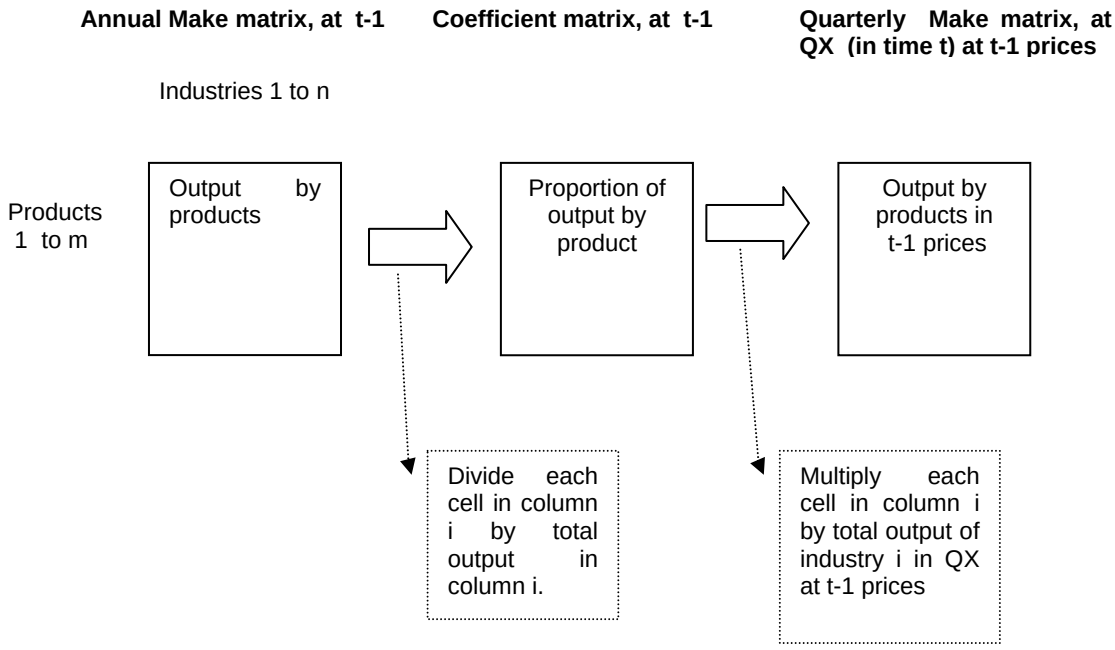
35. When supply-use relationships in constant prices, particularly the ratio of value-added to output, do not change significantly over time, this approach to GDP estimation can be expected to perform reasonably well. (Although one should note that the approach cannot generally deliver coherence at lower levels). However, whenever the relationships change, the result will be differences between the production and expenditure approaches. This is not an academic point. For example, the use of new technology in industries such as telecommunications and the internet, say, has radically changed the cost structures of many industries over the last few years. Quarterly supply-use tables, even without quarterly data on intermediate consumption, are an important diagnostic tool in this context, since they will be able to reveal, at a detailed level, where supply-demand discrepancies exist.

36. The ability of constant prices quarterly supply-use tables to reveal these imbalances, even without quarterly data on intermediate consumption, lies in the fact that the intermediate consumption parts of the table can be constructed using the same assumptions used to estimate constant price value-added; when constant price value-added is assumed to be a fixed proportion of constant price output. Namely, that the intermediate consumption to output ratios from the latest annual balance can be used to populate the quarterly supply-use tables. The flow diagrams and steps that follow describe this process in more detail.

37. In what follows we assume that data on output by industry on a quarterly basis in time t is available as are all of the data used to estimate GDP from the expenditure approach. Further we assume that an annual supply-use table for time t-1 is also available.

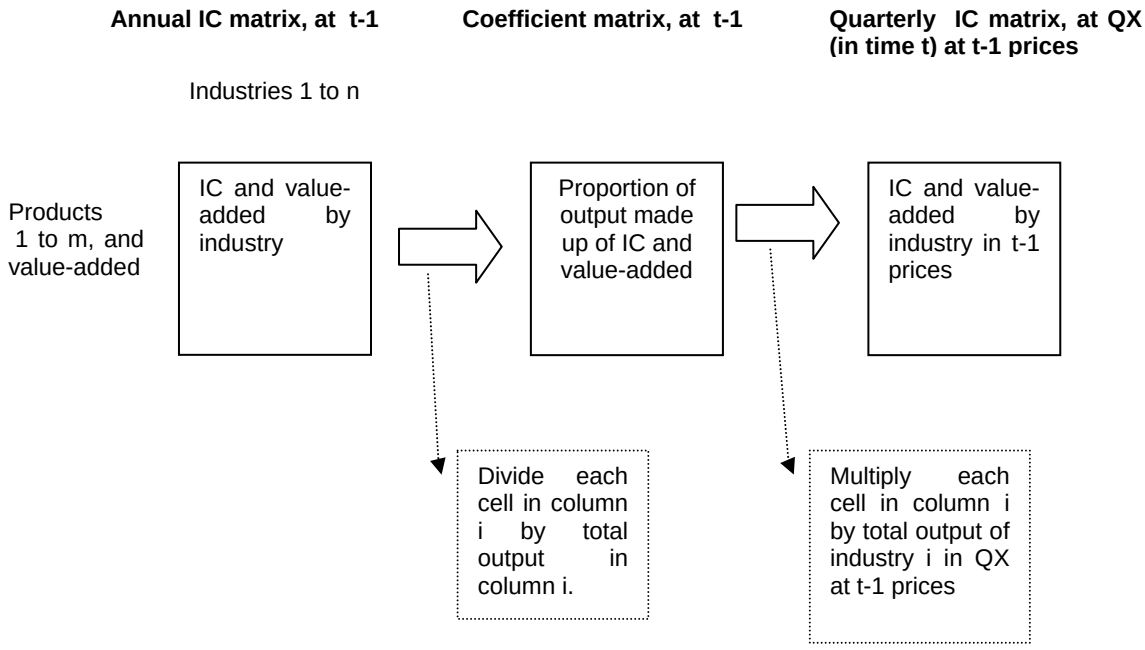
Step 1 – Creating the make matrix

38. The first step is to convert the output data for quarter X (QX) in time t into constant t-1 prices using the same deflators commonly used to generate estimates of gross value-added using the production approach. These estimates show constant price output by industry only. But recall that the Make matrix of the supply-use framework breaks down the output of each industry into products. In order to do this for QX, assuming that the raw data is not available, one can use the relationships from the annual supply-use table at time t-1. The flow diagram below describes how this can be done.



Step 2 – Creating the intermediate consumption matrix

39. In the same way, estimates of output by industry in constant prices can be estimated by assuming that intermediate consumption and value-added to output ratios are unchanged in QX compared to t-1. The flow diagram below illustrates how this is achieved.



Step3 – Populating the Import and Final Demand categories

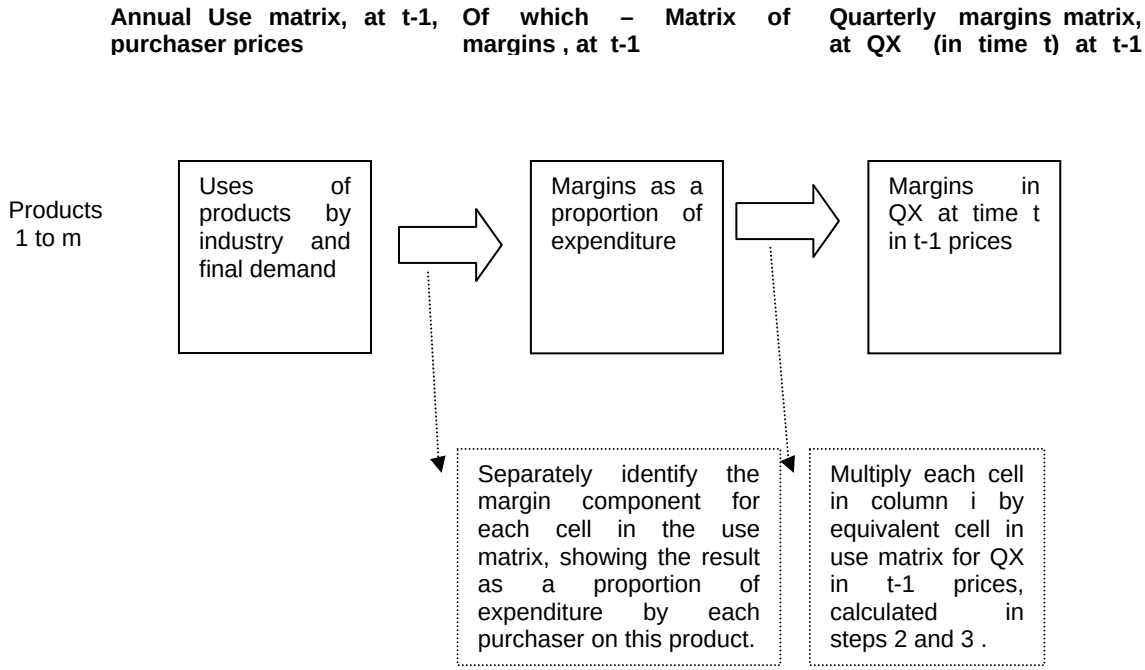
40. Quarterly final demand and import data can usually be allocated to a supply-use framework in the same way that annual data is. This may not always be the case. For example components may not be available at the necessary level of detail. For example, quarterly data of households' final consumption may include a total for electronic products rather than a more detailed breakdown that may be needed in a supply-use framework. There are two ways to resolve this problem. The first is to collapse the quarterly supply-use framework so that the number of industries and products is less than that used for annual statistics. The second is to allocate this total to its separate sub-components based on the proportions of the annual table.

Step4 – Estimating margins and taxes by product

41. The estimation of quarterly margins and taxes by product needed to complete the columns of the supply matrix is another area where relationships based on t-1 annual statistics are needed. The flow diagram below explains the process for margins which is similar to the case for taxes. The first procedure in this process is to calculate the margins component of each cell in the Use matrix as a proportion of the price paid by each purchaser, for each product. The second procedure is to multiply each of these proportions by the equivalent figures of expenditure made by each 'purchaser' (industries, and categories of final demand) in QX at t-1 prices, estimated in steps 2 and 3. This results in a matrix of margins for

each purchaser by each product in QX at t-1 prices. Summing across the rows gives the margins' column needed in the supply table. A similar process can be used for taxes.

42. Incidentally, one should note that this process can also be used as an independent means to estimate the total output of the margins' industries. In some countries this activity is broken down into a number of separate industries (for example, wholesale and retail). The process in these circumstances is the same as described above and in the flow diagram below, except that it should be calculated separately for each industry/margin type.



Step 5 – Balancing/ Scrutinising Supply and Demand estimates

43. Having completed steps 1 to 4, unbalanced estimates of supply and demand are the outcome. Very few countries, if any, make serious attempts to balances these estimates fully at this stage so that they can be used for publication. Rather the process is to use the tables as diagnostic tools that identify at a detailed level where inconsistencies exist in the accounts. So, ensuring that published estimates of constant price GDP take into account all possible information, and, that coherence in the estimates occurs at as detailed a level as possible.

44. For example, if the demand by businesses for telecommunications products had increased significantly between t-1 and t, this would show up as much higher supply than demand, since the quarterly

tables assume the same intermediate consumption to output ratios as those observed in t-1. The corollary of this is that estimates of constant price GDP using the production approach, and based on the assumption that value-added to output estimates are fixed, would be higher than GDP estimates based on the expenditure approach, all other things being equal. Where the production estimates are given higher weighting than the expenditure estimates in the balancing process, the result would be an over-estimate of GDP, assuming quarterly supply-use tables were not available. However quarterly supply-use tables will be able to reveal that a large part of the increased value-added in the telecommunications sector may be the result of increased intermediate consumption of telecommunications services by industries. So, the overall effect on total GDP of the increase in telecommunications' output will be less, and adjustments can be made to reflect this.

45. An additional improvement to the process described above can be made by developing current price quarterly supply-use tables. These tables can be produced by reflating the quarterly constant price supply-use tables. The added benefit of the current price tables is that they brings estimate of GDP based on income components into the quarterly supply-use balancing framework.

Changes in Constant Price Value-Added to Output Ratios

46. Intermediate consumption or value-added to output ratios change for a number of reasons and these all need to be borne in mind when balancing both annual and quarterly supply-use tables.

Product Change

47. Product change occurs when the specification of products produced or used by an industry changes. This doesn't necessarily imply a change in supply-use relationships but changes in these relationships should be scrutinised to ensure that quality changes have been correctly accounted for in the deflators used. As far as the production of higher quality goods goes though, it is possible that the ratio of intermediate consumption of goods to output ratios will change. For example higher specification (faster) PCs will generally tend to use the same quantities of casing as lower specification PCs.

Substitution

48. Substitution occurs when products used in the production process are replaced with newer often cheaper domestic equivalents or imports. Some commentary is useful here. When Paasche based price deflators are used it is possible that substitution, which leads to higher current price value added than would have been the case if substitution had not occurred, can lead to lower constant price value-added

since the values of the new products purchased were probably higher than the values of the substituted products in t-1.

Outsourcing

49. Outsourcing usually occurs when services (usually) produced internally by an industry are instead purchased from other sectors. This often results in a reduction in value-added to output ratios. This is somewhat counter-intuitive since outsourcing commonly occurs with increased profitability in mind. However, one should not confuse profitability with value-added. When outsourcing occurs the contribution made by the former employees, via compensation of employees, no longer occurs but intermediate consumption increases.

50. An important consideration is necessary in this context. Countries that measure output using a production approach will measure higher levels of output where outsourcing occurs within the economy; either through the creation of a new enterprise or through increased output of an existing enterprise. The use of output as a proxy for value-added will imply higher levels of total economy value-added and GDP. This is a mistake, of course, since the increase in value-added also reflects an increase in intermediate consumption.

Restructuring

51. Statistically, inter-industry restructuring occurs when enterprises are broken into more than one reporting unit, or many are merged into one. If they are split, internal transactions that were previously unrecorded are subsequently identified, and, so, the overall ratio of value-added to output will fall; if, apart from the break-up, all other things remain equal. On the other hand, mergers can work the other way, although this is less likely since the notion of the reporting unit for statistical data collection purposes is unlikely to change.

Enterprise Reclassification

52. Enterprises can of course move into other industrial classifications. The impact that the change makes on value-added to output ratios depends critically on the ratio of the reclassified industry and the proportion of secondary activities it engages in. The fact that a reclassification has occurred does however suggest that the proportion of secondary activities is likely to be higher than the norm in its (new and old) sector, and, so, one can expect the value-added to output ratio to change if the industry has significant output.

Differential Pricing

53. If purchasers pay different prices for the same products, shifts in the distribution of buyers will change ratios in the industry that produces the products where this phenomenon occurs (shift-share problem). This mainly affects the energy industries, in particular the electricity industry, where, for example, prices paid by households per kilowatt of electricity are usually very different to those paid by industry.

Efficiency

54. Last, but by no means least, in this list is efficiency savings. Industries are constantly seeking to save money in production by using less physical inputs for given output. This can often translate into higher value-added to output ratios. Increases in labour productivity or capacity utilisation rates will not however translate into an increase in value-added to output ratios, all other things equal.

Conclusion

55. The integration of supply-use tables such that they become a key part of the national accounts compilation process has been recognised by a number of countries in recent years. The costs of redesigning systems to accommodate this change are not insignificant but the benefits are significant. A key criteria, or pre-requisite, in this process is the development of a supply-use culture within statistical offices such that national accounts compilers can understand the compilation through this prism. This, together with the inevitable associated costs for new computer systems, should not deter statistical offices from undertaking these challenges since the benefits are clear, and, arguably, over the longer term, the cash benefits may outweigh the costs. This of course is contentious. What are not contentious, however, are the significant benefits in terms of improvements to statistical quality.

56. Frameworks built around a supply-use table provide, without doubt, the best way to ensure consistency and coherence of economic statistics. At the same time they can be used to improve transparency in the decision making used in balancing GDP – another important dimension of quality. Moreover they can also ensure that estimates of GDP are as exhaustive as possible. This is particularly relevant to countries with large non-observed economies, as is likely in China, and, so, of additional interest to policy makers who may wish to identify the key sectors where underground (tax evasive) production occurs or where the informal sector provides an important social safety net. Additionally the framework lends itself readily to the development of other important economic statistics, such as productivity, since the estimates of labour productivity can be generated as part of an integrated whole, and, with estimates of capital stock, it can be used to generate KLEMs based estimates of total factor productivity.

REFERENCES:

AHMAD N (1999): Experimental Constant Price Input-Output Supply-Use Balances: An approach to improving the quality of the national accounts, Office for National Statistics, *Economic Trends no 548,* July 1999.

AHMAD N (2003): Developments and current research on services statistics: Paper prepared for the 7th NBS-OECD Workshop on National Accounts, (Nov 24-27, 2003, Dalian)

DIEWERT E.W (2004): Index Number Theory and Measurement Economics.

EUROSTAT (2001): Handbook on Price and Volume Measures in the National Accounts

OECD (2004): Handbook on Hedonic Indexes and Quality Adjustments in Price Indexes: Special Application to Information Technology Products, *STI Working Paper 2004/9.*

ROBERTS D (1997): GDP at Constant Prices: Paper prepared for the 1st NBS-OECD Workshop on National Accounts, 1997.