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**MANAGING SUPPLY-USE BENCHMARKING IN THE AUSTRALIAN NATIONAL ACCOUNTS**

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*WORKING PARTY ON NATIONAL ACCOUNTS*

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## MANAGING SUPPLY-USE BENCHMARKING IN THE AUSTRALIAN NATIONAL ACCOUNTS

### 1. Introduction

1. In 1995 Australia made the decision to use annual supply and use benchmarking in the construction of its national accounts estimates of GDP. This decision followed international best practice and was a significant change in the way in which the accounts were compiled for Australia. Traditionally, current price measures of output and intermediate consumption had not been compiled in a time series fashion and so the move to supply and use benchmarking tested both our ability to compile new perspectives on GDP and our ability to integrate a new benchmarking and balancing approach within a well established compilation system.

2. The first estimates on the new approach were released in late 1998 so with six years of experience we are now starting to ask questions about how we have implemented the supply and use approach and how we compare against other countries. In particular, we would like to consider how we might learn from other countries' experiences over the past decade.

3. While a general assessment of our supply and use benchmarking suggests a successful implementation, there are certain aspects that deserve further consideration. This paper seeks to highlight some of the key operational issues that we have encountered which might serve as a basis for having an increased range of operational level discussions across the international national accounts community. The paper also summarises the re-development of our annual supply and use table system that is presently well underway. We understand that a number of countries are undertaking re-developments or have recently changed systems and our summary may provide a starting point for consideration of any synergies that might be exploited.

4. The main aim of presenting this paper is to encourage increased discussion on some of the practical aspects of national accounting. We believe that we might be able to learn a significant amount and generate a range of improvements through increased liaison on operational matters.

### 2. The ABS approach to benchmarking

#### *The basics*

5. A brief introduction to the ABS benchmarking approach is required. The following are the pertinent points:

- A time series of supply and use (SU) tables is maintained. Annual SU tables in current prices commence in 1994-95 and annual SU tables in prices of the previous year (constant price) commence in 1995-96.
- In a "normal" year three SU years are considered. For example, for the annual data to be released up to and including 2003-04 (year t), we compile current and constant price tables for 2002-03

(t-1), 2001-02 (t-2) and 2000-01 (t-3). Respectively these versions are called the first preliminary table, the second preliminary table and the final table.

- Since 1998 we have had one "historical revision" in 2001 in which all tables from 1994-95 onwards were updated. We are planning another historical revision to be implemented in 2005 during which it is planned that all tables from 1994-95 will be updated.
- The results of the SU table compilation are used as benchmark data for the annual national accounts release each year which occurs in early November. Thus aggregate results from the first preliminary are incorporated into the accounts 16 months after the reference period. Often the data set available for the construction of the first preliminary table is somewhat incomplete and so revisions in the second preliminary and final tables occur.
- There are three sections that work on the regular compilation of the accounts: the National Income and Consumption section (NIC) (which also compiles regional accounts); the Capital, Production and Deflators section (CPD); and the Supply and Use Benchmarks section (SUBS). This structure is essentially the one which has been in use for a long period of time. Previously, SUBS was the Input-Output section and compiled the I-O tables which were not directly used in the published quarterly and annual national accounts.
- The NIC and CPD sections work on both the quarterly and annual accounts while SUBS works annual SU tables more specifically. NIC and CPD are required to use the compiled benchmarks and apply them in a longer time series context (back to 1959-60) and in quarterly terms.
- NIC and CPD work mainly using FAME although some components are still compiled using spreadsheets. SUBS works mainly using Excel spreadsheets and some legacy software components but also uses FAME to a limited degree for compiling constant price tables. There are very few direct links between the SU table systems and the NIC and CPD systems.
- The revisions policy has become more restrictive under the SU benchmarking approach. In the past, revisions to time series were generally constrained to once per year but, if required, could happen during any quarterly release. Since the introduction of SU benchmarking it has been necessary to constrain revisions to time series quite significantly. Generally, revisions to periods from t-1 forward are permitted in any quarter, revisions to t-2 and t-3 are permitted once per year and revisions earlier than t-3 are permitted during historical revisions only.
- The timing of compiling GDP components has had to improve to ensure that there is sufficient time for the confrontation and balancing process to occur. In general we aim to complete all inputs to the set of SU tables for a given cycle around 4-5 months ahead of the release of the data but this does not often occur in practice.

### *The challenges*

6. There are, of course, continual challenges in putting together the national accounts. Bringing together a diverse range of data sources and compiling three "independent" measures of the same thing while separating out the price and volume components is no easy task. Nonetheless, based on our experience, there seem to be some particular challenges that we have faced over the past six years that appear to be more specific to compiling GDP in an SU framework.

*a) Culture and structure*

7. The first challenge which are slowly overcoming is introducing a supply and use mentality to all of our compilers. In the past there had been relatively few people who were required to look over the accounts in their totality partly because there was no explicit link between the different approaches to GDP at a fine level of detail. Increasingly we are asking compilers to consider their time series in a broader context. This cultural change is quite significant. Of course, for those working in SUBS the cultural change was not great since many of them had been working in an Input-Output environment for some time. But for NIC and CPD staff the process is still ongoing. At the same time the challenge for staff in SUBS was to start thinking in a time series context as they had been working on individual Input-Output tables released once every three years.

8. One issue is whether the structure of the compiling sections is optimal. While it may be an obvious choice to compile SU benchmarks in the former I-O section, a question we are now posing is whether an alternative structure could be conceived. This might mean that the compilation of SU tables is more integrated with the traditional national accounts work. Do other countries have similar structure to the ABS or is the compilation of supply and use tables a well integrated process?

*b) Data management*

9. The second challenge is data management. Prior to the introduction of SU benchmarking there had never been systemic problems of versions of series. At times there were problems of ensuring the annual data set was consistent with a particular quarter's release but on the whole this was not a systemic problem. Since adopting the SU benchmarking approach we now find that possibly four versions (and at least two versions) of any single series may be in existence at any one time. One version is the estimate to be released in the next quarterly publication. The second version is that to be released as part of the next SU benchmark. A third version would be where a series was being developed on a new basis for inclusion in an historical revision. A fourth version might be related to being compiled on a new industry or updated SNA basis. This versioning creates significant issues for data management. Not least of which is that when new source data are introduced all of the relevant versions need to be updated but not necessarily in the same way - depending on the consistency of compilation method over time.

10. Our current "solution" is to store the different versions on different FAME databases. This works but is quite labour intensive to maintain and is relatively risky in the sense that using the wrong version at the wrong time could occur. To date no errors have occurred but, equally, no obvious solutions to this issue have emerged. ABS would be very interested to know if other countries using an SU benchmarking approach face a similar practical data management problem and if so, whether any good solutions have been adopted.

*c) Editing tools*

11. Editing the increased range of data inherent in an SU benchmarking approach has also been challenging. In our case this has resulted from a combination of needing to develop editing skills and the complexity of our systems environment. The difficulty is trying to both edit data in a structural sense (supply versus use) and also over time. While reasonably easy to visualise the editing that is required, developing an outcome in a technical sense has proved difficult. In the re-development of our SU system (discussed in the next section) the ability to look at both the structural and time series dimensions simultaneously has been a key driving factor. More broadly, we feel that the type of technical solution that would assist in this type of editing could be powerful in the context of compiling and editing the series of income, capital and financial accounts and balance sheets which also have both a structural and a time

series dimension. We presume that other countries face similar editing problems and a discussion on the types of solutions that have been found would be useful.

*d) Time series of SU data*

12. At present, we have decided to continue to maintain the time series of balanced GDP levels and movements from 1994-95 onwards. However, at some point the maintenance of balanced GDP becomes a very onerous task as not all revisions to independent times series are "balanced" revisions. Are countries who have compiled annual SU benchmarks for longer than ten years in the habit of maintaining balances? Do countries only keep the latest few years in balance? While there are clearly individual country's user needs to consider some understanding of how countries deal with long time series of annual SU tables would be useful.

*e) SU compilation skills*

13. In ABS, there is a decreasing number of staff with expert skills in input-output and supply-use analysis. In the past, the input-output tables were a fairly separate and unique set of outputs leading to the development of specialised skills that were not actively required in other parts of the ABS. The introduction of SU benchmarks has brought the need for these skills into sharp focus as the compilation of GDP now relies on having staff who understand the intricacies and nuances of SU and I-O table construction and balancing. Further the advancement of satellite accounting requires a similar set of skills. In ABS we are seeking ways to try and develop the required skill set among our staff but our feeling is that people who can become real experts in this area are few and the process of developing these skills time consuming. Do other countries have a skill shortage in this area and if not, is this because training programs and the like are working well?

### **3. Planned developments for the ABS supply-use and input-output systems**

*Background*

14. One of the more significant barriers to the effective implementation of the Supply Use benchmarking strategy described above was and remains the lack of integrated software to support the statistical processes involved in compiling and disseminating the various sets of data required.

15. In particular the mainframe system used to produce Input Output tables prior to the move to the new strategy did not provide all the functionality required to deliver the benchmark production accounts. In principle the data content of the basic building blocks for the SU and IO tables are identical. However, there are important differences in emphasis between the respective outputs as well as some differences that have arisen as a consequence of decisions taken by the ABS in implementing the approach.

16. Further, the IO mainframe system did not provide the level of flexibility and useability required to compile several years of SU tables concurrently. At the time of transition the team developing the initial benchmarks were operating under considerable time pressures and not all members of the team were skilled in the use of the mainframe system. The solution that was adopted was to develop an independent "system" built around Excel spreadsheets, for the current price component. This solution is still the current practice. Volume estimates are derived by transferring these current price estimates to FAME and deriving the volume estimates on that platform. The price deflators required for this task are stored on FAME. The separation of the processing of current price and volume estimates is seen to be a major shortcoming of the current approach as it means that it is difficult to balance current price and volume estimates in a fully consistent manner.

17. Another important objective of the current strategy is that the analytic IO tables released by the ABS present estimates that are entirely consistent with the estimates released in the most recent edition of the annual national accounts release. Given the architecture of the current system this is difficult to achieve as the analytic IO tables are produced somewhat independently of the Supply Use tables and at a later time.

18. The separate processing of the IO and SU tables occurs because

- the level of product and industry detail used in the compilation of the SU tables is at a higher level of aggregation than that adopted for the IO tables; and
- the IO tables require that each product is balanced at basic prices, as well as at purchasers' prices, meaning that each margin, including taxes and subsidies, needs to be allocated to final use and intermediate use categories. Balancing of the SU tables is limited to balancing at purchasers' prices.

19. The less extensive method of balancing needed for SU table compilation and the less detailed product and industry are both necessary requirements in the current systems environment in order for us to achieve the compilation of the benchmark SU tables within the timelines required for the release of the annual and quarterly accounts.

20. Beyond these requirements it is also clear that the separation of the current price and volume components of the SU system and the lack of integration of the SU system with the national accounts systems are significant statistical barriers. These issues are the principal drivers of the redevelopment of the SU system that is currently underway. Other drivers of the redevelopment include the need for greater integration of SU and IO tables and the removal of dependencies on legacy software and mainframe systems.

### ***The technical solution***

21. The current redevelopment of the supply use system is intended to meet the following objectives.

- Concurrent balancing in current price and volume terms
- Concurrent balancing across the time series dimension
- Use of corporately approved tools, especially in respect of metadata maintenance and output data stores
- Integration of input output and supply use
- Robust data management tools
- Retention of a flexible 'front end' that facilitates 'data scavenging' from ABS and non-ABS sources

22. The underlying data store will be an Oracle data store based on a 'star schema' dimensional model. This is a powerful and robust system that will support up to date data management practices and migration of data and metadata to corporately supported data stores. This is the 'back end' of the system and will be largely hidden from the supply use compilers.

23. The 'front end' of the system will appear to be a set of Excel workbooks. These workbooks will be used to facilitate data scavenging from a variety of data sources. As the ABS input data warehouse becomes more powerful and more comprehensive the possibility of directly sourcing data from the ABSIW will be investigated.

24. Excel will also be used as the main tool for viewing and amending the data on the Oracle store. This will retain the flexibility inherent in the existing system, but with a robust set of underlying building blocks.

25. The key to melding the Excel environment with the Oracle environment is the use of the Visual Studio toolset in the Microsoft .Net environment. This will allow the creation of objects which appear to be simple Excel worksheets, but are actually highly structured and controlled 'windows' into the Oracle system. In this way the users will retain the flexibility for data capture and transformation inherent in a spreadsheet based system but also link to the robust data management facilities of a modern database management system.

26. The redeveloped system will allow importation of data in a variety of formats from the full range of platforms in use in the ABS. It will also allow the production of 'data cube' datasets, either directly or via existing ABS dataset infrastructure.

#### **4. Conclusion**

27. The adoption of SU benchmarking in the Australian national accounts has been a very positive development. It is clear that we have achieved greater coherence throughout our production account series and in the overall measure of GDP. Further, the ABS has greater confidence in the published series and better intelligence on how to sensibly reconcile data from various sources. Indeed, in recognition of the power and usefulness of the supply and use framework, we have developed experimental quarterly supply and use tables to assist in our editing of quarterly data. A separate paper outlining this development has also been presented to this National Accounts Experts meeting.

28. While the adoption of the benchmarking approach has been positive, the compilation environment and particularly the systems available for its implementation have been difficult to manage. This paper has noted a range of challenges that we have had to deal with in implementing and maintaining SU benchmarking and provided some detail behind developments that are underway to improve the systems environment.

As noted in the introduction, the main aim of presenting this paper is to encourage increased discussion on some of the practical aspects of national accounting. We believe that we might be able to learn a significant amount and generate a range of improvements through increased liaison at the operational level. One idea to further this objective is for an EDG to be established through which countries might exchange developments, ideas and problems, particularly those relating to compilation systems and data management.

#### ***Issues for discussion***

- To what extent do other countries face similar challenges in the compilation of SU tables?
- Are there commonalities in method/approach that can be built upon?
- Would an EDG allowing a forum for exchange on SU benchmarking, compilation systems and data management issues be a useful idea?