

**For Official Use**

**STD/CSTAT/WPNA(2006)3**



Organisation de Coopération et de Développement Economiques  
Organisation for Economic Co-operation and Development

**18-Sep-2006**

**English - Or. English**

**STATISTICS DIRECTORATE  
COMMITTEE ON STATISTICS**

**STD/CSTAT/WPNA(2006)3  
For Official Use**

**Working Party on National Accounts**

**NEW ESTIMATES OF HOURS WORKED IN AUSTRALIA**

**To be held on 10-12 October 2006  
Tour Europe - Paris la Défense  
Beginning at 9:30 a.m. on the first day**

*This document has been prepared by the Australian Bureau of Statistics*

**JT03213799**

Document complet disponible sur OLIS dans son format d'origine  
Complete document available on OLIS in its original format

**English - Or. English**

## NEW ESTIMATES OF HOURS WORKED IN AUSTRALIA

### 1. Introduction

The Australian Bureau of Statistics (ABS) produces estimates of annual hours worked by employed Australians for an index of hours worked. The estimates are derived from information on hours actually worked by employed people using the ABS Labour Force Survey (LFS). The index of hours worked captures underlying trends in hours worked over the year and is used as a labour input for productivity estimates in the Australian System of National Accounts. Estimates of annual hours worked are also provided to the OECD and included in their Employment Outlook publication. While adequate for use in an index, the level estimates of annual hours worked contain an upward bias because the method used does not include the effects of public holidays and other events which tend to reduce hours actually worked.

This paper presents a revised method of calculating average and total annual hours worked. First we briefly describe the data available in the ABS Labour Force Survey. This is followed by a description of the current method of calculating average annual hours worked and an alternative method, based on the methodology used by Statistics Canada (See Maynard, J-P (2004)). We then present the estimates of average and total annual hours worked between 1979 and 2004 calculated using the new methodology. These estimates are compared to figures currently provided to used and published, by the OECD.

### 2. Data: The ABS Labour Force Survey (LFS)

The LFS is a monthly survey of approximately 27 000 households which has collected information on hours actually worked since February 1978. Information for over 60 000 people is collected each month during a two week enumeration period. The interviews usually begin on the Monday which falls between the 6th and 12th of the month. Information is collected on employment and hours actually worked during the week preceding the interview. This provides us with information on work patterns during two reference weeks of each month.

Apart from the long time series and large sample size, the major advantage of using the LFS to estimate annual hours worked is that the careful survey design allows us to collect reliable information on actual working behaviour in the reference week. The survey collects information on both hours actually worked and labour force status – the main variables of interest in estimating average annual hours actually worked.

Another advantage is that the LFS includes people who are self-employed and people employed in industries such as agriculture and fisheries. These groups, and information on hours actually worked, are not included in the scope of the ABS establishment surveys.

### 3. Methods

#### *Current method: the mid-quarter month method*

The current method of estimating average annual hours worked, as published in the OECD Employment Outlook, is based on hours actually worked in the LFS reference periods for February, May,

August and November. These four mid-quarter months are used for two reasons. The first and most important reason is that these months are relatively unaffected by non-random holidays - such as public holidays and school holidays - and so they tend to capture underlying trends in hours worked and are well suited to the production of an index. Secondly, the LFS only collects information on industry and occupation in these four mid-quarter months.

Average annual hours worked is calculated by:

- Taking the average of total hours worked in the four mid-quarter months to estimate the number of hours worked per week.
- This average is divided by seven to estimate the number of hours worked per day.
- Hours per day are multiplied by 365.25 to estimate the total hours worked during the year.
- Finally total annual hours worked are divided by the average number of employed people in the mid-quarter months.

This simple method overestimates average annual hours actually worked by employed people over the year. The main cause of the overestimation is that the method makes no adjustment for hours lost from national public holidays and school holidays which are under-represented in the mid-quarter months. The method also excludes seasonal changes in hours worked, such as the relatively high hours worked in early December and relatively low hours worked in January.

The method also tends to underestimate average employment. Since growth in employment is non-linear across the year, an average using only data from the 4 mid-quarter months tends to be lower than an average which uses all 12 months of data.

Both of these factors cause an upward bias in estimates of average annual hours worked calculated when the mid-quarter month method is used.

***Revised method: Statistics Canada based method***

The revised method, based on the methodology used by Statistics Canada, attempts to estimate average hours worked in every week of the year. The method explicitly includes hours lost from major non-random events such as national public holidays and school holidays. By using average hours worked in all 12 reference periods of the year, the method provides better representation of both hours actually worked and employment across the year. The revised method (set out in detail in ABS(2006)) can be summarised into nine steps\*:

- Calculate average hours worked in each LFS reference period
  - in all 12 months of the year,
  - plus the preceding December and the following January.

Holiday correct LFS reference periods by temporarily adding in estimates of hours lost from major non-random events obtained through intervention analysis.

Assign each holiday corrected LFS reference period to one calendar week: the first week of the reference period.

Linear interpolation is used to estimate all other weeks.

Estimate observed non-random events using holiday corrections.

Estimate unobserved non-random events based on observed holiday corrections.

Adjust each week for non-random events.

Estimate partial start and end weeks of each month (since not all months or years begin on a Monday and end on a Sunday).

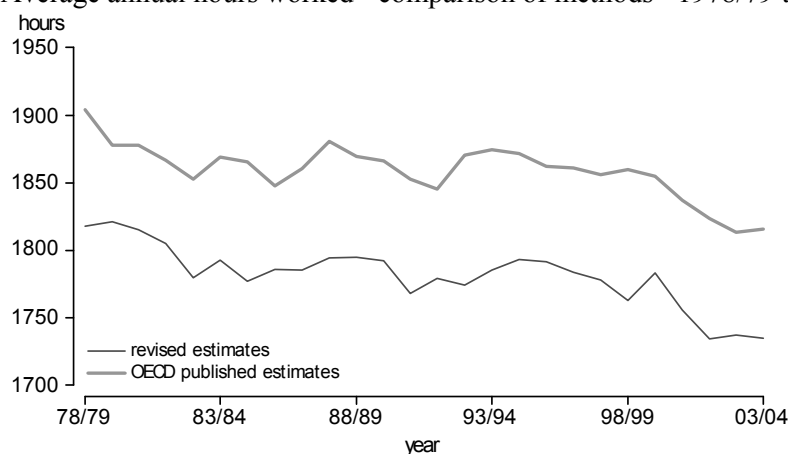
Add all full and partial weeks for estimates of average monthly, quarterly or annual hours worked.

#### 4. Results

In this section we apply the revised method of estimating average annual hours worked to ABS labour force data from June 1979 to July 2004. A very similar method is used to estimate total annual hours worked. These estimates are compared to estimates currently used in the OECD Productivity Database, January 2006. Finally, we use GDP in constant Australian dollars as given in the OECD Productivity Database, January 2006, to explore the effects of the new method on estimates of GDP per hour worked.

Figure 1 shows estimates of average annual hours worked using both the current and revised methods for each financial year between 1978/79 and 2003/04. The revised estimates are substantially lower than the current estimates. Between 1978/79 and 2003/04 the revised estimates are an average of 77.5 hours, or 4.2%, lower than the estimates created using the mid-quarter month method. We estimate that this is an average difference of over 12 week days per year. It also appears that this difference between the two sets of estimates is increasing over time, with the revised estimates being an average of 81.3 hours between 1990/91 and 2003/04.

1 Average annual hours worked - comparison of methods - 1978/79 to 2003/04



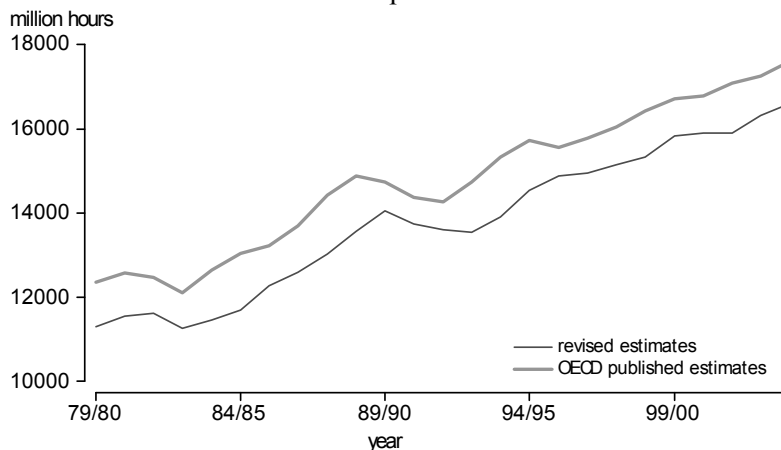
Source: OECD Productivity Database, January 2006; ABS Labour Force Survey 1979-2004.

In general, movements in the revised series are similar to the current estimates, but there are some differences in turning points. For example, during the early 1990s the estimates given in the OECD Productivity Database fall between 1988/89 and 1993/94. The revised estimates do show a slow decline from 1989/90 and average annual hours worked begins to increase in two years earlier than the current estimates.

Other differences between the two series include a notable rise in the revised estimates during 1999/00 which does not appear in the current estimates. An analysis of the quarterly and monthly data showed that this rise in hours worked in the revised series is at least partly due to the effects of the Millennium New Year and the Sydney Olympics.

Figure 2 compares estimates of total annual hours worked using the two methods. Again, the revised estimates are consistently well below the current estimates. These two series also show fairly similar patterns over time. However, the difference between the two series appears to have decreased slightly over time. The average difference between 1979/80 and 1989/90 is 1071 million hours, while the average difference between 1990/91 and 2003/04 is 960 million hours. This suggests that the increasing difference between the current and revised estimates of average annual hours worked over time is due to changes in the estimation of employment, rather than total annual hours worked.

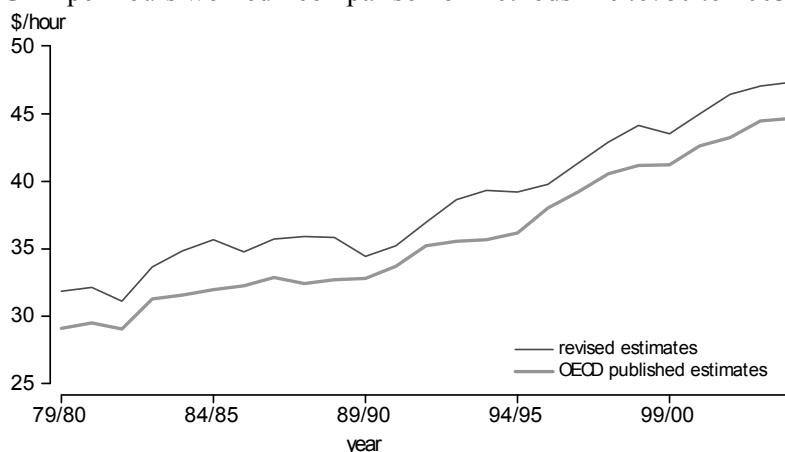
2 Total annual hours worked - comparison of methods - 1979/80 to 2003/04



Source: OECD Productivity Database, January 2006; ABS Labour Force Survey 1979-2004.

Figure 3 shows how estimates of total annual hours worked calculated using the two different methods affects GDP per hour worked. Since estimates of total annual hours worked are lower when the revised method is used, GDP per hour worked is consistently higher when using the revised estimates. In constant Australian dollars, the difference between the two series over the entire period is an average of \$2.63 per hour.

3 GDP per hours worked - comparison of methods - 1979/80 to 2003/04



Source: OECD Productivity Database, January 2006; ABS Labour Force Survey 1979-2004.

5. Conclusion

The main aim of this paper has been to present a revised method of calculating average and total annual hours worked. We believe that this method for estimating average annual hours worked, based on the Statistics Canada methodology, is a conceptual improvement over the method currently used to produce the estimates which are published by the OECD.

We have found that the current method not only overestimates total annual hours worked, but underestimates average employment for the year. Both these factors cause an upward bias in the mid-quarter month average annual hours worked estimates. In contrast, the new method explicitly includes hours lost from public and school holidays. By including employment levels in all 12 months of the year, the method also includes non-linear seasonal patterns in employment over the year. This suggests that the new method more accurately reflects average annual hours worked by employed Australians.

Estimates of both annual and total annual hours worked are reduced in every year when using Statistics Canada based methodology. Average annual hours worked is decreased by an average of 77.5 hours during the period 1979/80 to 2003/04 and total annual hours is decreased by an average of 1009 million hours per year over the period. This decline results in an increase in estimates of GDP per hour worked by an average of \$2.63 per hour.

**References**

Australian Bureau of Statistics (2006) *Research Paper: Estimating Average Annual Hours Worked*, cat. no. 1352.0.55.077, ABS, Canberra.

Maynard, J-P. (2004) Annual Measure of the Volume of Work Consistent with the SNA: the Canadian Experience, Paper presented to