

CHAPTER 3

LABOUR INPUT

3.1 Introduction

The atomistic structure of an industry consisting generally of small owner-operated farms creates special problems in measuring labour used in rural production. The labour working in the rural sector falls into a number of broad classes:

proprietors, whether owners, sharefarmers or lessees,
family employees either paid or unpaid,
employees, either temporary or permanent, and
contractors supplying services to the rural sector.

Both males and females are included in each group but in general, the female proportion is small and not important¹.

Among the various classes of rural workers, there are great variations in the quality of workers, the continuity of employment, the hours worked per day and so on. This makes the precise measurement of labour input very difficult. To obtain some measure of labour input, two general approaches are possible. The first assumes that wages paid takes account of skills, working hours, seasonality of employment, etc, so that the total wage bill paid by the rural sector is a reasonably accurate measure of labour inputs. However, the large proportion of workers who are self-employed, more than half of the total, do not receive a wage at all. Thus, this approach, which may be suitable for large manufacturing industries, or perhaps the economy as a whole, is not appropriate to the rural sector.

¹ At times such as World War II, female labour was a very important component of the agricultural production effort and this is reflected in the workforce estimates contained in Section 3.2.4.

The second possibility is to take account of the various factors influencing labour input in an attempt to approach a man-hours of labour measure. To employ this method fully requires a considerable amount of data on all aspects of the rural workforce, much of which does not exist or is unavailable. However, this approach to measuring labour inputs is examined in this chapter. Estimates of the size of the rural workforce are discussed in Section 3.2. In Section 3.3 consideration is given to a variety of factors which are important in attempting to aggregate all components of the rural workforce into some common unit of measure of labour input (say adult male equivalents working the award hours of work per week). Finally, the estimates of labour input are discussed in Section 3.4.

3.2 Compilation of a Rural Workforce Series

3.2.1 The Objective

Estimates of the number of persons in the rural labour force are compiled and discussed in this section. There are a number of definitional aspects which need to be considered. These include the criteria for inclusion in the workforce and the basis for classifying workers to particular industries. These, and other aspects related to definitions used for the population census, A & P census and the labour force survey are reviewed in Appendix 3A.

As explained in Section 3.2.2, most of these estimates are based on population census data. This entails accepting the A,B.S. population census definitions of the rural workforce. These details are included in Appendix 3A, but in summary, any person who was (i) working at a job or business, (ii) working for pay or profit, (iii) temporarily laid off, or (iv) looking for work, in the week preceding the census are included in the workforce. These persons are allocated to the industry in which they were mainly engaged in that week preceding the census. Likewise the population census definition of occupational status is used which groups the persons as follows:

working proprietors, those conducting their own business; employees, those working for wages or salary; and helpers, those working but not receiving wages or salary.

Throughout this study, these definitions are used and estimates are made for each of the three occupational groups and for both males and females. Over the period of this study, there has been some revision of definitions which are indicated in Appendix 3A, while in 1971, the Australian Standard Industrial Classification, (A.S.I.C.) classification of industries [1] was used for the first time replacing the A.B.S. "Classification of Industries" used previously. However, so far as possible, the effects of such changes have been eliminated to provide a consistently defined set of estimates.

3.2.2 Data Sources

There are two main sources of information on the rural workforce, the A & P census, and the population census¹. The A & P census has the advantage of being collected each year, but there are disadvantages stemming from the incompleteness of the series in recent years particularly for female workers, from the unsupervised filling in of the form by farmers, from less rigorous checking of the returns and coverage of the rural sector compared to the population census, and from the inconsistencies of definition and collection dates between the various States prior to World War II.

The population census has advantages in consistency between States, and more thorough coverage and checking of returns, and is thus likely to be more accurate. However, this source provides only periodic estimates requiring some other means of estimating the workforce for intercensal years.

¹ The A & P data are published in the Rural Industries Bulletin [6] while population census data are published in Population Census Bulletins [2].

Since 1964, the A.B.S. has conducted a quarterly sample survey to determine various aspects of the labour force¹. This includes estimates for the rural sector. While this source provides useful information, it covers only a small portion of the period covered in this study. Further, being a sample survey with the standard error for the male rural workforce estimate assessed at 4.3 per cent, there is likely to be some sampling errors.

The three sources employ different collection procedures and minor differences in definition occur as discussed in Appendix 3A. This results in some difficulty in reconciling the estimates. For example, in 1971 the following estimates are available for males employed in the rural sector:

population census, 30th June	298,323
labour force survey, February	352,700
labour force survey, May	341,900
labour force survey, August	333,800
A & P census, 31st March ²	345,000

Apart from the obvious problems of reconciling estimates made at different times of the year, it is clear that the labour force survey and the A & P census are fairly close, but both are significantly higher than the population census estimate. The size of the difference is disturbing but seasonal fluctuations in employment would be the most important single factor creating the difference. For example, in Section 3.2.4, the seasonality adjustment to the population census estimate, designed to approximate the average level of employment for the year, adds about 12,500 to that estimate. A downward adjustment of

¹ These estimates are published in a bulletin titled The Labour Force [4]. Hereafter, this source is referred to as the "labour force survey".

² This is an estimate because incomplete data is available for temporary male employees.

a similar size to the A & P census estimate would leave about 20,000 to be explained by definitional and collection procedure differences.

In his study of the Australian workforce which preceded the commencement of the labour force survey, Keating [15] reviewed the available sources and concluded that the population census data provided the best basis for estimating the rural workforce at census dates, but used A & P census data to interpolate between censuses. Keating's estimates are used in this study up to 1960-61 and the methods he used are summarised in Section 3.2.4. The population censuses of 1966 and 1971 form the basis for extending Keating's series to 1969-70, while the intercensal years have been interpolated using both A & P census and labour force survey estimates. It should therefore be noted that the rural workforce estimates contained in this study and based on population census data, are near the lower end of the range of estimates contained in official publications.

3.2.3 Other Studies

Substantial studies of the rural workforce have been made by Gutman [13] and Keating [15]. Both have relied extensively on population census data supplemented by A & P data. Gutman's series extends from 1920-21 to 1947-48 while Keating covered the period from 1910-11 to 1960-61. Generally the two sets of estimates are fairly close, with Keating's estimates slightly higher. This arises because Keating makes some adjustments to allow for the seasonal pattern of employment because the population census date tends to be close to the seasonal low in terms of the level of employment.

Five factors lend support to the use of Keating's estimates rather than Gutman's,

- (1) Keating's study spanned a longer period of time.
- (2) Keating disaggregated the workforce into three groups, working proprietors, employees and helpers for both males and females while Gutman only separates males and females.

- (3) Keating adjusts the number of employees for seasonal variations in the level of employment.
- (4) The method of compiling the estimates is provided in detail by Keating while the methods used by Gutman are not detailed.
- (5) Keating compiled his estimates with considerable knowledge of and access to A.B.S. data as he was employed for some years in the A.B.S.

Section 3.2.4 provides a resumé of the methods adopted by Keating and details the extension of the estimates to 1969-70.

Wilson [21] in his study adopted Keating's estimates and extended them to 1966-67 on the basis of the labour force survey estimates. It is not clear if Wilson made any adjustments to overcome the apparent definitional differences between the Keating and labour force survey estimates.

Young [22] studied the period from 1948-49 to 1967-68 and based his labour input estimates on A & P census data. This is the only study which relies on this data source and as such, provides a useful basis for comparison with population census based estimates. Young also carried out a number of adjustments to the labour data which will be referred to in Section 3.3.

3.2.4 Estimation of the Rural Workforce

Workforce data is more extensive for males than for females, and in the following the male component is considered first, followed by the female component. Initially, Keating's method of compiling the estimates is summarised followed by a description of how Keating's estimates were extended to 1969-70.

(1) The male rural workforce

The male workforce was classified into three categories, working proprietors, unpaid helpers and employees. Keating first

established "benchmarks" for each category of the workforce, for each population census year. The benchmarks included some reclassification such as adding in the number unemployed and reclassifying contractors from the proprietors to the employee class. For the proprietors and unpaid helpers groups, these benchmarks were adopted as representing average employment in these two groups for the whole year. This assumes that the work carried out by these groups is constant throughout the year.

Because the population census date does not fall at a time when employment is near the average for the year, a major adjustment is necessary¹. Specifically, the population census date (generally June 30th) is close to the low point of rural employment. Keating developed a set of adjustment factors to obtain an estimate of the average number of employees in the rural sector.

Keating's pre-war adjustment for seasonality of employment was based on a number of sources including an unpublished A.B.S. manuscript on the subject², a detailed analysis State by State of crop calendars and some wage data available for N.S.W. and Queensland. From this information, an adjustment factor was determined for each State which is an indicator of the size of the census date estimate of the number of employees relative to the average number of employees for the year. The census estimate was then divided by the adjustment factor to yield an estimate of the average number of employees for that year. The adjustment factors for 1939 and subsequent census years, are shown in

¹ The same applies to the A & P census date (generally March 31st) which is close to the high point of rural employment particularly where Autumn harvested crops are important. Keating [15] compiled a set of adjustment factors to adjust A & P census data as well.

² The main results from this manuscript are contained in a paper by Mauldon [16]. The estimated average employment reported by Mauldon for 1938-39 of 205,433 is close to that estimated by Keating (218,300) after an adjustment for unemployment in the rural workforce of approximately 16,000 (see Appendix 3E), most of which would be unemployed employees.

Appendix 3B. With only minor changes, Keating used the 1939 factors throughout the pre-war period.

In the post-war period, Keating derived a set of adjustment factors from unpublished monthly payroll tax data for the rural sector. These data only include employees employed by farmers subject to payroll tax. The adjustment factor is the ratio of payroll tax employment in the particular month, (June in the case of the population census) to the average payroll tax employment in that year. Such a factor was calculated for each State, for each population census year¹.

The adjustment factors based on payroll tax data are biased to the extent that they represent only relatively large employers of labour. There is no way of estimating the extent of such biases. However, some consideration is given to the reasonableness of the factors so derived. For the 1947, 1954 and 1961 census years the factors were relatively constant for each State, with the largest variation occurring in Victoria. In Vic., S.A., Tas. and to a lesser extent N.S.W., the importance of Autumn harvested crops such as potatoes and fruit, makes the June employment level below the average for the year. In Qld. and W.A., the differences are much less which suggests that the temporary employees find greater continuity of work throughout the year in those States. This is likely to be the case as these employees are associated with shearing, fencing, dam sinking etc., which has less of a seasonal pattern than fruitpicking. The sugar harvest in Qld. spans May to December, so it is not unrealistic to have factors for Qld. indicating greater employment in June than the average for the year. Thus, the factors derived by Keating seem satisfactory and can be justified in the absence of more detailed data on rural employment patterns².

¹ More detailed discussion of the calculations are in Keating [15, Appendix 4].

² Consideration of the equivalent factors derived by Keating [15] for making a similar adjustment to the A & P census taken in March further supports these observations.

The adjustment for seasonality of agricultural employment completed Keating's calculation of population census benchmarks. Keating then used the trends shown by the A & P census data in each labour category to interpolate between censuses and so obtain estimates for each year. If A & P census data were not available, interpolation was used.

The series has been extended in the present study to 1969-70 using essentially the same method as Keating. Population censuses were taken in 1966 and 1971. There was a slight change in the definition of the workforce in 1966 (see Appendix 3A) which added about 2.3 per cent to the workforce overall. However, this effect was concentrated on the female component of the workforce with little influence on the male component. In 1971, the population census used the A.S.I.C. industry classification for the first time. However, the rural industry groups used in 1971 correspond closely to those groups used in earlier population censuses¹.

The 1965-66 and 1970-71 benchmarks for the proprietor and unpaid helpers groups were taken directly from the census data without adjustment. This is slightly different to the procedure used by Keating who reallocated contractor proprietors to employees. Data for this adjustment was not available but the numbers involved are believed to be small relative to the total number of proprietors.

For employees, the unemployed were first added to the number employed². These totals were obtained for each State, and adjusted for seasonality using Keating's 1961 factors to establish the census year benchmarks for employees.

¹ Personal communication with officers of the A.B.S.

² For 1971, no estimate of the number of rural workers unemployed is contained in the population census data, nor is it explicitly included in the labour force survey estimates [4]. In the latter case, industries with less than 4,000 are not separately mentioned. A one per cent level of unemployment was assumed for the rural sector and added on to the number of employees.

Keating's 1961 factors have been used rather than calculating new factors for several reasons. The main reasons included the non-publication of payroll tax data of the kind used by Keating, and the observed stability of the factors in the 1947, 1954 and 1961 census years. These seasonality factors will vary in response to structural changes causing the output mix to vary or to variation in the timing of operations in particular years. There is little evidence of substantial structural changes between 1961 and 1971. Certainly some increased grain cropping has occurred but this is not a major factor giving rise to changing seasonal employment patterns because the industry does not employ a large amount of temporary labour. The most important potential source of change is in horticultural operations which have not been the subject of major structural changes. There may be some reservations about applying the 1961 factors in 1971 because 1971 is the furthest removed from 1961, and because 1971 was a year of severe rural recession. However, this recession affected most sectors of rural industry and so would have tended to depress all rural employment rather than particular sectors which would be required to alter seasonal employment patterns.

Barring major structural changes, the seasonal pattern of employment may be influenced by the advent of early or late seasons (i.e. whether harvests are early or late relative to the norm). However, these influences would appear to be small in the case of the population census date (June 30th). This is because June is not a time of extensive sowing or harvesting which would make early or late seasonal influences unimportant¹. Finally, these calculated factors should be recognised for what they are, proxies in the absence of more accurate data on labour inputs. They cannot be regarded as precise indicators but as general trend indicators. So overall, using the 1961 factors is unlikely to result in significant errors.

¹ By contrast these factors are more important in relation to the A & P census date of March 31st,

The above procedures established the 1965-66 and 1970-71 benchmarks for each worker category. The intercensal years have been interpolated for each category on the basis of the trends shown by the corresponding category in the A & P census data. The complete series covering the period 1920-21 to 1969-70 are shown in Appendix 3C.

(ii) The female rural workforce

Data on females working in the rural sector are inadequate yet at times such as World War II they were a very important component of the rural workforce. In some industries, notably dairying, female labour has always been important. Apart from estimates of the number of females in the rural workforce, there is no information on the amount of work performed yet many would be part-time workers. However, in terms of the total rural workforce, females are a relatively small component so that errors in the estimates for female workers will not have a major impact on total labour input.

Keating used essentially the same methods for females as males, that is, population census benchmarks for each of the three worker categories, but with no adjustment for seasonal fluctuations in the number of female employees. However, A & P census data for females working in agriculture either has not been collected or is unavailable in a consistent form. Thus, throughout the period studied by Keating the intercensal years were derived by interpolation¹.

The extension of Keating's series from 1960-61 to 1969-70 encountered a number of difficulties. The main one was the effect of the more specific definition of the workforce which was introduced at the time of the 1966 population census (see Appendix 3A for details). This resulted in the total female workforce estimate being about 100,000 more than it would have been under the definition used in previous population censuses. Many of the additional females were classified as part of the rural workforce and as a result the reported number of

¹ A variety of methods were used but the details are not reported here; see Keating [15] for details.

females in the rural workforce almost doubled between the 1961 and 1966 census estimates. Therefore, some adjustment was made to the 1966 census estimates (and subsequently, the 1971 census too as the revised workforce definitions were retained) to establish benchmarks comparable to those employed by Keating in the period up to 1961.

The benchmark for 1965-66 was established for females (all categories together) by extrapolating the trend in the series between the 1954 and 1961 censuses, which resulted in a 15.6 per cent increase over the 1961-66 period. This method was used because a steady upward trend in females working in agriculture was evident since the late 1940's. It was not possible to draw on the labour force survey data to any extent because the survey only began in 1964, although this source does confirm an increase in female employment in the rural sector between 1964 and 1966. A & P census data is only available from 1963 and even then only for N.S.W. and Victoria. Over the 1963 to 1966 period, the A & P census data indicates a slight decrease. Overall, the evidence is conflicting but would tend to support the increasing level of female rural employment over the 1961 to 1966 period.

The trend between the 1966 and 1971 censuses was also confusing. The population census indicated a decline in the female rural workforce of 9.4 per cent. This was supported by the A & P census data for N.S.W. and Victoria which indicated a decline of 18.8 per cent. The labour force data reported a 12.1 per cent increase over the same period. In these circumstances, the evidence of the population census appeared strongest, so the 1970-71 benchmark was established in accord with the trend in total females in the rural workforce between the 1966 and 1971 censuses, i.e. 9.4 per cent lower in 1970-71 than in 1965-66.

The conflicting trends shown by the labour force survey data and the A & P census data did not provide a satisfactory basis for estimating the female rural workforce in the intercensal years. Thus, these years were estimated by linear interpolation between the benchmarks.

In allocating the total number of females among the three worker categories, the evidence from the labour force survey and the population census was also very confusing. This was partly because both sources employ the wider definition of the workforce¹ which includes a large number of females in the unpaid helper category relative to the other categories. This means that the ratio of the worker categories to the total number will be significantly distorted. But the trends are useful.

Over the 1966 to 1971 period, the trends in the workforce categories were consistent between the two data sources. Working proprietors increased (as they have since the late 1940's) while employees and helpers decreased. These trends suggest that the 1970-71 proportion of proprietors to total female workers would be higher than in 1960-61. This is arbitrarily estimated to have increased from 68 per cent to 72 per cent. For unpaid helpers, both the population census and labour force data suggest that this category was more important in 1965-66 than in either 1960-61 or 1970-71. Thus, the proportion was estimated to have increased from 8 per cent to 10 per cent over 1960-61 to 1965-66 and subsequently to have declined to 8 per cent by 1970-71. The employee group then represented the balance of the estimated total. Finally, the intercensal years have been estimated by linear interpolation between the benchmarks. The completed estimates are shown in Appendix 3D.

3.2.5 Some Comments on the Rural Workforce Estimates

Data on the rural workforce are not as adequate as one would like. However, the use of Keating's estimates are probably the best obtainable from the available data and the series have been extended by generally following the methods developed by Keating. This should have resulted in series that are consistent over the fifty years.

¹ The population census adopted this first in 1966, see Appendix 3A.

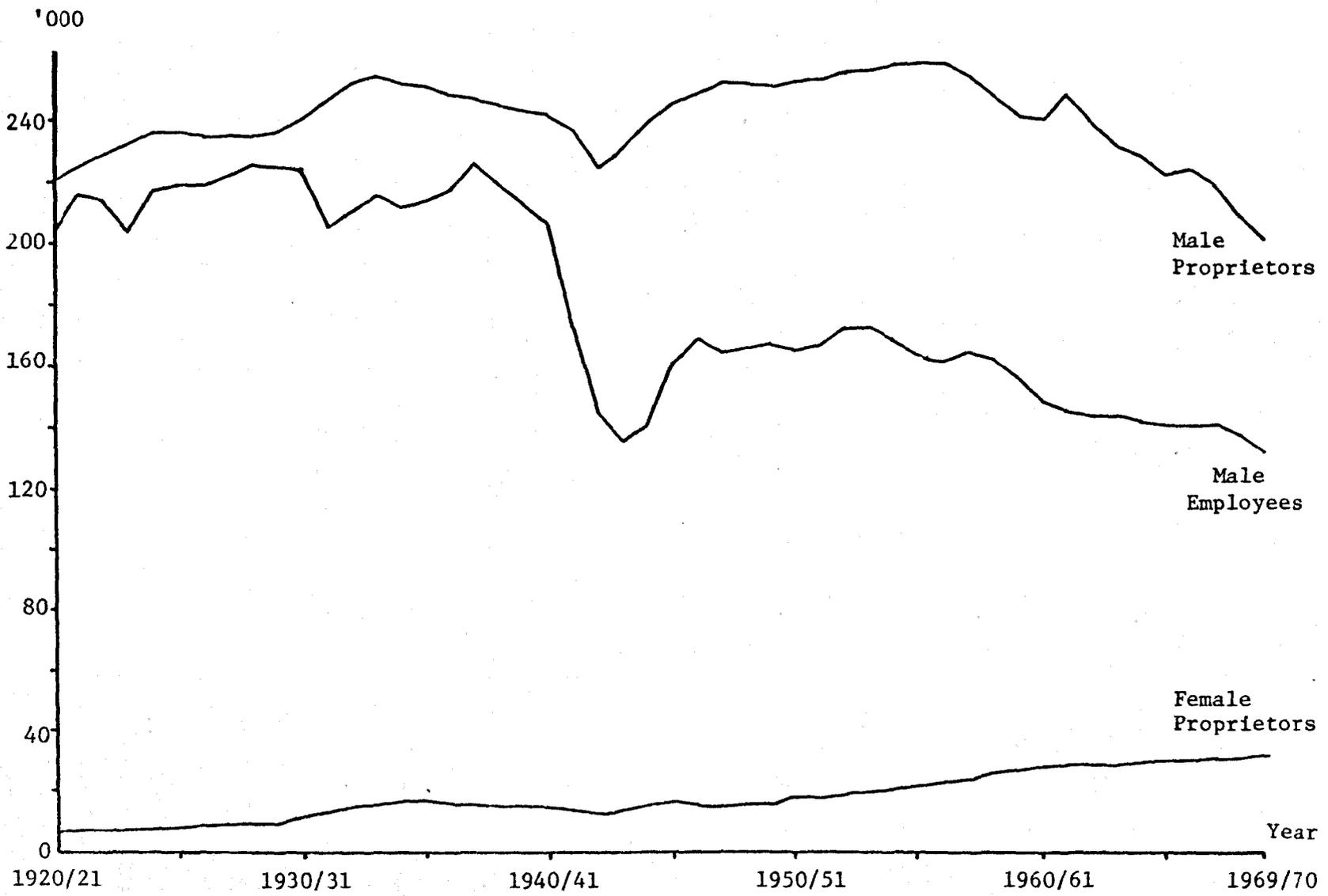
Selected components from the estimates are shown in Figure 3.1.

The estimates indicate a general expansion of the workforce through the 1920's which was shared by most components and both males and females. The post World War I soldier settlement policies and the policies aimed at developing and intensifying the rural sector as suggested by Sinclair [17] would be important in this trend.

The advent of the 1930's depression created quite a different situation in the rural sector. There was a tendency for the number in the rural workforce to increase at a time when unemployment levels in the economy generally were high. In these circumstances farms provided the opportunity to produce many basic living requirements if nothing else, and so presented a more attractive situation for "getting-by" than did urban areas.

There was a sharp difference in the behaviour of the employees series and the other groups in the workforce during the early 1930's. Sharply reduced farm incomes forced farmers to reduce expenditure and one way this was achieved was via a reduction in hired labour. This was made easier by the drift of unemployed back to the farms of families, relatives and friends. But few of these became employees receiving a regular wage, rather they swelled the number of proprietors and unpaid helpers both male and female. It is also possible that some of those who were previously rural employees became proprietors or unpaid helpers. For the remainder of the 1930's, there was a reversal of those trends as the number of proprietors declined and the number of employees increased.

The advent of World War II caused a major and rapid change in the situation. In the space of two years, 1940-41 to 1942-43, the male workforce had decreased by about 85,000, mostly helpers and employees. This was partially offset by significant increases in female helpers and employees which increased by about 15,000. The labour shortage created many difficulties for the rural sector [10], but overall, the War did have the effect of removing an abundance of labour from the rural sector of which only about half returned in the post-war period.



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FIGURE 3.1

Selected Components of the Australian Rural Workforce, 1920-21 to 1969-70: thousands.

The post-war period experienced a fairly rapid expansion of the male workforce, both proprietors and employees. This was aided by various rural settlement programs and the shortage of materials and machines which held back the rate of mechanisation. But by the mid 1950's, all male worker categories were declining steadily. This decline began in the employee group 4 to 5 years ahead of the proprietor group. The rate of decline speeded up in the late 1960's as the effects of reduced prices for lambs, wool and grains particularly, took effect. It is significant that both the employee group and the proprietor group in 1970-71 were about 70 per cent of the early 1950's peak. This suggests significant restructuring of farms was taking place, particularly the ownership of farms, in addition to reductions in the use of hired labour. The other notable aspect was the very small number of unpaid helpers that remain in 1969-70.

The female component of the total rural workforce has risen steadily from about 2 per cent in the early 1920's to around 12 per cent at the end of the 1960's. Up to World War II the proportion of females increased to around 4 per cent but this increased rapidly during the war to reach 10 per cent. The proportion fell back to near 5 per cent post-war but has been climbing steadily throughout the 1950's and 1960's.

The main characteristic of the female rural workforce was the post-war increase in proprietors while the other groups remained fairly steady. Even allowing for wide margins of error in the allocation of females between worker categories, this is not so surprising. Throughout the 1950's and 1960's, the number of rural partnerships, private companies and trusts increased rapidly. In the sheep industry Wells and Bates [20] found that almost half of the partnerships were of a husband and wife nature. The increased use of these farm business structures, was stimulated by the income tax and estate tax advantages they confer and were a major factor causing the growth in the estimated number of female working proprietors. This raises doubts

about the real level of labour input of female proprietors but these doubts are relevant to all labour components. Some consideration of these aspects is included in the next section, but the lack of data on these aspects makes it impossible to resolve these doubts.

3.3 Measuring Labour Input from Workforce Data

The estimated rural workforce is a useful indicator of the number of workers who are in some way dependent on the rural sector for their income. However, the workforce estimate does not measure the amount of labour actually utilised by the rural sector. Some of the factors to be considered in estimating actual inputs include the level of unemployment, the numbers of hours worked per day, and the number of days worked per year. In addition, there are differences in worker ability and skill. A precise estimation of labour input would entail complete enumeration of all the workforce. Each individual's actual work time would be established and then weighted by an appropriate quality factor. The sum of all individual totals would measure the total labour input. In this section some aspects influencing actual labour input are considered.

A wide variety of factors could be considered in this context, but only some are discussed here. They have been chosen on the basis of their importance, the possibility of obtaining some objective basis for taking them into account, and the likelihood that the factor may vary in its influence through time. More elusive factors such as improved health levels of workers leading to higher worker productivity and similar effects of reduced working hours on productivity, have not been considered.

Three factors which were considered but are not discussed in detail below, were the effects of a changing age distribution of the rural workforce, the growth in non-commercial farms and off-farm work. Young [22] made an adjustment on account of the number in the workforce over 65 years of age. He included these persons as 0.65 of an adult

male. Such an adjustment was arbitrary, and because there has been only small variations in the proportion of the male rural workforce aged 65 or more¹, any adjustment will have little impact on the trends in labour input.

Young [22] also adjusted his labour input estimates for off-farm work. B.A.E. surveys [8, 9] indicate that off-farm work amounts to about 5 per cent of available farm labour. But frequently this work will be for other farmers so the real level is likely to be less than 5 per cent. Thus this factor is trivial and no adjustment is made. Finally the growth in non-commercial farms² which have increased from about 30,000 in 1959-60 to over 40,000 in 1968-69 may influence the workforce estimates. Many of those are "hobby" or "weekend" farms where the owner is fully employed elsewhere in the economy. Thus, most of these "farmers" would not be included in the rural workforce, so little distortion of labour input would arise from this source.

3 3.1 Adjustment for Unemployment

The workforce estimates include unemployed and underemployed labour. An estimate of labour input should at least adjust the workforce for the number unemployed but estimates of underemployment would be more intractable. Estimates of the number of registered unemployed have been compiled since 1948 [5]. However, unemployed who were not registered with the Commonwealth Employment Service were not included. A similar situation occurs prior to 1947-48 when unemployment data was based on information supplied by reporting trade unions [5]. Unemployed persons belonging to non-reporting trade unions or non-unionists who were unemployed were not included. These aspects were considered in detail by Forster [12] who concluded that the trade union estimates were reasonable indicators of the trend in unemployment.

¹ For the population censuses 1947, 1954, 1961, 1966 and 1971, the proportion of males over 65, and in the male rural workforce ranges from 7.3 to 7.7 per cent [7].

² These are defined by the A.B.S. on the basis of estimated gross income [3].

Population censuses include data on unemployment by industry¹. This source is a more complete enumeration of the unemployed than either the trade union or the Commonwealth Employment Service data. To adjust the male rural workforce, this study has used the population census estimates of unemployed males in the rural sector as benchmarks. The intercensal years were then estimated in accord with the trend in the level of male unemployment in the whole economy, using trade union estimates up to 1946-47 and the registered unemployed thereafter. This established a series indicating the per cent of the male workforce unemployed (both proprietors and employees). The number unemployed was then calculated and deducted from the total workforce². The adjustment is shown in Appendix 3E.

The female portion of the rural workforce is not adjusted for unemployment because the level of female unemployment indicated by the population censuses was always below 1 per cent, so any adjustment would be miniscule.

The described unemployment adjustment adopted the census date level of unemployment as an indicator of unemployment throughout the year. The census date has generally been June 30th which is close to the seasonal trough in rural employment and as a result, may tend to overestimate unemployment. However, there is no easy remedy for this deficiency.

¹ This information was not available from the 1971 census.

² The data, both census and that used for intercensal years, does not indicate the occupational status of the unemployed. While it is likely that some farmers (proprietors) may have been forced to leave their farm and joined the unemployed, most of the unemployed would consist of persons previously classed as employees. Although this is not important in measuring total labour input it is significant for the calculation of total labour payments if employees and proprietors do not receive the same level of payments. These payments are calculated in Chapter 4 and for that purpose, the number of unemployed are deducted from the employee group.

A second deficiency is the use of whole economy unemployment rates to indicate the intercensal trends. These trends from the mainly non-rural sectors may not coincide with trends in rural unemployment. In particular, the depressed conditions of the 1930's may have experienced the peak in non-rural unemployment earlier than did the rural sector. In Appendix 3E, the peak unemployment rate occurs in 1931-32 based on the reporting trade union data, yet the drift back to rural areas resulted in a peak workforce in 1933-34. Thus, if the sequence of events was rising non-rural unemployment, drift to the rural sector, rising rural unemployment, then the unemployment adjustment may be slightly inaccurate in its timing. However, it should be recognised that this is a simple and crude adjustment designed to capture the broad trends in rural unemployment. Because the level of unemployment was important during certain periods, some adjustment for this factor would certainly be better than none.

3.3.2 Adjustment for Hours Worked per Week

The number of hours worked per week was considered because there was a decline in the standard hours of work during the period studied. The standard hours of work are of importance to the employee portion of the rural workforce, but are unlikely to influence the hours worked by the self-employed portion of the workforce. There is little evidence that farmers are presently working less hours than farmers did fifty years ago. They may have more regular holidays now than they did in the 1920's, but this could be compensated for by an increase in 'after-hours' reading relevant to their business and generally attending to the business aspects of the farm. Thus hours worked by the self employed are not considered important in this context.

The number of hours to be worked by employees is specified in various relevant industrial awards. Throughout the period, standard hours of work has declined. The decline is not steady but tends to be in discrete jumps. Up to 1948 most awards were for a forty-four hour working week and thereafter forty hours, while claims for a thirty

five hour week are a feature of the early 1970's.

Apart from standard hours, overtime should also be considered. Overtime would be important in periods of general labour shortage, such as World War II, and would tend to even out the "jumps" in hours worked such as the advent of the forty-four hour week in 1948. Further problems in the rural sector arise with temporary employees. These may be employed on various harvesting operations and paid on a piece rate basis. In these cases, a wide spread of hours worked would exist.

There was no data available to indicate the trend in actual hours worked in the rural sector. Only award hours information was available but this is a poor guide to actual hours worked. The possibility of obtaining a guide from non-rural sectors was also ruled out because actual hours data is only available since 1966 [5]. As a result, no adjustments are made for changes in hours worked. This would tend to bias upwards the labour input estimates in the recent years of the study period relative to the earlier years.

3.3.3 Adjustment for Labour Quality

At any point in time, there will be substantial differences in the quality of labour based on managerial abilities, technical skills, education levels, etc. These factors would vary over time which means it is unlikely that one hour of work undertaken in 1920 will be as effective as one hour of work in 1970 after allowing for additional capital. The discussion so far has been related to trying to measure the time concept of labour input ignoring labour quality.

It is not proposed to make any adjustments for labour quality in this study. This reflects the acceptance of a model of technological change which attributes the productivity gains arising from improved input quality to the residual or technological change. The reasons for this assumption are explained elsewhere (Chapter 10). Most of the study of labour quality change is related to education represented by data showing either education expenditure or years of schooling.

There are major problems in obtaining these data for fifty years [18] which would make such adjustments a substantial research task well beyond the scope of this project. However, such a refinement in the study of technological change is part of research to improve the analytic model and develop the data to attempt to understand the causes or sources of technological change¹.

3.3.4 Adjustment of the Female Component of the Workforce

In compiling a non-monetary measure of labour input, the problem of parity between male and female workers must be considered. This stems from the frequent occurrence of females combining farm work with household duties which means that less than a full day of farm work is performed. In the dairy industry for example, women may assist with the milking but do little else on the farm. Thus, it seems realistic to make an adjustment on this basis.

The adjustment is arbitrary in the absence of detailed information on actual working hours. Actual hours worked should be the evidence used, not relative female/male wage levels as used in B.A.E. survey calculations of adult male equivalents of labour [9]. The latter implies lower productivity of female labour which is not the issue in this case. The issue is simply the amount of time females have for rural work relative to males. In this study females are assumed to work 75 per cent of the time worked by males throughout the entire period covered by the study. This may reasonably approximate the general ratio between hours worked by males and females, but at certain times, such as World War II, the ratio would have been lower, while in the 1930's it would have been higher.

¹ Denison, and Jorgenson and Griliches are contributors in this area and examples of their work are contained in the following references [11, 14].

3.3.5 Adjustment of the Unpaid Helper Component of the Workforce

Unpaid helper labour would include mainly work done by family labour. Many may be employed in other jobs off the farm or perhaps still attend school. At peak work times these family members assist on the farm. Again, detailed information on the amount of work performed by these persons is not available. However, some tabulations compiled by the U.S.A. Bureau of Agricultural Economics in 1950 (referred to in [19, p.73]) indicated family workers as equivalent to 0,65 of a full-time worker. This value has been used in this study and applied to both the male and female unpaid helper categories¹.

3.4 Discussion of the Labour Input Estimates

In deriving labour input estimates from the workforce estimates, three adjustments were made. Account was taken of the level of unemployment and the smaller number of hours available for farm work of all classes of female labour and of male unpaid helpers. The resultant series is included in Appendix 3F as is the unadjusted total rural workforce. The adjustments reduce the total workforce by 5 to 6 per cent in most years due mainly to the adjustments to female and unpaid helper labour. But in the depression of the early 1930's, the adjustment for unemployment is very important and the total adjustment reaches as high as 12 per cent. The adjusted series which measures rural labour input in adult male equivalents is shown in Figure 3.2.

There are four notable features of the series shown in Figure 3.2. First, there was a general high level of labour input into the rural sector up to World War II. Second, the post-war recovery of labour input did not reach the average pre-war level which supports the view that there was considerable slack in the rural workforce in the

¹ This means the female unpaid helpers are recorded as 0,4875 of an adult male being subject to adjustment for both females (see Section 3.3.4) and unpaid helpers.

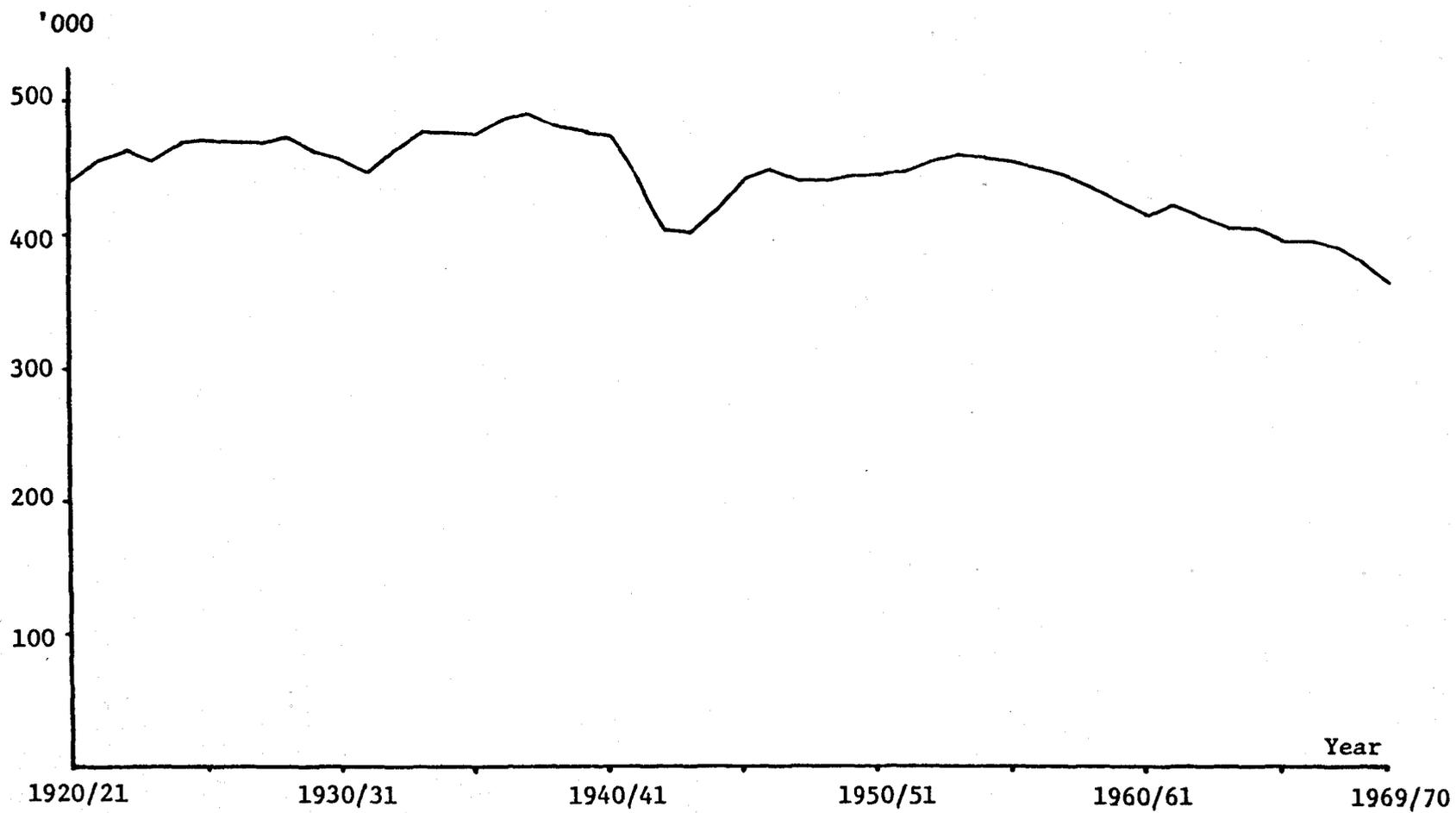


FIGURE 3.2

Total Labour Input in Australian Agriculture, 1920-21 to 1969-70: thousand adult male equivalents.

late 1930's [10]. Third, labour input has steadily declined since the early 1950's. Finally, there are two significant short-term reductions in labour input shown by the series, around the early 1930's and during World War II. To some extent both may be artefacts. The 1930's may be partly due to the problems associated with using an unemployment adjustment based on non-rural unemployment levels which may affect the timing of the adjustment (see Section 3.3.1). During the war, the reduction in numbers working would have been offset to some extent by increased hours worked per week and probably increased intensity of work.

Two final points are relevant. The first is a reminder that no adjustment has been made to allow for the amount of labour used in producing capital goods on the farm. This aspect was discussed in Chapter 2 and will be examined further in Chapter 9. Second, no adjustment has been made for underemployment of rural labour although it has been suggested that this was common particularly during the 1930's. Further, this problem is partly interwoven with the availability of labour for producing capital goods. Thus, some consideration of underemployment is also deferred to Chapter 9.

3.5 References

- [1] AUSTRALIAN BUREAU OF STATISTICS, Australian Standard Industrial Classification, Canberra, 1969.
- [2] AUSTRALIAN BUREAU OF STATISTICS, Census of the Commonwealth of Australia, Canberra, various issues. The Tables used in this study are those classifying the population by Industry and Occupational Status. The detailed data from the 1971 census is unpublished and was provided by the A.B.S.
- [3] AUSTRALIAN BUREAU OF STATISTICS, Classification of Rural Holdings by Size and Type of Activity, Canberra, various issues.

- [4] AUSTRALIAN BUREAU OF STATISTICS, The Labour Force, Canberra, various issues.
- [5] AUSTRALIAN BUREAU OF STATISTICS, Labour Report, Canberra, various issues.
- [6] AUSTRALIAN BUREAU OF STATISTICS, Rural Industries Bulletin, Canberra. For details of all issues in this series see same Reference Chapter 2.
- [7] AUSTRALIAN BUREAU OF STATISTICS, Rural Land Use, Improvements, Agricultural Machinery and Labour, 1971-72, Canberra, 1974. (This is the first issue in a new series.)
- [8] BUREAU OF AGRICULTURAL ECONOMICS, The Australian Dairy Industry, Canberra, 1966.
- [9] BUREAU OF AGRICULTURAL ECONOMICS, The Australian Wheatgrowing Industry, An Economic Survey 1964-65 to 1966-67, Canberra, 1969.
- [10] CRAWFORD, J.G., et al., Wartime Agriculture in Australia and New Zealand 1939-50, Stanford University Press, 1954.
- [11] DENISON, E.F., "Some Major Issues in Productivity Analysis: An Examination of Estimates by Jorgenson and Griliches", Survey of Current Business, 49(5), 1-30, May, 1969.
- [12] FORSTER, C., "Australian Unemployment, 1900-1940", Econ. Record, 41(95), 426-450, Sept., 1965.
- [13] GUTMAN, G.O., "Investment and Production in Australian Agriculture", Rev. Mktg Agric. Econ., 23(4), 237-310, Dec., 1955.
- [14] JORGENSON, D.W. and Z. GRILICHES, "The Explanation of Productivity Change", Rev. Eco. Stud., 34(3), 249-283, July, 1967.
- [15] KEATING, M., The Growth and Composition of the Australian Workforce 1910-11 to 1960-61, Vols. 1 and 2, unpub. Ph.D. thesis, A.N.U., Nov., 1967. Subsequently published as KEATING, M., The Australian Workforce 1910-11 to 1960-61, Canberra, Progress Press, 1973.

- [16] MAULDON, F.R.E., "Seasonal Variations in Labour Requirements in Australian Industries", Econ. Record, 17(32), 81-96, June, 1941.
- [17] SINCLAIR, W.A., "Capital Formation", Chapter 1 in FORSTER, C. (ed.), Australian Economic Development in the Twentieth Century, Sydney, Australasian Pub. Co., 1970.
- [18] STAYNER, R.A., The Economic Effects of Education, With Particular Reference to its Productivity in Agriculture, unpub. M.Ag.Ec. thesis, U.N.E., 1969.
- [19] STRAND, E.G., E.O. HEADY and J.A. SEAGRAVES, Productivity of Resources Used on Commercial Farms, U.S.D.A. Technical Bulletin, No.1128, 1955.
- [20] WELLS, J.M. and W.R. BATES, "Changes in Farm Business Organisation in Australia", Qrtly Rev. Agric. Econ., 22(2), 53-65, April, 1969.
- [21] WILSON, R.L.K., Productivity and Technological Change in the Australian Rural Sector, unpub. M.Econ. thesis, U.N.E., 1971.
- [22] YOUNG, R.R., "Productivity Growth in Australian Rural Industries", Qrtly Rev. Agric. Econ., 24(4), 185-205, Oct., 1971.

CHAPTER 4

TOTAL LABOUR PAYMENTS

4.1 Introduction

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4.2.2 Discussion and Evaluation of the Wage Series

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CHAPTER 4

TOTAL LABOUR PAYMENTS

4.1 Introduction

This chapter is not concerned with estimating inputs, but with the valuation of labour input which was estimated in the previous chapter in terms of adult male equivalents. The total value of the labour input (hereafter referred to as "total labour payments") is required for subsequent estimates of the rate of technological change. Total labour payments are estimated by multiplying the number of persons in the rural workforce by the appropriate wage rate. For employees, this is not so difficult because data on wages is available. This is discussed in Section 4.2. Much more difficult problems arise in relation to the working proprietors who do not receive a wage in the usual sense but obtain a reward for their contribution of capital, labour and management to the farm business. These aspects are considered in Section 4.3. Section 4.4 brings together the alternative estimates of the total return to labour,

4.2 The Wage Rate - Employees

The main alternative wage series are the award rates and average earnings. There is an important difference between the two with average earnings taking into account over and under award payments and actual hours worked rather than award hours. Obviously, average earnings are preferable in calculating total payments to labour.

Data on total wages paid for Australia as a whole are available from 1938-39 coinciding with the publication of detailed national accounts estimates [1]. Data for the rural sector alone is available on an annual basis as total wages, salaries and supplements, from the

A.N.A. [1] since 1948-49¹. In addition estimates of labour payments by rural industry have been compiled from data collected in the A & P Census. These estimates have been published in the Rural Industries Bulletin [4] but are not a complete series even in recent years. Since regular publication of labour payments estimates began in 1950-51, complete estimates for all States were published up to 1957-58. Since then, estimates have only been published for some States. Prior to 1950-51, labour payments data was only collected by some States, the most notable being N.S.W. These data are published in the N.S.W. Year Book [3].

In addition to average earnings data, award wage data is available. Award wage data is generally more extensive and available over the entire period under consideration. Up to 1958 an award rate for the rural sector was published in the Labour Report [2]. Since 1946, the B.A.E. has published [6] a wages index based on award rates applying in the rural sector. A combination of these sources has been used to compile the award wage series for the 1920-21 to 1969-70 period, shown in Tables 4.1 and 4.2. This series cannot be considered a particular award rate but rather to be representative of the set of award rates applicable to the rural sector.

In compiling and discussing the wage series, two periods of time are considered. These periods relate to the sources of actual earnings data.

4.2.1 Estimation of Average Earnings and Award Wages

(i) Average earnings and award wages, 1920-21 to 1947-48

Average earnings data is not available for Australia so the series is based on data for N.S.W. which is published in the N.S.W. Year Book [3]. The information given includes the number of permanent

¹ Since 1966-67, rural industry wage payments have not been published but an estimate for primary industry provides a basis for estimating rural industry wage payments.

male employees, payments (including the value of board, etc.) to permanent male employees, payments to temporary male employees, and payments to all female employees. There are no estimates of the number of temporary male employees or female employees, so it is not possible to estimate their average weekly earnings. However, it is possible to estimate the average weekly earnings of permanent male employees. Because N.S.W. employs more rural labour than any other State, and has a diversified pattern of production ranging from temperate horticultural enterprises through extensive grazing and cropping to sub-tropical enterprises such as sugar cane production, it is likely to exhibit characteristics that approximate the national scene. Thus, it seems justifiable to use this N.S.W. data as a proxy for average rural earnings in Australia.

The series is complete except for the years 1942-43 to 1946-47 inclusive. During these years data on wages paid is unavailable so estimates have been made for these years. During the emergency war conditions of 1942 and 1943, a larger number of rural workers were brought under wage awards which were increased rapidly at this time [9, pp.104-5]. Assuming that average earnings moved in a similar way to the change in award wages, and that the decline in the ratio of earnings to award rates was approximately linear over 1942-43 to 1946-47, an estimate of average earnings was obtained. The resultant estimates of average earnings shows a substantial rise during 1942-43 corresponding to the increases in award rates. Crawford et al. [9] indicate that rural award rates in 1945 were almost 50 per cent higher than in 1938. The data in Table 4.1 indicates the 1945-46 award rate at 1.48 times the 1938-39 rate, while the equivalent for average earnings was 1.44. Allowing for a lag of earnings behind awards, these data appear reasonable in the light of Crawford et al.'s remarks.

The average earnings series is very similar to that compiled by Campbell [7] from the same sources, but he did not provide estimates for 1942-43 to 1946-47. The series indicates rising average earnings

TABLE 4.1

Male Average Earnings and Award Wages in the
Rural Sector 1920-21 to 1947-48

Year	Male Average Weekly Earnings ^a \$	Male Award ^b Wage \$	Average Earnings Award Wage Ratio
1920-21	6.92	8.71	.79
1921-22	6.62	8.90	.74
1922-23	6.73	8.39	.80
1923-24	6.84	8.57	.80
1924-25	6.82	8.58	.79
1925-26	7.08	8.73	.81
1926-27	7.38	9.34	.79
1927-28	7.30	9.42	.77
1928-29	7.28	9.57	.76
1929-30	7.01	9.55	.73
1930-31	6.24	8.74	.71
1931-32	5.93	8.02	.74
1932-33	5.63	7.48	.75
1933-34	5.47	7.19	.76
1934-35	5.37	7.33	.73
1935-36	5.44	7.33	.74
1936-37	5.67	7.57	.75
1937-38	5.95	7.87	.76
1938-39	5.94	8.22	.72
1939-40	6.09	8.40	.73
1940-41	6.28	8.57	.73
1941-42	6.86	9.35	.73
1942-43	8.04(c)	11.17	.72
1943-44	8.44(c)	11.89	.71
1944-45	8.47(c)	11.93	.71
1945-46	8.53(c)	12.18	.70
1946-47	8.90(c)	12.90	.69
1947-48	9.22	13.64	.68

^a Wages paid to permanent male employees divided by the number of permanent male employees in N.S.W. [3], converted to a weekly basis.

^b Award wage for agriculture, Labour Report [2].

^c Estimated.

throughout most of the 1920's, a decline in the first half of the 1930's then a rising trend since 1934-35, but the 1920's wage levels were not regained prior to the end of the 1930's. Then followed a fairly large boost during 1942-43 as a result of decisions related to the war effort. These trends generally followed the award rates so that the ratio of actual earnings to the award level of wages has been fairly steady, with a tendency to be higher in the boom period of the 1920's and lower in the more difficult depression and war years.

(ii) Average earnings and award wages 1948-49 to 1969-70

The data on male and female employees combined with the A.N.A. [1] estimates of wages, salaries and supplements paid by the rural sector are used to estimate average actual earnings per adult male for Australia for the period 1948-49 to 1969-70. The number of male employees have been adjusted by the number unemployed, while female workers (at least in terms of award rates) did not earn the full adult male wage. Beginning during the war period, and extending up to 1950, female award rates were gradually increased from about 55 per cent to 75 per cent of the male award rate. Since December 1950, the female basic wage has been equivalent to 75 per cent of the male rate [2]. On the basis of this information a factor of 0.75 has been applied to the number of female employees to obtain an estimate of total employees in adult male equivalents (a.m.e.). The A.N.A. estimate of wages and salaries paid was divided by the number of a.m.e. to obtain an estimate of actual earnings. These are shown in Table 4.2.

The estimates of average earnings shown in Table 4.2 overlap estimates available from N.S.W. data for the years 1948-49 to 1954-55. A comparison of the two estimates reveals that they are close, with the A.N.A. based estimates approximately \$1.00 per week higher¹.

¹ The figures for N.S.W. for 1948-49 to 1954-55 were \$10.21, \$11.71, \$18.00, \$19.81, \$21.88 and \$23.00 respectively.

TABLE 4.2

Male Average Earnings and Award Wages in the
Rural Sector 1948-49 to 1969-70

Year	Total Employees ^a a.m.e. ,000	Wages Paid ^b \$m	Male Average ^c Weekly Earnings \$	Male Award ^d Rate \$	Average Earnings Award Wage Ratio
1948-49	165.8	94	10.90	15.81	.69
1949-50	168.4	107	12.21	17.46	.70
1950-51	167.3	137	15.75	22.22	.71
1951-52	169.3	170	19.31	27.91	.69
1952-53	175.9	192	20.99	30.09	.70
1953-54	177.2	211	22.90	31.97	.72
1954-55	173.9	218	23.93	31.96	.75
1955-56	168.7	220	24.81	32.67	.76
1956-57	162.8	232	27.41	35.10	.78
1957-58	161.1	245	29.24	35.47	.82
1958-59	157.8	237	28.89	36.02	.80
1959-60	154.1	245	30.58	37.70	.81
1960-61	145.5	247	32.65	38.49	.85
1961-62	145.2	256	33.91	40.08	.85
1962-63	145.7	269	35.50	40.08	.89
1963-64	148.5	283	36.65	40.08	.91
1964-65	148.3	298	38.64	42.46	.91
1965-66	146.5	301	39.51	44.05	.90
1966-67	144.2	320(e)	42.67	46.43	.92
1967-68	145.4	338(e)	44.70	48.41	.92
1968-69	141.0	354(e)	48.27	49.60	.97
1969-70	135.0	364(e)	51.85	51.19	1.01

^a Male employees - unemployed males + 0.75 female employees, (Appendices 3C, 3D and 3E).

^b A.N.A. [1].

^c Wages Paid divided by Total Employees and then converted to a weekly basis.

^d To 1958-59, Labour Report [3], thereafter adjusted by the B.A.E. Prices Paid Index, wages item [6].

^e Estimated from A.N.A. [1] Total Wages, Salaries and Supplements Paid by Primary Industry, divided by 1.14 which is the average ratio of Primary Industry wage payments to Rural Industry wage payments for the 1948-49 to 1965-66 period.

Three reasons could account for this. First, the A.N.A. estimate refers to the year ended June 30th, while the N.S.W. estimate refers to the year ended March 31st. In a period of rapid escalation of wages, the one quarter lag could be significant. Second, the estimated number of full-time a.m.e. used for the A.N.A. based average earnings estimate could be too low. This could arise from errors in adjusting for seasonal variation in the number of temporary employees (described in Chapter 3) or from underestimating the a.m.e. attributable to female employees. Third, N.S.W. may not be an accurate reflection of the situation in Australia as a whole. On these grounds, it is satisfying that the difference between the two estimates is small. It is unlikely that this is coincidence and it lends support to the general validity of both methods of estimation, particularly the use of N.S.W. data as a proxy for Australian data for the 1920-21 to 1947-48 period.

Over the 1920-21 to 1969-70 period estimated average earnings have increased 4.76 times while the award wage increased 3.24 times. This differential has resulted in average earnings rising from 69 per cent of the award rate to exceed the award rate by one per cent in 1969-70. The differential between average earnings and award wages has been steadily declining since the mid 1950's.

4.2.2 Evaluation and Discussion of the Wage Series

The two estimates which comprise the fifty year series should be consistent. The N.S.W. estimates are based on A & P Census data, while the A.N.A. estimates correspond closely with A & P Census based estimates of wages paid by rural industry when the latter have been published¹. The N.S.W. series up to 1947-48 is based on A & P Census data for permanent male employees only. To estimate total wages paid to all employees, an estimate of the proportion of the permanent male rate paid to temporary males and all females is required. In effect, this is a similar problem to that of deriving the estimated permanent

¹ The A & P estimates were published regularly between 1950-51 and 1957-58 but since then, full information for Australia has not generally been published.

male wage from the total wages paid data. The same problems of assessing the a.m.e. of temporary male employees and female employees are present. Despite these difficulties any errors in these wage estimates are believed to be small, at least relative to the errors associated with imputing a wage to owner-operators of farms.

One aspect of both the A & P Census and the A.N.A. wage payment data is that some labour payments are included in other cost categories. These payments mainly relate to contracting operations such as fertiliser spreading, shearing, and stock and crop contracting, which contain a labour component as well as a materials component, yet both tend to be included in what the A.N.A. calls other costs¹. At the same time, the estimates of rural employees (compiled in Chapter 3) includes contractors engaged in these activities². This will mean that some underestimation of total labour payments will occur throughout the entire period. No estimate of this deficiency is available because of the difficulties in estimating either the deficiency in wages paid, or the number of employees involved but the effect is likely to be small.

The finding that average earnings are significantly below the award wage for most of the period is interesting. A number of factors could contribute to this situation.

(i) There is a number of persons employed who are under 21 years of age and do not qualify for the adult male wage.

(ii) Wage payments to rural employees are complicated by non-monetary payments, the major item being board and lodgings. Although the statistics include these items, they are most likely conservatively valued for

¹ At present, detailed estimates of these components are not available, but the Agricultural Finance Survey will give some information for recent years when available.

² This is not strictly correct as for the years after 1960-61 some contractor proprietors are included in proprietors rather than employees but the number is quite small.

statistical purposes, and would therefore tend to reduce the level of average earnings.

(iii) Substantial over-award payments are a comparatively recent feature of the Australian economy, even in the non-rural sectors. For example, around 1950, non-rural earnings were only about fifteen per cent above non-rural award levels [2]. Throughout the pre-war period there would have been few persons either rural or non-rural, receiving over-award payments to counterbalance the under award payments to younger workers.

(iv) The rural sector, with its atomistic structure is possibly less suited to having award wages strictly enforced.

(v) In the pre-war period award wages were not applicable to all employees in the rural sector [9].

(vi) For much of the period, there has been little pressure on farmers forcing them to compete with non-farming industries for labour.

This last point is of some significance and was made by Campbell [7] in 1956. Campbell was discussing the fairly steady ratio of rural average earnings to non-rural average earnings over the 1920's to mid-1950's period. This is somewhat surprising, at least for the first decade following World War II, when labour was relatively scarce and the rural workforce was still rising. However, the mid-1950's would seem to have been a turning point in this situation. Reference to Table 4.2 indicates that the narrowing of the gap between award wages and average earnings began in the mid-1950's. Evidence on average earnings in the non-rural sector, suggests that the gap between average earnings in the rural and non-rural sectors has been closing too¹. This has been most pronounced in the 1960's and suggests increasing competitiveness in the labour market, with farmers having to compete

¹ In 1949-50 the ratio of non-rural average earnings to rural average earnings was 1.58, while in 1969-70 it had declined to 1.47.

for labour by offering higher wages. Alternatively employees may have become more conscious of wage rates and perhaps more mobile between occupations and locations.

The final point on wages relates directly to the estimation of technological change. There is no disputing that average earnings should be used where possible. The comparison between average earnings and award wages made in this section clearly indicates that award wages are a poor proxy for average earnings for two reasons. First, throughout the period from 1920-21 to the mid-1950's, using the award wage will overestimate the total wage payments by up to 40 per cent, and so overestimate the share of output attributed to labour¹. Second, from the mid-1950's to 1969-70, the award rate has increased much more slowly than average earnings. The implication of these two effects on technological change are explored in Chapter 10, But it should be noted that most of the estimates of technological change [5, 16, 17, 20] have used award wages, though Herr [13, p.111] indicated that he used the basic wage for the economy and so he did not use a wage related to the rural sector.

In summary, this section has determined an average earnings series for the Australian rural sector. It is not possible to claim great precision for the series, but there are clear advantages in using this series for estimating technological change.

4.3 The Wage Rate - Working Proprietors

There are two main methods used to assess the return to proprietor labour. The first is based on the use of average earnings of employees as the opportunity cost for proprietor labour. Jorgenson and Griliches [15] are leading proponents of this method which has

¹ One of the effects of this overestimation is that during the 1930's, the total labour payment exceeds the value of factor output.

been widely used because of the relative ease of obtaining this wage data. The alternative approach has been proposed by Denison [11, 12] and is based on splitting proprietor income into its labour and capital components. These methods are discussed below and labour payments for proprietors are estimated using both procedures.

4.3.1 Use of Wage Data

In an analysis of the whole economy, there is a choice between using average award wages or average earnings. For a study of the rural sector, there is also a choice between wages for the whole economy or for the rural sector only. Whichever wage is used, the assumption is made that a proprietor who ceases to operate his personal business, has his best alternative employment as an employee. In Section 4.2 when considering the wage for employees, actual earnings were preferred to award wages. The same argument would apply in this case.

In this study, the choice is between using actual earnings data for the whole economy or for the rural sector alone. The whole economy figure would be relevant where there was considerable mobility of proprietors out of the rural sector to other sectors in the economy. For rural proprietors in Australia, this is unlikely to be the case even though there has been a declining workforce, and a drift of the population from rural areas to the major cities. This drift is unlikely to reflect farmers leaving farms and taking jobs in the city. Rather, it is more likely to be the younger persons who are about to enter the workforce that are drifting to the major cities. This would lead to a declining rural workforce because replacements (those coming into the workforce) are less than those retiring. But there has been a significant reduction in the number of proprietors in the rural sector and it seems likely that these people have found alternative employment either working for other farmers, or working in nearby towns. In both of these alternatives, the wage earned would be nearer average rural earnings than average earnings in the economy as a whole.

It also seems likely that average earnings in country towns are lower than in the major cities¹, and that there are relatively small differences between the average earnings of persons working on farms and those working in nearby towns. Thus, in the absence of data on regional wage differences it would seem that an appropriate opportunity wage for farm proprietors is the average earnings of rural employees.

An additional factor that is difficult to assess precisely, is the non-monetary benefits of rural work². These include cheap rentals of houses and free farm produced goods for employees, while the proprietors probably enjoy these benefits plus the (taxation) advantages stemming from the difficulty of separating the farm business from the farm household [10, 18, 19]. In Section 4.2, it was suggested that recorded earnings of rural employees may be lower than their real earnings because of the conservative valuation of such benefits. Thus, the real earnings of rural workers may be nearer the level of average earnings in the whole economy than indicated by recorded earnings. At the same time, some of these benefits such as the provision of farm produce to workers, is also part of rural sector output which may be undervalued or omitted in output estimates.

Consistency between the measurement of output and the measurement of labour payments is needed. The recorded earnings of employees, as discussed in Section 4.2, and the recorded output are consistently estimated, when both underestimate the non-monetary components. However, using the average earnings for the whole economy as a proxy

¹ No published evidence has been obtained to support this apart from the evidence that average earnings tend to be lower in the smaller capital cities than Melbourne and Sydney.

² These were alluded to earlier in discussing wages paid to rural employees. The benefits referred to will apply to both the employee and proprietor groups but are likely to be of most benefit to proprietors.

for the real earnings of rural workers, will create an inconsistency unless rural output is also adjusted to include the rural employment "benefits" at their real value. There is no adequate data on which these adjustments to earnings and output may be based. Thus, there are conceptual and consistency arguments in favour of using average earnings of rural employees, rather than average earnings for the whole economy to calculate labour payments. Therefore, an estimate of labour payments to proprietors is based on average earnings of rural employees.

The above estimate assumes that the farm proprietor has equal skills and works equal hours to that of rural employees. It would seem likely that proprietors have additional responsibilities and skills that would suggest a higher wage than that paid to the average employee. One avenue for assessing this difference is a comparison of the wage paid to employed farm managers relative to ordinary farm employees. Time and resources did not enable this aspect to be thoroughly investigated and anyway, the differential may have varied significantly over the 50 years. However, a quick impression was obtained by contacting Armidale stock and station agents and discussing these aspects. The resulting impression was that farm managers' wages were approximately 40 per cent above that of ordinary farm hands. An alternative estimate of labour payments to proprietors was based on this impression. This estimate assumes that the 1.4 ratio was constant throughout the 50 year period, and that displaced proprietors find rural employment as farm managers, or a position with similar responsibilities and remuneration. Both of these assumptions may be challenged, but in the absence of conclusive empirical evidence, this estimate of the return to the labour component of the proprietors' input may be better than the earlier estimate based on average earnings. It should be noted that the use of a constant adjustment factor will not substantially change the trend of this labour payment series, but does increase the share of output allocated to labour.

Hussey [14] proposed an alternative method of estimating the additional return due to proprietors. He added a managerial allowance equivalent to one per cent of the capital stock to the award wage level. While this is an arbitrary additional amount it does vary in relation to the size of the agricultural sector which would have some influence on the required management input. An estimate is made using this method for comparative purposes.

4.3.2 Use of Proprietor Income

This approach uses the incomes of working proprietors and attempts to split that income to labour and capital components. Denison has used this method in analysing economic growth in a number of countries [11]. He assumed that the labour share of national income contributed by unincorporated businesses (these have working proprietors) is the same as the labour share contributed by non-financial corporations¹ (these have only employed labour). This may be represented as

$$x I = W + y P$$

where x = ratio of wages paid by corporations to national income produced by corporations,

I = national income produced in the unincorporated sector,

W = actual earnings of employees in the unincorporated sector,

y = proportion of proprietor income attributed to labour, and

P = proprietors income in the unincorporated sector.

The variable y is calculated to ensure that $(W + y P)/I = x$, or the share of output attributed to labour in the unincorporated sector is the same as that in the corporate sector. In Denison's study of the American economy, y was approximately 0.6, which means about 60 per cent of proprietor income was attributed to proprietor labour.

¹ These are corporations excluding banks, finance companies, etc.

There is a substantial difference in principle between this method and the wage based methods. This is best illustrated by considering how the additional output in a year of high output is distributed between labour and capital. In the average earnings model, the added returns are allocated to capital, while proprietor labour still obtains only the average earnings¹. In Denison's model, the added returns are shared between capital and labour in accord with the corporate wage, corporate national income ratio. The sharing of returns on this basis is a preferable assumption to specifying a particular return to labour and allocating the balance to capital (or vice-versa). For this reason, an estimate was made based on this model, despite the reservations noted below.

The method can be defended more easily for analysis of the whole economy, and where the commodity make-up of the unincorporated sector approximates the make-up of the corporate sector. The application of the corporate wage, corporate national income ratio to rural unincorporated businesses is much more difficult to defend because of the differences between the two groups of enterprises both in structure of the business, and the nature of the production processes involved. Ideally, for the analysis of particular sectors, data on the wage, national income ratio for corporations in each sector is required. This ratio could then be applied to the unincorporated component of that sector².

This method was applied in this study with some modifications and approximations. A break-up of the rural sector into corporate and unincorporated components was not possible. In fact, the A.N.A. does not provide such a segregation at the whole economy level, because the

¹ There may be some tendency for average earnings to absorb some of the additional returns via higher over-award wages or higher bonuses, but the general point still holds.

² This information is not available in published statistics but perhaps could be obtained from analysis of selected company reports. However this was not attempted in this study.

level of wages and salaries paid by companies is not separately included. As an approximation the x variable is determined as the whole economy ratio of wages and salaries to gross national product at factor cost. It is possible to calculate this value for every year from 1938-39 [1]. Over this period the value varies between 0.502 and 0.628 without any significant trend and averages 0.574. No estimates were available for years prior to 1938-39 so the average value was used for those years.

To obtain the total labour payment in the rural sector, an estimate of factor output is required. This is discussed in Chapter 8. Multiplying factor output by the ratios derived above, establishes the total labour payment (and by deduction, the remainder is the payment to capital). The labour payment is made up of wages paid to employees¹ which was deducted from the total labour payment to determine the payment attributed to proprietor labour. The amount this represents per proprietor is obtained by dividing the proprietor component by the number of proprietors (both male and female). This amount represented an average of 58 per cent² of the average actual income for farmers derived from taxation data [8] for the period 1947-48 to 1969-70. That is, the y term in the earlier equation averages 0.58, so that the addition of actual labour payments to employees, and 58 per cent of the income of proprietors, will give a total labour payment to factor output ratio for the rural sector, equal to the total wage, gross national product ratio for the whole economy.

In his study, Young [20] endeavoured to employ the Denison model to assess the labour input of Australian farm proprietors for the 1948-49 to 1967-68 period. He used the whole economy ratio of wages to gross national product as described above, and applied this

¹ For this purpose, this also includes an imputed amount for the unpaid helpers. The actual earnings series is used with one female = 0.75 a.m.e., and helpers = 0.65 a.m.e. (See Chapter 3).

² This figure is very close to the three fifths figure obtained by Denison [12] for the whole of the U.S.A. economy.

ratio (0.56) to the number of proprietors. Labour input was then valued at the award wage with the net result that proprietor labour payments were assessed at 0.56 of the award wage payable to an employee. This is an incorrect application of Denison's model which is designed to allocate the incomes of proprietors and not to allocate the time input of proprietors.

Time inputs can only be arrived at indirectly after taking account of the rate of payment for labour services. Young would have been nearer the mark if he had used the average rural proprietor's income such as in the taxation statistics [8], in valuing the input of proprietor labour, rather than the award wage. But even so, the application would still be incorrect, because the fixed portion of proprietor time, valued at a rate equivalent to proprietor incomes will not necessarily equate the labour payments, gross national product ratio of the rural sector with the equivalent ratio for the whole economy.

To conceptualise the situation more clearly, consider the numerical outcomes of the procedure employed by Young and that used in this study¹. Taking the year, 1969-70, and referring to Table 4.2, the annual award wage was \$2,662. Young then valued the proprietor labour at 0.56 of this, \$1,491. This payment to 230,200 proprietors (Appendix 3C) makes a labour payment of \$343m to proprietors, and added to the \$380m actual wage payments to employees, totals \$723m. This amount related to factor output of \$1,521m (Chapter 8) is equivalent to 47.5 per cent.

In this study, the Denison wage, gross national product ratio for the economy as a whole for 1969-70 was 0.59. If the rural labour

¹ As Young's data series are not available these calculations cannot be performed on his series. Instead, his calculations have been performed on the data used in this study. Further, although Young's study did not include 1969-70, the procedures are still valid for the purpose of illustrating the effect of his error.

proportion of factor output is to be 0.59, then labour payments will be \$897m. Deducting wage payments of \$380m, leaves \$517m attributable to 230,200 proprietors at an amount of \$2,246 each which is 60 per cent of average proprietor income.

The result of these comparisons for 1969-70, and for other years which are not reported, is that Young has generally underestimated the share to labour by approximately one quarter compared to the application of the Denison method in this study¹. For example, his method allocates about 40 per cent of factor output to labour while in this application of the Denison method, the share averages 57 per cent, that is the wage, gross national product ratio for the whole economy. This represents a substantial error in Young's study and because the capital (and intermediate inputs) share is overestimated, would have resulted in an underestimate of the rate of technological change.

Further evidence that Young has substantially underestimated some factor payments is contained in his discussion of how the factor shares were derived [20, p.189]. Rather than adopt the procedure of estimating shares to labour and intermediate inputs and imputing the capital share as a residual, he estimated the annual value of service flows to all three inputs and then normalised them so that gross output was entirely allocated between the three inputs. Before normalising, the average sum of the shares was 0.665 of gross output with a small variance of 0.011. Such a large divergence from 1.0 is not to be expected using his method of calculation, and is indicative of some factor(s) being undervalued. When it is realised that proprietors are only being valued at 0.56 of the award wage the main source of the divergence of the sum of factor shares from 1.0 is apparent.

¹ An exact estimate is not possible because Young worked with gross output, considering non-factor expenses to be an intermediate factor of production. Thus, gross output is allocated between labour, capital and intermediate inputs so that both capital and intermediate input shares would be overestimated.

In this section, a number of alternative methods of imputing labour payments to farm proprietors have been considered. In the case of labour payments to employees there was a clear-cut case for using the average earnings based estimate. However, there is no obviously superior estimate of labour payments for farm proprietors. As a result, all of the alternative estimates are used in Chapter 10 in estimating the rate of technological change. Some further comments are contained in the next section which discusses the estimates themselves.

4.4 Total Payments to Labour

In Sections 4.2 and 4.3 alternate procedures were outlined for estimating total labour payments. There are two estimates of payments to employees, one based on average earnings and the other on award wages. These two estimates are shown in Appendix 4A in current price terms¹.

These series indicate clearly the higher level of the award wage based estimate until 1969-70. Apart from the convergence of the two estimates particularly during the 1960's, other comments are worthy. First, the level of wage payments was high in the 1920's, but much lower in the 1930's, due to the lowering of wages, and some reduction in the number employed. Second, wage payments rose very slowly after the depression and did not reach the pre-depression levels until after World War II. There was then a very rapid rise until 1954 in parallel with the level of inflation, aided until 1953 by automatic adjustment of wages based on living costs (now referred to as indexation). Third, throughout the late 1950's and 1960's,

¹ All the wage series shown are in current price terms. This is because the deflator used to obtain a constant price series is dependent on the purpose for which the series is used. For example, in Chapter 10, they are deflated by the agricultural product price index, yet for other purposes they may most appropriately be deflated by the consumer price index.

total wage payments rose slowly, as increased wage levels were offset by reductions in the number of employees working in the rural sector.

In Appendix 4B, five estimates of labour payments to proprietors are shown. The average earnings and award wage based series bear the same relationship to each other as for payments to employees. That is, the award wage based series lies above the average earnings series, but the two series converge during the 1960's. The estimates based on proprietors receiving 1.4 times average earnings is not very different to the award based series until the late 1950's when the multiplied average earnings series rises to be substantially above the award based series. All of these three series follow trends similar to the series for employees but without such an accentuated downturn in the 1930's depression. This difference arises because there was no substantial fall in the number of proprietors during the depression as there was in the case of employees. In fact there was a tendency for the number of proprietors to increase.

The series which includes a managerial component of 1 per cent of the capital stock value in addition to average earnings, falls between the average earnings and the multiplied average earnings estimates and follows similar trends. The most significantly different series is that based on the Denison method. This series links the proprietors share to factor output so that payments to proprietors fluctuate in tune with output. Thus, in years of low production, returns to proprietors are low, while the contrary exists in years of high output. Further, because the series is in current prices, fluctuations in the price of agricultural output also influence the estimated labour payment to proprietors. As a result, very low payments are recorded in the 1930's depression years and very high payments during the 1950's wool boom. But in general this estimate tends to be near the estimates based on multiplied average earnings and the award wage.

Each of the series for proprietor labour payments has interesting characteristics. All of the alternative estimates are used, in combination with the estimated payments to employees, in later estimates of technological change. Five combinations of the estimates are used as shown in Table 4.3. The resultant estimates are shown in Appendix 4C. Three of the series, numbers 1, 3 and 5 from Table 4.3, are shown in Figure 4.1. Apart from the fluctuations of the Denison based series, the three series follow quite similar paths. As a result, this tends to suggest that the estimate of total labour payments is not sensitive to the method used. But on closer inspection, there are quite important differences in the series. First, the Denison method yields significantly lower labour payments from 1920-21 until the mid-1940's, higher payments in the late 1940's, early 1950's, and tending to be lower in the late 1950's and 1960's. Second, the multiplied average earnings series is close to the award wage series because of the multiplied (1.4) average earnings imputed to proprietors.

TABLE 4.3

Alternative Bases for Estimating Total Labour Payments

Method Number	Basis of Payment to Employees and Helpers	Basis for Imputing Payment to Proprietors
1	Award Wage	Award Wage
2	Actual Wage	Actual Wage
3	Actual Wage	1.4 (Actual Wage)
4	Actual Wage	Actual Wage + 0.01 (Total Capital Value)
5	Actual Wage	Denison Method

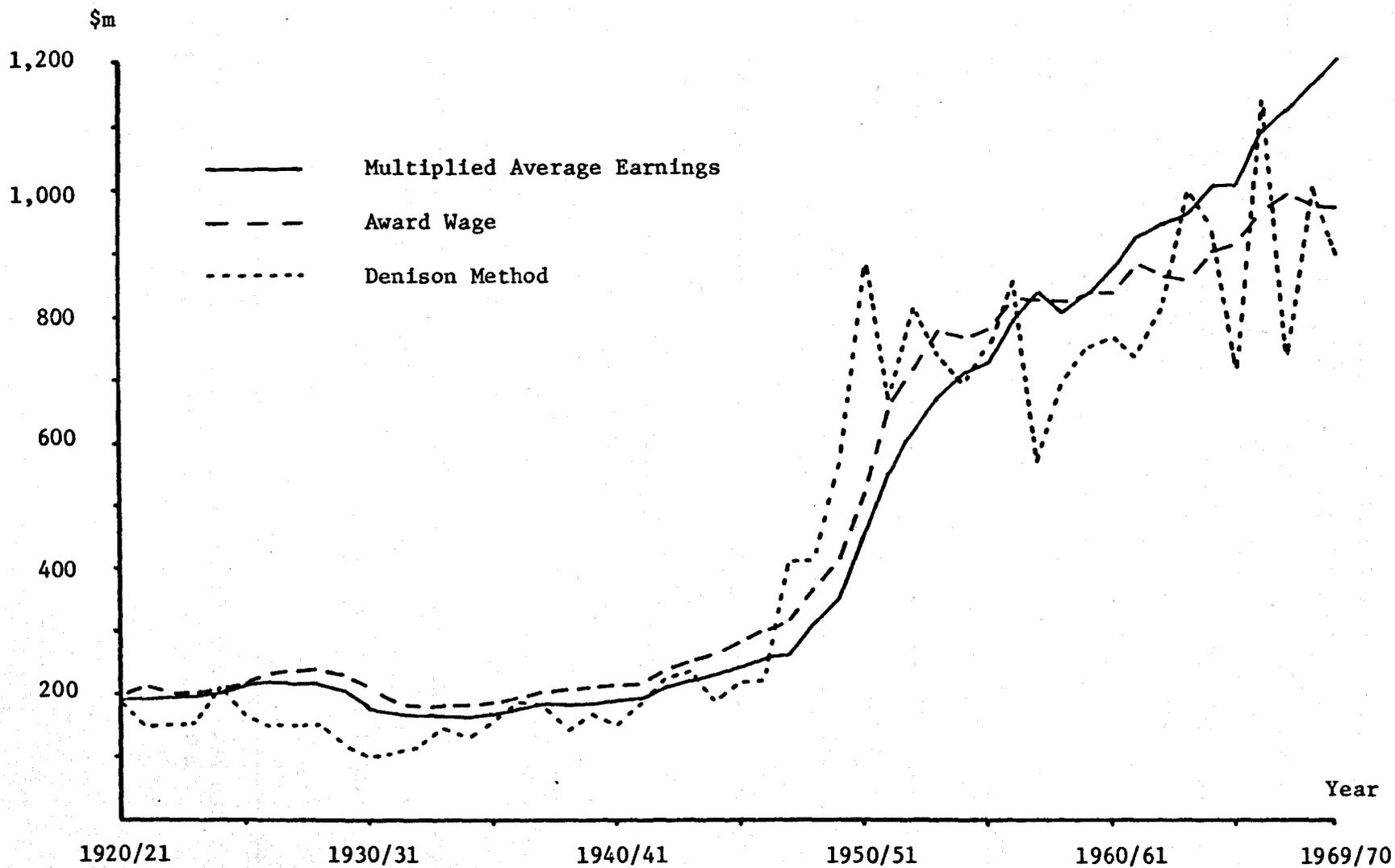


FIGURE 4.1

Selected Estimates of Total Labour Payments to Proprietors, 1920-21 to 1969-70: \$m, current prices

Otherwise the average earnings series is below the award wage series, but is increasing more rapidly through the late 1950's and 1960's. These differences are relatively small but are likely to have an impact on the estimated rate of technological change¹. Further discussion of these effects is deferred to Chapter 10. This concludes the treatment of labour input and labour payments. Attention now turns to capital inputs.

4.5 References

- [1] AUSTRALIAN BUREAU OF STATISTICS, Australian National Accounts, Canberra, (various issues).
Estimates of National Income and Expenditure extending back to 1938-39 can be found as a supplement to Commonwealth of Australia, National Income and Expenditure, 1951-52, Canberra, 1952.
- [2] AUSTRALIAN BUREAU OF STATISTICS, Labour Report, Canberra, (various issues).
- [3] AUSTRALIAN BUREAU OF STATISTICS, Official Year Book of New South Wales, Sydney, (various issues).
- [4] AUSTRALIAN BUREAU OF STATISTICS, Rural Industries Bulletin, Canberra. For details of all issues in this series see same Reference, Chapter 2.
- [5] BATES, W.R. and W.F. MUSGRAVE, "Technological Change and Labour-Capital Substitution in Australian Agriculture", Paper read to Section G, 44th ANZAAS Congress, 1972.

¹ Differences of a similar nature exist for the two series not shown in Figure 4.1 or included in this brief discussion.

- [6] BUREAU OF AGRICULTURAL ECONOMICS, Indices of Prices Paid, Canberra, (mimeo).
- [7] CAMPBELL, K.O., "Current Agricultural Development and Its Implications as Regards the Utilisation of Resources", Econ. Record, 32(62), 119-134, May, 1956.
- [8] COMMONWEALTH OF AUSTRALIA, Taxation Statistics, Supplement to the Report to Parliament of the Commissioner of Taxation, Canberra, (various issues).
- [9] CRAWFORD, J.G. et al., Wartime Agriculture in Australia and New Zealand 1939-50, Stanford University Press, 1954.
- [10] DAVIDSON, B.R., "Welfare and Economic Aspects of Farm Size Adjustment in Australian Agriculture", in Makeham, J.P. and G. Bird (eds) Problems of Change in Australian Agriculture, Proceedings of National Workshop on Agricultural Adjustment Problems, Univ. of New England, Armidale, 1968.
- [11] DENISON, E.F., Why Growth Rates Differ, Washington, The Brookings Institution, 1967.
- [12] DENISON, E.F., "Some Major Issues in Productivity Analysis: An Examination of Estimates by Jorgenson and Griliches", Survey of Current Business, 49(5), 1-30, May, 1969.
- [13] HERR, W.M., "Capital Formation: Its Importance and Determinants", Aust. J. Agric. Econ., 8(2), 97-111, Dec., 1964.
- [14] HUSSEY, D.D., An Investigation of Productivity and Technological Advance in New Zealand Agriculture, Lincoln College, Agricultural Economics Research Unit Technical Paper No.8, 1970.
- [15] JORGENSON, D.W. and Z. GRILICHES, "The Explanation of Productivity Change", Rev. Econ. Stud., 34(3), 249-282, July, 1967.

- [16] LONGMIRE, J.L., Technological Change in Australian and New Zealand Agriculture - A Comparison, Unpub. B.Ag.Econ. thesis, U.N.E., 1971.
- [17] LONGMIRE, J.L. and R.A. POWELL, "Technological Change in Agriculture: Australia Compared with New Zealand and the U.S.A.", Paper read to the Annual Conference, Australian Agricultural Economics Society, 1973.
- [18] MCKAY, D.H., "The Small Farm Problem in Australia", Aust. J. Agric. Econ., 11(2), 115-132, Dec., 1967.
- [19] STANDEN, B.J., "The Conflict Between the Papers by McKay and Davidson - A Balancing Note", in Makeham, J.P. and G. Bird (eds) Problems of Change in Australian Agriculture, Proceedings of National Workshop on Agricultural Adjustment Problems, Univ. of New England, Armidale, 1968.
- [20] YOUNG, R.R., "Productivity Growth in Australian Rural Industries", Qrtly Rev. Agric. Econ., 24(4), 185-205, Oct., 1971.