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Abstract

Many people experience poverty at some time in their lives. Tertiary students are an example, but most of them will escape poverty at the conclusion of their studies. People in transition between jobs may be in poverty temporarily and have to consume out of past savings. This type of poverty – transitory poverty – should be of less concern than prolonged, chronic poverty yet little is known about the extent of chronic poverty in Australia. This paper uses data from the Household, Income and Labour Dynamics in Australia Survey to measure chronic and transitory poverty from 2000-01 to 2003-04. An individual is considered to be in chronic poverty if he or she has insufficient *permanent* income to meet basic needs. Transitory poverty occurs when the individual's permanent income exceeds a given minimum standard but annual income falls below that standard in some years.

Chronic and transitory poverty are measured using two axiomatically sound indices of aggregate poverty. For comparison purposes we also employ the crude, but easily interpretable, head-count ratio and we compare the results with those obtained using a tabulation approach. Our results are presented as poverty profiles, which show the sensitivity of the various poverty measures to the poverty threshold. We find that, for equivalised poverty lines from $10,000 through $18,000 per annum (in 2003-04 dollars), the proportion of people with permanent income less than the poverty threshold is at least double the proportion of people who are poor in all four years. Our preferred index – that of Foster, Greer and Thorbecke – indicates that when the real equivalised poverty line is increased from $10,000 through $18,000 per annum, the proportion of total poverty that is chronic in nature increases from approximately 16 per cent to 51 per cent.

I. Introduction

Little is known about chronic poverty in Australia, yet this is an aspect of poverty that should be important to policy makers, welfare organisations, charities and others. Debate about issues such as "the working poor", "the cycle of poverty" and "inter-generational poverty" rests on the assumption that much poverty is chronic rather than transitory in nature. Chronic and transitory poverty are likely to have different causes and are likely to call for different policy responses.

The reason for the lack of research on chronic poverty is that Australian longitudinal data on household income have not been available until recently. As successive waves of data from the Household, Income and Labour Dynamics in Australia (HILDA) Survey become available, empirical research holds the promise of revealing more about poverty dynamics. To our knowledge only one published study has utilised the HILDA data to document long-term poverty: that of Heady, Marks and Wooden (2005). These authors used the first three waves of HILDA data and found that just over four per cent of Australians were poor in all three financial years 2000-01, 2001-02 and 2002-03. Of those who were poor in the first year, about half escaped poverty in the later years.

Our study utilises data from the first four waves of the HILDA survey and adds to existing knowledge of long-term poverty in Australia in three main ways:

- We use a measure of permanent income to identify individuals who are in chronic poverty, compute a chronic-poverty rate based on permanent, rather than annual, income and compare that rate with the proportion of people who are poor in all four years.

- We use axiomatically sound[1] poverty indices to measure chronic and transitory poverty and we compare the proportion of poverty that is chronic with that based upon the ubiquitous, but axiomatically deficient, head-count ratio.
- We construct poverty profiles, which reveal how sensitive various measures of chronic poverty are to the poverty threshold used – the latter being a matter of considerable debate and contention.

We acknowledge that a four-year panel is too short to establish conclusive results. In fact, four years of data is the bare minimum required to measure permanent income. Our conclusions, therefore, are tentative.

The remainder of this paper is organised as follows. We discuss the suitability of the HILDA data for the measurement of chronic poverty (Section II) and the conventions employed in this study (Section III). Annual poverty-rate profiles and multiple-year poverty-rate profiles are presented, as a benchmark, in Section IV. In Section V we examine the temporal variability of poor people's real incomes and the extent to which poor people save and borrow. Our findings support the case for using permanent income to measure long-term poverty. In Section VI we describe our preferred measure of chronic poverty, which is based upon a measure of permanent income, and apply it using the crude, but easily interpretable, head-count ratio. Axiomatically sound poverty indices are used to measure chronic and transitory poverty in Section VII and the results are compared with those based upon the head-count ratio. Section VIII concludes.

[1] A poverty index is axiomatically sound if it satisfies certain properties that have been identified as desirable in any measure of aggregate poverty. The theory of poverty measurement is most commonly associated with the work Sen (1973, 1974, 1976, 1977 and 1981).

II. The Data[2]

This study uses unit-record data from Release 4.1 of the Household, Income and Labour Dynamics in Australia (HILDA) Survey, conducted by the Melbourne Institute of Applied Economic and Social Research. The HILDA Survey began in 2001 with a complex random sample of 7,682 Australian households occupying private dwellings. The 19,914 people of all ages who were members of the sampled households that participated in Wave 1, and any children later born to or adopted by them, are tracked and, where possible, information about them is collected annually. People who, in Wave 2 or later, join a household and have a child with one of the original sample members or their descendents are also followed year by year. The latter two groups of people are called 'continuing' sample members. Other people who, in Wave 2 or later, share a household with a continuing sample member are also followed and information is collected on them also, but only for as long as they remain in the household of a continuing sample member. When appropriate weighting procedures are applied, the HILDA sample constitutes a representative sample of all Australians living in households in non-remote areas, both in cross section and over time.

The HILDA Survey is well suited to the study of poverty dynamics. Its longitudinal design allows the income and needs of individuals to be observed over several consecutive time periods along with events, such as changes to household structure and labour-market activities of household members, that are likely to affect, or be affected by, people's standard of living. Unlike surveys conducted by the Australian Bureau of Statistics (ABS), the original HILDA sample included individuals living in boarding schools, halls of residence and university colleges, thereby removing one

[2] This section draws heavily upon discussion of the original HILDA sample, the rules by which individuals are followed and the reference population in Goode and Watson, 2006, p.2 and pp.79-81.

potential source of bias and making it possible to better investigate youth poverty. The original sample excluded persons living in institutions such as prisons, hospitals and aged-care facilities but continuing sample members who move into such institutions in subsequent years are retained in the sample. This will remove another source of bias and make it possible, in principle, to study the effect of institutional transitions on poverty status. The major deficiency of HILDA for studying poverty is that, being a household survey, it excludes the homeless and similar itinerant people, who presumably are some of the poorest members of society. It also excludes people living in remote and sparsely populated areas, many of whom are indigenous and very poor (Hunter, 1999).

III. Measurement Conventions

In any empirical analysis of poverty there are a number of decisions that the researcher must make, which are largely judgment calls and which often affect the results of an investigation. In this section, we consider these issues and specify the conventions used in this paper.

What social unit is to be identified as poor or non-poor?

With the data provided by the HILDA survey, poverty can be identified at the level of the household, the family or the income unit. HILDA definitions of these three terms are consistent with those of the ABS (see ABS, 2003-04a, *Glossary*). The income unit is closely akin to the nuclear family and is the unit within which income is assumed to be shared. There are four types of income unit: couples, couples with dependent children, single persons, or single parents with dependent children. Dependent children, by definition, are either younger than 15 years or are full-time students between the ages

of 15 and 25 years who have no partner or child of their own residing with them. Families are comprised of income units. A family is a single person or a group of people residing in the same dwelling, at least one of whom is 15 years or older, who are related by blood, marriage (including de facto), adoption or fostering. Income is likely to be shared within families as, for example, when non-dependent young adults live with their parents, or elderly people live with their adult children's families. Households constitute the broadest of the three forms of living arrangement. A household is a group of people who usually live together and jointly provide for food and other necessities. Households come in three different types: one-person households, group households (which consist of unrelated individuals) and family households. Most family households consist of a single family. However, some family households contain two or more families and others are a mixture of families and unrelated individuals.

In this study, poverty is identified at the household level. Our assumption is that one important reason why people live together is to improve their standard of living by taking advantage of economies of scale in consumption that arise from sharing accommodation, utilities and other amenities (ABS, 2006, pp.198 and 203). If people live together at least partly for economic reasons then measured poverty is likely to be lower when the household, rather than the family or the income unit, is chosen as the social unit to be classified as poor or non poor. For example, a household consisting of couple and a nondependent adult child contains two income units. The nondependent child – for example, a part-time student between the ages of 15 and 25 years – may well be "poor" in terms of his or her own income, even if the person receives free or low-cost accommodation or other substantial resource transfers from his or her parents. Similarly,

an elderly person, if evaluated as a separate income unit, may be classified as "poor" despite living with and being supported by his or her affluent adult offspring.

What variable is to be used to identify poor social units and to measure their material standard of living?

Poverty is typically identified using either income or expenditure. Ideally, income-in-kind and wealth, particularly imputed rent on owner-occupied housing, should also be taken into account but for practical reasons they seldom are.[3] The choice between income and expenditure depends on whether one is interested in the standard of living actually experienced (expenditure) or the standard of living that potentially could be experienced, given available resources.[4] We prefer the latter and identify poverty using household income. Thus, a rich miser would not be judged poor in our analysis but a profligate pauper (short-term presumably) would be identified as poor.[5]

Household income is measured by the aggregate disposable income of all its members. Disposable income is gross income minus estimated income tax. Gross income is comprised of wages and salaries, business income, investment income, private pensions and transfers, Australian government pensions and benefits, family tax benefits and maternity allowances. Household disposable income measures the maximum

[3] Chotikapanich, *et al.*, 2003 and Flatau and Wood, 2000 are two poverty studies to include imputed rent on owner-occupied housing. Including wealth reduces measured poverty particularly among the elderly, who have a relatively high incidence of home ownership (ABS, 2006, Table 7.2, p.199).

[4] Tsumori, Saunders and Hughes (2001, pp.9-13) argue that expenditure is measured more accurately than income because people are reluctant to reveal their complete incomes on surveys, particularly those conducted by the government. However, given a choice between longitudinal income data collected by a non-government body and cross-section expenditure data collected by government, we prefer the former. Bane & Ellwood (1986, p.6) note that the US' Panel Study of Income Dynamics finds more income than the Current Population Survey. It would be interesting to know whether HILDA survey finds more income that the ABS' surveys of income and housing.

[5] We recognize that well-being is multi-dimensional: leisure, health, access to a clean, safe environment, social interactions and personal autonomy are important contributors to well being. Unfortunately, they are also difficult to measure and sometimes even difficult to conceptualise.

consumption achievable by household members without running down wealth or accumulating debt. Windfall income and the Child Care Benefit[6] are excluded. When household disposable income is negative, such as when losses incurred from unincorporated business or investment income exceed any positive income from other sources, we set household disposable income to zero.

Over what time period should material standard of living be measured?

Poverty studies are typically based upon annual data, probably because survey data are typically recorded on an annual basis.[7] Whatever the time period over which income is measured, the implicit assumption is that individuals can make intra-period income transfers at zero cost but that inter-period income transfers are not possible. This may, or may not, be a reasonable assumption, depending upon the circumstances of the people concerned and the objective of the study. In countries where many people do not save or borrow, either because their incomes are too meagre or because appropriate financial institutions do not exist, a one-year income period may be too long. But in developed countries where most people have enough income to allow some saving and borrowing, a one-year period may be too short (Rodgers and Rodgers, 1993, p.26). In this study, we measure poverty both on an annual basis (Section IV) and on a four-yearly basis (Section VI) allowing for saving and borrowing at prevailing interest rates. We justify the use of a multi-year time period using the results reported in Section V: low-

[6] The Child Care Benefit can either be paid to the family or directly to the child care centre (ABS, 2006, p.210). In Release 4.1 of HILDA the Child Care Benefit is regarded as a payment in kind.

[7] The ABS' Survey of Income and Housing Costs reports both annual income and income received in the week when the data were collected. Harding and Szukalaska (2000) use current weekly income in their study of child poverty but state that they do so because of concerns about the comparability of annual income data in the surveys that were conducted in the 1980s and mid 1990s.

income people and high-income people experience considerable variation in their incomes from year to year and both groups actually do save and borrow.

What equivalence scale is to be used to compare the needs of social units of different size and composition?

An equivalence scale facilitates a comparison between the needs of a household with a given number of adults and children and the needs of a lone-person household. Thus, a household with an equivalence rating of 1.7 is said to contain 1.7 'adult equivalents' and to have needs that are 1.7 times the needs of an adult living alone. Clearly, poverty thresholds and equivalence scales are closely related concepts. An equivalence scale can be derived by dividing the poverty thresholds of households of various sizes and compositions by the poverty threshold of a one-adult household. This approach is common in studies of poverty in the US, where 'official' poverty lines are available for households of different types and sizes. Alternatively, poverty thresholds for various types and sizes of households can be derived by multiplying the equivalence rating of each household category by the poverty threshold for a single-adult household. This second approach tends to be followed in countries, such as Australia, that have no official poverty thresholds and in multiple-country studies of poverty. Whatever comes first, the poverty thresholds or the equivalence scale, the simplest computational procedure is to divide household disposable income by the number of adult equivalents in the household and compare the resulting 'equivalised disposable income' to the poverty line for a single adult.

In Australia, the Henderson equivalence scale, constructed by the 1973 Commission of Enquiry into Poverty, is based on the budgeted costs of meeting the basic

needs of families of 22 different sizes and compositions (see Johnston, 1987 for details). The Henderson scale has been criticized (Saunders, 1999, pp. 43-44) not least because it was derived from a set of budgets originally drawn up for New York City in 1954. Recent research in Australia has used the 'modified OECD' equivalence scale, in which the first adult in the household receives a weight of one point, each additional person who is 15 years or older is allocated 0.5 points, and each child under the age of 15 is allocated 0.3 points.[8] The Henderson scale, however, has two conceptual advantages over the OECD scale: the Henderson scale takes account of the costs of working and the cost of renting, rather than owning, accommodation. As a result, using the Henderson scale is likely to produce lower poverty rates for the elderly, and others who are not in the work force, relative to poverty rates of the working-age population. We make no comparisons of poverty among various subpopulations in this paper so the choice of scale is less contentious than when such comparisons are made. Hence, while acknowledging its shortcomings, we use the simpler, and more transparent, OECD scale.

To what poverty line should the material standard of living of a given social unit be compared?

Distinct from the choice of equivalence scale is the choice of poverty line to be assigned to a given type of household, for example, a single-adult household. In developed countries, where most people have access to adequate food, clothing and housing, the poverty line is typically set, not at a level necessary for survival, but at a level that is sufficient to fund a material standard of living regarded as minimally

[8] According to the ABS (2003-04b, pp.52-53): “The 'modified OECD' equivalence scale has been used in more recent research work undertaken for the OECD, has wide acceptance among Australian analysts of income distribution, and is the stated preference of key SIH users”.

acceptable to that society. A minimally acceptable standard of living can be budgeted or it can be set at a certain point in the income distribution, such as 50 per cent of median income. The former is called an absolute poverty line; the latter is called a relative poverty line. An absolute poverty line does not have to represent a frugal material standard of living, although the absolute poverty line that is typically employed in studies of US poverty is generally held to do so.

We have no objection to the use of either type of poverty line in studies that compare the poverty of subpopulations of a country at a point in time. However, we have a distinct preference for the way in which the poverty line is adjusted in studies that compare poverty at different points in time. One approach is to adjust the poverty line for a given year by changes in the cost of living, which keeps the standard of living represented by that poverty line constant through time. Studies of poverty in the US typically use constant real poverty lines. A second approach, which is used by the OECD in studies of inter-temporal poverty, and is most often used by researchers into poverty in Australia, is to set the poverty line in a given year equal to a particular point in *that year's* income distribution. For example, Heady, Marks and Wooden (2005) calculated poverty rates at 50 per cent (and 40 per cent and 60 per cent) of median, equivalised, disposable money income in each of 2000-01, 2001-02 and 2002-03. Other authors (Harding and Szukalska, 2000) have used half the mean, equivalised money income in the *current* year in their studies of Australian poverty. It should be pointed out that a measure of poverty that is based on a poverty line that varies in real terms through time will not be independent of the incomes of the non-poor. This violates the desirable property of 'focus' (Sen, 1981, p.186).

We concede that as a society becomes more affluent, its concept of what constitutes a minimally acceptable standard of living will change, albeit slowly. Comparisons of poverty over a period of several decades need to confront this issue, but comparisons of poverty over a period five or so consecutive years do not. We also concede that it is possible that a person's 'happiness' is influenced by his or her relative position in the income distribution (Kahneman and Kreuger, 2006, p. 8; Di Tella and MacCulloch, 2006, pp.33-34). Happiness, however, is distinct from one's material standard of living, and policy is directly concerned with the raising latter, not the former. To be consistent, those who advocate a relative poverty line that varies over time must surely also advocate a relative poverty line that varies in cross section among certain subpopulations. For example, young adults lead very different lifestyles to the elderly and the two groups are likely to feel relative deprivation according to their position in the income distribution of their cohort. The same applies to people living in geographically dispersed areas. The Jones with whom people compare themselves are the Jones in their locality, not those in a distant part of the country.[9]

In summary, when making temporal comparisons of poverty we contend that the same poverty threshold (in real terms) should apply in all periods. If the poverty threshold is not fixed in real terms, then changes in measured poverty resulting from changes to the threshold will be confounded with changes in measured poverty resulting from changes in individuals' real incomes. For example, consider an increase in median income that increases the proportion of the population earning less than half of median income but does not change their incomes. This certainly signals an increase in inequality

[9] This point is quite distinct from the fact that the cost of living varies among rural and urban areas and ideally should be taken into account so that poverty lines reflect the same real standard of living in all areas of the country. Unfortunately, price indices that measure spatial differences in the cost of living are not available in most countries.

– a change that may be of concern – but it does not signal an increase in the proportion of people with insufficient income for some fixed standard of living. An increase in the incomes of non-poor people that raises the median income is of less concern than a situation where the poor experience reductions in their real incomes. By keeping the poverty threshold constant in real terms, changes over time in a poverty index will signal changes in the real standard of living of the most deprived members of society.

Some of the disagreement about where to set the poverty line can be largely avoided by choosing not one poverty line but many. In this paper we construct poverty profiles, which express poverty as a function of the poverty line. A graphical display of a poverty profile shows the sensitivity of measured poverty to the chosen poverty line. All our poverty profiles have been constructed using incomes and poverty lines that are measured in 2003-04 dollars.[10] Poverty lines for a single adult vary in real terms from $10,000 to $18,000 per annum. The lower value of $10,000 is equal to 36 per cent, and the upper value of $18,000 is equal to 64 per cent, of the 2003-04 median, equivalised, annual, disposable income ($28,114).[11]

What index should be used to measure aggregate poverty of a group of social units?

By far the most commonly used measure of aggregate poverty is the head-count ratio, which is the proportion of people in the population who are poor. Each household is classified as poor or non-poor on the basis of its real equivalised disposable income and all people in a poor household are classified as poor. Thus, it is the poverty of individuals

[10] The values of the consumer price index (CPI) used in the conversions are 132.17 (2000-01), 135.94 (2001-02), 140.14 (2002-03) and 143.44 (in 2003-04) (see ABS, *Consumer Price Index, Australia,* 6401.0 Table 7L. CPI: All Groups, Weighted Average of Eight Capital Cities).

[11] The CPI-adjusted Henderson poverty line for a single adult in 2003-04 is $11,401. If household disposable income per capita is used to make temporal adjustments, the Henderson poverty line for a single adult in 2003-04 is $15,836. Henderson's equivalence scales were used in both these calculations.

(not households) that is used in calculating the head-count ratio and other indices of aggregate poverty. The head-count ratio used in this paper takes account of the need to weight the HILDA data:

$$H_w = \frac{\sum_{i=1}^{m} w_i n_i}{\sum_{i=1}^{N} w_i n_i} \qquad (1)$$

where N is the number of households in the sample; households 1, 2,…. m are poor, households m+1, m+2,…. N are non-poor; n_i is the number of people in household i; and w_i is the weight applied to household i.

The deficiencies of the head-count ratio as a measure of poverty are well documented (Sen, 1976; Takayama, 1979; Kakwani, 1980; Foster, Greer and Thorbecke, 1984). The head-count ratio violates Sen's monotonicity axiom: H_w does not change, even if the incomes of all poor people fall. Nor does H_w change if the income of every poor person rises but by an amount that is insufficient to move anyone across the poverty line. The head-count ratio also violates Sen's transfer axiom: H_w does not change even if every poor person transfers some of his or her income to the non-poor. Nor does H_w change if every non-poor person transfers some of his or her income to the poor provided that neither the donor nor the recipient of the transfer crosses the poverty line. Finally, H_w does not change if every poor person transfers some of his or her income to another poor person provided they both remain below the poverty line. The head-count ratio treats poverty as a discrete state: people are either poor or non-poor, and no poor person is counted as poorer than any other poor person. The implication is that if a society's poverty rate is an argument in its social welfare function, all poor carry the same negative weight no matter how poor, and all non-poor carry zero weight no matter how close they

are to the poverty line. According to H_w, both the depth of poverty and the distribution of income among the poor are irrelevant.

Given these properties of H_w it is surprising that it continues to be used, particularly in view of the fact that far better indices are available. A summary of the properties of a number of poverty indices can be found in Rodgers and Rodgers, 1991, pp.340-345. In Section VII of this paper we conduct our analysis of chronic and transitory poverty using two indices that have more desirable properties than the head-count ratio. The first is Watts' (1968) normalised deficit:

$$HI_w = \frac{1}{\sum_{i=1}^{N} w_i n_i} \sum_{i=1}^{m} w_i n_i \left(\frac{z - y_i}{z} \right) \qquad (2)$$

where N, m, n_i and w_i are as defined for H_w; y_i is the real equivalised disposable income of the ith household; and z is the poverty line for a single-adult household. HI_w is reasonably easy to understand because it is the product of two common-sense measures of poverty, the head-count ratio, H_w, and the mean poverty-gap ratio, I_w:

$$I_w = \frac{1}{\sum_{i=1}^{m} w_i n_i} \sum_{i=1}^{m} w_i n_i \left(\frac{z - y_i}{z} \right) \quad = \quad \frac{z - \mu_p}{z} \qquad (3)$$

where μ_p is the (weighted) mean income of the poor. Watt's normalised deficit takes account of the mean income of the poor and the proportion of the population that is poor. Both H_w and I_w lie between zero and one so HI_w is necessarily numerically smaller than H_w. Notably, HI_w does change when there are net transfers of income between the poor and non-poor even if such transfers do not cause anyone to cross the poverty line. The only perverse characteristic of HI_w is that it does not change if every poor person

transfers some of his or her income to another poor person and they both remain below the poverty line. The implication is that HI_w is axiomatically superior to H_w.

The other index used in the analysis of Section VII is the Foster, Greer and Thorbecke (1984) index:

$$FGT_w = \frac{1}{\sum_{i=1}^{N} w_i n_i} \sum_{i=1}^{m} w_i n_i \left(\frac{z - y_i}{z} \right)^{\alpha} \qquad (4)$$

where N, m, n_i, w_i, y_i and z have the same definitions as in the HI_w index. H_w and HI_w are special cases of FGT where α=0 and α=1, respectively. We set α=2, in which case FGT_w is an average of squared poverty-gap ratios. FGT_w is necessarily smaller than HI_w, which is an average of poverty-gap ratios, all of which lie between zero and one. The FGT_w index can also be written as $FGT_w = H_w [I_w^2 + (1-I_w)^2 V_w^2]$, where V_w is the (weighted) coefficient of variation in the income distribution of the poor (Foster, *et al.*, 1984, p.762). Therefore, FGT_w with α=2 takes account of the distribution of income among the poor, as well as the mean income of the poor and the proportion of the population that is poor. The FGT_w index displays none of the perverse behaviour that characterises the H_w index.

IV. Annual and Multiple-Year Poverty-Rate Profiles

The analysis in this section was performed using H_w and annual income data in real (2003-04) dollars. The results are intended as a benchmark for the analysis in Sections VI and VII, which are based upon permanent income from 2001 through 2004.

Annual poverty-rate profiles

Annual poverty-rate profiles for the four financial years are presented in Figure 1, each profile being a graph of the poverty rate for that year against the poverty threshold for a single adult. Dashed vertical lines in Figure 1 are drawn at $11,246, $14,057 and $16,869, which correspond to 40 per cent, 50 per cent and 60 per cent (respectively) of the 2003-04 median, real, equivalised, annual disposable income, which equals $28,114. Poverty rates at these values are presented in the top section of Table 1. Henceforth, "real, equivalised, annual disposable income" will be abbreviated to "READ income".

Three features of Figure 1 are worth noting. First, at every poverty line displayed on the horizontal axis, the 2003-04 poverty profile lies below those of the previous years. Second, at any given poverty line the differences among the poverty rates in 2000-01, 2001-02 and 2002-03 are small compared with the differences between the 2003-04 poverty rate and those for the earlier years.[12] Third, the choice of poverty line has a considerable influence on the poverty rate, as one would expect. At a poverty line of $10,000 the poverty rate is less than five per cent in all four years. A poverty line equal to 50 percent of median READ income ($14,057) implies a poverty rate that is approximately three times as high. Indeed, the rate of increase in the poverty rate with respect to the poverty threshold is larger for poverty thresholds above $11,500 than for poverty thresholds below $11,500.

The poverty profiles in Figure 1 have been constructed using the same (real) poverty line in all years and we argued in Section III that it is appropriate to do so. To illustrate the point we present, in the bottom section of Table 1, poverty rates that have

[12] The one-off payment to families and carers that was announced in the May 2004 Budget (payable in 2003-04), and the 4.8 per cent increase in average real wages and salaries between 2002-03 and 2003-4, both probably contributed to the lower poverty rates in 2003-04 (ABS, Yearbook Australia, 2006, p.198).

been calculated at 40 per cent, 50 per cent, and 60 per cent *current-year* median READ income. The set of three dotted vertical lines closest to the vertical axis in Figure 1 are plotted at 40 per cent of median READ income in each of 2000-01, 2001-02 and 2002-03. The other two sets of dotted vertical lines are plotted at 50 percent and 60 per cent of current-year median READ income. The proximity of the dotted lines within each set reflects that fact that the median READ income is approximately the same ($26,800) in 2000-01, 2001-02 and 2002-03. In contrast, 2003-04 median READ income ($28,114) is much larger. If the poverty line were allowed to vary over time, as it does in the bottom section of Table 1, then the change in the proportion of people receiving less than a given proportion of median READ income between 2000-2003 and 2003-04 would be influenced by both the increase in the median READ income and the downward shift in the poverty-rate profile between the two periods. For example, a variable poverty line set at 50 per cent of current median READ income indicates a small increase in poverty from 12.6 per cent in 2002-03 to 12.8 per cent in 2003-04. However, a constant poverty line set at 50 per cent of 2003-04 median READ income indicates a substantial decrease in poverty from 14.4 per cent to 12.8 per cent between 2002-03 and 2003-4. In this case, the increase in median READ income between 2002-03 and 2003-04 increased the poverty rate from 12.6 per cent to 14.4 per cent along the 2002-03 poverty profile. However, the downward shift in the poverty-rate profile between 2002-03 and 2003-04, with median READ income constant at its 2003-04 level, decreased the poverty rate from 14.4 per cent to 12.8 per cent.

Multiple-year poverty-rate profiles

One way to measure poverty persistence is by the proportion of people who are poor in all four years. Figure 2 presents the poverty-rate profile for this measure calculated using a balanced panel of 14,188 people who were present in HILDA households in 2001, 2002, 2003 and 2004. Also graphed in Figure 2 are three other poverty-rate profiles: the proportion of people who were poor in exactly three years, exactly two years and exactly one year. Table 2 lists several values that lie on the four poverty-rate profiles in Figure 2.[13]

At poverty lines below $11,500 the four-year, poverty-rate profile is flat and less than one per cent of people are poor in all four years. At poverty lines higher than $11,500, the choice of poverty line has a considerable influence on the proportion of people who are poor in all four years: almost five per cent at a poverty line of $14,000, eight per cent at a poverty line of $16,000 and 12 per cent at a poverty line of $18,000. A second feature of Figure 2 is that the four-year poverty-rate profile crosses the other three. For example, at poverty lines greater than $13,500 a larger proportion of people are poor in all four years than are poor in exactly three of the four years. This occurs because the always-poor category gains observations from the other categories as the poverty line is increased. For example, all people who are poor in four years, and some people who are poor in exactly three years, at a poverty line of (say) $13,000, are poor in all four years at a poverty line of (say) $14,000. For similar reasons, the never-poor category

[13] Using the balanced panel does not appear to lead to unacceptable levels of attrition bias in poverty estimates. Annual poverty rates based on the 14,188 people in the balanced panel were compared with the annual poverty rates underlying Figure 1, which are based on all people present in the data set in each year. The differences between the two sets of poverty rates are less than – in many cases much less than – one percentage point at all poverty lines in all years. Poverty rates based on the balanced panel are a little smaller in 2000-01 and 2001-02, and a little larger in 2002-03 and 2003-4, than poverty rates based on all the people present in a given year.

(Column 6 in Table 2) loses observations and becomes smaller and smaller as the poverty line is increased. The intermediate categories both gain and lose observations and consequently, their poverty rates do not necessarily increase monotonically as the poverty line increases.

Column 7 in Table 2 shows that the choice of poverty line also has a large impact on the proportion of ever-poor people who are persistently poor. For example, at a poverty line of $10,000, almost (0.003/(1-0.883) =) 3 per cent of ever-poor people are poor in all four years while at a poverty line of $14,000 almost 18 per cent of the ever-poor are persistently poor. At a poverty line of $18,000, almost 30 per cent of the ever-poor are in persistent poverty.

V. Income Variability, Saving and Borrowing

Affluent countries such as Australia have financial institutions that allow individuals to save and borrow. Whether people *actually do* save and borrow depends in part upon the variability of their income-to-expenditure ratios over a given period. Economic theory suggests that among people with relatively stable rates of time preference, those with incomes that are more variable over time will have more incentive to save and borrow than those whose incomes are more stable. In this section, we investigate the extent to which people's READ incomes varied over the four years, 2000-01 through 2003-04 and the extent to which they saved and borrowed. All financial data used in the analysis are in 2003-04 dollars.

For each individual in HILDA's balanced panel we computed the four-year coefficient of variation in his or her READ income. We separated people into groups: those with four-year average READ incomes less than $18,000 (referred to in this section

as low-income people) and those with four-year average READ incomes greater than or equal to $18,000 (referred to in this section as high-income people). The frequency distributions of the coefficients of variation of the two groups are plotted in Figure 3. They show that both high-income, and low-income, people have coefficients of variation that range from close to zero, meaning there is virtually no temporal variation in READ income, to approximately two, meaning that the four-year standard deviation is twice as large as the four-year average. The median coefficient of variation for low-income people is 0.188 whereas the median coefficient of variation for high-income people is 0.161. Therefore, according to this analysis, low-income people experience more relative income variability than high-income people. To put these figures in perspective, consider the following income streams. Someone who experiences a 14 per cent increase, or a 12.5 per cent decrease, in READ income in each of four consecutive years has a coefficient of variation equal to 0.17. Someone with a four-year READ income stream of {X, 0.79X, X, 1.21X} (for any positive X) has a coefficient of variation equal to 0.17. When viewed in this light, the coefficients of variation in Figure 3 indicate substantial variation in real income for at least half the low-income people in the panel, and also for at least half the high-income people in the panel. Hence, there appears to be a *prima facie* incentive for both groups to save and borrow.

The extent to which people actually do save and borrow can be gleaned from Table 3, which has been constructed using data from the special 'wealth module' that was part of the HILDA survey in 2002. This time, individuals have been split into two groups according to whether their READ income in 2001-02 was less than $18,000 (low-income people) or at least $18,000 (high-income people). The top panel of Table 3 gives a frequency distribution of the equivalised bank accounts of the two groups. Although 51

per cent of low-income people, and 30 per cent of high-income people, hold no more than $1,000 in bank accounts, a substantial proportion of both groups have quite large savings of this type. For example, 28 per cent of low-income people, and 38 per cent of high-income people, have equivalised bank-account balances of more than $5,000. The second panel of Table 3 displays a frequency distribution of equivalised debt, which is the total of credit-card debt, car loans, hire purchase debt, overdrafts and loans from people not in the household. Borrowing is less prevalent than saving and, as one might expect, low-income people borrow less than high-income people. Nevertheless, borrowing is still common even for low-income people: 23 per cent of low-income people and 43 per cent of high-income people had borrowed more than $1,000; nine percent of low-income people and 25 per cent of high-income people had a total debt of more than $5,000.

The statistics in Table 3 are consistent with ABS findings,[14] overseas research[15] and with HILDA respondent's statements about their saving and borrowing behaviour. Sixty per cent of low-income people, and 76 per cent of high-income people, report that they save, either irregularly or regularly. Seventeen per cent of low-income people, and 27 per cent of high-income people, report that they save on a regular basis. Forty per cent of low-income people, and 58 per cent of high-income people, report that they could easily raise $2,000 in the period of one week. Sixty-one per cent of low-income people and 66 per cent of high-income people indicated that they would use their own savings to access $2,000 if the need arose. Sixteen and 29 per cent of low-income and high-income

[14] Based on data from the Household Expenditure Survey, the ABS cautiously concludes that people in the lowest and second lowest income quintiles spend more than they earn (ABS, 2006, p.204 and ABS (2003-04a, pp. 11-12), which could indicate savings and borrowing behaviour.

[15] Slesnick (1992) and Mayer and Jencks (1989) provide evidence that many poor people in the U.S. can and do save and borrow.

people, respectively, indicated they would borrow from a financial institution or use credit to raise the $2,000.

VI. Permanent-Income Approach to Chronic Poverty

The fact that low-income people experience considerable variation in their incomes from year to year, and the fact that many low-income people save and borrow, suggest that chronic poverty is better analysed using some measure of permanent, rather than annual, income.[16] The methodology used in this section to measure chronic poverty is that of Rodgers and Rodgers (1993) in which an average-annual-poverty index is decomposed into chronic and transitory components. Given a balanced panel of data, an average-annual-poverty index is a simple average of its component annual poverty indices, all of which assume that individuals can make intra-year income transfers at zero cost but that inter-year income transfers are impossible. Chronic poverty is identified by comparing an individual's permanent income with a selected poverty line. Permanent income is defined as "the maximum sustainable annual consumption level that the agent could achieve with his or her actual income stream over …. T years, if the agent could save and borrow at prevailing interest rates" (Rodgers and Rodgers, 1993, p. 31). If the same interest rate applies to both saving and borrowing and is constant through time then permanent income is simply an annuity of equivalent value to the actual income stream. Otherwise, permanent income is calculated using the numerical algorithm described in Rodgers and Rodgers (1993, p. 37). In this paper, we have used an interest rate on savings equal to five per cent per annum and an annual interest rate on borrowing of 15

[16] As argued in Rodgers and Rodgers (1993, pp. 34-35), the use of permanent income to measure chronic poverty does not depend on whether individuals actually do save and borrow. What is important is that they *could* if, given their actual income stream, it were advantageous for them to do so.

per cent to compute each individual's permanent income during the four-year period 2000-01 to 2003-04. Transitory poverty is defined as the difference between average-annual poverty and chronic poverty.

Average-annual, chronic and transitory poverty profiles, based on the head-count ratio, were calculated using a balanced panel of 14,188 persons of all ages who were present in all four waves of HILDA data. These profiles are presented in Figure 4 and in Columns 1 through 4 of Table 4. The rate of increase in the chronic poverty-rate profile is quite sensitive to the choice of poverty line, as one would expect from an index that treats poverty as a zero-one condition. As the poverty line is increased from $10,000 to $11,000 the chronic-poverty rate increases by 1.1 percentage points (from 1.3 per cent to 2.4 per cent). An additional increase in the poverty line from $11,000 to $12,000 results in a 2.3 percentage point increase (from 2.4 to 4.7 per cent) in the chronic-poverty rate. At a poverty line of $14,000, 10.8 per cent of people are chronically poor, which implies an additional increase of 3.05 percentage points per $1,000. At a poverty line of $16,000, 16.5 per cent of people are chronically poor while 22.4 per cent of people are chronically poor at a poverty line of $18,000.

Column 5 of Table 4 gives the proportion of average-annual poverty that is chronic, which is an increasing function of the poverty line and ranges from 33 per cent when the poverty line is $10,000, to 75.2 per cent at a poverty line of $14,000, to 90 per cent when the poverty line is $18,000. The transitory poverty rate is approximately three per cent and is largely independent of the poverty line.

The chronic poverty rates in Table 4 are much larger than the four-period poverty rates in Table 2. For example, at a poverty line of $14,000, 10.8 per cent of people are chronically poor (see Column 3 of Table 4), whereas 4.9 per cent of the sample are poor

in all four periods (see Column 2 of Table 2). Clearly, at a given poverty line, everyone who is poor in all four periods must be chronically poor but not everyone who is chronically poor is poor in all four periods. Many people who were poor in some but not all four periods have permanent incomes below the poverty line. Depending on the poverty line chosen, between 73 per cent and 87 per cent of people who were poor in exactly three years were also chronically poor (see Column 6 of Table 4). The proportion of people who were poor in exactly two years who were also chronically poor is smaller but still substantial - between 14 per cent and 40 per cent, depending on the poverty line chosen (see Column 7 of Table 4). Only a small proportion (three to five per cent) of people who were poor in only one year, were also chronically poor (see Column 8 of Table 4).

VII. Axiomatically Sound Measures of Chronic Poverty

Average-annual, chronic and transitory HI-poverty profiles are presented in Figure 5 and some points on the profiles are listed in Table 5. All three poverty profiles increase monotonically with respect to the poverty line, although transitory HI-poverty increases at the slowest rate. Chronic HI-poverty is more than four and one half times as large at a poverty line of $14,000 as it is at a poverty line of $10,000 and almost three times as large at a poverty line of $18,000 as it is at a poverty line of $14,000. Column 5 of Table 5 indicates that the percentage of average-annual HI-poverty that is chronic ranges from 23 per cent at a poverty line of $10,000 to 70 per cent at a poverty line of $18,000. These percentages are much smaller than the corresponding percentages for the head-count ratio (see Column 5 of Table 4) but provide a better measure the proportion of

poverty that is chronic in that HI takes account of the depth, as well as the incidence of poverty.

Figure 6 presents average-annual, chronic and transitory FGT-poverty profiles and Table 6 lists some of the points on the profiles. Like those based on HI, all three poverty profiles increase monotonically and transitory FGT-poverty increases at the slowest rate. Chronic FGT-poverty is more than two and one half times as large at a poverty line of $14,000 as it is at a poverty line of $10,000. At a poverty line of $18,000, chronic FGT-chronic poverty is more than three times as large as it is at a poverty line of $14,000. The percentage of average-annual FGT-poverty that is chronic ranges from 16 percent at a poverty line of $10,000 to 51 per cent at a poverty line of $18,000. In that FGT takes account of the distribution of income among the poor, the depth of poverty and its incidence, these are our best measures of the proportion of poverty that is chronic. They are much smaller than the corresponding chronic-poverty shares for H and HI, which are displayed in Tables 4 and 5.

Figure 7 displays three poverty profiles for the share of poverty that is chronic based on the H-index, the HI-index and the FGT-index. The H-chronic poverty-share profile is steep and somewhat erratic, particularly for poverty lines towards the lower end of the scale. This means that the H-chronic-poverty share is extremely sensitive to the choice of poverty line. The HI-chronic poverty-share profile is smoother and less steep than the H-chronic poverty-share profile so the choice of poverty line is less crucial when HI is used. The FGT-chronic poverty-share profile is as smooth but less steep than the HI-chronic poverty-share profile so the choice poverty line has an even smaller influence on the proportion of poverty that is chronic. As there is no consensus as to precisely

where the poverty line for Australia should be set, lack of sensitivity to the poverty line is a desirable property of a poverty index in our opinion.

VIII. Conclusions

In this paper we have discussed several issues concerning the measurement of poverty. From a theoretical perspective, we would like to stress three points. First, we argue that it is important to use a constant real poverty line when making inter-temporal comparisons of the level of poverty. The practice of using a poverty line that varies through time, such as half the current median income, confounds changes in measured poverty caused by changes in the poverty line and changes in measured poverty caused by changes in the real incomes of people at the lower end of the income distribution. Second we have reiterated the deficiencies of the head-count ratio as a measure of poverty and have argued in favour of two alternatives: the normalized deficit of Watts (1968) and the index Foster, Greer and Thorebeck (1984), both of which take account of the depth, as well as the incidence, of poverty. Third, we have advocated a measure of chronic poverty that is based upon a measure of permanent income, in preference to using the proportion of years in which an individual's income is below the poverty line as a measure of persistent poverty.

We also present empirical estimates of total, chronic and transitory poverty in Australia during the financial years 2000-01 through 2003-04, calculated using the first four waves of data from the HILDA survey. Our results are displayed in the form of poverty profiles, which are graphs of a poverty index against a range of poverty lines. By presenting poverty profiles we avoid the contentious issue of precisely where the poverty line should be set and we can assess the sensitivity of various poverty indices to the value

of the poverty line. The poverty indices underlying our results are the head-count ratio, Watt's normalised deficit and the Foster, Greer and Thorbecke index. The head-count ratio serves as a benchmark against which to compare results based on the other two axiomatically sound poverty indices.

Using a poverty line of $14,000, we estimate that five per cent of the Australian population were poor in all four years from 2000-01 through 2003-04 and that these people constitute almost 18 per cent of those who were poor in at least one of the four years. On the other hand, almost 11 per cent of people have equivalised permanent incomes less than $14,000 per annum, many of whom fall below the same poverty line in only three, or even two, of the four years. Chronic poverty, according to the head-count ratio, permanent income and a poverty line of $14,000, constitutes approximately 75 percent of average annual poverty. The two axiomatically sound indices indicate that chronic poverty is a much smaller proportion of total poverty during the period 2000-01 through 2003-04. At a poverty line of $14,000, Watt's normalised deficit indicates that 49 per cent of average annual poverty is chronic in nature whereas the Foster,Greer and Thorbecke index indicates that 29 per cent of measured poverty is chronic.

If Australian policy makers are serious about designing and implementing policies and programs to ameliorate the most serious forms of poverty, and if they wish to measure the efficacy of such programs, we suggest the methodologies presented in this paper are likely to be useful.

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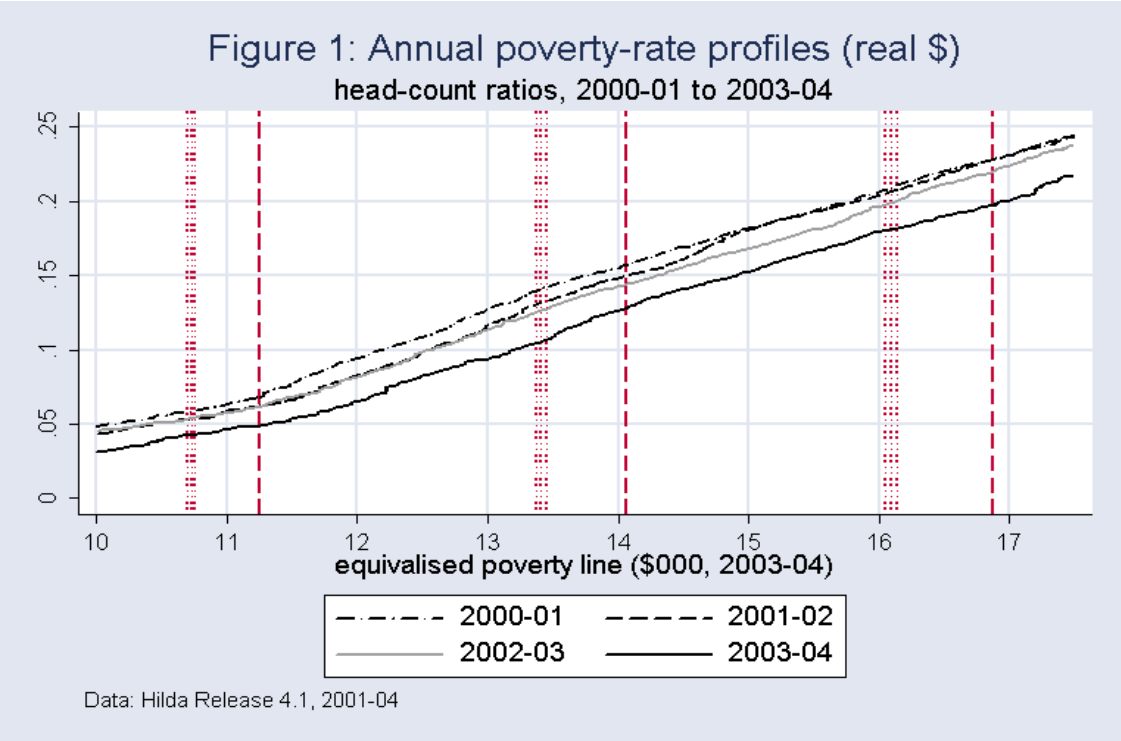

Table 1: Annual Poverty Rates

(1)	2000-01 (2)	2001-02 (3)	2002-03 (4)	2003-04 (5)
Poverty line constant through time:				
40% of 2003-04 median income	$11,246	$11,246	$11,246	$11,246
Poverty rate	0.068	0.062	0.062	0.049
50% of 2003-04 median income	$14,057	$14,057	$14,057	$14,057
Poverty rate	0.157	0.150	**0.144**	**0.128**
60% of 2003-04 median income	$16,869	$16,869	$16,869	$16,869
Poverty rate	0.228	0.228	0.220	0.197
Poverty line variable through time:				
40% of current-year median income	$10,756	$10,700	$10,729	$11,246
Poverty rate	0.059	0.053	0.054	0.049
50% of current-year median income	$13,446	$13,375	$13,411	$14,057
Poverty rate	0.142	0.131	**0.126**	**0.128**
60% of current-year median income	$16,135	$16,049	$16,093	$16,868
Poverty rate	0.211	0.205	0.198	0.197

Source: Hilda, Release 4.1, combined files for 2001, 2002, 2003 and 2004.
Notes Median READ incomes and poverty lines are all in $2003-04. Computations are based on 19,914, 18,295, 17,691 and 17,209 "enumerated persons" present in HILDA households in 2001, 2002, 2003 and 2004, respectively. Cross-section weights were used.

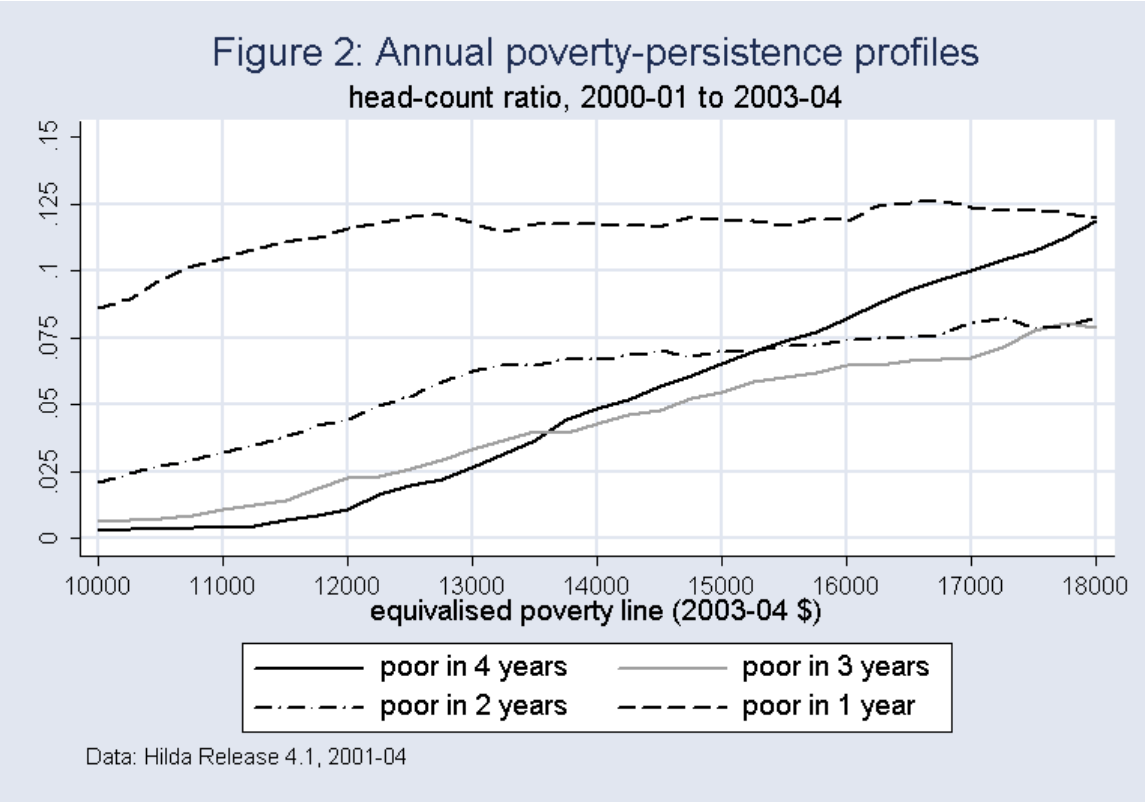

Table 2: Tabulation Study of Poverty Persistence from 2000-01 to 2003-04

Equivalised poverty line in $2003-04 (1)	Proportion poor in exactly 4 years (2)	3 years (3)	2 years (4)	1 year (5)	0 years (6)	Proportion of poverty that is persistent (7)
10000	**0.003**	0.007	0.021	0.086	**0.883**	**0.026**
12000	0.011	0.023	0.045	0.116	0.806	0.056
14000	**0.049**	0.043	0.067	0.118	**0.724**	**0.176**
16000	0.082	0.065	0.074	0.119	0.660	0.242
18000	**0.119**	0.079	0.083	0.120	**0.600**	**0.298**

Source: Hilda, Release 4.1, combined files for 2001, 2002, 2003 and 2004.
Notes: Computations are based on a balanced panel of 14,188 "enumerated persons" present in HILDA households in 2001, 2002, 2003 and 2004. Longitudinal weights were used.

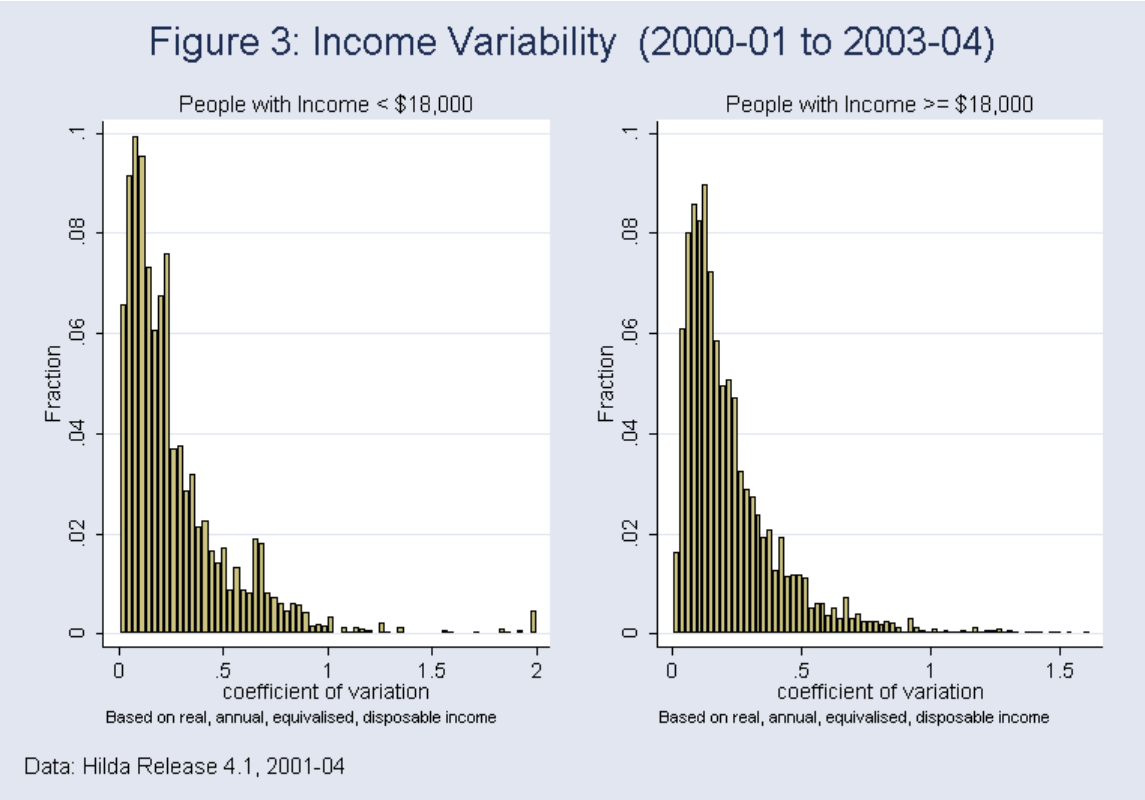

Table 3: Frequency Distributions of Saving and Borrowing

	People with READ income		
	< $18,000	At least $18,000	All people
(1)	(2)	(3)	(4)
Equivalised bank accounts	%	%	%
nil	5.2	1.8	2.7
$1-$1000	45.5	27.8	32.4
$1001-$5000	21.8	32.7	29.8
$5001 or more	**27.5**	**37.7**	35.1
Total	100.0	100.0	100.0
Equivalised debt	%	%	%
nil	64.4	46.3	51.0
$1-$1000	12.2	10.6	11.0
$1001-$5000	**14.7**	**18.5**	17. 6
$5001 or more	**8.6**	**24.6**	20.4
Total	100.0	100.0	100.0

Source: Hilda, Release 4.1, combined file for 2002.
Notes: Computations are based on 18,295 "enumerated persons" present in HILDA households in 2002. There were 4,830 and 13,465 people with 2001-02 READ income less than $18,000 and at least $18,000, respectively. Cross-section weights were used.

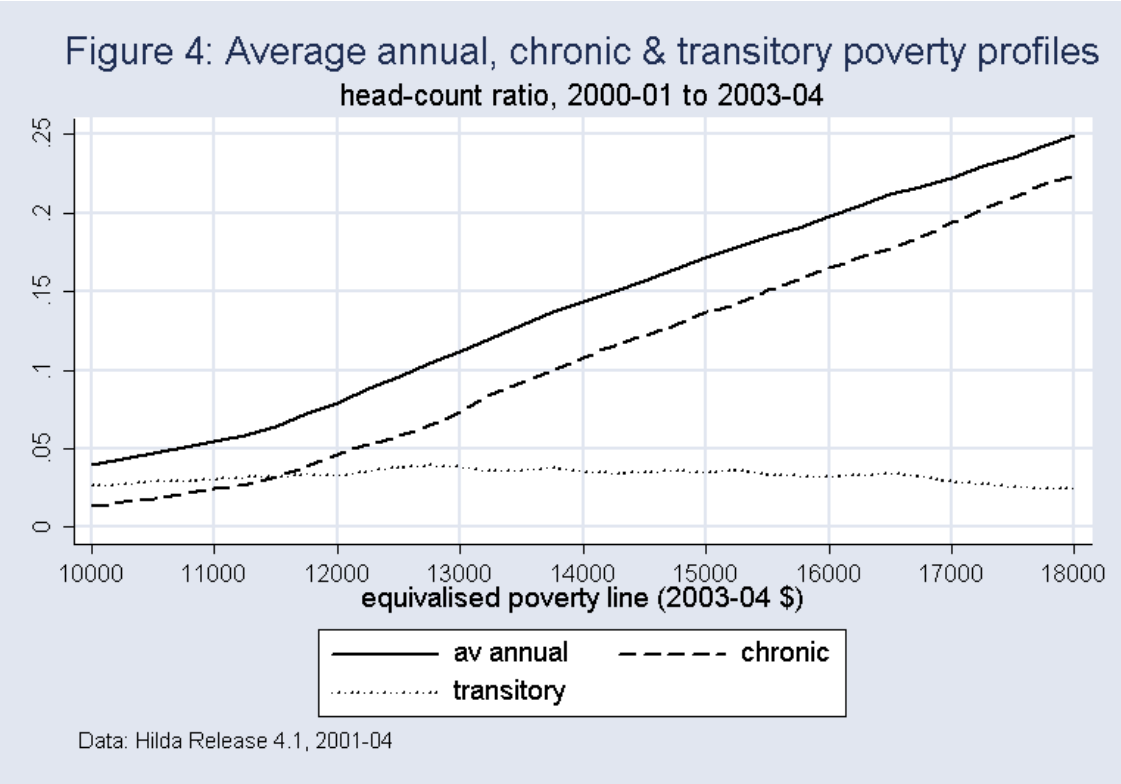

Table 4: Average-Annual, Chronic and Transitory Poverty from 2000-01 to 2003-04 (based on the head-count ratio)

Equivalised poverty line in $2003-04	average annual poverty	chronic poverty	transitory poverty	chronic ÷ average annual	Proportion of those poor in: 3 years who are in chronic poverty	2 years who are in chronic poverty	1 year who are in chronic poverty
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
10000	0.0400	**0.0132**	0.0267	**0.3311**	**0.7314**	**0.1477**	**0.0265**
12000	0.0794	**0.0467**	0.0327	0.5882	0.8563	0.2320	0.0499
14000	0.1433	**0.1078**	0.0355	**0.7520**	0.8053	0.3217	0.0291
16000	0.1977	**0.1652**	0.0324	0.8359	0.8077	0.3644	0.0302
18000	0.2492	**0.2241**	0.0250	**0.8995**	**0.8694**	**0.3977**	**0.0332**

Source: Hilda, Release 4.1, combined files for 2001, 2002, 2003 and 2004.
Notes: . All equivalised disposable income data and poverty lines are in $2003-04. Computations are based on a balanced panel of 14,188 "enumerated persons" present in HILDA households in 2001, 2002, 2003 and 2004.

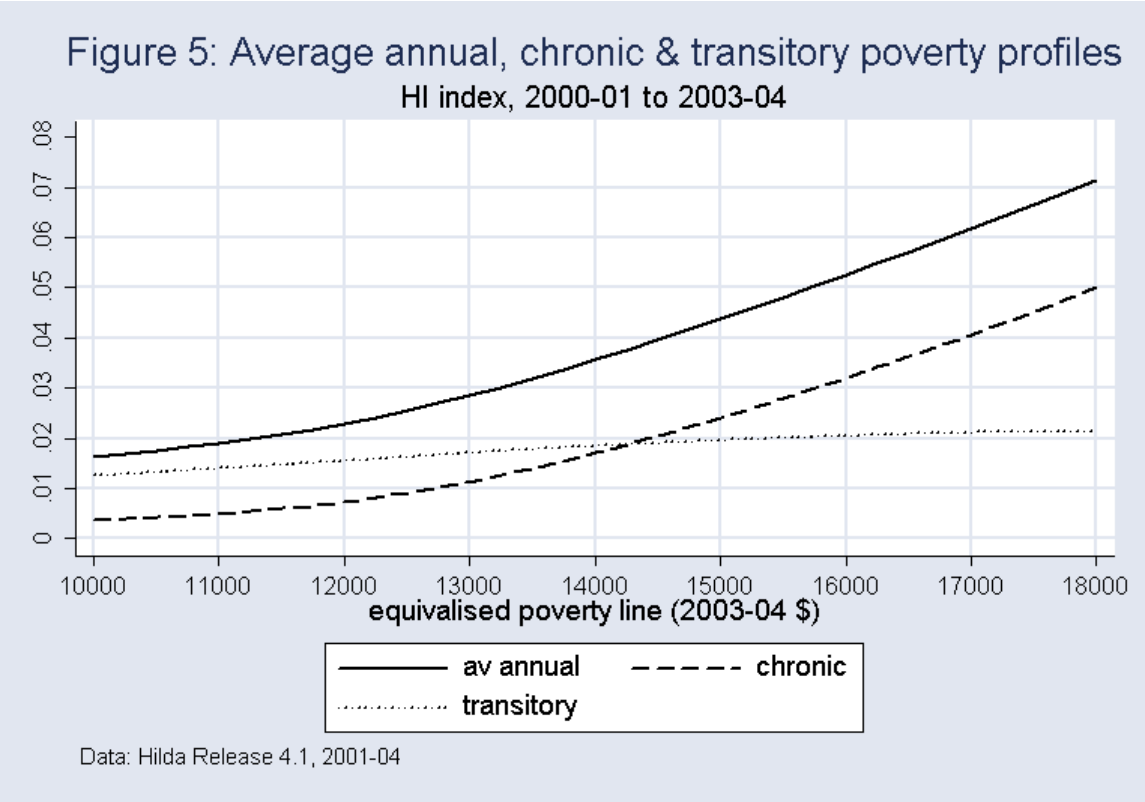

Table 5: Average-Annual, Chronic and Transitory Poverty from 2000-01 to 2003-04 (based on the HI Index)

Equivalised poverty line in $2003-04	average annual poverty	chronic poverty	transitory poverty	Proportion of poverty that is chronic
(1)	(2)	(3)	(4)	(5)
10000	0.0169	**0.0039**	0.0130	**0.2311**
12000	0.0229	0.0074	0.0156	**0.3209**
14000	0.0357	**0.0171**	0.0186	**0.4794**
16000	0.0526	0.0320	0.0205	**0.6091**
18000	0.0715	**0.0500**	0.0215	**0.6994**

Source: Hilda, Release 4.1, combined files for 2001, 2002, 2003 and 2004.
Notes: . All equivalised disposable income data and poverty lines are in $2003-04. Computations are based on a balanced panel of 14,188 "enumerated persons" present in HILDA households in 2001, 2002, 2003 and 2004.

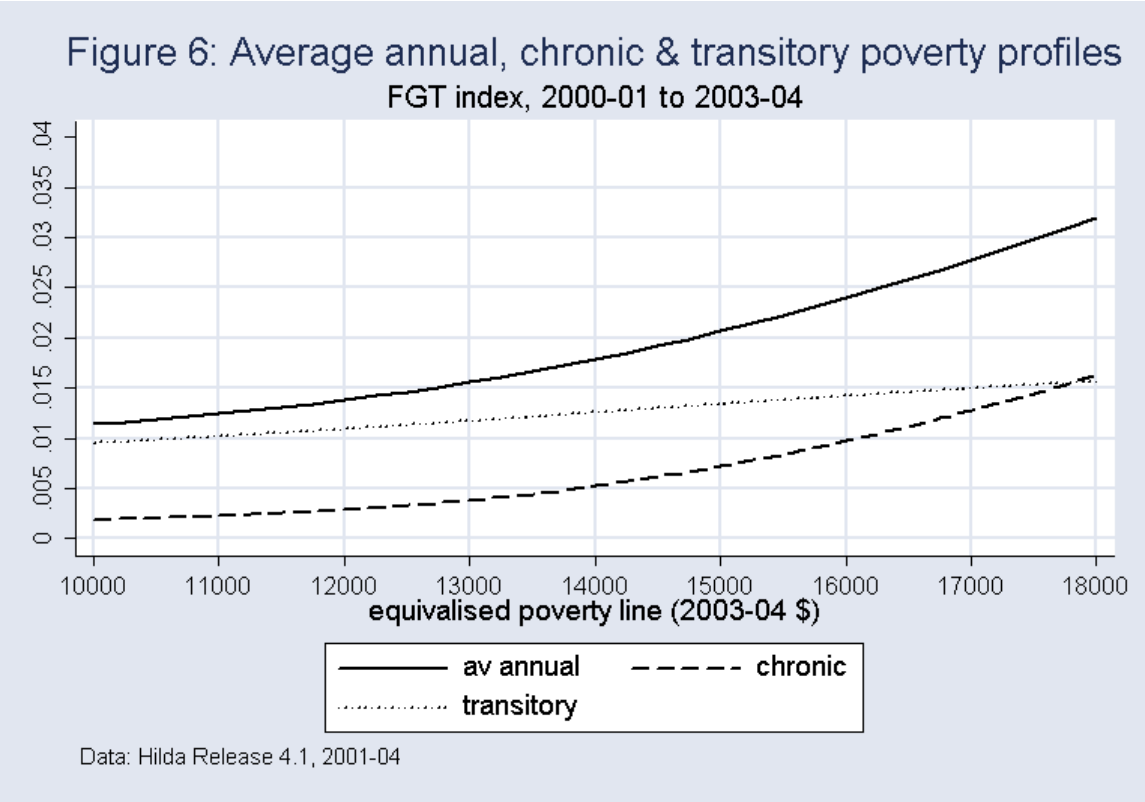

Table 6: Average-Annual, Chronic and Transitory Poverty from 2000-01 to 2003-04 (based on the Foster, Greer and Thorbecke (FGT) Index)

Equivalised poverty line in $2003-04	average annual poverty	chronic poverty	transitory poverty	Proportion of poverty that is chronic
(1)	(2)	(3)	(4)	(5)
10000	0.0114	**0.0019**	0.0095	**0.1634**
12000	0.0138	0.0029	0.0109	**0.2086**
14000	0.0178	**0.0052**	0.0126	**0.2939**
16000	0.0240	0.0097	0.0142	**0.4060**
18000	0.0320	**0.0163**	0.0157	**0.5092**

Source: Hilda, Release 4.1, combined files for 2001, 2002, 2003 and 2004.
Notes: . All equivalised disposable income data and poverty lines are in $2003-04. Computations are based on a balanced panel of 14,188 "enumerated persons" present in HILDA households in 2001, 2002, 2003 and 2004.

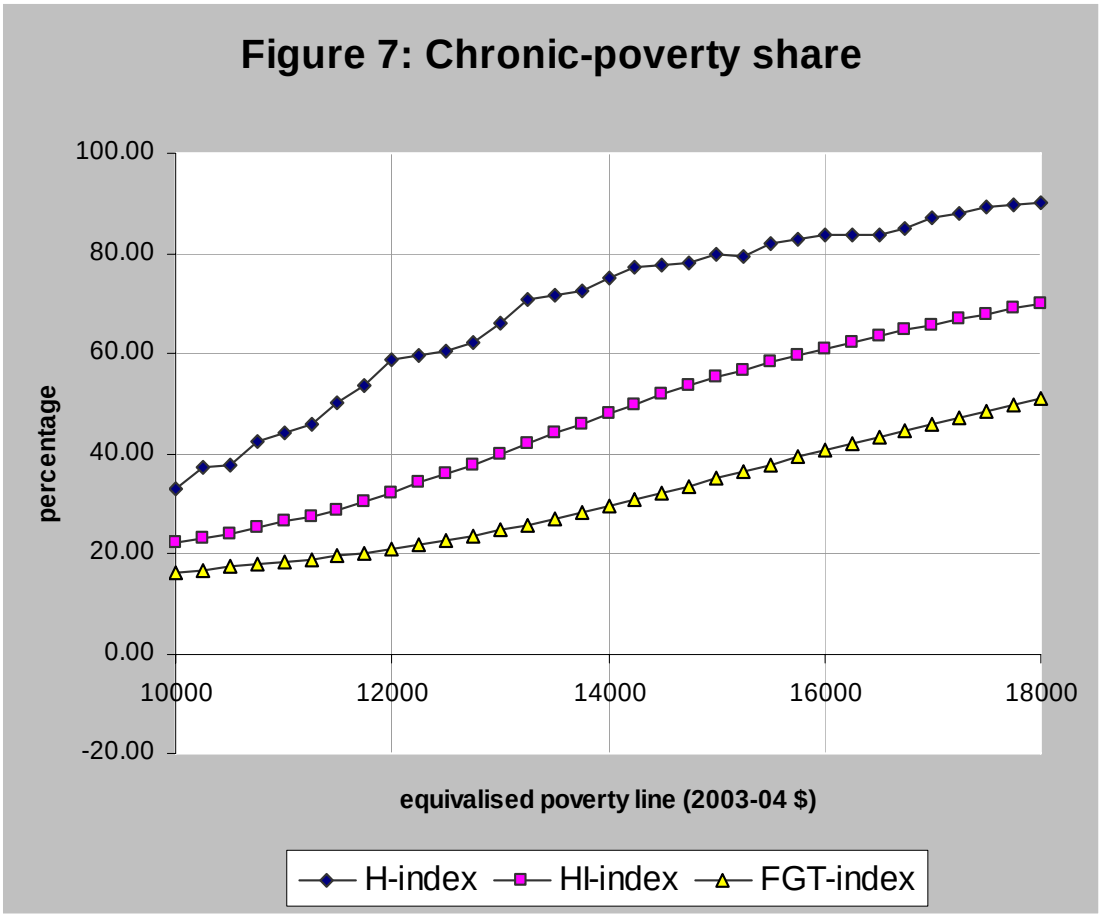
Figure 7: Chronic-poverty share
100.00
80.00
60.00
40.00
20.00
0.00
-20.00
percentage
10000
12000
14000
16000
18000
equivalised poverty line (2003-04 $)
H-index
HI-index
FGT-index