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One size fits all?: The effect of equivalence scales on Indigenous and other Australian poverty

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Abbreviations and acronyms

ABS	Australian Bureau of Statistics
AGPS	Australian Government Publishing Service
ANU	The Australian National University
ATSIC	Aboriginal and Torres Strait Islander Commission
FGT	Foster, Greer and Thorbecke
ME	Marginal Effects
NATSEM	National Centre for Social and Economic Modelling
NHS	National Health Survey
SLAs	Statistical Local Areas
SPRC	Social Policy Research Centre

Abstract

Indigenous households are more likely to be multi-generational and have several families in residence than other Australian households. Equivalence scales attempt to control for family size and composition and the relative costs of maintaining various families. We use the 1995 National Health Survey to examine how variations in the assumptions underlying equivalence scales, such as household composition and economies of size, affect poverty measures for Indigenous and non-Indigenous Australians. Our results show that the choice of equivalence scale affects the level and composition of poverty. This is evident in that variations in the assumption about the costs of children can increase Indigenous poverty by a factor of two-and-a-half. We also examine how equivalence scale variations can induce large threshold effects, and demonstrate the influence of zero and negative incomes in our data set on the composition of poverty.

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Introduction

It is impossible to estimate poverty on a value-free basis (Johnson 1996). Recent public debate illustrates the difficulties in identifying a socially accepted minimum standard of living (Harding, Lloyd & Greenwell 2001; Saunders 2002; Tsumori, Saunders & Hughes 2002).[1] Apart from a persistent penchant for 'poor' puns, such debates are necessary, but often rather unproductive.[2] An important issue is for researchers to ensure that the assumptions made in measuring poverty are transparent and can be evaluated by commentators contributing directly to the policy debate. While this principle is admirable, the statement of apparently simple assumptions can often hide the immense complexity of the processes underlying poverty measurement. This paper attempts to illustrate how the composition of the poor changes with small variations in seemingly innocuous assumptions.

The only point of agreement in the poverty literature is that people who live in poverty must live in a state of deprivation, a state in which their standard of living falls below some minimum acceptable level. However, the way in which poverty has been defined and measured provokes a multitude of questions (Greenwell, Lloyd & Harding 2001: 10–1):

- What is the best way to measure a person's standard of living?
- Which is the best group among whom to assume income is shared—the nuclear family, the extended family or the household?
- What scale can be used to compare households or families of differing size and composition?
- Where should the poverty line be drawn?[3]
- What is best way to determine the extent of poverty?

This paper focuses on the third and fifth questions. Some of the other issues are discussed in detail elsewhere. For example, Hunter, Kennedy and Smith (2002) provide a convincing argument as to why poverty studies of Indigenous people should focus on households rather than income units or families.[4]

The use of income to measure wellbeing in this paper should not be taken as a blanket endorsement for its use in all circumstances, especially given the obvious limitations of monetary income in the Indigenous context (Altman & Hunter 1998). There are also serious limitations in using income to measure the wellbeing of the rest of the population: particularly the measure of income used in this paper, which is equivalised gross household income. While the measure of income used in this paper does not enable us to make direct welfare comparisons, we are still able to illustrate the impact of equivalence scales on income distributions and poverty measurement.

Poverty lines are commonly distinguished by whether they are 'absolute' or 'relative'. Absolute poverty commonly refers to people who live in families that do not have enough money to purchase the basic necessities, such as food and housing. The development literature is replete with criticism of the notion of basic needs, which is more subjective than it appears at first glance. Indeed, the concept of need is inherently culturally bound. For example, Saunders (1998: 7) argued that 'a diet consisting of mainly lentils and brown rice may meet … dietary guidelines, but be of little relevance to the actual eating habits of the vast majority of Australians'. Few Australian studies have analysed absolute poverty—this study follows this convention by using a poverty line defined as one half of the median Australian income, after adjusting for household size and composition.[5]

Indigenous families experience substantial and multiple forms of economic burden arising from the size and structure of their families and households (Daly & Smith 1995). In contrast to the living arrangements of other Australians, Indigenous people are more likely to live in larger households that include more than one family. Indigenous households are also more likely to be multi-generational, with older Indigenous people living with younger people in extended family households. Adult mortality is another important factor driving family formation (and dissolution) among the Indigenous households with many children forced to live with other relatives or friends (Gray 1990). The complexity of extended family

formations is matched by equally complex definitions of parenting and related child-care arrangements. In view of these fundamental differences between Indigenous and other households, the decisions about how to control for differences in household structure are clearly important.

Poverty and inequality studies almost always use an equivalence scale to adjust raw income to account for the cost of maintaining households and families.[6] These costs are said to vary with household size and composition, and sometimes the number of employed in the household, and other household characteristics. Unfortunately, variations in the assumptions about the relevant costs, and the relative complexity of the transformations involved, mean that measures of equivalent income are difficult to compare directly. For example, different groups may be classified as poor depending on which equivalent income is used.[7] The purpose of this paper is to explore the intricacies of equivalent income calculations and to identify whether a particular group, Indigenous persons, are being disproportionately re-ranked by several widely used measures of poverty.

There is a voluminous and expanding literature on poverty measurement. Much of the debate can be grouped according to Sen's (1976) two-step process for measuring poverty: 'identification' and 'aggregation'. Identification involves identifying who is poor, and specifying a threshold or poverty line (i.e. after adjusting for household differences using equivalence scales). Aggregation involves compiling an index, given a poverty line, with which to measure poverty. Given the number of choices to be made in both the identification and aggregation steps there are many possible measures of poverty. The literature on stochastic dominance addresses the relative merits of deriving conclusions from the multitude of poverty measures (Zheng 2000).

It has been suggested that the focus in the academic literature has been on aggregation given the somewhat 'intractable' nature of the identification problem (Callan & Nolan 1991: 244). While we pay due attention to these conventional academic concerns, especially in the next section, the paper has a more practical focus on the interaction between an important aspect of the identification problem and the aggregation problem, especially the issues arising out of the assumptions of household costs embedded in the equivalence scale. The paper tests a range of different equivalence scales (used in the *identification* of poverty) and examines their impact on several different indices of poverty (which are used to aggregate the poor). Hunter, Kennedy and Smith (2002) show that equivalence scales affect the position of Indigenous people in the Australian income distribution. This paper seeks to build on this by illustrating the implications of this distributional sensitivity for the measurement of Indigenous poverty.

The remainder of this paper is structured as follows. The following section provides a brief overview of the equivalent income methodology. The third section introduces the main source of data used in this paper, the 1995 National Health Survey (NHS). The next section documents the substantial differences in household composition of Indigenous and other Australians. This is followed by an overview of Indigenous income distributions, and some direct evidence on the potential sensitivity of Indigenous poverty to the particular equivalence scale used. The main finding is that Indigenous poverty can be dramatically understated by the use of particular equivalence scales. Also, the treatment of unreliable incomes, such as those households with zero or negative income, is particularly important when using distribution-sensitive indices to estimate and compare Indigenous and non-Indigenous poverty. The penultimate section teases out the compositional issues surrounding poverty measurement by estimating a standard limited dependent variable model of who is poor when equivalence scale parameters are varied. The final section makes some concluding remarks about the implications for the results, and explores the difficulty of developing equivalence scales that reflect the circumstances of Indigenous people.

Method

Representing equivalence scales

To compare economic wellbeing one should adjust for the income needs of households with different characteristics. This can be achieved by applying equivalence scales to adjust raw household income, thus deriving equivalent (or equivalised) household income.

$$I_E = \frac{I_H}{S_i} \tag{1}$$

where I_E is equivalent income, I_H raw household income and S_i the equivalence scale. When S_i is set equal to one, the scale does not vary with households size or composition and equivalent income I_E equals raw household income I_H. When S_i equals the number of persons in the household, I_E is per capita income. Equivalence scales typically result in measures of equivalent income that lie between raw household income and per capita income.

Equivalence scales can be represented in a parametric form to facilitate comparisons between scales. A useful parametric form of S_i is:

$$S_i = (A + \eta K)^{\theta} \tag{2}$$

where A is the number of adults in the household and K the number of children. The parameter η (*eta*) can be thought of as a relative weight for children while θ (*theta*) captures economies of size. The differential weighting for children, as opposed to adults, permits the analyst to capture differences in household composition as well as household size. Variation in *eta* and *theta* between 0 and 1 will produce measures of equivalent income that lie between raw household income and per capita income. In this paper, equation 2 is used to represent the full range of possible scales.

Table 1. Parametric representations of standard equivalence scales using equation 2

	Economies of size parameter *theta*	Children weight *eta*
Raw income	0	0
USA (Citro and Michael, (1995))	0.70	0.70
OECD (old)	0.80	0.74
OECD (new)	0.64	0.62
Henderson	0.46	0.95
Square root of household size	0.5	1
Per capita	1	1

Notes: Given NHS data on the numbers of adults and dependents in households, and the values of the other standard equivalence scales, a non-linear least squares model is used to estimate the parameters of equation 2. The new OECD scale is that used in De Vos and Zaidi (1997: 321). The old scale was the standard typically used in OECD studies before that. The square root of household size is gaining currency as a simple scale which does not place particularly heavy demands on data (e.g. Saunders & Smeeding 1998).

Table 1 reports the implicit parameter values of several prominent equivalence scales to illustrate the wide range of values that the parameters may reasonably take. While the extreme values of zero and one appear to be outside the feasible range, the bands are quite wide. Accordingly, the following discussion will focus on the parameters, *eta* and *theta*, with values between 0.5 and 0.8, although it may be prudent to also examine a child weight as high as 1 given that this is the assumption implicitly made by Saunders and Smeeding (1998) and others.

Capturing the three I's of poverty

A desirable poverty measure should capture three dimensions that are sometimes referred to as the three I's of poverty: the 'incidence' of the poor, the 'intensity' of poverty, and 'inequality' amongst the poor (Creedy 1998). The standard measure of the incidence of poverty is the headcount index, which measures the proportion of people below the poverty line. Unfortunately, this basic measure fails to capture two important aspects of poverty. No account is taken of the extent to which poor people are poor (i.e. the amount by which poor incomes fall short of the poverty line or the intensity with which poverty is felt) and no account is taken of the distribution of incomes within the population of poor people (or inequality within the poor population). The first problem is overcome with another relatively simple index of poverty, the income gap index. The income gap index is sensitive to the extent to which the income of the poor falls short of the poverty line as well as the proportion of the population, which are below the poverty line.

Until Sen (1976), poverty was measured by either the headcount or income gap indexes. He noted that existing measures were completely insensitive to the distribution of poor incomes. Given a poverty line, his solution to this problem may be summarised as an acceptance of three basic axioms; a 'focus axiom' which requires the measure to depend on the incomes of the poor and not on the incomes of the non-poor; a 'monotonicity axiom' which requires poverty to increase only when the income of a poor individual falls; and a 'transfer axiom' which requires poverty to increase whenever a small sum of income is transferred from a poor person to a richer person. The headcount measure is not necessarily consistent with the monotonicity and transfer axioms, while the income gap fails the transfer axiom. The index Sen proposed was

$$P_S = P_I + (P_H - P_I) * I_G \tag{3}$$

where P_H is the head-count index and P_I is a version of the income gap index, and I_G is the Gini index of inequality applied to the income distribution of the poor.

Another composite measures of poverty, which satisfies Sen's three axioms, was provided by Foster, Greer and Thorbecke (1984) (hereafter FGT). FGT noted that the Sen index was not decomposable by population subgroup. In order to compare population subgroups when using different equivalence scales, we adopt the FGT measure, which is a sub-group decomposable poverty index (equation 4), and readily interpretable in terms of well known measures of poverty such as the headcount and the income gap ratios. The FGT index can be defined as

$$P_\alpha(y;z) = \frac{1}{n}\sum_{i=1}^{q}\left(\frac{g_i}{z}\right)^\alpha \tag{4}$$

where z is the poverty line, y a vector of incomes, $g_i = z - y_i$ is the income gap of the ith person's income, q the number of poor households, and α is a parameter that can be viewed as an inequality aversion parameter because it places more weight on poverty among lower incomes when α is greater than one.

The FGT index has several useful interpretations for different values of α. For example, when $\alpha = 0$ the index is equal to the familiar headcount ratio, and when $\alpha = 1$ the index represents a re-normalisation of the income gap. When $\alpha = 2$, the FGT index is also directly decomposable into the headcount ratio, income gap and squared coefficient of variation of the poor. We present results for each of these components and for the FGT index when $\alpha = 2$.

As noted earlier the FGT index is additively decomposable into population subgroups (see Foster and Shorrocks 1991). In particular, the following equation:

$$P_\alpha(y;z) = \sum_{j=1}^{m}\frac{n_j}{n}P_\alpha(y^{(j)};z) \tag{5}$$

holds for any income vector broken down into 'm' subgroups and satisfies a subgroup montonicity proposition. That is, an increase in subgroup poverty will increase overall poverty. Thus, equation (5) allows us to represent the percentage contribution of subgroup 'j' to total poverty.

Therefore the advantage of the FGT approach is that it enables us to explicitly identify the contribution of the three I's of poverty (incidence, intensity and inequality) to the overall composite index, and then relate these partial measures of poverty to the contribution of the sub-group population, in this case, Indigenous Australians. Consequently, if the partial measures move in different (offsetting) ways then FGT enables us to describe how this may be obscured in a composite measure of poverty.

The likely impact of variations in equivalence scales on poverty

Before considering the impact of equivalence scales on poverty measures for population subgroups, it is useful to consider the likely effect of changes in equivalence scales on poverty measures for the total population. The following discussion focuses on a debate in the *Economic Journal* in the early 1990s (Banks & Johnson 1994; Coulter, Cowell & Jenkins 1992; Jenkins & Cowell 1994). The main conclusions of that debate were that both inequality and poverty measures are probably non-monotonically related to equivalence scale parameters, and that empirical studies have an important role in discerning the effect of equivalence scales. That is, such relationships are difficult to characterise precisely from theoretical analysis alone (Jenkins & Cowell 1994: 893).

In this study we use a well-known relative poverty line, 50 per cent of median income. If we had used an absolute poverty line, then variations in equivalence scales would have had a known effect on the level and composition of poverty. For an absolute poverty line, fixed relative to the equivalence scale, equivalence scales with higher values of *theta* and *eta*, effectively increase the poverty line for larger households, and hence lead to more poverty. However, the effects on absolute poverty do not necessarily hold in the case of relative poverty. Increases in equivalence scale parameters will decrease the relative income of larger households, but they also contract the overall distribution of equivalised income, and thus reduce the relative poverty lines. Appendix A, Figure A1 describes differences in the relative poverty lines for the full range of equivalence scales applied to the 1995 NHS data.

Coulter, Jenkins and Cowell (1992: 1075–7) derive their theoretical expectations of changes on poverty from the partial derivative of FGT with respect to *theta* from the single parameter representation of equivalence scales in Buhman et al (1988). Jenkins and Cowell (1994: 892–3) calculate the analogous derivative for the *eta* in equation 2 above. These calculations reveal that there are three main effects on poverty from equivalence scale parameters. The first is the 'pure poverty line' effect described above, which effects both absolute and relative poverty measures. The second effect, that also affects both types of poverty lines, reflects changes in the shape of the income distribution below the (changing) poverty line. This means that normalised income gaps, and hence measured poverty, rise as economies of scale fall (i.e. as *theta* rises). The third effect is the 'indirect poverty line' effect, which only arises when a relative poverty line is used. A higher value for *theta* (and *eta*) tends to lower average equivalent income and hence lowers the poverty line for each household type, which in turn, tends to lower poverty. This last effect is in the opposite direction to that of the other two effects.

Note that the qualitative conclusions about the effect of equivalence scale parameters also depend on the inequality aversion parameter chosen for the FGT. However, the effect of the inequality aversion parameter always effects poverty in the same (predictable) direction, irrespective of whether one uses an absolute or relative measure. Consequently, the focus of the empirical study should be on whether the 'indirect' poverty line effect dominates. That is, a U-shaped curve of poverty will result if the third effect dominates for some values of *theta* and *eta*, but not others.

Data

The 1995 NHS was conducted over the period February 1995 to January 1996. Households were randomly selected using a stratified multi-stage area sample. The survey obtained information from over 54,000 Australian residents of private and non-private dwellings. The overall response rate for households was 91.5 per cent. In addition to the main NHS sample, a supplementary sample of 1,034 Indigenous persons was obtained. This resulted in a total sample of 2,099 Indigenous persons. There were 52,763 non-Indigenous persons in the sample.

In this study, we have excluded households where a response to income questions was not obtained for all persons in the household or information about the composition of the household was incomplete. Visitors to the household and households in remote areas were excluded because of questions about data availability and quality.[8] Remote areas were defined as Statistical Local Areas (SLAs) where the dwelling density was less than 57 dwellings per 100 square kilometre.[9] Applying these exclusions to household data reduced the sample sizes to 43,464 and 1,420 respectively (Table 2). Indigenous Australians were 1.8 per cent of the weighted NHS population used in this analysis.

Table 2. NHS samples sizes (after exclusions), 1995

	Indigenous	Non-Indigenous
Persons in sample	1,420	43,464
Weighted	257,434	14,382,469

Note: The sample excludes remote households, households with incomplete or no income data, and visitors to a households.

The measure of income on the 1995 NHS was gross personal income from all sources. The estimates of household income are based on a standard ABS definition. The definition of households includes all persons who are usual residents of the particular dwelling.

For the purposes of this study, we define children in a manner that is consistent with the Australian Bureau of Statistics' (ABS) (1997: 51) definition. That is, any full-time student aged between 15 and 24 years is classified as a dependant. This assumption can be contrasted to the standard OECD scale where only those aged 14 years or less are treated as dependent children.

Why Indigenous households are different from other households?

The distinct nature of Australian Indigenous households and families is well known. Despite an extensive literature on household composition, there is little discussion of how the different structures of Indigenous and non-Indigenous households can be related to income measurement issues. One essential precursor to such a discussion is a summary of the joint distribution of adults and dependents in the respective household types using the most recent census data. Surprisingly, most published studies focus on overall household size or ethnographic case studies. Hunter, Kennedy, and Smith (2002) redress this hole in the literature using both census and NHS data.[10] Table 3 reports the census data from that paper, which are more comprehensive in scope.

While non-Indigenous households are twice as likely as Indigenous households to have one adult and no dependents (10.6% and 5.2% respectively), they are actually less likely to live in households with only one adult. The difference arises, of course, because single adult Indigenous households are substantially more likely to have dependents than other households with only one adult in them. This observation is particularly pronounced among single adult households with four or more dependents (2.9% and 0.5% respectively).

The second salient point to arise from Table 3 is that Indigenous households are much less likely than other households to have exactly two adults in them (45.6% and 66.9% respectively). This confirms that Indigenous people do not conform to the dominant paradigm of a nuclear family 'model' where there is a couple living in a single dwelling.

The only two adult household where Indigenous people are more likely to live than other Australians are those with four or more dependents. This is consistent with the third stylised fact of Indigenous households that they are more likely to have large numbers of dependents living in them. The only households with dependents where Indigenous households were less likely to be concentrated than non-Indigenous households were those with exactly two adults in them, and between one and three dependents. Indeed, Indigenous households were less likely to have two dependents than non-Indigenous households (20.9% and 20.4%), but this minor difference is driven solely by the concentration of non-Indigenous dependents in two adult families.

Indigenous people are disproportionately concentrated in households with three or more adults. More than one-third of Indigenous people live in such households (35.9%). In contrast, less than one-sixth of the non-Indigenous population live in these 'atypical' households (16.5%). A substantial part of this difference arises from particularly large households where there are more than three adults taking care of four or more dependents—6.9 per cent and 0.2 per cent respectively.

Table 3. Percentage of population living in households by composition of adults and dependents, 1996 Census

	Number of dependents					
Number of adults	0	1	2	3	4 or more	TOTAL
	Non-Indigenous					
1	10.6	2.1	2.3	1.1	0.5	16.7
2	27.4	10.5	16.3	8.9	3.8	66.9
3	4.3	1.5	1.5	0.8	0.3	8.5
4 or more	6.0	0.8	0.7	0.2	0.2	8.0
TOTAL	48.4	15.0	20.9	11.0	4.7	100.0
	Indigenous					
1	5.2	3.3	4.1	3.0	2.9	18.5
2	10.0	7.7	10.7	8.8	8.4	45.6
3	3.3	2.5	2.9	2.5	2.3	13.5
4 or more	8.2	2.5	2.7	2.1	6.9	22.4
TOTAL	26.7	16.0	20.4	16.4	20.5	100.0

Note: At the time of the 1996 Census there were 17,536,300 non-Indigenous people and 352,800 Indigenous people counted. These counts are adjusted for non-response and other factors in deriving final estimates of the resident population.

Source: Hunter, Kennedy, and Smith (2002). To recapitulate, Indigenous people are more likely to live in larger households where there are three or more adults and large numbers of children. One important exception to this observation is that Indigenous people are substantially more likely to live in single parent households.[11]

While this paper does not model the costs associated with employment, certain equivalence scales attempt to correct for such costs. For example, the equivalence scale derived from the 1970s Commission of Inquiry into Australian Poverty, sometimes called the Henderson scale, incorporates a separate adjustment depending upon whether the household head is working (Henderson 1975). Indigenous people are much more likely to be living in households where either no one works or only one person is employed. That is, in spite of the fact that Indigenous people are more likely to live in multi-adult households, they are less likely to live with more than one employed person. This follows, more or less directly, from the disproportionate level of joblessness in the Indigenous community and has important implications for the extent of re-ranking from Henderson equivalent income.[12]

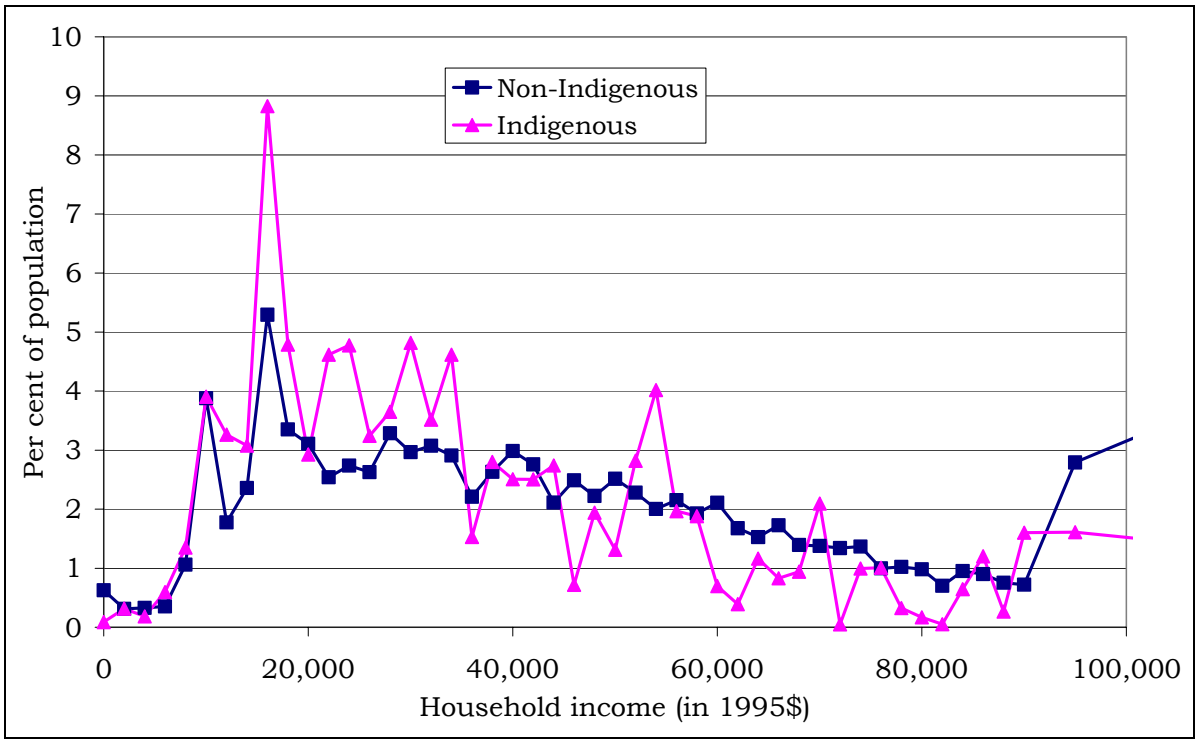
Unpacking the measures of Indigenous and non-Indigenous poverty

Having established that Indigenous households are very different from other households, we now turn to the implications of these differences for income-based studies. Fig. 1

presents the distribution of raw household income for the respective populations. At first glance, the distributions are broadly similar with the exception that there are more people concentrated at the extremes of the distribution for the non-Indigenous population. The fact that more non-Indigenous people have a zero (or negative incomes) has particularly important implications for poverty measurement, which we will return to latter in the paper.

One explanation for the apparent similarity between the distributions is that Indigenous households are bigger, and have more income earners in them (even if they are less likely to be employed). While the relatively small number of Indigenous households in the NHS sample means that a greater variability in their distribution is to be expected, there also appears to many peaks in the low income range of this distribution spaced between four and six thousand dollars apart. This is consistent with several household members independently receiving some basic form and welfare payment. Clearly, there is a need to control for the substantial differences in the size, composition, and nature of households.[13]

Fig. 1. Income distributions of Indigenous and non-Indigenous households, 1995 NHS



Note: The scale for income is truncated at $100,000 and hence does not represent the open-ended category in order to maximise the information about the rest of the distribution. However, the open-ended category is an extrapolation of the line crossing the right hand side of the income scale.

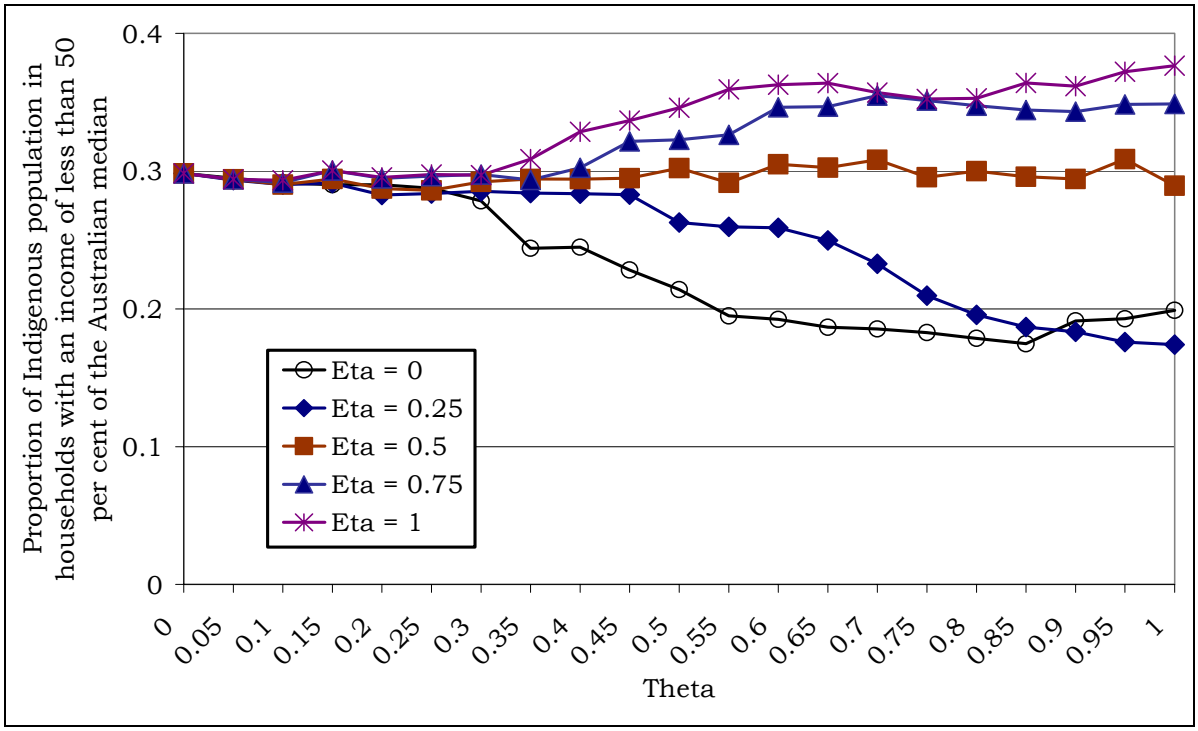
Hunter, Kennedy, and Smith (2002) illustrate how the process of applying equivalence scales has a differential effect on single adult households and multiple adult households with numerous children. The preponderance of large Indigenous households tend to move down the distribution as economies of scale are reduced (i.e. the costs of running large households is assumed to be higher). To some extent, this tendency is counterbalanced by the substantial number of small Indigenous households with only one adult (and few children perhaps) who tend to move up the distribution as one moves away from raw household income. The net effect is that applying equivalence scales to raw income tends to put more Indigenous households into the ranks of the poor. The remainder of this paper uses equation 2 and NHS data to examine this hypothesis on the standard aspects of poverty.

Fig. 2 illustrates how the incidence of Indigenous poverty can be doubled by making different assumptions about the cost of additional dependents. The cost of dependents

seems to matter most when measuring Indigenous poverty, which is not surprising given the large number of children in Indigenous households. In general, the higher the assumed costs of keeping dependents, the larger the number of people who are identified as poor. However, Indigenous poverty is largely unchanged when there are substantial economies of household size (i.e. when *theta* is less than 0.3), irrespective of the costs of dependents (i.e. the value of *eta*).

One observation that can be made about Fig. 2 is that headcount measure becomes more variable as fewer economies of size are assumed (as *theta* approaches 1). The variations in headcount measures are not smooth between the scales because different households are moving in and out of poverty. This is most evident in the line of headcount estimates when *eta* equals zero crosses over the headcount estimates when *eta* equals 0.25 (i.e. when *theta* is increased from 0.85 to 1). That is, where there are few economies of living in larger households, a substantial number of Indigenous households are classified as poor when the child weight is reduced from 0.25 to zero. One possible explanation is the relatively large 'cluster' of multiple-adult Indigenous households with no dependents are classified as poor when *eta* is 0.25, but are not if *eta* is zero. That is, the indirect poverty line effect means that the relative poverty line increases as *eta* is reduced, but the equivalent income of this group does not change because they are not affected by the costs of dependents.

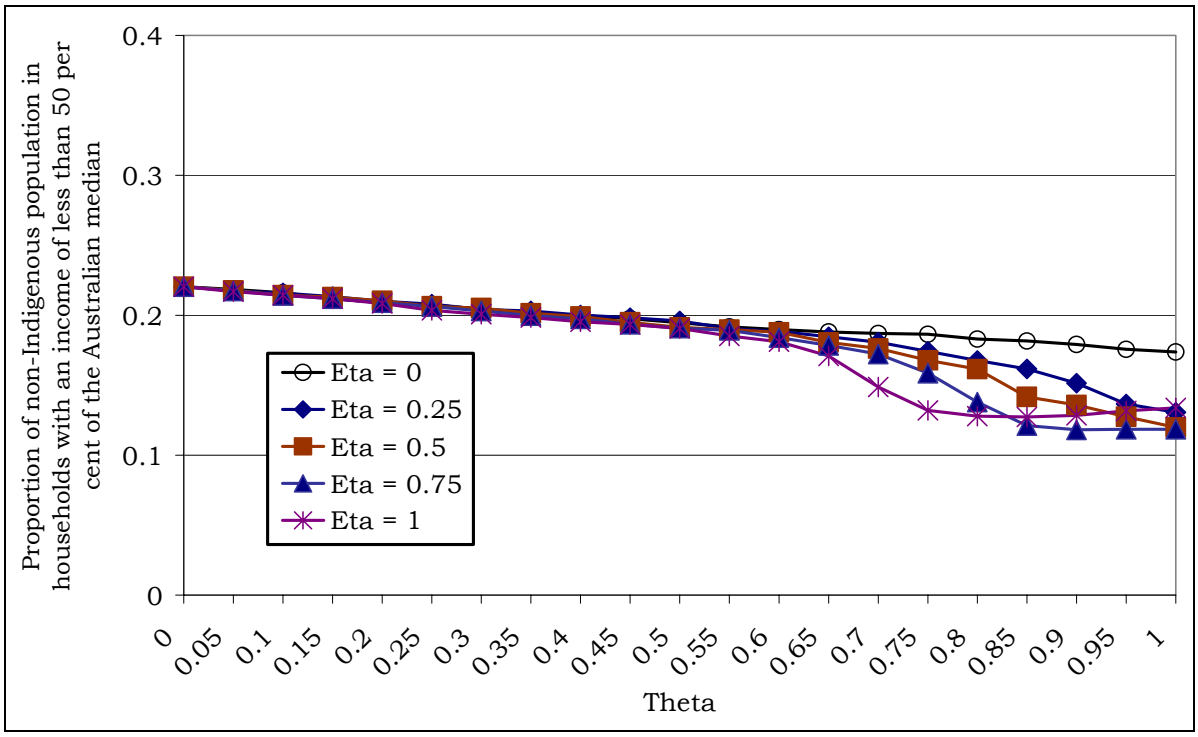
Fig. 2. Headcount measures of Indigenous poverty



For all the values of *eta* and *theta* presented in Fig. 2 and Fig. 3, the headcount ratio for Indigenous is always above that for the non-Indigenous. Another contrast between the headcount measures of Indigenous and other Australian poverty is that non-Indigenous poverty is more stable for the various assumptions about the economies of household size and composition. Indeed, there is little variation in the headcount measure in Fig. 3 until *theta* is greater than 0.7. This is significant because most equivalence scales assume that economies of household size are around 0.7 or slightly less. Therefore the headcount measure of non-Indigenous poverty is not particularly sensitive to the assumptions underlying equivalence scales. However, when the non-Indigenous headcounts diverge, increasing the child weight tends to systematically lower this basic measure of poverty. This manifests itself as a 'threshold effect' whereby an additional group of non-Indigenous people, amounting to about 25 per cent of those classified as poor, are no longer classified

as poor when a small increase in child weight is experienced in conjunction with a small increase in economies of size (i.e. as *theta* is reduced by 0.05). Closer inspection of the income distributions for different equivalence scales showed a large peak in the distribution close to the poverty line. Looking at changes in median income and variances for different scales showed how the distribution compresses as the median falls for higher values of *eta* and *theta* leading to a large number of non-Indigenous households jumping over the poverty line. An examination of the characteristics of this group showed them to be in the main older pension recipients whose income does not fall as fast as the poverty line.

Fig. 3. Headcount measures of non-Indigenous poverty



There is little or no systematic variation in the income gap for Indigenous respondents (Fig. 4) especially with regards to a change in the costs of dependents. However, there is some decline in the income gap as *theta* increases. To the extent that the Indigenous headcounts are increasing, because people close to the poverty line are now being included amongst the poor whilst those at the bottom of the distribution are maintaining their income these small declines in the income gap measures are to be expected. In addition as the distribution of equivalised income shrinks with higher values of *eta* and *theta*, we would expect the income gap to fall (see Coulter, Cowell & Jenkins 1992: 1075–7).

As with the Indigenous income gap measures, Fig. 5 illustrates that the non-Indigenous income gaps tend to decline as *theta* is increased. However, for values of *theta* greater than 0.65, the resulting income gaps become greater for higher values of *eta*. This is associated with the threshold effect shown in Fig. 3 whereby a large group of people close to the poverty line move out of poverty.

Fig. 4. Income gap measures of Indigenous poverty

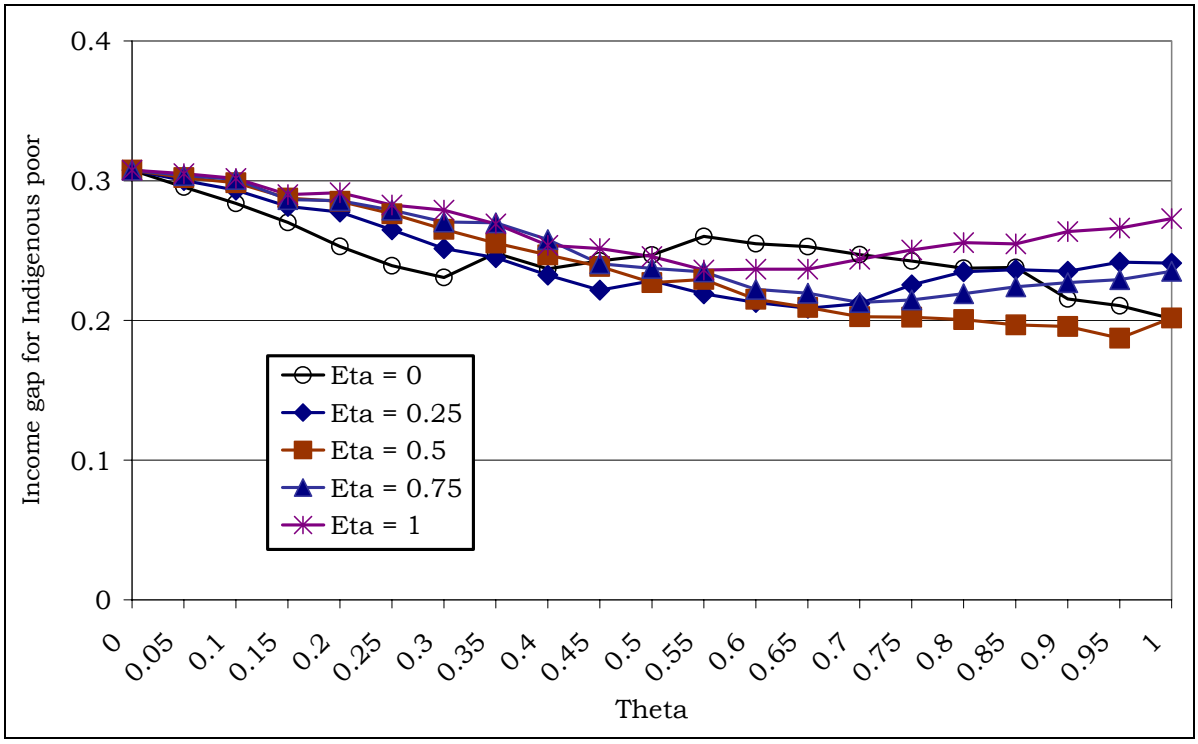
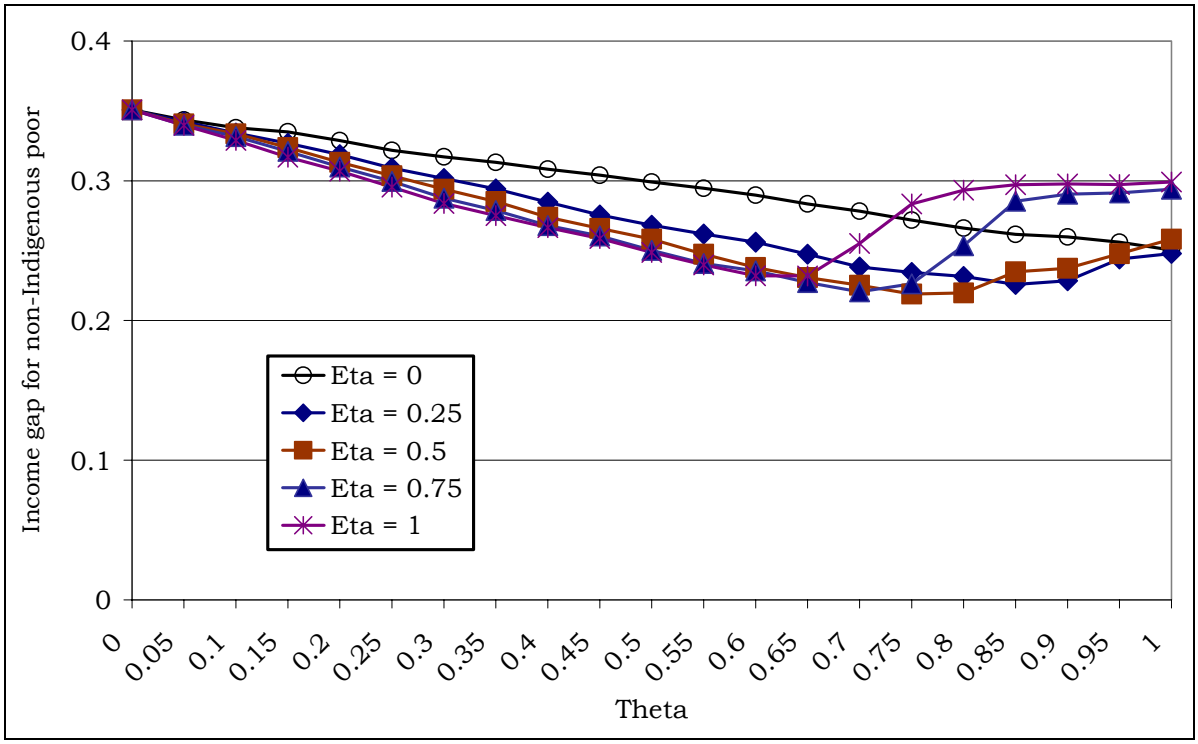


Fig. 5. Income gap measures of non-Indigenous poverty



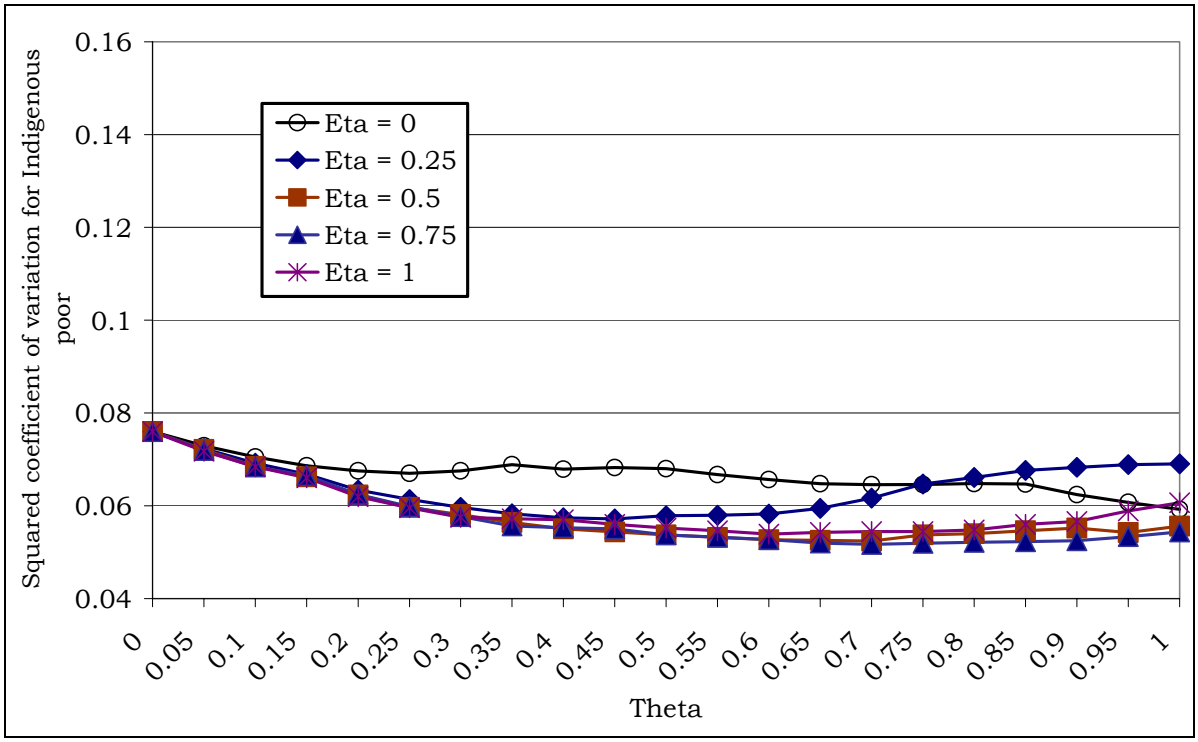
There is not much systematic variation in the coefficient of variation for Indigenous respondents (Fig. 6). That is, inequality amongst the Indigenous poor is reasonably small and hence their incomes are somewhat compressed. One plausible explanation is that many of the Indigenous poor are now covered by the social security system (although this has not always been the case, see Altman & Sanders 1994). Furthermore the 'threshold

effect' in the non-Indigenous coefficient of variation estimates mirrors that evident for headcounts (especially for *theta* >0.6).

While Indigenous poverty measured by headcounts is always higher than non-Indigenous poverty, this is not true of the income gap and squared coefficient of variation measures of poverty. The comparison of Fig. 4 and Fig. 5 shows that, if anything, non-Indigenous Income gaps are higher than the analogous Indigenous measures and Fig. 6 and Fig. 7 show that non-Indigenous coefficients of variation are much higher than that for the Indigenous population. One explanation for this is the relatively large numbers of non-Indigenous people in households with either a zero or negative income. Such incomes will become an increasingly important component of the income gap and income inequality among the poor as the headcount falls.

The components are roughly offsetting resulting in an overall FGT poverty index of a roughly similar magnitude for the Indigenous and Non-Indigenous.

Fig. 6. Squared coefficient of variation measures of Indigenous poverty



The FGT measures for the Indigenous population are less volatile than for the partial measures of poverty reported above. This is in the nature of such composite measures, which enable analysts to rank a more complex set of household circumstances than is possible using partial measures (e.g. see Zheng 2000).

The patterns in Fig. 8 can be related to the analysis in Coulter, Jenkins and Cowell (1992). The indirect poverty line effect appears to dominate for most values of the *eta*. However, a U-shaped curve of poverty does result for *eta* greater than 0.5 as the indirect poverty line effect dominates for some values of *theta* and *eta*, but not others.

Fig. 7. Squared coefficient of variation measures of non-Indigenous poverty

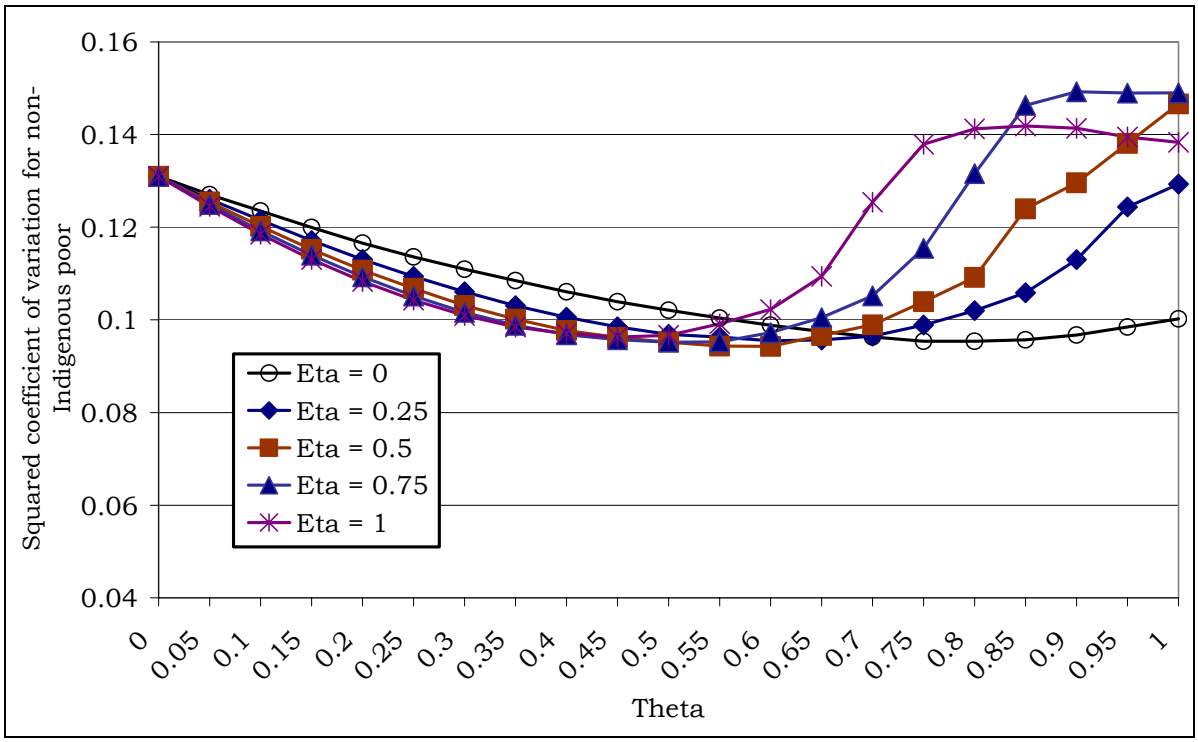


Fig. 8. FGT measures of Indigenous poverty

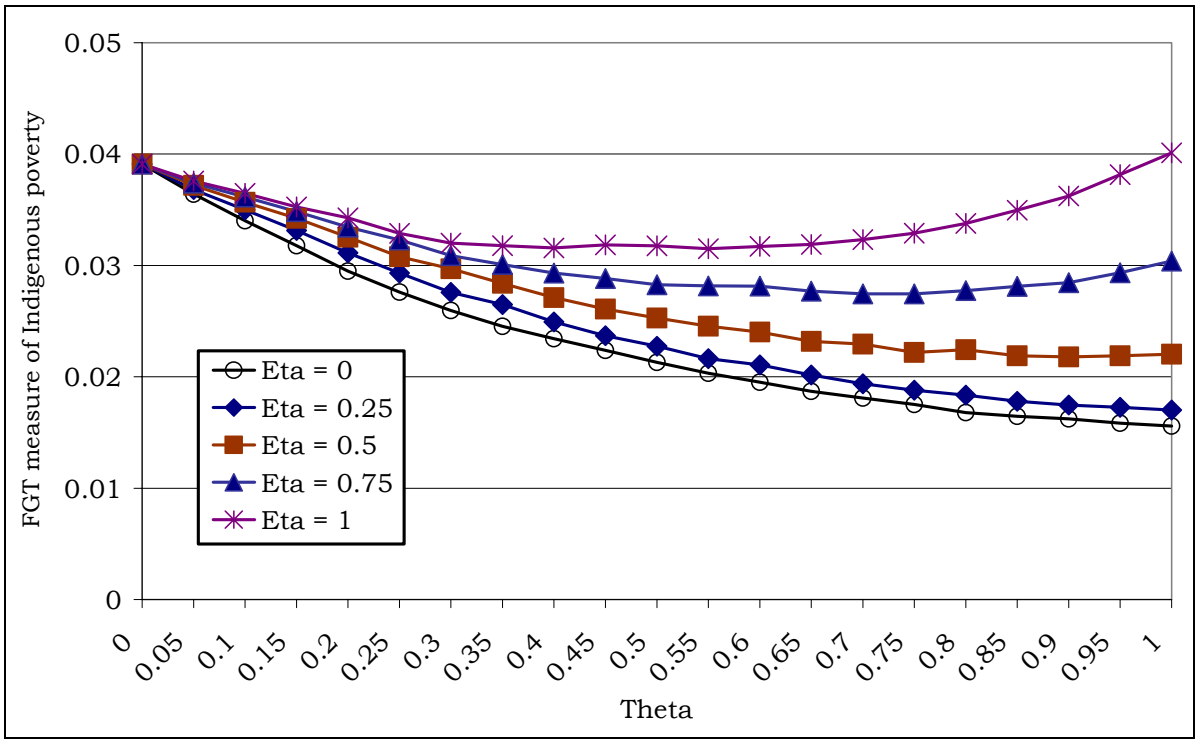
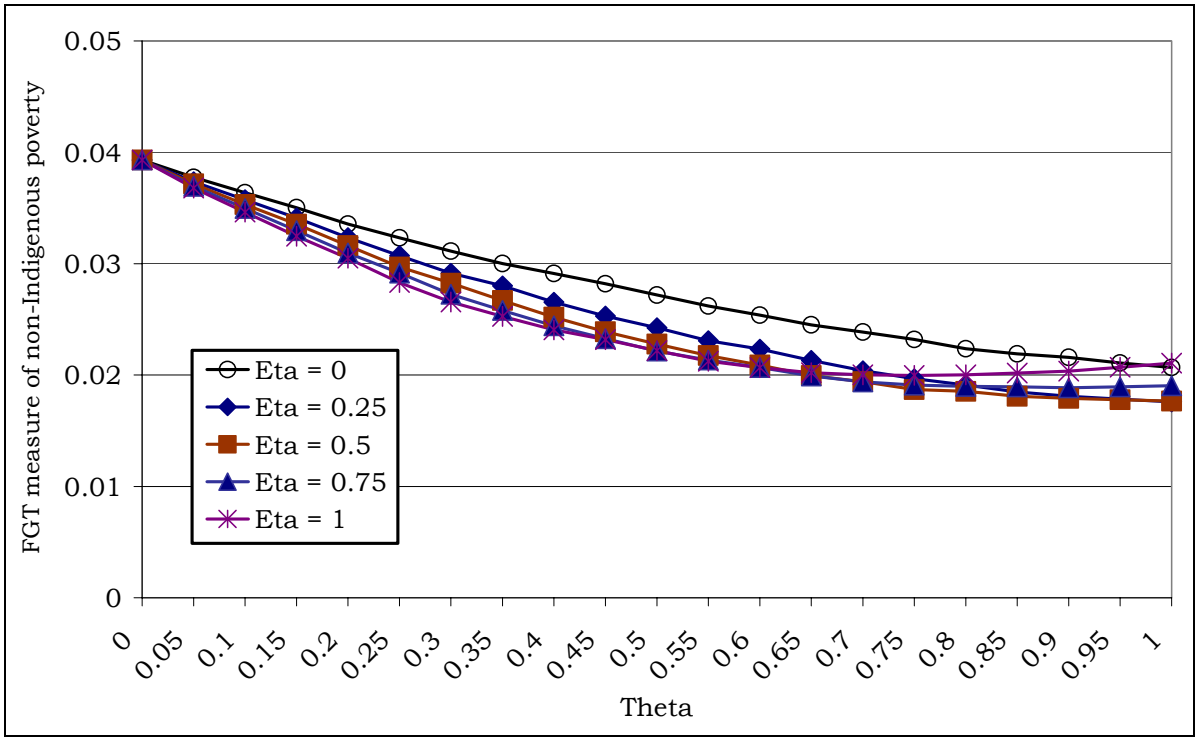


Fig. 9. FGT measures of non-Indigenous poverty



The FGT measures do not show much variation for the different values of *eta* for non-Indigenous population (Fig. 9) because of the offsetting patterns of the headcount versus the income gaps and coefficients of variation. That is, the first 'I' of poverty works against the second two 'I's'. There is, however, a systematic decline in the estimated FGT as *theta* approaches one. This is due to a number of factors including a smaller distribution of equivalised income for higher values of *theta* and *eta*.

The relationship between household economies and poverty are more U-shaped for Indigenous households than for other households, presumably because of the greater effect of the changing poverty line on that population (i.e. because of the indirect poverty line effect in Coulter, Cowell & Jenkins 1992: 1075).

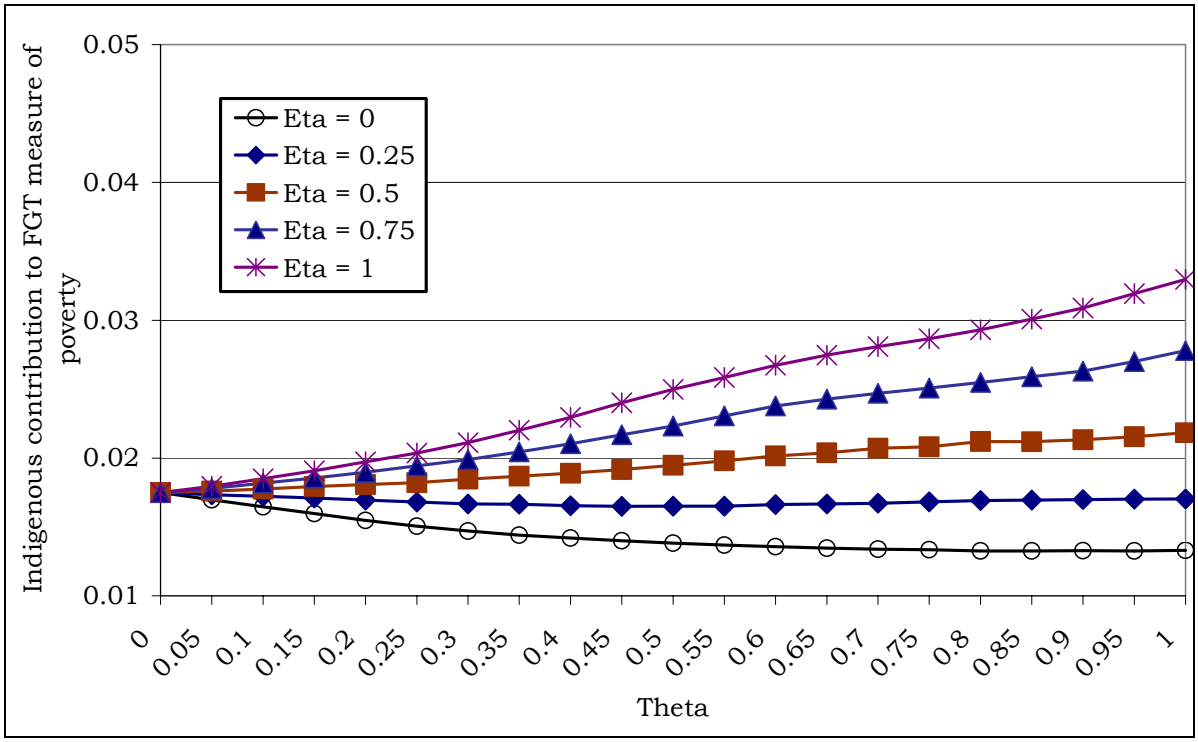
Indigenous contribution to overall poverty measures

The advantage of using the FGT measure is that, unlike those derived by Sen using Gini coefficients; it can be decomposed into the contribution to overall poverty from the Indigenous and non-Indigenous sub-populations. Fig. 10 reports the headline result of this paper that the contribution of Indigenous poverty depends crucially upon the assumptions of economies of household size and composition embodied in the equivalence scales. When there are perfect economies for living in larger households (i.e. larger households cost the same to maintain as smaller households), the contribution of Indigenous poverty is similar to the proportion of Indigenous people in the underlying population. However, if there are no economies of living in larger households, and therefore per capita income is used, the proportion of poverty arising from Indigenous households is almost doubled to about 3.4 per cent. Interestingly, there is no crossing of lines and the pattern of variation of Indigenous contribution is reasonably smooth and almost completely monotonic in relation to the various equivalence scale parameters.

The other feature of Fig. 10 is that the Indigenous contribution to FGT poverty is very sensitive to the assumption about the costs of children. This should not be surprising since Indigenous households are much more likely to have large numbers of children. This is underscored by the fact that totally discounting the cost of children (i.e. assigning an *eta* of zero) leads to a small decline in the Indigenous contribution to overall poverty. Despite the

substantial numbers of Indigenous households with more than two adults, the intrinsic heterogeneity in this population means that the effect of the disproportionate number of single adult Indigenous households seems to dominate when *eta* equals zero.

Fig. 10. Indigenous contribution to FGT



It is possible to attribute the Indigenous contributions to the differences in headcounts and income gaps between the populations for the respective equivalence scale parameters (Fig. 11 & Fig. 12). The Indigenous contribution to overall poverty (as measured by FGT) is almost entirely due to the differences in headcounts for the respective populations. While the pattern across the various assumptions of economies of household scale is not entirely smooth (or monotonic), it is very similar to that in Fig. 10. Indeed, the choice of child weights can increase the Indigenous contribution to headcounts by a factor of 2.5. This is of course at one of the extreme values of *theta*, although as mentioned earlier these are values occasionally used by researchers. One difference between Fig. 10 and Fig. 11 is that the contribution to headcounts is always above the proportion of the population who are Indigenous. Consequently, the implication is that income gaps (and by implication coefficients of variation) are dragging Indigenous poverty towards the Australian average.

The percentage Indigenous contribution to the total income gap is fairly constant, and generally below the Indigenous representation in the underlying population (Fig. 12). The effect of *eta* (child weight) has a much larger effect on the Indigenous contribution to the headcount measures than on income gaps, and, as indicated above, this ultimately affects the FGT measure. That is, there is no discernible pattern in the variation in the Indigenous contribution to income gaps across the various equivalence scale parameters.

Fig. 11. Indigenous contribution to headcount

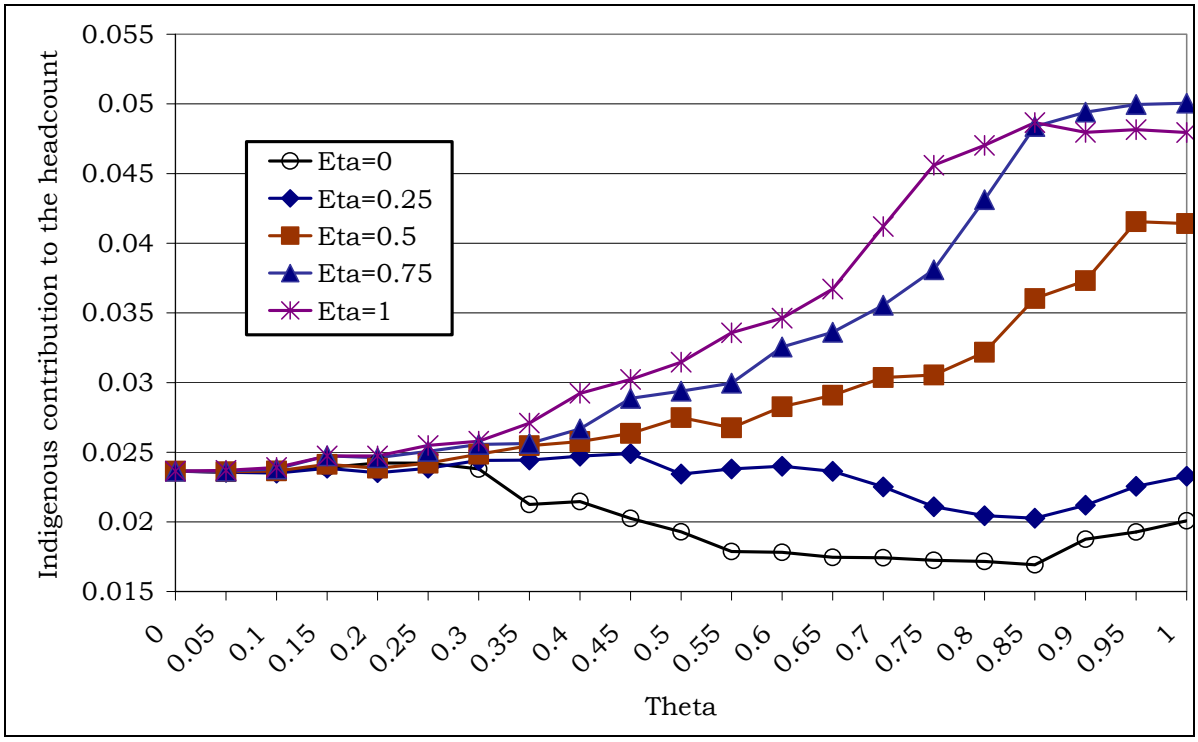
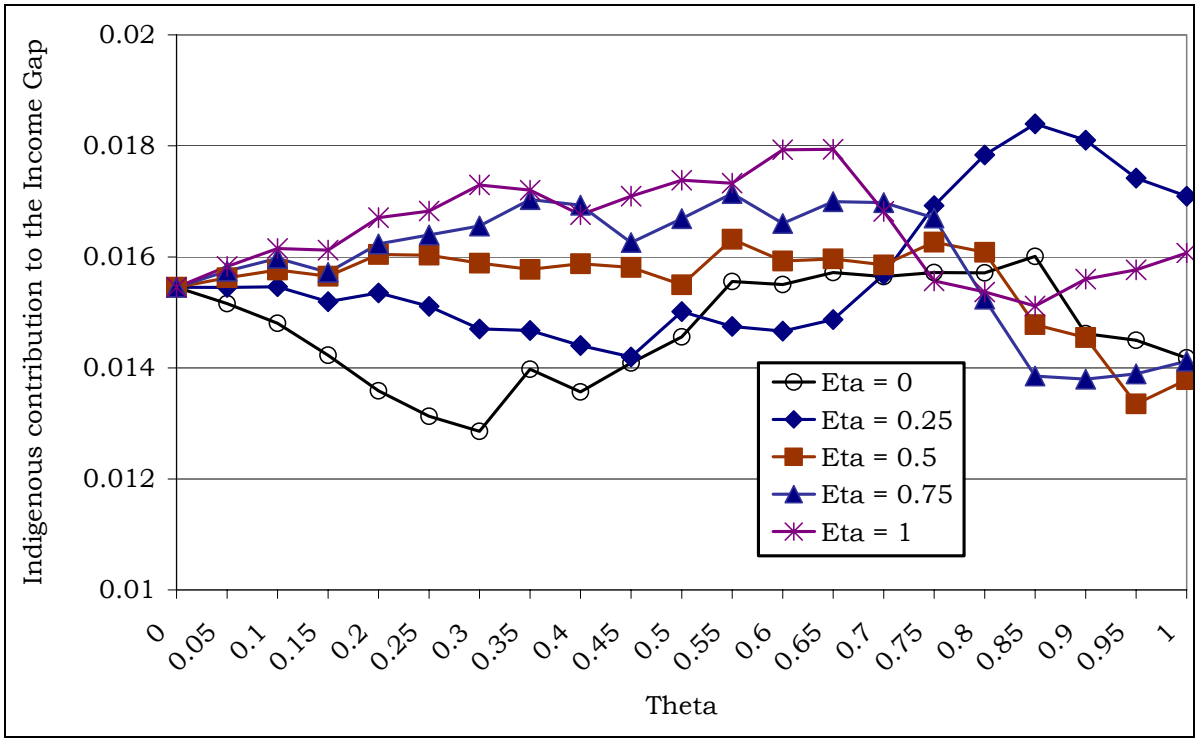


Fig. 12. Indigenous contribution to the income gap



The impact of zero and negative income

A significant proportion of people in the NHS reported either negative or zero income. It is reasonable to expect that many of these people are either dis-saving due to lifecycle factors or maintaining the household by other means. In the context of Indigenous poverty, this question may not be viewed as important because very few Indigenous households have a

zero or negative income. However, when assessing the incidence of Indigenous poverty relative to non-Indigenous poverty this issue becomes important because of the likely distortions in non-Indigenous poverty.

Why are the income gap and squared coefficient of variation lower for the Indigenous population compared to that for other Australians? Closer inspection of income distributions reveals relatively large numbers of zero and negative incomes for the non-Indigenous populations.[14] Thus, the poor non-indigenous income distribution is somewhat bimodal. If these very low incomes are under-reported, transient and temporary as a result of life cycle factors, then it could be argued that people in such household should not be classified as poor.

Table 4 reports the characteristics of households with zero or negative income relative to other households. As indicated above, few Indigenous households have zero income—only 0.4 percent of people in households that reported zero income were Indigenous. Of the households reporting a negative income, none contained Indigenous people. The converse of this is that households with Indigenous people were more likely to have a positive income.

Table 4. Household characteristics by broad income range, 1995

Contains one or more adult in the household	Negative income	Zero income	Positive income	Total
	Percentage of income group			
Indigenous	0.0	0.4	2.1	2.1[a]
Aged 65 years or more	2.9	9.2	10.7	10.7
Self employed	27.7	7.1	6.4	6.5
Private health insurance	23.5	19.1	23.0	23.0
	Average no. per income group			
Average no. of adults	2.1	1.6	2.1	2.1
Average no. of children	1.5	0.4	1.2	1.2
Sample	151	91	44 642	44 884
Weighted population	58 899 (0.4%)	31 605 (0.2%)	14 549 399 (99.4%)	14 639 903 (100.0%)

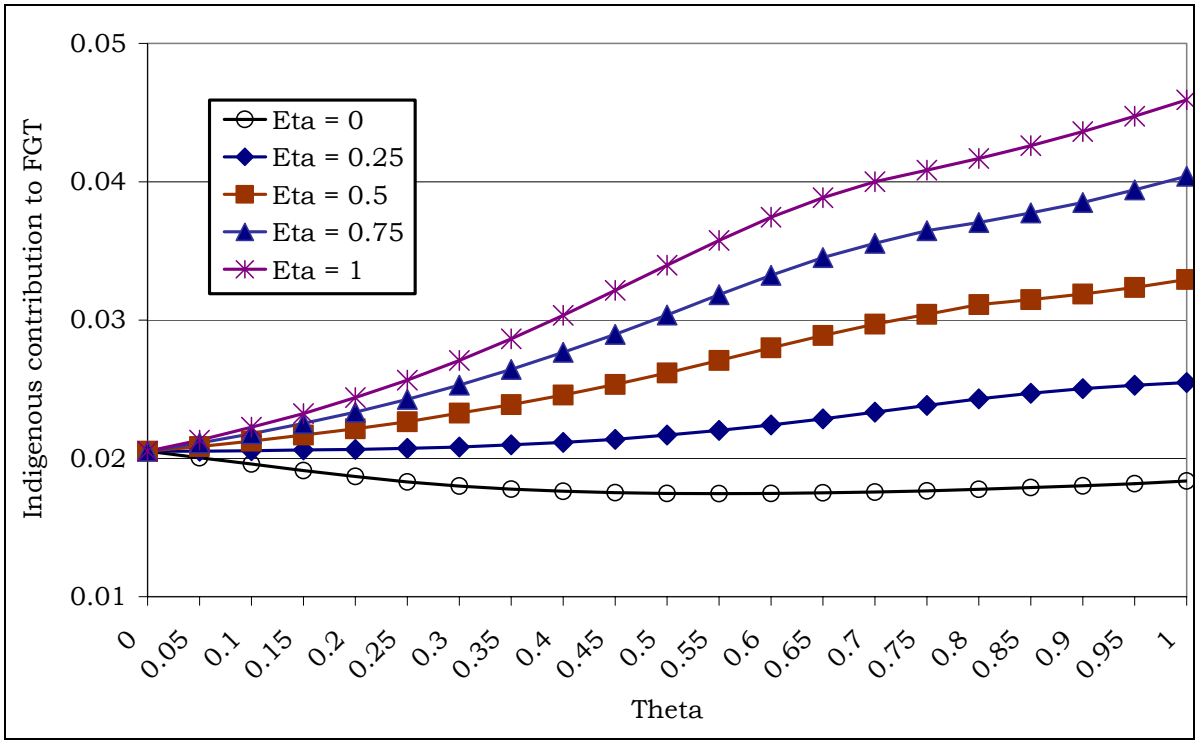
Note: a. The percentage of total population in each income range is reported in brackets. The estimate of total Indigenous population (i.e. 2.1%) is based on all persons in a household, which include at least one Indigenous person. Consequently, the percentage of people in Indigenous households is greater than the percentage of Indigenous people in the underlying population (1.8% of population in Table 1), because the former includes some non-Indigenous people.

The other characteristics of the households with zero or negative income are equally revealing. Households with negative income are about four times less likely to be aged 65 years and over than in other households. Self-employment is particularly prevalent among such households (with 27.7 per cent as opposed to 6.5 per cent being so employed). People in households with negative income were slightly more likely to have private health insurance than the average households (23.5 per cent as opposed to 23.0 per cent). In contrast, households that indicate they have no income are only slightly more likely to be self-employed and less likely to have private health insurance than households with positive incomes. Given that it is relatively expensive to purchase health insurance coverage, such households are unlikely to be disadvantaged.

Another indication that there is heterogeneity in the households classified as having zero income in the above analysis is that there are fewer residents in the households with no income compared to those with a negative income. Not only are there fewer adults on average in such households (1.6 as opposed to 2.1) but they have fewer children (0.4 as opposed to 1.5). Households with negative income have a similar number of adults and actually more children than the average household in the whole NHS. Households with negative incomes must either be in particular distress (given that it is costly to maintain more people), or their income does not reflect their economic situation.

We examined the sensitivity of our conclusions to the above results by re-estimating poverty after households with zero and negative incomes were excluded. Once zero (and negative) incomes are excluded, the FGT index now is greater for Indigenous for all representations of equivalence scales presented (Fig. 13). The effects of headcounts and income gaps (and coefficient of variation) are no longer offsetting. The net effect is that the Indigenous contribution to overall poverty (as measured by the FGT) is greater and closer to the magnitudes of the Indigenous contribution to headcounts. Not only is the Indigenous contribution to poverty greater than their representation in the population, but the dispersion of poverty measures is substantially greater. The choice of the assumption about the costs of dependents again becomes crucial and can increase the contribution of Indigenous poverty by a factor of 2.5. Note that the variation is of a similar magnitude in the range of parameters implied by the widely used equivalence scales in Table 1.

Fig. 13. Indigenous contribution to FGT (0's excluded)



There is still a threshold effect for the non-indigenous population where the headcount at one point falls dramatically and the income gap and coefficient of variation rise.

The effect of excluding zero and negative incomes has the effect of increasing Indigenous poverty vis-à-vis other poverty because relatively few Indigenous households are in this income range. One reason for this is the disproportionately low number of self-employed in the Indigenous population—which is sometimes taken to be sign of social exclusion (Arthur 1999; Commonwealth of Australia 1998; Hunter 1999). The measures of income poverty that exclude very low incomes are in line with expectations based on the depth and historic nature of much Indigenous disadvantage (Altman 2001).

Benchmarking the results to using alternative poverty lines

The above method of calculating relative poverty lines is commonly used in Australian studies (Greenwell, Lloyd & Harding 2001). However, there are other ways of constructing a poverty measure. Citro and Michael (1995) calculate the poverty line as a proportion of a reference group median income and then adjust this poverty line using the equivalence scale so that particular household types have a different poverty line.[15] In this section, this technique is used to test the sensitivity of the above results.

The patterns of poverty across the various parameters are very similar if one compares our estimates to that based on the Citro and Michael technique. For example, the range of the ratios of Indigenous to non-Indigenous headcounts using our technique was 1.4 (raw income) to 2.8 (per capita income).[16] The use of the US style procedure resulted in a virtually identical range of ratios of Indigenous to non-Indigenous headcounts. In Ross and Mikalauskas (1996), the ratio of the Indigenous to non-Indigenous headcount measures for all families with children was 2.4 in 1991, which is well within the range of measures for the other two approaches. These sensitivity tests illustrate that the findings are not altered by using an alternative technique for adjusting relative poverty lines.

Who are the poor?

The above results clearly demonstrate that the choice of equivalence scale clearly matters for poverty measurement, especially when the focus is on important sub-populations. That is, the composition of poor is radically different depending upon which scale is used. This section further highlights these compositional issues by estimating who is poor when various equivalence scales are used to estimate the incidence of poverty. The results in this section only illustrate the effect of equivalence scales on the composition of the poor remembering that the measure of income used in this paper does not allow us to make direct welfare comparisons. We illustrate compositional issues by using a basic probit model to estimate whether an individual is classified as poor when household costs are based on four sets of equivalence scale parameters spanning the plausible range of values.

The probability of being in poverty is explained in terms of the marginal effects of several demographic, ethnic and geographic variables. Some of these variables may also capture aspects of income measurement that are subject to error. Marginal effects (ME) are measured relative to a reference person defined as a non-Indigenous male whose NHS interview was conducted in English, was born in Australia, was aged between 25 and 64 years, and who lived in a capital city household where there are two adults and no dependents.

The sets of parameters are designed to capture situations where low, medium, and high economies of scale are assumed by setting *theta* equal to 0.25, 0.5 and 0.75 respectively. Since the parameter associated with the costs of dependents has an analogous interpretation (i.e. in terms of the relative costs of larger households), *eta* is set to the same values. However, the sensitivity of the composition of poor to the assumptions about *theta* can be captured by also estimating a probit model when *theta* and *eta* are set at 0.75 and 0.25 respectively. Note that these parameter values are not very different from those used in standard scales cited in Table 1.

The 'goodness-of-fit' statistic in Table 5 (i.e. the pseudo R^2) is lower for the higher values of *theta* because of the fanning out evident in the above graphs, with various child weights resulting in very different measures of poverty. That is, the diversity of circumstances facing families means that as the costs of children become more important (with the associated lower economies of scale) a single scale is less likely to cover a range of circumstances. This is also confirmed by the fact that the marginal effect of variables for the number of adults and children were so significant.

Table 5. Marginal effects (%) of the probability of being in poverty under various equivalence scale parameters

	Equivalence Scale (*Theta*=0.25, *Eta*=0.25)		Equivalence Scale (*Theta*=0.5, *Eta*=0.5)		Equivalence Scale (*Theta*=0.75, *Eta*=0.75)		Equivalence Scale (*Theta*=0.75, *Eta*=0.25)	
	Marginal effect	Standard error	Marginal effect	Standard error	Marginal effect	Standard error	Marginal effect	Standard error
Indigenous	9.8	(1.3)	12.1	(1.3)	16.2	(1.3)	10.2	(1.2)
Female	2.3	(0.4)	1.6	(0.3)	0.9	(0.3)	1.0	(0.3)
Aged 0 to 14	4.3	(0.6)	4.0	(0.6)	4.2	(0.5)	2.6	(0.5)
Aged 15 to 24	1.9	(0.6)	1.3	(0.6)	1.6	(0.6)	0.5	(0.6)
Aged 65 and over	37.6	(0.9)	30.4	(0.9)	15.9	(0.8)	28.0	(0.9)
Adults 1	29.7	(0.7)	26.9	(0.6)	21.0	(0.6)	12.1	(0.6)
Adults 3+	-15.7	(0.3)	-12.9	(0.4)	-9.2	(0.4)	-9.2	(0.4)
Kids 1	-3.3	(0.5)	-1.8	(0.5)	3.0	(0.6)	-4.1	(0.5)
Kids 2	-6.8	(0.5)	-3.9	(0.5)	4.3	(0.6)	-7.2	(0.4)
Kids 3+	-8.1	(0.5)	-1.3	(0.6)	14.2	(0.7)	-4.1	(0.5)
Non-capital city	6.3	(0.4)	5.4	(0.4)	4.8	(0.4)	5.4	(0.4)
Interview not English	14.5	(1.1)	15.2	(1.1)	16.3	(1.0)	16.0	(1.0)
Born overseas	3.2	(0.5)	2.9	(0.5)	2.5	(0.5)	2.5	(0.5)
Pseudo R^2	0.245		0.186		0.125		0.137	
LR chi2(13)	10,936		8,033		4,959		5,527	
Log likelihood	-16,857		-17,542		-17,343		-17,413	

Notes: Omitted Variables: Adults 2, Kids 0, Aged 25 to 64, non-Indigenous, not born overseas, no people in household self employed, doesn't live outside a capital city, interview conducted in English.

After taking into account household composition, the influence of the lifecycle, and other factors related to income measurement, the Indigenous are still more likely to be poor as indicated by positive marginal effects. When the economies of household size are relatively high (i.e. low values of *theta* and *eta*), Indigenous people are 9.8 percentage points more likely to be poor. In contrast, when *theta* and *eta* are increased, the marginal effects increase significantly to 16.2 percentage points. However, if the value of *eta* were kept at 0.25, the effect of Indigenous variable on the incidence of poverty reduces to 10.2 percentage points. The Indigenous composition of the poor is significantly different between each set of equivalence scale parameters.

The proportion of poor who are Indigenous is a relatively minor issue compared to the other compositional changes. For example, the largest change in marginal effects is for households with three or more dependents, which changes from a marginal effect of –8.1 to 14.2 percentage points between the low *theta* and high *theta* households—a difference of 22.3 percentage points. However, the main dynamic is the child weight as the marginal effect for this variable is again negative when the value of *eta* is reduced to 0.25 (*theta*=0.75). In a sense, this could be considered a validation test of the set of equivalence scales. Given that one would expect such households to be under some economic stress, one would expect the marginal effect to be positive unless the welfare system had over-compensated for the labour supply disadvantages of such households.

In contrast, sole adult households tend to always have a positive marginal effect—that is, they are more likely to be counted as poor than two adult households. When *theta* and *eta* are equal to 0.25, sole adult households are 29.7 percentage points more likely to be in poverty. The effects of living in such households are significantly less as the value of *theta* is increased. Given that the effect of this variable drops by almost one half to 12.1 percentage points when the child weight is reduced from 0.75 to 0.25, a great deal of this reduction is probably due to sole parent families. The other side of this issue is that living with three or more adults significantly reduces the probability of being in poverty by between 9 and 16 percentage points.

One of the biggest marginal effects is for those aged 65 and over who are as much as 37.6 percentage points more likely to be in poverty when *theta* and *eta* equals 0.25. This falls to as low as 15.9 percentage when both parameters equal 0.75. The incidence of poverty in this group is remarkably sensitive to variations in the child weight parameter, *eta*—the probability of being poor increases by about 12 percentage points as *eta* is increased from 0.25 to 0.75. As noted earlier, this is due to a threshold effect that arises as the distribution of equivalised income contracts with high values of eta and theta. Notwithstanding such variations, older people are a significant component of the poor.[17]

The other marginal effects tend to be relatively minor. For example, while females are significantly more likely to be in the ranks of the poor, the magnitude of the marginal effects are small at about 1 percentage point.

Even where the marginal effects of other variables are substantial, they do not vary much with variations in the assumptions about economies of household scale. For example, the effect of the variable, 'NHS interview not in English' is about 15 and 16 percentage points, irrespective of the equivalence scale parameters. Similarly, being born overseas and living outside capital cities increases the likelihood of being poor by about three and six percentage points respectively. There are no significant differences in the marginal effects for the different values of *theta* and *eta*.

Note that the larger marginal effects are of a similar order of magnitude to the actual headcount, and hence the compositional variations between equivalence scales are serious. As a matter of principle, equivalence scales should be consistent with other evidence about the economic stress facing particular types of households. That is, if the composition of poor is at variance with our (well-informed) expectations, then one should reflect on the validity of the equivalence scale used. Unfortunately, unless accurate expenditure data can be obtained, it is easier to highlight the problem than do something about it.

Concluding remarks

One of the key findings of this paper is that equivalence scale choice matters! This is most clearly evident in the fact that variations in the assumption about the costs of children have a more pronounced effect on Indigenous poverty. While Indigenous poverty (FGT) is generally higher than that in the non-Indigenous population, the Indigenous contribution to poverty is as much as two-and-a-half times larger when children are assumed to cost as much as adults (compared to when they cost nothing). Furthermore, Indigenous headcounts are between 10 and 16 percentage points higher than non-Indigenous headcounts after controlling for other factors, with the larger differentials being associated with higher child weights in the equivalence scales. These variations in poverty are statistically significant and indicate the importance of ensuring that equivalence scales reflect the circumstances of a diversity of family types and cultures. Unfortunately, this is not a trivial exercise, especially when the sub-population of interest is only a small proportion of the overall population.

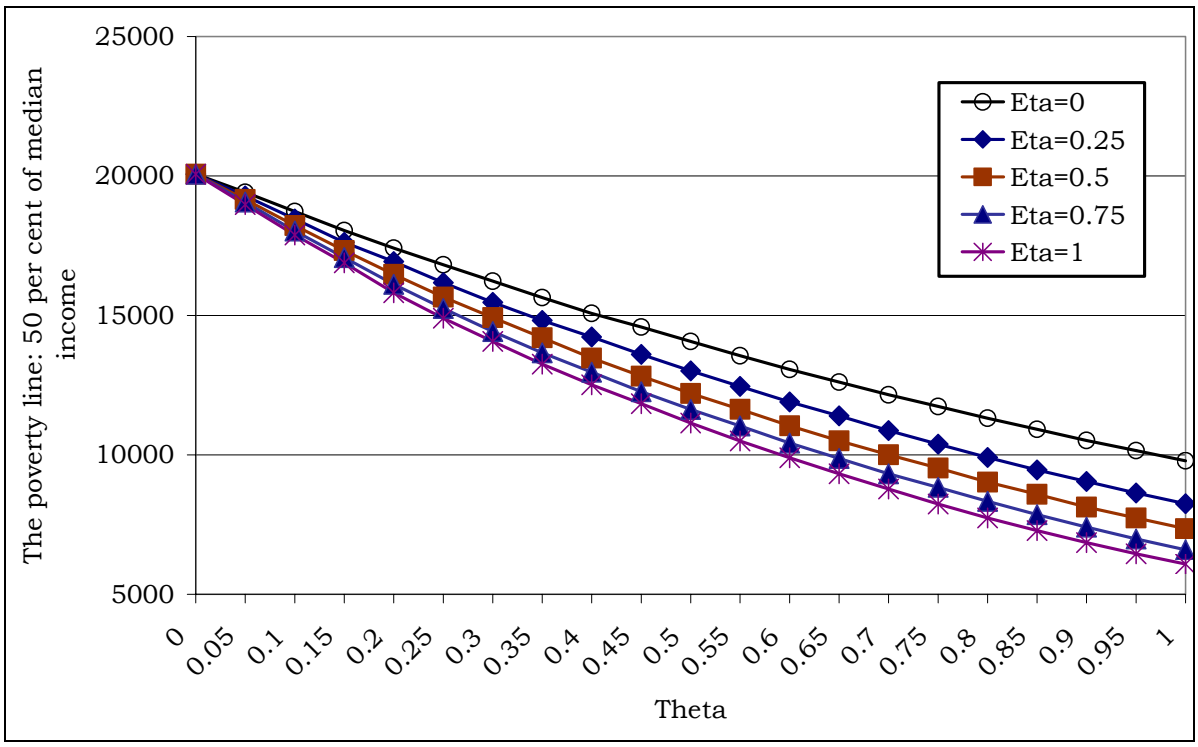
The use of the same equivalence scales for Indigenous and other Australians is clearly problematic (Altman & Hunter 1997). Unfortunately, the assumption is routinely made and is probably the only one practicable in the short-run. If one wanted to model a separate equivalence scale for the two groups, detailed expenditure data for Indigenous and other Australians would be required.[18] To date there has not been a comprehensive study of Indigenous household expenditure patterns.[19] This is unlikely to occur in the near future because of intrinsic methodological constraints and the substantial cost of over-sampling Indigenous respondents.

One often ignored element of poverty measurement debates is that sub-populations are affected differently by various poverty measures, and such effects may be subsumed in the more sophisticated measures. This paper demonstrates that the intensity and inequality of poverty can offset the incidence of poverty. Such offsetting effects are an important component of the substantial variations in the Indigenous contribution to overall poverty. Given that the intensity and inequality of poverty may be driven by the substantial

numbers of (mostly non-Indigenous) people living in households with a zero or negative income, this reflects on the accuracy of composite measures of poverty. If income measurement issues are prevalent, then headcounts may actually give a more accurate picture of Indigenous poverty.[20] That is, the desirable properties of composite poverty measures may be less important when such measures are likely to result in distorted poverty measures dominated by issues in measuring income (and the accurate specification of household economies in the underlying model). Even though the more sophisticated measures allow the analyst to rank the circumstances of more households this is not sufficient justification for their use in all situations.[21] Ultimately, it may be more useful to have a greater focus on the identification end of the process of poverty measurement rather than on aggregation issues.

Appendix A. Poverty lines and inequality for overall distribution, 1995

Fig. A1. Poverty lines calculated as 50 per cent of the median income



Appendix B. Descriptive statistics for probit regressions of incidence of poverty

	Mean	Standard Deviation
Poor (*theta*=0.25, *eta*=0.25)	0.198	0.398
Poor (*theta*=0. 5, *eta*=0.5)	0.186	0.389
Poor (*theta*=0.75, *eta*=0.75)	0.161	0.368
Poor (*theta*=0.75, *eta*=0.25)	0.166	0.372
Female	0.513	0.500
Age 0 to 14	0.240	0.427
Age 15 to 24	0.142	0.349
Age 65 and over	0.103	0.304
Indigenous	0.032	0.175
Adults 1	0.162	0.369
Adults 3+	0.193	0.395
Kids 1	0.163	0.369
Kids 2	0.232	0.422
Kids 3+	0.174	0.379
Non-capital city	0.310	0.462
Interview not English	0.067	0.249
Born overseas	0.215	0.411
Number of observations	44,883	

Notes

1. Tsumori, Saunders and Hughes (2002) make three main criticisms of National Centre for Social and Economic Modelling's (NATSEM's) analysis of trends in recent Australian poverty for The Smith Family: First, relative measures of poverty are different from the lay interpretation of poverty, which is more aligned with absolute measures of poverty; Second, if one must use a relative measure, a poverty line based on one half of the median income is more robust than one half of the mean or average income; and Third, income data is more problematic for measuring poverty than expenditure data, inter alia, because of measurement error (i.e. under-reporting) for people on low income, especially those who indicate they have an income less than or equal to zero. While the relevant sections of this paper reflect on such issues, the penultimate section of this paper illustrates the importance of the third issue.
2. In addition to the alliteration in some of above references, there are many instances in poverty measurement debates including John Quiggin's opinion piece in the *Australian Financial Review* (31 January 2002), 'Poverty is such a rich issue'.
3. Greenwell, Lloyd, and Harding (2001) also focus on the how a poverty line should be indexed over time because they are interested in trends in poverty. In contrast, this paper only uses one source of data because that is the only one available with sufficient number of Indigenous respondents to make meaningful statements.
4. In addition to being culturally inappropriate, income units frequently generate distributions of equivalent income, which do not accord with widespread consensus about Indigenous income.
5. One problem with relative poverty lines is that poverty can fall in downturns as the income distribution shrinks (Myles & Picot 2000). However, there are also problems in establishing trends in absolute poverty lines such as ensuring that it is relevant to the expectations on today's society. While the focus on relative poverty lines in this paper is arbitrary, it is justifiable on the grounds that we are analysing cross-sections at a point in time. Note that the deviation of absolute and relative poverty lines becomes a more important issue when updating poverty lines (Foster 1998).
6. This revolves around the nature and extent of economies of scale in families or households—the smaller the proportion of expenditure on items which display economies of scale, the more justifiable it is simply to divide family or household income by the number of people it supports

(i.e. express income in per capita terms—see Guobao, Richardson & Travers 1996). When income levels are very low, a high proportion of expenditure is on food, basic clothing, cooking fuel and certain health expenditures. Given that each of these varies directly, and quite closely, with the number of people in the family it may make it appropriate to give each person a similar weight by focusing on per capita income. In contrast, where so-called 'public goods' (i.e., where a certain expenditure improves the wellbeing of all residents and not only the person consuming the resources) are important, more account needs to be taken of potential economies of scale implicit in the equivalence scales. At the other extreme to the per capita measure is raw income, which implicitly assumes that extra family members cost no more to maintain than the first person. While this assumption is obviously untenable it provides a useful bound on possible assumptions about economies of scale.

7. See Trigger (2000) for a detailed analysis of the effect on overall Australian poverty.
8. The data on visitors was frequently incomplete because the ABS did not collect data on people who were not usual residents. The data quality and comparability of data in remote areas has been questioned, especially in the context of the NHS (Altman & Hunter 1998; Gray 1997; Hunter 2001).
9. In 1995, there were 156,000 persons living in remote areas of whom 68,400 were Indigenous persons—see ABS (1999).
10. They compare the census and NHS data to illustrate that the latter is broadly representative of the Indigenous population.
11. Hunter, Kennedy and Smiths' (2002) analysis of income units indicates that Indigenous sole parent families tend to live in multi-adult households with their extended families—a finding that is consistent with the ethnographic evidence.
12. See Hunter and Gray (1998) for details of employment disadvantage of Indigenous Australians.
13. The process of applying equivalence scales also effects the overall income distribution, and hence impact on the measured poverty lines and inequality (see Appendix A). While the poverty lines behave predictably declining significantly as scales assume that there are fewer economies of size, inequality as measured by Gini coefficients declines, and then increases, with higher values of *eta* (i.e. fewer economies of scale). Also, the higher child weights, *theta*, are also associated with substantially higher overall income inequality. Clearly, the choice of equivalence scales has important implications for income distribution studies. Particular attention needs to be paid to the costs assumed for additional dependents.
14. Note that negative incomes are coded as zero in the above analysis, and in other sections of this paper.
15. Certain elements of this European approach have an analogy in the Henderson poverty lines which are also differentiated by family type (Johnson 1996).
16. The ratio of Indigenous to non-Indigenous head counts was actually lower than 1.35 for equivalence scales that assumed the cost of children were zero, but otherwise households had few economies of scale.
17. Travers (2002), uses New Zealand data to illustrate that, with few exceptions, older people believe they are living well. If such results were replicated in Australia, this would raise questions as to the validity of the income measure of poverty for this group. In addition to the research results, Travers provides an excellent discussion of the complexities of inter-generational policy issues.
18. Note that it is not logically necessary to assume a monolithic Indigenous culture when evaluating equivalence scales—except perhaps because there is no adequate data of sufficient quality against which particular sub-populations could be benchmarked. Unfortunately, this qualification will be a binding constraint on the ability to distinguish between groups of Indigenous Australians in the near future.
19. Simply implementing an Indigenous identifier in the ABS's Household Expenditure Survey would not cater for an adequate, nor reliable assessment. The sample size of the Indigenous households would also need to be extended so that it will be large enough to produce reliable estimates with relatively low standard errors. Oversampling may be necessary notwithstanding wide geographical distribution and diverse situations of Indigenous populations. Surveys of Indigenous people typically suffer from four major methodological issues; the nature of kin-related households; the effect of reciprocity and sharing within the community; the economic impact of subsistence activities and; the cultural sensitivity of questions posed. All of these problems complicate and distort expenditure measures of welfare.
20. See Hughes (2001) for a discussion of measurement problems for low-income groups.

21. The composite poverty measures allow situations of second and third order stochastic dominance to be ranked (Zheng 2000).

References

Australian Bureau of Statistics (ABS) 1997. *Survey of Income and Housing: User Guide*, Cat. no. 6553.0, ABS, Canberra.

—— 1998. 'Poverty: different assumptions, different profiles', *Australian Social Trends*, Cat. no. 4102.0, ABS, Canberra, pp. 125–9.

—— 1999. *1995 National Health Survey: Aboriginal and Torres Strait Islander Results*, Cat. no. 4806.0, ABS, Canberra.

Altman, J.C. 2001. 'The economic status of Indigenous Australians' in J. Jupp (eds) *The Australian People: An Encyclopedia of the Nation, Its People and Their Origins*, Cambridge University Press, Cambridge.

—— and Hunter, B. H. 1997. 'Indigenous poverty since the Henderson Report', *CAEPR Discussion Paper 127*, CAEPR, ANU, Canberra.

—— and Hunter, B. 1998. 'Indigenous poverty', in R. Fincher & J. Nieuwenhuysen (eds), *Australian Poverty: Then and Now*, Melbourne University Press, Melbourne.

—— and Sanders, W. 1994. 'From exclusion to dependence: Aborigines and the welfare state in Australia', in J. Dixon & R. Scheurell (eds), *Social Welfare for Indigenous Populations*, Routledge, London.

Arthur, W.S. 1999. 'What's new? The parliamentary Inquiry into Indigenous Business', *CAEPR Discussion Paper No. 177*, CAEPR, ANU, Canberra.

Banks, J. and Johnson, P. 1994. 'Equivalence scale relativities revisited', *Economic Journal*, 104 (425): 883-90.

Buhman, B., Rainwater, L., Schmaus, G. and Smeeding, T.M. 1988. 'Equivalence scales, well-being, inequality, and poverty: Sensitivity estimates across ten countries using the Luxembourg Income Study (LIS) database', *The Review of Income and Wealth*, 34 (2): 115–42.

Callan, T. and Nolan, B. 1991. 'Concepts of poverty and the poverty line', *Journal of Economic Surveys*, 5 (3): 243–61.

Citro, C.S. and Michael, R.P. 1995. 'Adjusting poverty thresholds', in C.S. Citro and R.P. Michael (eds), *Measuring Poverty and New Approach*, National Academic Press, Washington.

Commonwealth of Australia 1998. *Addressing Priorities in Indigenous Affairs*, Statement by Senator the Honourable John Herron, Minister for Aboriginal and Torres Strait Islander Affairs, AGPS, Canberra.

Coulter, F.A.E., Cowell, F.A. and Jenkins, S.P. 1992. 'Equivalence Scale Relativities and the Extent of Inequality and Poverty', *Economic Journal*, 102: 1067–82.

Creedy, J. 1998. 'Measuring poverty: An introduction', *Australian Economic Review*, 31 (1): 82–9.

Daly, A. and Smith, D. 1995. 'The economic status of Indigenous Australian families', *CAEPR Discussion Paper No. 93*, CAEPR, ANU, Canberra.

De Vos, K. and Zaidi, M.A. 1997. 'Equivalence scale sensitivity of poverty statistics for the member states of the European Community', *Review of Income and Wealth*, 43 (3): 319–33.

Foster, J. E. 1998. 'What is poverty and who are the poor? Redefinition for the United States in the 1990's', *American Economic Review*, 88(2): 335-41.

——, Greer, J. and Thorbecke, E. 1984. 'Notes and comments: A class of decomposable poverty measures', *Econometrica*, 52 (3): 761–6.

—— and Shorrocks, A. F. 1991. 'Subgroup consistent poverty indices', *Econometrica*, 59 (3): 687–709.

Gray, A. (ed.) 1990. *A Matter of Life and Death: Contemporary Aboriginal Mortality*, Aboriginal Studies Press, Canberra.

Gray, B. 1997. 'Indigenous data quality in the National Health Survey 1995: Analysis of selected questions from the unedited, unweighted file', *ABS Internal Discussion Paper 97/1*, National Centre for Aboriginal and Torres Strait Islander Statistics, Darwin.

Greenwell, H., Lloyd, R. and Harding, A. 2001. 'An introduction to poverty measurement issues', *NATSEM Discussion Paper No. 55*, NATSEM, Canberra.

Guobao, W., Richardson, S. and Travers, P. 1996. 'Multiple deprivation in rural China', *Working Paper No. 96/1*, Chinese Economy Research Centre, Adelaide.

Harding, A., Lloyd, R. and Greenwell, H. 2001. *Financial Disadvantage in Australia 1990 to 2000*, The Smith Family, Sydney.

Henderson R.F. (Chairman) 1975. *Commission of Inquiry into Poverty: Poverty in Australia, First Main Report*, AGPS, Canberra.

Hughes, H. 2001. 'The politics of envy: Poverty and income distribution', *Policy*, 17 (2): 13–8.

Hunter, B.H. 1999. 'Indigenous self-employment: miracle cure or risky business', *CAEPR Discussion Paper No. 176*, CAEPR, ANU, Canberra.

—— 2001. 'Tackling poverty among Indigenous Australians', in R. Fincher and P. Saunders (eds), *Creating Unequal Futures*, Allen and Unwin, Sydney: 129–57.

—— and Gray, M.C. 1998. 'Recent changes in the Australian workforce: A focus on the structure of Indigenous employment', *Australian Bulletin of Labour*, 24 (3): 220–40.

——, Kennedy, S. and Smith, D. 2002. 'Sensitivity of Australian income distributions to choice of equivalence scales: Exploring some parameters of Indigenous incomes', in T. Eardley and B. Bradbury (eds), *Competing Visions: Proceedings of the National Social Policy Conference, Sydney 4-6 July 2001*, Social Policy Research Centre Report 1/02, SPRC, University of New South Wales, Sydney.

Jenkins, S.P. and Cowell, F.A. 1994. 'Parametric equivalence scales and scale relativities', *Economic Journal*, 104 (425): 891–900.

Johnson, D. 1996. 'Poverty lines and the measurement of poverty', *Australian Economic Review*, 29 (1): 110–26.

Myles, J. and Picot, G. 2000. *Accounting for Neighbourhood Inequality: Economic Segregation Income Inequality and the Neighbourhood Distribution of Income*, Statistics Canada, Ottawa.

Ross, R. T. and Mikalauskas, A. 1996. 'Income poverty among Indigenous families with children: Estimates from the 1991 Census', *CAEPR Discussion Paper No. 110*, CAEPR, ANU, Canberra.

Saunders, P. 1998. 'Using Budget Standards to assess the well-being of families', *SPRC Discussion Paper No. 93*, SPRC, UNSW, Sydney.

—— 2002. 'Poor statistics: Getting the facts right about poverty in Australia', *Issue Analysis No. 23*, Centre for Independent Studies, Sydney.

—— and Smeeding, T. M. 1998. 'How do the elderly in Taiwan fare cross-nationally?: Evidence from the Luxembourg Income Study project', *SPRC Discussion paper No.81*, SPRC, UNSW, Sydney.

Sen, A. 1976. 'Poverty: An ordinal approach to measurement', *Econometrica*, 44 (2): 219–31.

Travers, P. 2002. 'Living standards of older people and policy implications for their grandchildren', *Family Matters*, 61(Autumn): 68–73.

Trigger, D.S. 2000. Does the Way We Measure Poverty Matter?: An Analysis of Alternative Poverty Measures with Particular Reference to Changes in the level of Poverty in Australia Between 1975 and 1994, PhD Thesis, NATSEM, University of Canberra, Canberra.

Tsumori, K., Saunders, P. and Hughes, H. 2002. 'Poor arguments: A response to the Smith Family Report of poverty in Australia', *Issue Analysis No. 21*, Centre for Independent Studies, Sydney.

Zheng, B. 2000. 'Poverty orderings', *Journal of Economic Surveys*, 14 (4): 427–66.