5. Scale Development and Validation

One of the objectives of this research is to develop a material well-being scale that can be used to describe the living standards of older people. This chapter sets out the process that was used to develop this scale. When the various combinations of answers to the questions posed in the main survey are taken into account, we have several hundred indicators of each household's standard of living. The task is then to gather this information into a small number of coherent measures, and ultimately into a single scale of material well-being.

5.1 The Conceptual Model

Chapter Two developed a justification for assessing living standards in terms of direct measures of material conditions and consumption rather than indirect measures derived from income or expenditure patterns and briefly described the conceptual model that lays the foundations for a testable statistical model of material well-being.

The key assumption of the model developed in this study is that CEUs can be ranked along some continuum reflecting their levels of material well-being from the most economically restrained households to the most materially advantaged households. This underlying dimension is not directly observable in the sense that the CEU's income can be (in principle) observed and counted, rather it is assumed to be a latent dimension whose properties are manifest in observed fallible indicator measures.

To develop the statistical model in this report, a number of behavioural domains were chosen to portrait levels of material well-being. These aggregate indicators relate to:

1. Ownership Restrictions

One of the features that distinguishes well off families from less well off families is differences in their possession of various consumer durables, with the well off being able to buy those durables they wish to own, whereas the less well off may not be able to do so. Therefore, one method of getting a fix on the CEU's level of material well-being is to assess the extent to which the members of the CEU report failing to have consumer durables that they would like as a result of income or economic restriction.

2. Social Participation Restrictions

A second feature that may distinguish well off CEUs from less well off CEUs is the extent to which economic factors restrict their participation in social events such as visiting friends or family, involvement in clubs and societies, etc. Therefore, a second method of assessing the CEU's level of material well-being is to obtain accounts of the extent to which members of the CEU feel that their social participation is restricted by economic factors.

3. Economising

A further way in which variations in material well-being may be manifest is in the form of economising behaviours by which members of CEUs may chose to restrict their use and consumption of various items in order to make ends meet. Such economising behaviour may vary from the mild to the severe. In severe cases, CEUs may be obliged

to restrict the consumption of the necessities of life (food, housing, medical care) in order to live within their budget. Thus a third way in which variations in material well-being may be manifest is the extent to which members of CEUs report having to engage in economising behaviours because of lack of money.

4. Serious Financial Problems

A further indicator that is likely to identify CEUs subject to deprivation is the extent to which members of the CEU report facing severe financial problems such as inability to meet payments for utilities, being unable to pay rent or mortgage costs, borrowing money to meet living costs, etc. Although these behaviours are uncommon (see Chapter Four) their presence is likely to provide a strong indicator of those CEUs facing severe economic restriction.

5. Self-assessments

Another way of assessing the level of material well-being of the CEU is to ask members of the CEU to assess their level of material well-being relative to others in their age group.

Although each of the above measures describes an aspect of the material well-being of the CEU, it is clear that each measure has limitations as a description of the material well-being of the CEU. For example, CEUs may seek to sustain a high level of ownership by engaging in severe economising behaviours or by severely restricting their social participation. Similarly, those facing poverty or economic hardship may be reluctant to describe themselves as poor. For these reasons, it would be unwise to place heavy reliance on an *individual* aggregate indicator as the measure of the CEU's level of material well-being. However, collectively the examination of ownership, social participation, economising, financial problems and self-assessments should provide a good fix on the extent of the CEU's material well-being.

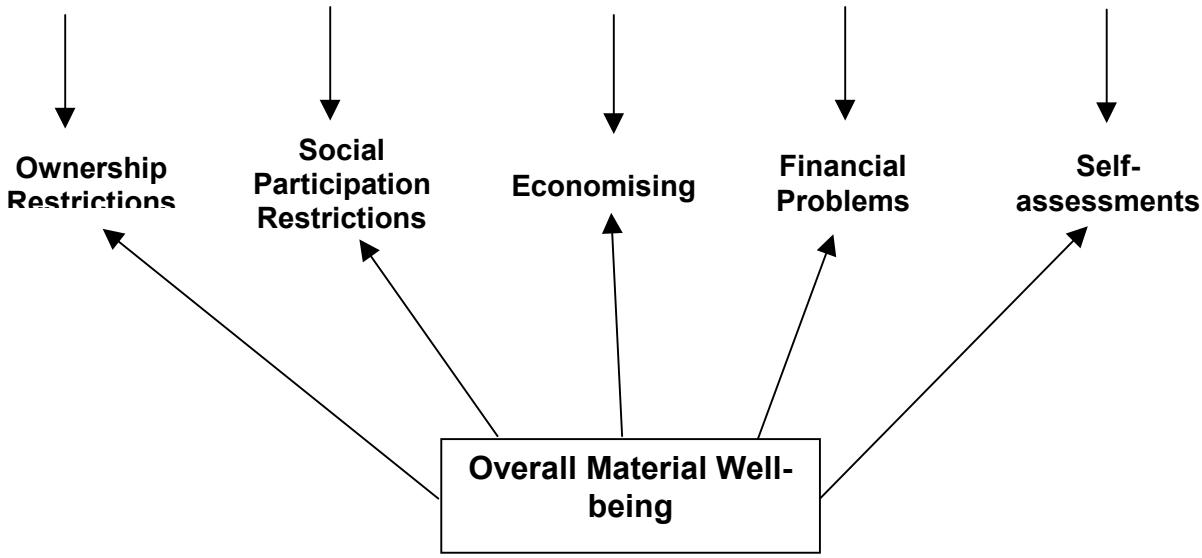
At one extreme, we would expect CEUs subject to poverty to report: restricted access to desired important consumer durables; limited social participation; frequent and severe economising behaviours, and to describe themselves as facing material hardship. At the other extreme, we would expect affluent CEUs to report: possession of important consumer durables; to have adequate levels of social participation; to engage in few, if any, forms of economising, and to describe themselves as well off. Between these extremes we might expect to find CEUs varying in their mix of ownership, social participation, economising, serious financial problems and self-assessments.

Figure 5.1 proposes a conceptual model that links the observed aggregate indicators (ownership restrictions, social participation restrictions, economising, serious financial problems, self-assessments) to the underlying latent dimension of material well-being. The model assumes that the overall material well-being of the CEU is reflected in each of the observed aggregate indicators but that these aggregates are also influenced by other non observed factors independently of material well-being.

The challenge posed by the conceptual model in Figure 5.1 is that of finding some way of using the observed aggregate indicators (ownership restrictions; social participation restrictions; economising behaviours; financial problems; self-assessments) to produce an estimate of the CEU's level of material well-being. An approach to resolving this problem

through the use of methods of confirmatory factor analysis (CFA) (Long, 1983) is developed next.

Figure 5.1: Conceptual model of material well-being amongst older people



5.2 The Statistical Model

5.2.1 Model Specification

One approach to operationalising the conceptual model in Figure 5.1 is to represent this model as a confirmatory factor model. The key assumption of the CFA model is that the relationships between the observed indicator measures and the latent factor in Figure 5.1 can be described by a linear model. More formally, let Xi (i = 1 ... n) denote the ith observed indicator variable and ξ denote the non observed latent factor.

The model in Figure 5.1 may then be written as:

$$Xi = \lambda i \, \xi + \delta i \qquad \text{EQ1}$$

where the coefficient λi is the factor loading linking the observed score Xi to the latent factor ξ. If Xi and ξ are treated as standardised variables with mean 0 and variance 1, then λi can be shown to be the correlation between the observed indicator Xi and the latent factor ξ. The term δi represents the error or uniqueness of each of the observed variables. For the present, it is assumed that the disturbances δi are uncorrelated. This model implies that the variation in the observed measures Xi is explained by a single common factor (ξ) with the remaining variation in Xi reflecting uncorrelated errors of measurement (δi).

5.2.2 Model Identification

With five indicator variables (ie n = 5) the model is over-identified. This over-identification may be seen as follows. The model in EQ1 requires the estimation of 10 model parameters. These parameters are the five factor loadings λi and the variances of the five error terms δi. The data available to estimate these parameters is the variance/covariance matrix (S) of the five measures Xi. This matrix contains five variances and 10 covariances. Thus if the model is identified it has five degrees of freedom. In general, it may be shown that models of the form of EQ1 are identified provided at least three indicators Xi are available (Long, 1983).

5.2.3 Testing Goodness of Fit

The importance of the model over-identification is that it makes the model in EQ1 testable. In particular, the model makes the strong assumption that the covariances of the observed indicators Xi are summarised by a single latent factor ξ. A necessary, but not sufficient, condition for this theory to hold is that the single factor model fits the observed variance/covariance matrix S adequately. There are a series of measures that may be used to assess the adequacy of model fit. These measures include:

1. The log likelihood ratio chi square goodness of fit test. This gives a chi square test of the extent to which the model parameters reproduce the observed variance/covariance matrix. A non-significant chi square value is taken to indicate a well-fitting model (Joreskog & Sorbom, 1993a).

2. The Root Mean Square Error of Approximation (RMSEA). The RMSEA is a measure of the discrepancy between the observed and fitted data adjusted for the number of available degrees of freedom (Joreskog & Sorbom, 1993b). Values of the RMSEA of less than .05 are taken as indicating good fit (Joreskog & Sorbom, 1993b).

3. The Root Mean Square Residual (RMSR). The RMSR is given by the square root of the sum of squares of the residual variances and covariances from the fitted model. Experience suggests that well fitting models have values of the RMSR less than .03 if all variables are standardised (i.e. S is a correlation matrix).

4. The Adjusted Goodness of Fit Index: This index gives a measure of the improvement of model fit when compared with a null model in which all parameters are zero. The AGFI has a maximum value of 1 with this value denoting a perfectly fitting model. Experience suggests that well fitting models have values of the AGFI in excess of .95.

5.2.4 Estimating Model Parameters

Given the matrix S of variances and covariances of the observed variables Xi, the model parameters may be estimated using a variety of methods. If it is assumed that the variables Xi have a multivariate normal distribution, then the model parameters may be estimated using full information maximum likelihood methods (Joreskog & Sorbom, 1993a). If the data are not multivariate normal then other methods such as asymptotic distribution free (ADF) estimation (Browne, 1984; Joreskog & Sorbom, 1993a) may be used to obtain estimates of the model parameters and their standard errors.

5.2.5 Estimating Individual Scale Scores

Since the factor ξ is a latent variable, the scores of any individual on ξ are not known. However, from the model parameters it is possible to secure a regression estimate of the score of the jth subject given the observed scores Xij.

The regression estimate is given by:

$$\hat{\xi}j = BXj \qquad \text{EQ2}$$

where $\hat{\xi}j$ is the estimated factor score for the jth subject, Xj is the n x 1 vector of observed scores (Xij) for the jth subject and B is the 1 x n vector of factor score coefficients. The vector B of factor score coefficients is given by:

$$B = \Lambda' \hat{S}^{-1} \qquad \text{EQ3}$$

where Λ is the n x 1 vector of factor loadings (λi) and $\hat{S}$ is the n x n correlation matrix of the variables (Xi) estimated from the fitted model (Joreskog & Sorbom, 1993a). It should be noted that if there is little variation between the factor score coefficients B then $\hat{\xi}j$ can be well approximated by:

$$*\hat{\xi}j = \sum_{i=1}^{n} Xij \qquad \text{EQ4}$$

5.3 Model Fitting

5.3.1 Sample and Sample Weights

As described in Chapter Three, the unit of analysis for this report is the Core Economic Unit (CEU), as defined by membership of a single or partnered household. In all analyses, data have been weighted using weights provided by Statistics New Zealand. These weights were designed to address a number of sample design and related features that included: sample stratification, clustering and missing data. To examine the effects of this weighting on results, all analyses have been conducted using both weighted and unweighted data. Both sets of analyses produced very similar findings and conclusions. Throughout this chapter all statistics including: percentages, means, standard deviations, correlations and model parameters are based on the weighted data. The sample sizes reported for each table are based on the weighted number of CEUs available for that analysis.

5.3.2 Data and Data Reduction

The conceptual model in Figure 5.1 assumes the presence of a series of indicator measures representing reports of: ownership, social participation, economising behaviours, and financial problems. Information on these behavioural domains was gathered as part of the Survey of Older People. Specifically:

1. Question 139 (see Appendix 1) provides a series of measures of the extent to which the respondents lacked access to various amenities and consumer durables because they believed they could not afford to purchase these amenities or durables. Table 5.1a below shows the test items and the proportion of CEUs reporting ownership restrictions for each item.

2. Question 142 (see Appendix 1) provides a series of measures of the extent to which the respondents felt unable to engage various social activities because of income restrictions. Table 5.1b shows the test items and the proportion of CEUs reporting social participation restrictions for each item.

3. Question 126 (see Appendix 1) provides a series of items describing areas in which the respondents may have felt obliged to make economies because of lack of money. Table 5.1c shows the test items and the proportion of CEUs reporting economising behaviours.

4. Question 127 (see Appendix 1) provides a further series of economising items describing actions the respondents may have been forced to take because of serious financial problems. Table 5.1d shows the test items and the proportion of CEUs reporting serious financial problems.

Table 5.1: Item endorsement rates (%) for ownership restrictions, social participation restrictions, economising and serious financial problem items (N = 3013)

Item	%	Item	%
a) Ownership Restrictions (Percentage of the sample reporting that they did not own item because of cost.)			
Phone	0.4	Television	0.2
Locks	5.3	Video	2.5
Microwave	1.8	Stereo	2.9
Washing machine	0.4	Contents insurance	4.6
Dryer	3.6	Car	1.3
Waste disposal	3.4	Pet	1.3
Dishwasher	4.9	Inside toilet	0.2
Food processor	3.2	Running water	0.0
Heating in main rooms	6.0	Mains power	0.1
Good bed	1.1	Hot water	0.0
Warm bedding	0.3	Warm coat	2.1
Best clothes	3.3	Good shoes	1.0

Item	%	Item	%
b) Social Participation Restrictions (Percentage of the sample reporting that they did not engage in the activity because of cost.)			
Participate in family/whanau activities	1.5	Give presents to family/friends on special occasions	2.3
Visit hairdresser once every 3 months	3.1	Holiday away from home every year	14.4
Overseas holidays once every 3 years	19.7	Night out once a fortnight	8.9
Day out once a fortnight	4.7	Visitors for a meal once a month	3.2
Special meal at home once a week	3.3	Space for family to stay the night	1.0
c) Economising (Percentage of the sample reporting that they economised "a little" or "a lot" on each item.)			
Less/cheaper meat	36.2	Postponed dentist visits	10.5
Less fresh fruit/vegetables	7.0	Gone without glasses	9.7
Bought second hand clothes	17.9	Gone without adequate dentures	10.4
Worn old clothes	12.3	Not picked up prescription	1.5
Put off buying new clothes	31.3	Cut back/cancelled insurance	13.9
Relied on gifts of clothes	6.5	Cut back on visits to family/friends	10.7
Worn out shoes	7.9	Cut back on shopping	10.6
Put up with cold	8.9	Less time on hobbies	9.9
Stayed in bed for warmth	8.7	Not gone to funeral	4.5
Postponed doctor's visits	7.7		
d) Serious Financial Problems (Percentage of the sample reporting problem.)			
Couldn't keep up payments for electricity, gas, water	1.7	Couldn't keep up payments on mortgage, rent	0.8
Couldn't keep up payments for hire purchase, credit cards	0.6	Borrowed money from family/friends to meet living costs	1.2
Received help (food, clothes or money) from community organisation	0.5	Pawned/sold something to meet living costs	0.9

To represent variations in each of the domains described in Table 5.1, score estimates were constructed from an unweighted sum of items. These scoring conventions imply that the various domains were represented by a series of unidimensional scales. To test this assumption an exploratory factor analysis model was fitted to the correlation matrix of the test items. This analysis suggested the presence of four common factors with these factors corresponding to: ownership restrictions; social participation restrictions; economising and serious financial problems (see Appendix 4 for details of the factor model and the items subsequently included in the scale).

5.3.3 Fitting the Confirmatory Factor Model

To fit the model outlined in Figure 5.1 a series of six aggregate indicator measures was employed. These measures comprised the scales of: ownership restrictions (aggregate of items not owned due to cost), social participation restrictions (aggregate of activities not done due to cost), economising (aggregate of behaviours with no, little and a lot being scored 1, 2 and 3 respectively), and serious financial problems (aggregate number of problems). In addition, the analysis also included two respondent ratings.

1. Standard of Living (Question 133, Appendix 1): The first rating was the respondent's self-assessment of their standard of living, made on a five-point scale from high to low (scored from 1 to 5).

2. Adequacy of Income (Question 130, Appendix 1): The second rating was the respondent's self-assessment of the adequacy of their income to meet everyday needs for such things as food, accommodation, clothing and other necessities. Ratings were made on a four point scale from more than enough to not enough (scored from 1 to 4).

The distributions of these measures have been reported in Table 4.21.

The data on which the confirmatory model was fitted, therefore, comprised two types of information: first, scale measures describing the CEU's level of ownership restrictions, social participation restrictions, economising and serious financial difficulties; and second, ratings made by the respondent of the CEU's living standards and adequacy of income.

Table 5.2: Matrix of correlations of the six indicator measures of material well-being[1] (N = 3013)

Variable	Ownership Restrictions	Social Participation Restrictions	Economising	Serious Financial Problems	Standard of Living	Income Adequacy
Ownership restrictions	1.00					
Social participation restrictions	.48	1.00				
Economising	.52	.59	1.00			
Serious financial problems	.28	.23	.36	1.00		
Standard of living	.28	.29	.38	.18	1.00	
Income adequacy	.35	.40	.48	.20	.45	1.00
Mean	.41	.61	22.06	.06	2.80	2.47
Standard deviation	1.03	1.24	5.00	.33	0.68	0.85

Note 1: All correlations are statistically significant (p<.001).

Table 5.2 shows the matrix of correlations, means and standard deviations of the six indicator variables. Inspection of the correlation matrix shows that, with the exception of the serious financial problems measure, there are moderate to strong correlations between all measures, with these correlations ranging from .28 to .59. The correlations of the serious financial problems measure with other variables are lower, varying from .18 to .36. (These lower correlations are most probably a reflection of the very low base rates for the items comprising the serious financial problems scale - see Table 5.1). However, all correlations are statistically significant.

Further inspection of the matrix also shows that the four subscales (ownership restrictions, social participation restrictions, economising and financial problems) tend to be more strongly correlated with each other than they are with the respondent ratings and that the respondent ratings are more strongly correlated with each other than they are with the subscale measures. These patterns of correlation are suggestive of the presence of method effects reflecting the fact that variables assessed by the same method (subscales; ratings) are more strongly correlated with each other than variables assessed by a different method. The way in which these method effects may be addressed within the context of the confirmatory factor model is discussed below.

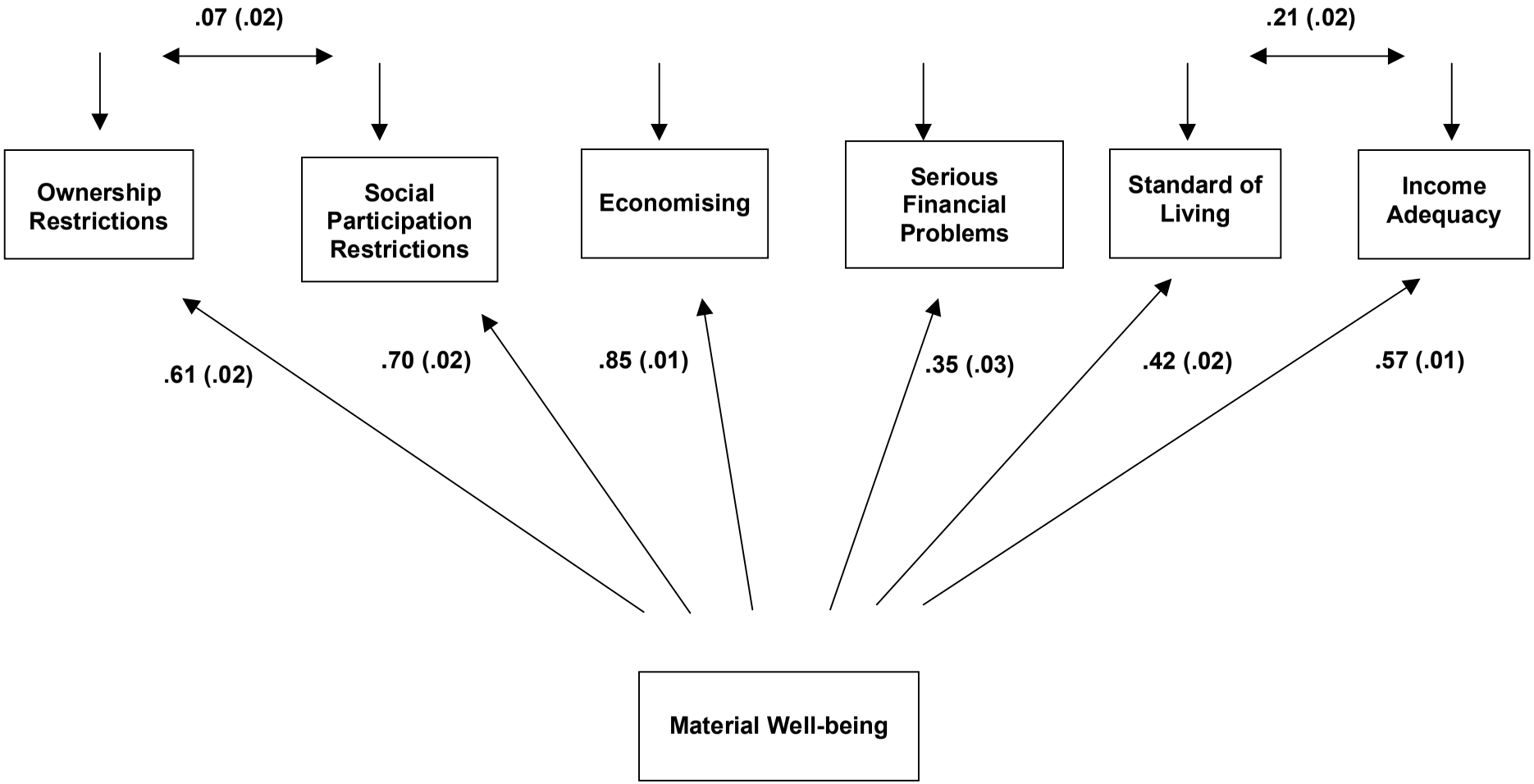
In the first instance, a single factor model was fitted to the data in Table 5.2 with this model assuming that the error terms (δi) of the model were uncorrelated. Model fitting was conducted using LISREL 8 (Joreskog & Sorbom, 1993a) and used asymptotic distribution free (ADF) estimation. This estimation method was used in view of the non normal distribution of the variables in Table 5.2. The initial model showed evidence of poor fit to the data (LR Chi Square = 202.0, df = 9, $p < .0001$; RMSEA = .084; RMSR = .051; AGFI = .961). Investigation of the sources of this poor fit suggested the presence of small method effects in the data.

These method effects were manifest in the fact that variables measured in the same way tended to be more strongly correlated with each other than variables measured in different ways. In particular, measures based on the four factor scores were more strongly correlated with each other than they were with subject ratings, and subject ratings were more strongly correlated with each other than they were with the factor scores. This pattern of correlation is consistent with the view that measures derived by a particular method (factor scores; respondent reports) contained variance that was specific to the method of measurement used.

In general, there are two ways of accommodating method effects within the context of the confirmatory factor model. The first is to introduce further factors to account for sources of method specific variation (Alwin, 1974; Long, 1983). The alternative approach is to relax the specification on the model to permit the errors (δi) of variables measured by the same method to be correlated (Fergusson, Horwood, & Lloyd, 1991). For this analysis, the latter method was used. It was found that by relaxing the assumption on the error correlations of errors (δi), a well fitting model could be obtained by the addition of two model parameters. These parameters were: a) a correlation between the errors of measures of ownership and social participation; and b) a correlation between the respondent reports of income adequacy and standard of living. These assumptions produced a model with good fit to the observed data (LR Chi square = 13.2, df = 7, p = .07; RMSEA = .017; RMSR = .021; AGFI = .997).

The fitted model is shown in Figure 5.2. This figure reports the standardised model coefficients linking the observed indicator variables to the latent dimension of material well-being. The standardised coefficients give estimates of the correlations between the underlying dimension and the observed indicator measures. These coefficients range from .35 to .85 showing that whilst all measures reflect the CEU's level of material well-being, each is a fallible measure of this well-being. The figure also shows the presence of small method effects reflected in the correlation of the disturbances of respondent ratings and in the correlation between the disturbances of the ownership and social participation restrictions subscales. These results are suggestive of the fact that both the subscale and rating data contain variance (test specificity) that is specific to a given method of measurement and not in common with the underlying latent dimension of material well-being.

Figure 5.2: Fitted confirmatory factor model of material well-being (All parameters are standardised; standard errors are in parentheses)



The overall conclusion that may be drawn from the confirmatory factor analysis of the six aggregate indicator measures is that these measures all reflect a common underlying factor that appears to reflect variations in levels of material well-being with this underlying dimension being manifest in both scale measures (ownership, social participation, economising, serious financial problems) and self evaluations (standard of living, income adequacy). However, this common factor model is overlaid with a certain amount of "noise" that arises from method effects associated with different approaches (scales; self evaluation) to assessing levels of material well-being.

5.3.4 Estimating Scale Scores

As explained previously, because the material well-being is a latent factor, the scores of individual CEUs on this factor are not exactly known. However, it is possible to secure a regression estimate of this score from information on: a) factor loadings; and b) the CEU's observed responses on the measures Xi. The regression estimate is given by:

$$\hat{\xi}j = \sum_{i=1}^{n} BiXij$$

where $\hat{\xi}j$, is the estimated score of the jth CEU on the latent factor ξ and Bi are the set of factor score coefficients. (The method by which the coefficients Bi are estimated has been described in section 5.2.5). *It is assumed that ξ and Xij are standardised variables with mean zero and variance one.*

A useful feature of the regression estimate of $\hat{\xi}j$ is that it proves straightforward to estimate the correlation between the regression estimate $\hat{\xi}j$ and the true but non observed score ξj. In this instance the correlation between $\hat{\xi}j$ and ξj was .91 suggesting that the regression estimate gave a good approximation to the scores on the latent factor ξ.

As noted earlier, in cases where there is relatively little variation in the factor score coefficients Bi an alternative estimate can be constructed from an unweighted sum of the (standardised) variables.

$$*\hat{\xi}j = \Sigma Xij$$

In this instance the correlation between the factor score estimate $\hat{\xi}j$ and the unweighted sum $*\hat{\xi}j$ was .95. *Since the unweighted sum closely approximated the least squares estimate but did not depend on sample specific parameters it has been used throughout this research as a measure of material well-being. For purposes of presentation the measure has been scaled to a mean of 100 with a standard deviation of 10, and has been scored such that increasing scores imply increasing material well-being.*

5.3.5 Estimating Scale Reliability

Since the factor score estimate derived above is a sum of test scores, it is possible to estimate the reliability of the measure using internal consistency methods. Perhaps the most commonly used internal consistency coefficient is Cronbach's alpha (Cronbach, 1951). The value of alpha was .77 suggesting that the derived scale was of moderate reliability.

5.3.6 Scale Validity

A number of approaches were used to assess the validity of the scale as a measure of the material well-being of older people. These approaches are described below:

1. Factorial Validity

As the analysis reported above shows, the data show good fit to a single factor model with the correlated disturbance terms reflecting the presence of method effects in the observed indicator measures. It is clear that the confirmatory factor model suggests that the data are consistent with the conceptual theory developed in Figure 5.1. To this extent the analysis supports the factorial validity of the scale measure.

2. Concurrent Validity

A further way of exploring scale validity is to examine the associations between the scale score and a series of alternative measures of material well-being. This issue is addressed in the top section of Table 5.3 which shows the correlations between the scale measure and a series of additional measures of material well-being that were gathered during the SOP. These measures include:

i. whether the respondent reported being unable to save on most months;
ii. whether the respondent reported being unable to find $5,000 in an emergency;
iii. whether the respondent reported health related financial stress in the past 12 months;
iv. whether the respondent reported being in possession of a Community Services Card;
v. whether the respondent reported feeling worse off than other New Zealanders; and
vi. whether the respondent reported being dissatisfied with their standard of living.

The table shows that in all cases there were statistically significant correlations between the scale score and concurrent measures of living standards with these correlations ranging from -.34 to -.47.

3. Construct Validity

A further way of exploring the validity of the scale is to examine the extent to which the scale is associated with the economic factors that one might expect to predict variations in material well-being. This issue is addressed in the lower section of Table 5.3 which shows the correlations between the scale measure and measures of net

annual income, financial assets, and weekly accommodation costs. In all cases, it is clear that there were statistically significant ($p < .0001$) correlations between the scale measure and the measures of economic circumstances, with these correlations (in absolute value) ranging from .24 to .42.

Collectively, the above analysis provides considerable re-assurance about the validity of the derived scale. The scale measure has been found to have factorial validity and to correlate significantly with a series of concurrent and predictor measures. All of these findings contribute to a picture of the validity and reliability of the scale measure as a description of variations in levels of material well-being within the sample being studied.

Table 5.3. Product moment correlations between material well-being score[1] and concurrent, predictive validation measures

Measure	Product Moment Correlation[2]
Concurrent Validation Measures	
Unable to save most months	-.41
Unable to find $5,000 in an emergency	-.47
Health related financial stress	-.41
Possession of Community Services Card	-.34
Feels worse off than other New Zealanders	-.34
Dissatisfied with standard of living	-.38
Predictive Validation Measures	
Net annual income ($Log_{10}$$)	.30
Financial assets ($Log_{10}$$)	.42
Accommodation costs ($ per week)	-.24

Note 1: Material well-being scale scored so that an increasing score implies increasing material well-being.
Note 2: All correlations statistically significant ($p<.0001$).

5.3.7 Effects of household type on scale properties

Although the preceding analysis suggests that it is possible to develop a scale measure that reflects variations in material well-being, it may be suggested that the scale properties may vary with household type. In particular, an important distinction within the sample is between those respondents who were single and those respondents who were married or living in partner relationships. It could be suggested that these populations should be described by different scale measures, with scale measures being developed separately for single and partnered CEUs. An advantage of the confirmatory factor analysis approach used in this analysis is that it provides a methodology for examining the effects of sample heterogeneity on scale properties through the use of so called multiple group modelling

methods (Joreskog & Sorbom, 1993a; Muthen, 1989). In particular, it becomes possible using these methods to ask a series of questions about the similarity of the factor models describing single and partnered CEUs. These questions include:

- Can both single and partnered CEUs be described by the same general factor model?

- Given that the same model can be applied to both groups, do the model parameters (factor loadings) vary with respondent type?

To examine these issues, a multiple group analysis was conducted as follows:

1. The sample was stratified by respondent type into those respondents who were single, including those widowed, separated and divorced (N = 1618) and those who were in partnerships including those in *de jure* and *de facto* unions (N = 1442).

2. For each strata, covariance matrices of the indicator measures and means of these measures were computed. The within strata means and covariances provided the input data for the multiple group model.

3. Using the stratified data, alternative multiple group models were fitted to the data. The first model assumed that both strata were described by the model shown in Figure 5.2 and that model parameters were the same for both single and partnered CEUs. The alternative model assumed that both strata were described by the model shown in Figure 5.2 but that the parameters of this model could vary with CEU type. Model fitting was conducted using the multiple group analysis option of LISREL 8 and all estimates were obtained from ADF estimation. The alternative models provided the basis of a log likelihood ratio chi square test of the equality of model parameters across the single and partnered strata. This analysis suggested the presence of small but detectable differences in the model describing single and partnered CEUs. The log likelihood chi square test showed these differences to be significant (LR Chi square = 23.6, df = 3, $p < .0001$).

4. Since the multiple group analysis suggested differences in the model parameters for the single and partnered groups, separate models were fitted to these strata. The fitted models for single and partnered CEUs are shown in Figures 5.3 and 5.4. Comparison of these figures suggests the following points of similarity and difference between the models for single and partnered CEUs:

    i. Model Structure: For both strata, the same model structure fitted the data. In this structure, all indicator measures were related to the underlying dimension of material well-being and the model permitted correlations between the error terms of: a) ownership restrictions and social participation restrictions; and b) respondent reports of standard of living and income adequacy. The overall fit of this model to the data was very good (LR Chi square = 18.0, df = 16, p = .33; RMSEA = .009; RMSR = .023; GFI = .99).

    ii. Factor Loadings: However, there were between strata differences in some of the factor loadings. In particular, the factor loadings for: ownership restrictions; economising and serious financial problems were consistently larger for the single group than for the partnered group. These findings suggest

that variables involved were somewhat better discriminators of living standards for single CEUs than for partnered CEUs. However, other factor loadings, including those for social participation restrictions; respondents' reports of standard of living and income adequacy, were found to be equal across strata.

The overall impression conveyed by these results is that the single and partnered groups were described by the same general model but there was evidence of group specific variations in factor loadings relating to ownership restrictions, economising behaviours and exposure to serious financial problems.

The differences in the model parameters for single and partnered CEUs could suggest the need to develop separate scale scores for these groups, with these scale scores being estimated using the model parameters specific to each group. However, the model differences shown in Figures 5.3 and 5.4 were relatively small and it became clear that for practical intents and purposes, all respondents could be scored on a common scale, rather than developing separate scale scores for single and partnered respondents. In particular, when alternative scales of material well-being were constructed using the model parameters and factor score coefficients that were specific to each group, it was found that for both single and partnered CEUs, the group specific scale was correlated in excess of .998 with the original scale of well-being described earlier. *This result suggests that for practical intents and purposes, the two groups can be scored on the same common scale, despite the differences in the factor loadings for the models for single and partnered CEUs.*

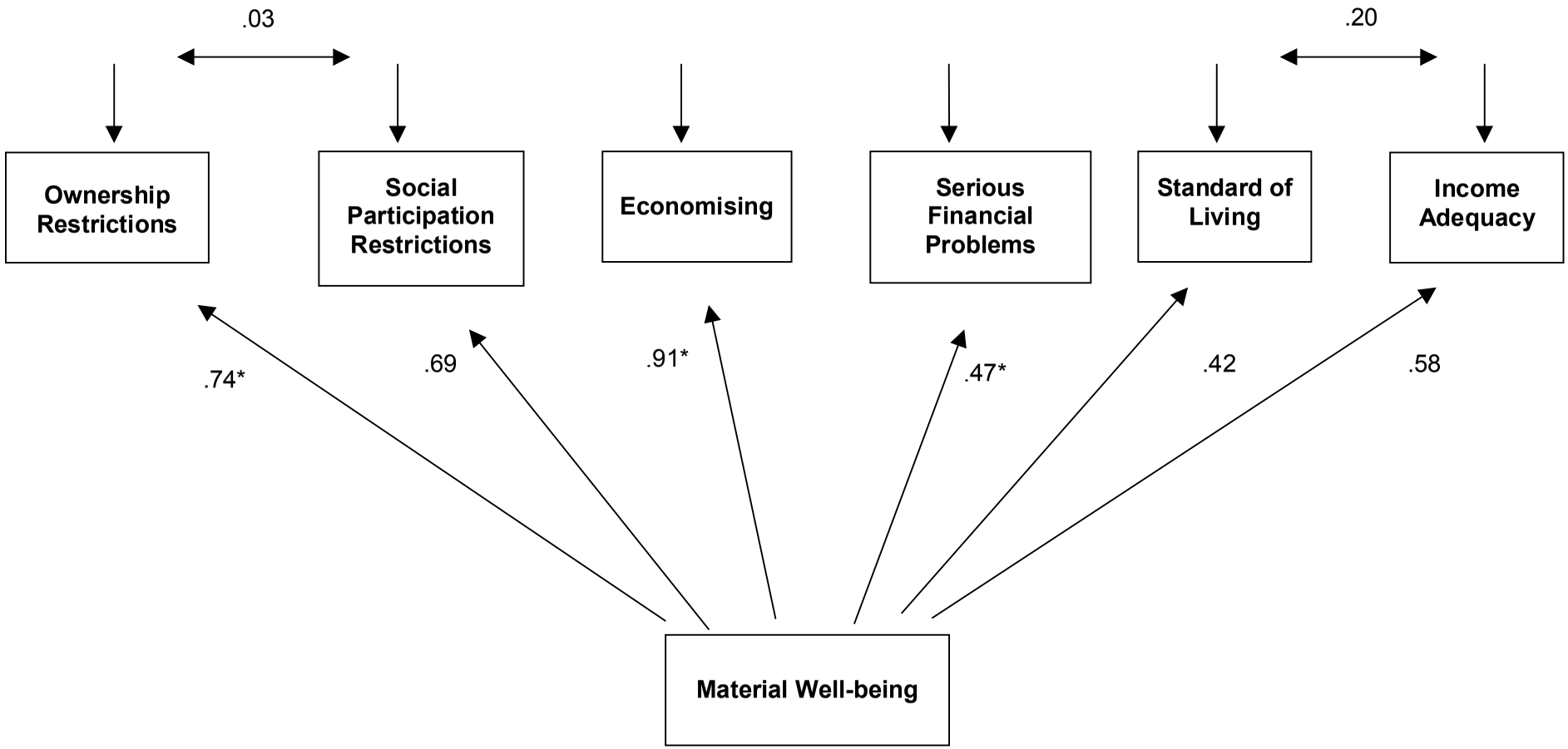
5.4 Concluding Comment

In this chapter, we have outlined an approach to developing a scale of material well-being using methods of confirmatory factor analysis. This scale is based on the assumption that material well-being is a latent variable whose properties are reflected in a series of observable indicator variables. These indicators include measures of: ownership restrictions; social participation restrictions; economising; serious financial problems; and self evaluations of living standards. The following general conclusions may be drawn from the modelling approach.

1. The matrix of correlations between the indicator measures was adequately described by a single factor model representing variations in levels of material well-being. This single factor model was overlaid by a certain amount of "noise" arising from method effects that resulted in measures obtained by the same method (scales/respondent evaluations) being more strongly correlated with each other than measures obtained by different methods.

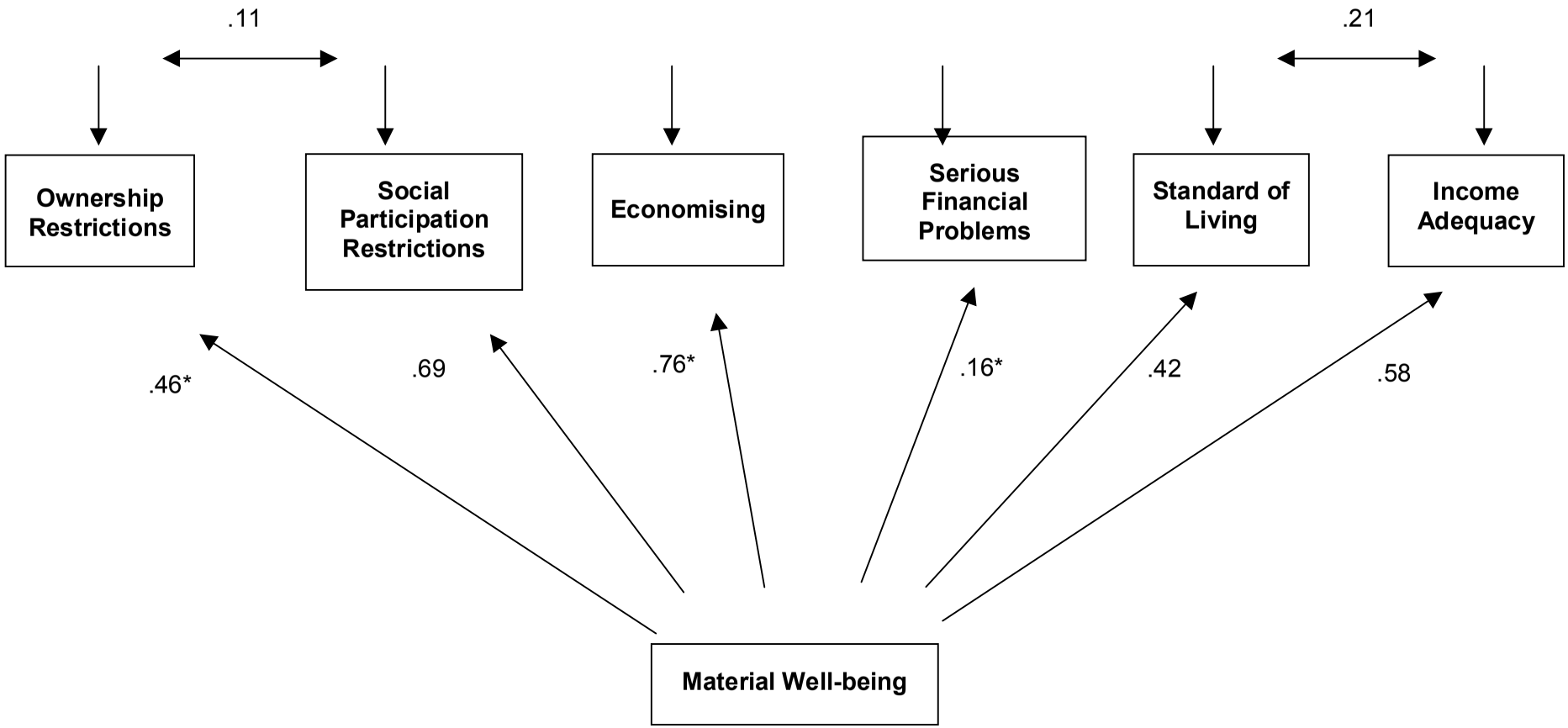
2. From the confirmatory factor model, it was possible to obtain, for each CEU, an estimate of their level of material well-being. This scale was of moderate internal consistency (alpha), exhibited factorial validity and was correlated with a series of concurrent and predictive validation measures.

Figure 5.3: Fitted model of material well-being for single CEUs (All parameters are standardised)



* Denotes model parameter significantly different (p<.05) across single and partnered strata.

Figure 5.4: Fitted model of material well-being for partnered CEUs (All parameters are standardised)



* Denotes model parameter significantly different (p<.05) across single and partnered strata.

3. The analysis was extended to examine the similarity of the factor models for those who were single and those who were partnered. This analysis showed that whilst the same general model described each group, there were some relatively small differences in factor loadings with measures of ownership restrictions, economising and serious financial problems being stronger indicators of material well-being for single respondents. However, it was found that these small differences in model parameters were not sufficient to justify developing separate scales for single and partnered CEUs.

In general, the results of this chapter suggest that the research has been successful in its aims of producing a robust and general measure that describes variations in the material circumstances of the sample under study.