Life Course Centre Working Paper Series

ARC Centre of Excellence for Children and Families over the Life Course

The Dynamics of Multidimensional Poverty in Contemporary Australia

Arturo Martinez Jr.
Institute for Social Science Research, The University of Queensland,

Francisco Perales
Institute for Social Science Research, The University of Queensland

A more recent version of this paper was published as Martinez A and Perales P. (2017) The Dynamics of Multidimensional Poverty in Contemporary Australia. Social Indicators Research, 130(2), 479-496

No. 2014-08
November 2014

NON-TECHNICAL SUMMARY

Poverty measurement and monitoring is of key importance for policy planning. Having a good understanding of what specific factors are responsible for national increases in poverty enables policymakers to devise more effective and cost-efficient policies aimed at tackling disadvantage.

There is growing recognition in the academia and among the public that being 'poor' is not simply lacking money, but also suffering from ill health or disability, not having an appropriate home, feeling unhappy with one's life, or lacking a decent level of education. However, the bulk of existing research on poverty in Australia still uses over-simplistic poverty measures that are based solely or largely on income indicators.

We contribute to the Australian body of evidence on poverty by considering a multidimensional measure of poverty that is to confined to people's income, but also considers information on their health, education, employment, safety, social support, and community participation. Additionally, we employ a novel analytical technique that enables us to determine how much of the year-on-year changes in national poverty rates are due to changes in each of the domains outlined before.

Our findings suggest that about 35% of the Australian population can be considered 'marginally disadvantaged', 5% 'deeply disadvantaged', and 1% 'very deeply disadvantaged'. Multidimensional poverty in Australia has remained fairly stable between 2001 and 2012, but this overall picture of stability masks substantial changes in its different components. For example, recent favourable changes in employment and education have lowered poverty, whereas recent unfavourable changes in materials resources and health have increased it.

Altogether, our findings underscore the importance of taking a more holistic approach to understanding and tackling poverty and disadvantage in Australia. High levels of disadvantage are clearly against the Australian ideal of a 'fair go', hamper national social progress, and present true challenges to sustainable economic growth. Researchers, policy makers and other stakeholders need to redouble their efforts to ensure that the benefits of current economic growth become accessible to all Australians; else this benevolent economic spell will be remembered historically as a lost opportunity to create a fairer and more equal society.

ABOUT THE AUTHORS

Arturo Martinez is PhD Candidate in Social Statistics at the Institute for Social Science Research at The University of Queensland. His research interests cover the application of statistical methods for measuring poverty and disadvantage in developing and developed countries. Recent publications include articles in Research in Social Stratification and Mobility and Asian-Pacific Economic Literature on employment quality and income mobility in Asian countries. Email: a.martinez2@uq.edu.au

Francisco Perales is Research Fellow in Longitudinal and Life Course Studies at the Institute for Social Science Research at The University of Queensland. His recent research has been on social disadvantage, gender inequalities, life course transitions, subjective wellbeing, and the use of household panel surveys within sociology. Recent publications include articles in Work, Employment and Society and Regional Studies on occupational sex segregation and Social Indicators Research on housing satisfaction. Email: f.perales@uq.edu.au

ACKNOWLEDGEMENTS: We would like to thank Mark Western, Michele Haynes, Wojtek Tomaszewski, Olaf Groh-Samberg and participants of InGRID Summer School on Advanced Poverty Research (Bremen, Germany) for valuable insights on earlier drafts. This paper uses unit record data from the HILDA Survey. The HILDA Project was initiated and is funded by the Australian Government Department of Social Services (DSS) and is managed by the Melbourne Institute of Applied Economic and Social Research (Melbourne Institute). The findings and views reported in this paper, however, are those of the authors and should not be attributed to either DSS or the Melbourne Institute.

(ARC Centre of Excellence for Children and Families over the Life Course)
Institute for Social Science Research, The University of Queensland
St Lucia, Qld 4072, Telephone: +61 7 334 **67477**
Email: lcc@uq.edu.au, Web: www.lifecoursecentre.org.au

Abstract

Successfully addressing social inequalities requires moving from one-dimensional to multidimensional poverty measures, but evidence on Australia is still largely reliant on the former. Using panel data and counterfactual simulations, we examine the relative roles of material resources, employment, education, health, social support, community participation, and safety perceptions in explaining changes in multidimensional poverty in Australia between 2001 and 2012. We find that year-on-year absolute changes in multidimensional poverty are mainly driven by fluctuations in social support, community participation, and health. Social support, health and material resources increased relative poverty, whereas personal safety, employment, community participation and education reduced it. Changes in socio-economic returns to parental characteristics had also some impacts on changes in poverty rates. These findings constitute evidence that integrating non-income indicators of wellbeing in Australian policies aimed at addressing poverty would enhance their effectiveness and efficiency.

Keywords: multidimensional poverty; poverty dynamics; counterfactual simulation; decomposition methods; intergenerational mobility; panel data; Australia

JEL classification codes: D31, I32, O15

1. Introduction

Poverty monitoring is one of the main pillars of policy planning in countries across the globe. Australia is no exception and in fact provides an important case study for a number of reasons. For many years, the country has enjoyed rapid economic growth. From 2000 to 2012, *per capita* gross domestic product (GDP) in Australia grew at an annual rate of 1.6%, significantly faster than in other highly developed countries, such as Germany (1.3%), the United States (0.8%), the United Kingdom (0.8%), and Japan (0.7%) (WDI 2014). In 2013, Australia ranked 2nd in the World in terms of average wealth (CSRI 2013). However, the proportion of the population that is relatively poor – currently one in eight – is increasing, the share of the population that is 'deeply and persistently disadvantaged' has not decreased in the last decade, and income inequality is on the rise (ACOSS 2013; Azpitarte 2013; McLachlan, Gilfillan and Gordon 2013; OECD 2014; Whiteford 2013). Additionally, some economists argue that the country may soon enter economic slowdown (OECD 2014; Jakobsen 2014; Carmody 2013), which could have the most profound impacts on the lives of the most vulnerable. To arrest the negative impacts of these scenarios, it is important to gain holistic and more nuanced insights into the drivers and dynamics of poverty and disadvantage in contemporary Australia.

Poverty researchers agree that disadvantage goes beyond income deprivation, with the debate progressively moving into the multiple dimensions of social deprivation and exclusion. While income remains a very important resource (ABS 2012) and a gatekeeper to participation in socio-economic transactions (Harding and Szukalska 2000), 'thin' conceptualizations of disadvantage that are solely based on income ignore the fact that people have different capabilities to convert income into resources that improve living standards (Callander, Schofield and Shrestha 2011). More importantly, many aspects of poverty are ignored by a narrow focus on things that can be purchased by income, including health, community participation and feeling safe (Alkire and Foster 2011). A better way to conceptualize disadvantage is as a lack of capabilities, freedom or resources to participate in mainstream society (UNDP 2008; Nussbaum and Sen 1993; Sen 1999). This implies a shift from conceiving disadvantage in terms of 'the means of living' people dispose of, to the 'opportunities' they are given to choose the life that they want to live (McLachlan et al. 2013).

A gap in our current understanding of social exclusion and disadvantage in the Australian context is how much various factors have contributed to changes in poverty rates in recent

times. This is important for strategic planning and policymaking, as it provides policy planners with the tools necessary to devise policy interventions that maximise economic growth and reduce socio-economic deprivation in targeted and cost-effective ways. The few studies that have examined factors associated with movements into and out of poverty and disadvantage in Australia rely solely on correlations (e.g. Saunders 2011; Smith 2005). Hence, their results help identify the risk factors associated with falling into poverty, but do not provide estimates of what share of the observed poverty changes can be attributed to each factor. This is limiting, as it makes it hard to gauge the extent to which perturbations in different factors affect the distribution of multidimensional poverty and therefore minimising the policy applicability of research findings.

Another gap in knowledge is how the current level of disadvantage affects the future risk of falling into multidimensional poverty. In general, economic growth only leads to poverty reduction if the poor can access the socio-economic opportunities emerging with such growth. If the poor benefit less than the rich from economic growth, then poverty rates would stagnate. Another contribution of this paper is measuring the degree to which economic returns to parental resources on multidimensional poverty rates have changed in recent times. If Australian society's reward-system increasingly penalizes people from poor families, then changes in the economic returns to parental resources will have an inflationary impact on poverty. Conversely, if increasing inequality in Australian society is the product inequality of outcome rather than inequality of opportunity, then the economic returns to parental resources will not affect poverty.

Using a novel methodology proposed by Azevedo et al. (2012) and panel data from the Household, Income and Labour Dynamics in Australia (HILDA) Survey covering 2001 to 2012 we identify proximate determinants of multidimensional poverty dynamics in contemporary Australia. Through counterfactual simulations, our approach decomposes the contributions to changes over time in multidimensional poverty of material resources, employment, education, health, social support, community participation and personal safety.

Key findings indicate that multidimensional poverty in Australia was relatively stable between 2001 and 2012. However, probing into its individual components reveals opposing trends: changes in social support, health and material resources increased multidimensional poverty, whereas changes in personal safety, employment, community participation and education decreased it. Our findings thus reveal that factors other than income have the

strongest impacts on poverty changes, and so Australian poverty reduction policies should pay more attention to addressing disadvantage on non-income dimensions.

2. Background

Despite Australia's robust economic growth rates in the last decades, previous research indicates that such growth has not been 'distributionally neutral' (Azpitarte 2013; Leigh 2013; Saunders 1992). Instead, some social collectives have benefited disproportionately more from economic growth than others. In particular, evidence suggests that Australia's 'poorest of the poor' have gained little from the socio-economic opportunities created by the recent phase of economic growth. Hence, poverty is not a trivial matter in Australia. Income inequality in the country is high, and on the rise. In 2012, 13.8 percent of the population was poor in relative terms, defined as having an income that is 50% lower than the country's median income (OECD 2012). This is higher than the analogous estimate for year 2000, of 12.2 percent, and that the OECD average for 2012, of 11.3 percent (OECD 2014). Increasing poverty and inequality are indicative of growing disparities between advantaged and disadvantaged population groups, and these can have profound impacts on Australia's ability to sustain economic development in the coming years.

Poverty monitoring is a crucial component of policymaking, as it allows planners to identify priorities for intervention. Over the years, there has been a lively debate as to how to better measure poverty in Australia. From the 1960s to the first half of the 2000s, poverty was equated to income deprivation (Callander et al. 2012). During this time, a myriad of relative and absolute poverty lines were proposed, with the resulting variation in poverty estimates being somewhat artificial and undermining the usefulness of poverty statistics for policymaking (Hagenaars and de Vos, 1988; Laderchi et al. 2003; O'Boyle 1999). More recently, inspired by Sen's (1985, 1989, 1999) notions of functioning and capabilities, global efforts were made to probe beyond one-dimensional measures of poverty and shift attention to more comprehensive poverty and disadvantage measures that include other aspects of living standards – such as health, education, and social support (Alkire and Foster 2011; UNDP 2008, 2010). Research in Australia recently began to mirror this course of action (Saunders and Bradbury 2006; Saunders, Naidoo and Griffiths 2008). However, the bulk of this body of evidence is based on a 'static' approach that fails to prove into poverty dynamics (McLachlan et al. 2013) or is confined to specific population groups, including children

(Harding et al. 2006) and Indigenous Australians (Altman et al. 2008). Recently, Kostenko et al. (2013) proposed a dynamic multidimensional poverty index using indicators that span seven domains of socio-economic exclusion (material resources, employment, education and skills, health and disability, social support, community participation, and personal safety perceptions). Azpitarte (2013) used this approach and HILDA Survey data and found that multidimensional poverty rates in Australia changed little between 2001 and 2008. He also found that low income people benefited more from economic growth than multidimensionally disadvantaged people.

Our research extends previous work, particularly Kostenko et al. (2013) and Azpitarte (2013), in several ways. First and foremost, we use more advanced counterfactual analysis techniques to identify which dimensions of socio-economic exclusion contributed more and which contributed less to recent changes in multidimensional poverty. In particular, the technique we use is superior to that employed in previous studies in that it decomposes changes in multidimensional poverty rates into contributions attributable to changes in each of the underlying factors. Second, we examine whether the observed increase in inequality has its roots in even earlier factors, namely parental resources. In other words, we examine whether intergenerational returns have changed over recent years, and to what extent any such changes are associated with changes in multidimensional poverty. In general, simply increasing people's capital levels does not guarantee an average improvement in living standards (King et al. 2012; Schultz 1975). For instance, if all workers in a country's labour force moved to the area in which average wages are highest, this would not necessarily result in upward economic mobility across the board. The latter would only occur if the demand for workers in such area increased at a comparable pace. Supply and demand principles dictate that an increase in the supply of skilled workers would likely result in lower economic returns to acquiring higher skills if the demand for high skill-jobs remains fixed. This is because there are more people competing for the same number of jobs. The same principle applies to the impact of changes in the economic returns to parental resources on poverty rates. If a society increasingly penalizes individuals from disadvantaged households, then poverty rates would not decline, even if the socio-economic capital of poor households increases. This would constitute evidence of a more persistent problem. Conversely, it is possible to observe significant poverty reduction with modest improvements in socio-economic capital if the socio-economic returns to parental resources change to the initially poor people's advantage.

We test which of these scenarios applies to the contemporary Australian case, as each suggests different policy directions.

Third, we extend the observation period until 2012, which enables examination of the potential impacts of the 2008 Global Financial Crisis (GFC) on multidimensional poverty in Australia. Some research suggests that the 2008 GFC had a benign effect on the country's income poverty. However, it is not clear (i) to what extent this was due to effective policy responses adopted in Australia (Edwards 2010, Saunders and Wong 2012), and (ii) whether the GFC had any effects on rates of multidimensional poverty and different subgroups of people, or opposite effects on different domains of multidimensional poverty.

3. Data and methods

3.1 Data

We use data from the HILDA Survey, an ongoing Australian household panel survey which since 2001 collects annual information on all members of sample households aged 15 and over (Summerfield et al. 2013, Watson and Wooden 2012). Wave 1 of the panel contained 19,914 individuals living in 7,682 households across Australia and was largely representative of the Australian population. The final estimation sample is based on a balanced sample consisting of 5,316 respondents aged 25 years or older in 2001 who participate in all 12 survey waves. We restrict the sample to the working-age population so that any observed changes in poverty and disadvantage will not be artificially affected by changes experienced by people who enter the labor force for the first time. This is a conventional approach in the literature. For example, Bourguignon et al. (2004), Díaz-Cuervo and Pudney (2013) and Dartanto and Nurkholis (2013) also restrict their samples to a balanced panel, whereas Dang et al. (2014) and Krebs et al. (2013) also exclude young workers. Working with a balanced sample makes year-on-year changes in multidimensional poverty rates more comparable. As a drawback, and as it will be discussed in more depth later, this strategy may be affected by non-random panel attrition.

The panel data from the HILDA Survey contains annual measurements of individual- and household-level factors that are known or suspected to contribute to poverty. This makes the dataset fit for examining trends in multidimensional poverty at the aggregate-level. To derive an appropriate measure of multidimensional poverty we follow the approach proposed by Kostenko et al. (2013). This involves combining information from 21 indicators into a single

poverty index, decomposable into 7 life domains. The indicators used for the derivation of this index are shown in Table 1. A sum-score approach is employed to combine the 21 indicators into 7 domain indices (Equation 1), which are then added up to create the final multidimensional poverty index (Equation 2). The values of the resulting index range between 0 and 7, where higher values correspond to higher levels of socio-economic disadvantage. As previous studies, we refrain from weighting the different index components. This (i) simplifies algebraic manipulation substantially, and (ii) prevents subjective judgments to permeate poverty definitions (Alkire and Foster 2011).

$$Y_{it}^{j} = \frac{\sum_{c=1}^{n_j} y_{it}^{c}}{n_j} \tag{1}$$

$$Y_{it}^{pov} = \sum_{j=1}^{7} Y_{it}^{j} = Y_{it}^{mat} + Y_{it}^{emp} + Y_{it}^{edu} + Y_{it}^{hea} + Y_{it}^{soc} + Y_{it}^{com} + Y_{it}^{saf} \tag{2}$$

Table 1. Indicators of poverty dimensions

Domain	Indicator	Description
Material resources	• Household income	1 if income is less than 60% of median income, 0 otherwise
	• Financial hardship	1 if experienced 3+ indicators of financial hardship (*could not pay electricity, gas or telephone bills on time; could not pay the mortgage or rent on time; pawned or sold something; went without meals; was unable to heat the home; asked for financial help from friends or family; asked for help from welfare or community organization*), 0 otherwise
Employment	• Long-term unemployment	1 if currently unemployed, looked for work for the past 4 weeks and has been unemployed for the preceding 12 months, 0 otherwise
	• Unemployment	1 if unemployed, 0 otherwise
	• Marginal attachment to the labour force	1 if not employed but looking for work or not employed and not looking for work because of the belief of being unlikely to find work, 0 otherwise
	• Underemployment	1 if working for less than 35 hours per week, 0 otherwise
	• Living in jobless household	1 if no household member is employed and at least one household member is aged 15 to 64, 0 otherwise
Education and skills	• Poor English-language proficiency	1 if respondent speaks a language other than English at home and reports that he/she does not speak English well, 0 otherwise
	• Low level of formal education	1 if respondent is not currently studying full-time and her highest educational qualification is less than high school completion, 0 otherwise
	• Limited work experience	1 if respondent has spent fewer than three years in paid employment, 0 otherwise
Health and disability	• Poor general health	1 if respondent indicated that he/she has poor general health (0-50 on a 0-100 scale), 0 otherwise
	• Poor physical health	1 if respondent indicated that he/she has poor physical health, (0-50 on a 0-100 scale), 0 otherwise
	• Poor mental health	1 if respondent indicated that he/she has poor mental health, (0-50 on a 0-100 scale), 0 otherwise
	• Presence of disable child	1 if respondent is living in a household that has a disabled (0-50 on a 0-100 scale), 0 otherwise
Social support	• Little social support	1 if respondent reported that he/she receives little social support (0-30 on a 0-70 scale), 0 otherwise
Community participation	• Low neighbourhood satisfaction	1 if respondent satisfaction with his neighbourhood was low (0-5 on a 0-10 scale), 0 otherwise
	• Low community connection	1 if respondent satisfaction with feeling part of local community was low (0-5 on a 0-10 scale), 0 otherwise
	• Non-participation to community activities	1 if respondent is not currently a member of a sporting, hobby or community-based club or association, 0 otherwise
	• Non-participation to voluntary work	1 if respondent is not engaged in any voluntary activity in a typical week, 0 otherwise
Personal safety (perceptions).	• Poor perceived personal safety	1 if respondent satisfaction with safety feelings low (0-5 on a 0-10 scale), 0 otherwise

Notes: Adapted from Kostenko et al. (2014).

3.2 Drivers of multidimensional poverty dynamics

The model shown in Equation 2 can be expanded to decompose the observed change in the index between times *t* and *t+r* into changes in the different domains that constitute it (Equation 3). Additionally, one can examine whether the intergenerational transmission of (dis)advantage contributes to multidimensional poverty dynamics by regressing the index ($Y_{it}^{poverty}$) on parental characteristics (W_{it}^{parent}) for each of the time periods of interest. This is shown in Equation 4, which also includes control variables for demographic traits (W_{it}^{demog}; age, sex, marital status, household type) and area-level characteristics ($W_{it}^{location}$; state of residence), and the usual stochastic disturbance term (ε_{it}).

$$\Delta_{t\to t+r} Y_i^{pov} = Y_{it+r}^{pov} - Y_{it}^{pov} = \Delta Y_{it}^{mat} + \Delta Y_{it}^{emp} + \Delta Y_{it}^{edu} + \Delta Y_{it}^{hea} + \Delta Y_{it}^{soc} + \Delta Y_{it}^{com} + \Delta Y_{it}^{saf} \quad (3)$$

$$Y_{it}^{pov} = \beta_t^{demog} W_{it}^{demog} + \beta_t^{location} W_{it}^{location} + \beta_t^{parent} W_{it}^{parent} + \varepsilon_{it} \quad (4)$$

$$\Delta_{t\to t+r} Y_i^{pov} = f(\Delta\beta_t^{demog}, \Delta W_{it}^{demog}, \Delta\beta_t^{location}, \Delta W_{it}^{location}, \Delta\beta_t^{parent}, \Delta W_{it}^{parent}, \Delta\varepsilon_{it}) \quad (5)$$

Earlier, it was argued that supply and demand principles mean that improvements in socio-economic capital do not necessarily translate into poverty reduction if the corresponding socio-economic returns decline faster. Similarly, changes in poverty levels could be affected by changes in the returns to parental resources. For notation purposes, the W term in Equation 4 represents socio-economic capital (SEC), and the associated β coefficients represent socio-economic returns (SER) to various forms of capital. Since parental characteristics are fixed over time, it follows that $\Delta W_{it}^{parent} = 0$. That is, parental characteristics cannot affect poverty levels. In contrast, β_t^{parent} can change over time: an increase in β_t^{parent} is indicative of parental characteristics becoming increasingly important determinants of poverty status, whereas a decrease in β_t^{parent} is indicative of parental characteristics losing in importance. As others before us, we treat $\Delta\varepsilon_{it}$ as a proximate indicator of how socio-economic shocks impact poverty (Solow 1957).

3.3 Decomposing multidimensional poverty dynamics

Since the pioneering work of Oaxaca (1973) and Blinder (1973), who proposed methods to decompose group differences in income, substantial methodological progress has taken place.

Particularly, several methodologies to decompose income distributions across space and over time have emerged. The Oaxaca-Blinder method splits differences in income between groups into: (i) a component due to differences in SECs, and (ii) a component due to variations in SERs. Since its inception, the Oaxaca-Blinder decomposition has been used extensively to estimate the separate contributions of group differences in outcomes of interest (most notably income or wages) with respect to observable characteristics (e.g. sex, education, ethnicity, and area of residence). It has also been used to explain temporal changes in average levels of a continuous measure.

To illustrate this method, we will use income as the outcome variable of interest. Let us assume that the income of individual *i* from the gth group ($Y_i^{(g)}$), is a function of his/her SECs ($X_i^{(g)}$), SERs ($\beta^{(g)}$), and an error ($\varepsilon_i^{(g)}$) (Equation 6). Usually, the income variable is expressed in the natural logarithmic form. For simplicity, we will assume that there are only two groups of individuals (g = 0, 1). The main objective of the Oaxaca-Blinder decomposition is to explain the difference in group averages denoted by $\bar{Y}^{(1)} - \bar{Y}^{(0)}$. This is accomplished by reconstructing the income for one group assuming that they have the income structure of the second group (i.e. the same SERs) ($\bar{Y}^{(c)}$) (Equation 7). The $\bar{Y}^{(1)} - \bar{Y}^{(0)}$ difference can be arithmetically expressed as a sum of two components, where the first term corresponds to group differences in SECs and the second term corresponds to group differences in SERs (Equation 8).

$$Y_i^{(g)} = \beta^{(g)} X_i^{(g)} + \varepsilon_i^{(g)} \rightarrow \bar{Y}^{(0)} = \hat{\beta}^{(0)} X_i^{(0)} \text{ and } \bar{Y}^{(1)} = \hat{\beta}^{(1)} X_i^{(1)} \quad (6)$$

$$\bar{Y}^{(c)} = \hat{\beta}^{(1)} X_i^{(0)} \quad (7)$$

$$\bar{Y}^{(1)} - \bar{Y}^{(0)} = (\bar{Y}^{(1)} - \bar{Y}^{(c)}) + (\bar{Y}^{(c)} - \bar{Y}^{(0)} = \hat{\beta}^{(1)}\left(\bar{X}^{(1)} - \bar{X}^{(0)}\right) + (\hat{\beta}^{(1)} - \hat{\beta}^{(0)})\bar{X}^{(0)} \quad (8)$$

Application of the Oaxaca-Blinder decomposition method is straightforward. In practice, it only entails fitting a linear regression model and perusing the estimated regression coefficients and the sample means of the explanatory variables. However, the approach has two well-known shortcomings. First, it can only be used to explain average differences in characteristics, while differences in other parts of the distribution are left unexplained (Bourguignon and Ferreira 2008). Second, results of the Oaxaca-Blinder decomposition differ when different subgroups are used as the reference group, and thus depend on an arbitrarily

chosen reference category (Oaxaca and Ramson 1999; Jones and Kelly 1984). Several alternative methodologies have been proposed to address these limitations, all of which involved trade-offs (see Bourguignon and Ferreira [2008] and Bourguignon et al. [2005] for reviews).

This study adopts a procedure that has been recently proposed by Azevedo et al. (2012), hereby referred to as the ANS method. Unlike the Oaxaca-Blinder method and most other techniques, the ANS method can accommodate quantiles, variances and any other features of the underlying distribution of the indicator of wellbeing that is being used – not just its mean. Furthermore, it can also address path-dependency issues inherent to other methods.

To illustrate the ANZ procedure, suppose that we treat individuals as the unit of analysis and assume that there are two time periods. The characteristic of interest is the person's level of disadvantage ($Y_{it}^{poverty}$), as in Equation 2. For notation purposes, we express $Y_{it}^{poverty}$ as a function of C components where each component is denoted by F_{it}^{c}, c = 1, 2, …, C; t = 0, 1 (Equation 9) and the term $M(Y_t)$ is used to denote a specific characteristic feature of the distribution of Y_t (e.g. mean, quantiles, poverty, inequality, etc.) Our aim is to decompose the change in the characteristic feature of the distribution of Y_t between time t = 0 and time t = 1 (i.e. $M(Y_1) - M(Y_0)$), into the contribution of changes in F_t^c (i.e. $F_1^c - F_0^c$). In other words, we are interested in measuring the percentage contribution of the value of $F_1^c - F_0^c$ to the value of $M(Y_1) - M(Y_0)$ for each c = 1, 2, … , C. In this study, $M(Y_t)$ represents one of three outcomes that will be considered sequentially: (i) the headcount multidimensional poverty rate (Equation 11), (ii) the multidimensional poverty gap (Equation 12), and (iii) the severity of multidimensional poverty (Equation 13). In all three equations, z represents the multidimensional poverty line.

$$Y_{it} = f(F_{it}^1, F_{it}^2, \ldots., F_{it}^{C-1}, F_{it}^C) \quad (9)$$

$$M(Y_{it}) = \emptyset(f(F_{it}^1, F_{it}^2, \ldots., F_{it}^{C-1}, F_{it}^C)) \quad (10)$$

Headcount poverty rate: $$\frac{1}{N}\sum I(Y_{it}^{poverty} < z) \quad (11)$$

Poverty gap: $$\frac{1}{N}\sum I(\frac{z - Y_{it}^{poverty}}{z}) \quad (12)$$

Severity of poverty: $$\frac{1}{N}\sum I(\frac{z - Y_{it}^{poverty}}{z})^2 \quad (13)$$

The step-by-step procedure for ANS Algorithm for Estimating the Contribution of F^c on $M_1(Y_1) - M_0(Y_0)$ consists of three steps. First, using the formula provided below, one computes the counterfactual poverty distributions at the initial time period and the corresponding parameter of interest $M(Y_0)^{(c)}$ for each factor F^c.

$$M(Y_0)^{(0)} = \emptyset\left(f\left(F_{i0}^1, F_{i0}^2, \ldots., F_{i0}^{C-1}, F_{i0}^C\right)\right) = M(Y_0) \quad (14.1)$$

$$M(Y_0)^{(1)} = \emptyset(f\left(F_{i1}^1, F_{i0}^2, \ldots, F_{i0}^{C-1}, F_{i0}^C\right)) \quad (14.2)$$

$$M(Y_0)^{(2)} = \emptyset(f\left(F_{i1}^1, F_{i1}^2, \ldots, F_{i0}^{C-1}, F_{i0}^C\right)) \quad (14.3)$$

$$M(Y_0)^{(C-1)} = \emptyset(f\left(F_{i1}^1, F_{i1}^2, \ldots, F_{i1}^{C-1}, F_{i0}^C\right)) \quad (14.4)$$

$$M(Y_0)^{(C)} = \emptyset(f\left(F_{i1}^1, F_{i1}^2, \ldots, F_{i1}^{C-1}, F_{i1}^C\right) = M(Y_1) \quad (14.5)$$

Second, one computes the contribution of F^c by subtracting $M_1(Y)^{(c-1)}$ from $M_1(Y)^{(c)}$:

Contribution: $$(F_{i1}^c - F_{i0}^c) = M(Y_0)^{(c)} - M(Y_0)^{(c-1)} \quad (15)$$

Percentage contribution: $$(F_{i1}^c - F_{i0}^c) = \frac{M(Y_0)^{(c)} - M(Y_0)^{(c-1)}}{M(Y_1) - M(Y_0)} \quad (16)$$

Third, steps one and two are repeated for all possible orderings of F^c's and then the average of (15) and (16) is used as the estimate of the absolute and relative contribution of each of the F_c's to poverty changes.

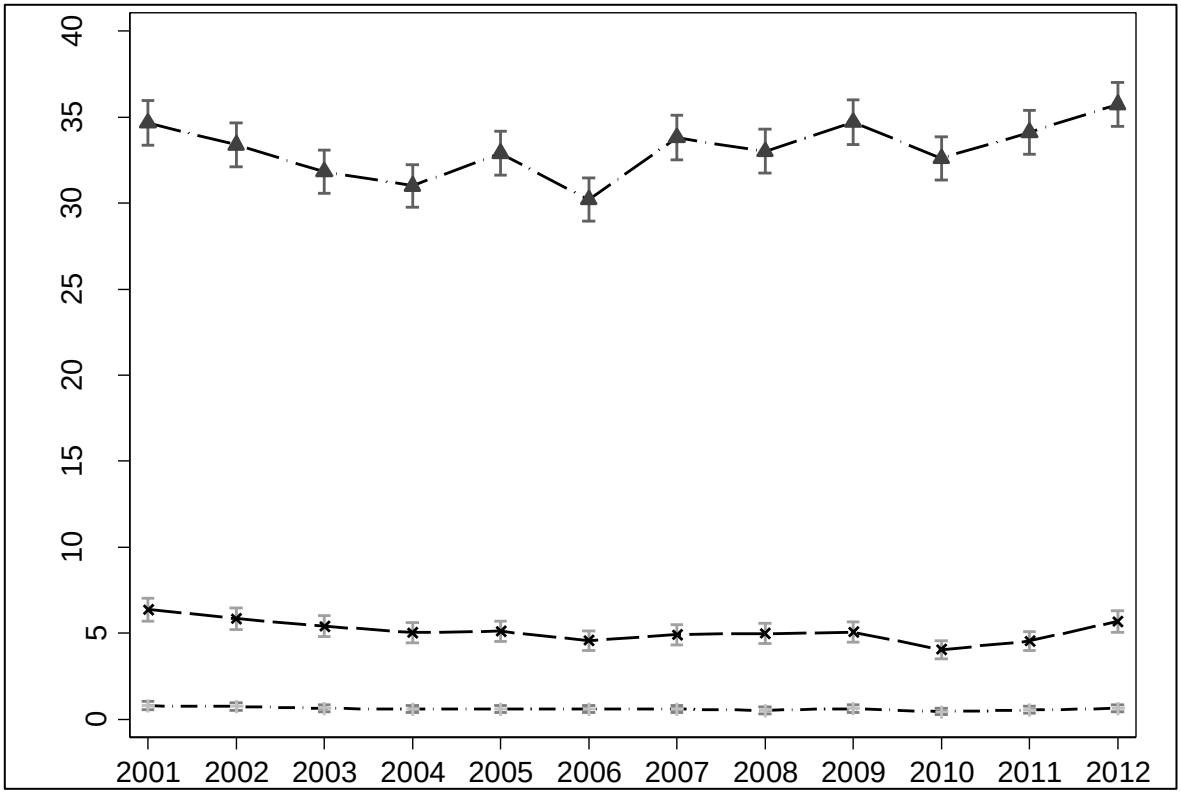
4. Empirical evidence: Multidimensional poverty trends in Australia

Figure 1 illustrates how the prevalence of multidimensional poverty in Australia has changed between 2001 and 2012, using three headcount measures of 'marginal', 'deep' and 'very deep' multidimensional poverty. We use the thresholds in Kostenko et al. (2009): 'marginally disadvantaged' individuals are those disadvantaged in just 1 of the 7 domains described before, 'deeply disadvantaged' individuals are those disadvantaged in 2 such domains, and 'very deeply disadvantaged' individuals are those disadvantaged in 3 or more domains.

There is a general downward trend for 'marginal disadvantage' over the first half of the observation period while an increasing pattern emerges for the second half. On average,

34.1% of the sample qualified as 'marginally disadvantaged' in the period comprised between 2001 and 2006, this increased to 36.2% in the period comprised between 2007 and 2012. In contrast, the sample prevalence of 'deep' and 'very deep' forms of disadvantage decreased slightly across these time periods: from 6.6% to 6.2% for 'deep disadvantage' and from 1.1% to 0.9% for 'very deep disadvantage'.

Figure 1. Time trends in multidimensional poverty



Notes: HILDA Survey data (2001-2012). Respondents aged 25 years or older participating in all waves. Vertical lines denote 95% confidence intervals.

Table 2 shows the over-time prevalence of poverty with respect to the 7 domains considered: material resources, employment, education, health, social support, community participation and safety perceptions. Disadvantage concerning community participation (affecting 23.5% of individuals) and employment (20%) are the most prevalent forms of disadvantage in Australia over the 2001-2012 period, followed by disadvantage with respect to material resources (11.7%) and health and disability (13.1%). In contrast, disadvantage relating to social support (9.1%), education and skills (6.7%), and safety perceptions (3.3%) is rarer.

Concerning temporal trends between 2001 and 2012, there has been a general reduction in disadvantage concerning safety perceptions (–4.3 percentage points), employment (–3.2), and

education and skills (–1). However, disadvantage has increased in all other domains: by 5 percentage points in health and disability, 1.1 percentage points in material resources, 0.7 percentage points in social support, and 0.5 percentage points in community participation. The findings for the health domain are particularly worrying, and mirror those in earlier research (Azpitarte 2013).[1]

Table 2. Dimensions of poverty and social exclusion

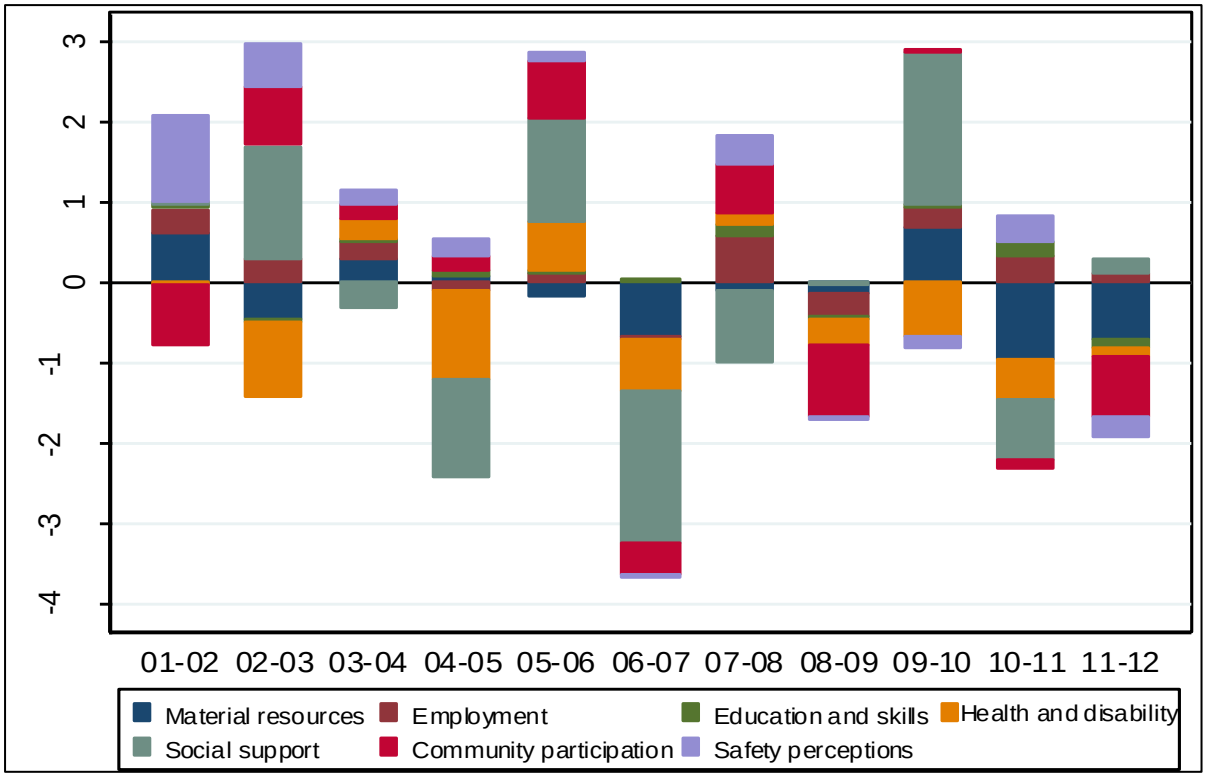
	Material resources	Employment	Education and skills	Health and disability	Social support	Community participation	Personal safety
All years	0.117	0.200	0.067	0.131	0.091	0.235	0.033
2001	0.120	0.220	0.072	0.107	0.090	0.240	0.060
2002	0.111	0.213	0.071	0.106	0.089	0.247	0.046
2003	0.115	0.210	0.071	0.120	0.072	0.238	0.038
2004	0.114	0.205	0.070	0.122	0.075	0.236	0.033
2005	0.111	0.204	0.069	0.130	0.091	0.234	0.033
2006	0.110	0.201	0.067	0.128	0.077	0.230	0.030
2007	0.120	0.198	0.067	0.131	0.099	0.231	0.030
2008	0.118	0.193	0.065	0.133	0.113	0.219	0.022
2009	0.124	0.194	0.064	0.141	0.109	0.230	0.030
2010	0.110	0.192	0.063	0.149	0.084	0.233	0.028
2011	0.127	0.187	0.059	0.153	0.094	0.235	0.023
2012	0.131	0.188	0.063	0.157	0.097	0.245	0.026

Notes: HILDA Survey data (2001-2012). Respondents aged 25 years or older participating in all 12 survey waves.

We now turn our attention to the drivers of annual changes in multidimensional poverty in Australia in the 2001-2012 period, by identifying which of the 7 dimensions of disadvantage have contributed more (and which less) to overall changes in multidimensional poverty. To accomplish this, we use the ANS algorithm (Figure 2). The size of the different coloured sections that together form the bars gives the contribution of the different poverty dimensions to the observed annual change in headcount marginal poverty. When coloured portions are below 0, this means that the corresponding factor contributed to increasing multidimensional poverty rates. Conversely, when coloured portions are over 0, this means that the corresponding factor contributed to decreasing multidimensional poverty rates.

[1] There are some *caveats* when interpreting the results. For instance, since we are using a balanced-panel, it is possible that the trends observed for some indicators such as education and health are due to respondents getting older. Further research should aim to adjust these indicators to control for age effects.

Figure 2. Decomposition of changes in multidimensional poverty



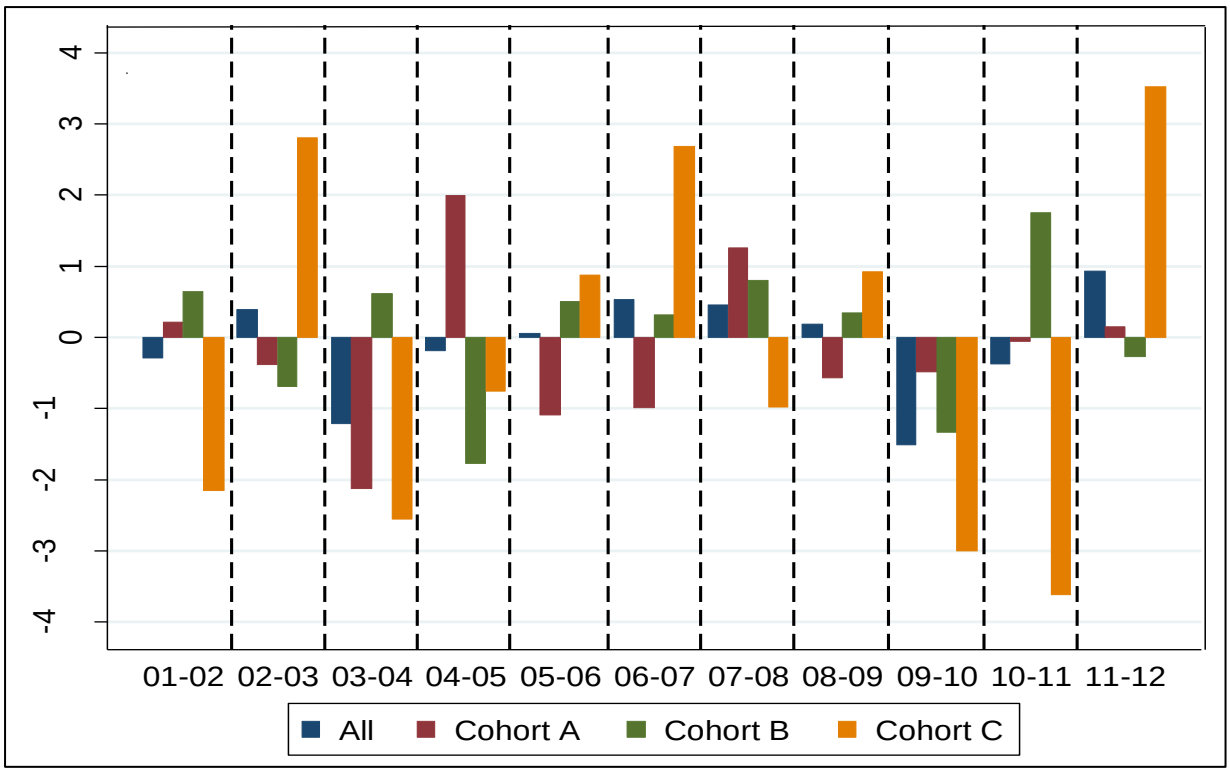
Notes: HILDA Survey data (2001-2012). Respondents aged 25 years or older participating in all 12 survey waves. Poverty threshold defined as respondent scoring 1 or more in the overall index ranging from 0 to 7.

Comparing first the relative sizes of the different coloured segments across years, it is apparent that annual changes in multidimensional poverty rates in Australia are largely driven by changes in social support (light green segments) and health and disability (orange segments). The contributions of the remaining dimensions – particularly employment (brown segments) and education and skills (green segments) – are visibly smaller. Focusing now on the placement of the different coloured segments relative to the 0 threshold, we can determine that changes in social support contributed to increased poverty until 2008 but this poverty-reducing impact was washed out during and after the GFC. In contrast, changes in community participation contributed to decreased poverty until 2008 and increased poverty thereafter. Throughout the observation period, changes in employment and education consistently decreased poverty, while changes in material resources and health consistently increased it.

Finally, we examine whether changes in the rate of transmission of parental advantage have played a part in recent changes in multidimensional poverty in Australia. To test this

proposition, we first divide individuals into three age cohorts: (i) individuals who were aged 25 to 39 years in 2001 [Cohort A], (ii) individuals aged 40 to 54 years in 2001 [Cohort B], and (iii) individuals aged 55 years and over in 2001 [Cohort C]. This allows us to capture the potential varying impact of inequality across various age groups. For each cohort group, we construct indices of socio-demographic characteristics, location and parental characteristics. We then regress $Y_{it}^{poverty}$ on the values of these indices (Equation 4). The indices are treated as the SECs while the resulting regression coefficients are treated as the SERs. Then, the ANS algorithm is used to estimate the contribution of each of these factors to the observed changes in multidimensional poverty rates.

Figure 3. Impact of changes in returns to parental resources on multidimensional poverty



Notes: HILDA Survey data (2001-2012). Respondents aged 25 years or older participating in all waves.

Figure 3 depicts how changes in socio-economic returns to parental characteristics have influenced changes in multidimensional poverty in Australia in the 2001-2012 period. The size of the bars gives the contribution of changes in returns to parental resources to annual changes in marginal poverty rates, for each cohort group. Results indicate that socio-economic returns to parental characteristics have differential effects on poverty trends for each of the three age cohorts. Such effects are most remarkable amongst the oldest cohort group (before, during and after the GFC). We find however little evidence of a consistent

effect of changes in returns to parental characteristics on changes in multidimensional poverty rates across all cohort groups and over time. A possible reason is that economic returns to parental resources might be better estimated using a longer observation period.

5. Discussion and conclusion

In this paper we have examined change and stability in multidimensional poverty and its drivers in contemporary Australia, using advanced counterfactual analyses and panel data covering the 2001-2012 period. In doing so, we contributed to the limited body of evidence by unveiling how the different dimensions of disadvantage interact with each other and how such interactions shapes multidimensional poverty over time. Key results indicate that:

(i) multidimensional poverty rates in Australia have been relatively stable in the 2001-2012 period, particularly after the GFC,

(ii) community participation, employment, material resources and health and disability are the domains on which Australian disadvantage is highest, while social support, education and skills, and safety perceptions are those in which it is lowest,

(iii) changes in the different dimensions of disadvantage offset each other, thus contributing to the emergence of a 'deceiving' overall picture of poverty stability that masks important dynamics at the domain level, and

(iv) changes in non-income dimensions of wellbeing contributed substantially and more than income to changes in poverty rates,

(v) changes in socio-economic returns to parental resources did not have consistent effects on multidimensional poverty rates.

We found that recent, small increments in Australian poverty rates were the net effect of offsetting factors moving in different directions. National falls in social support, material resources and health issues increased poverty the most. If the focus is to simply reduce the number of people who are multidimensionally poor and disadvantaged in Australia, this result suggest that targeting these specific factors would be the most efficient and cost-effective approach. For instance, policies that enhance the accessibility of health services could be used to improve health and social support, while income transfers could be used to alleviate disadvantage pertaining material resources. Trends concerning health-related are particularly alarming and show no evidence of improvement (Callander, Schofield and Shrestha 2011). Health is clearly a fundamental component of people's wellbeing, more so

given that good health is a prerequisite for success in other wellbeing domains such as employment or community participation. Our findings call for the urgent need to reconsidering current national initiatives to improve population health.

On the other side of the coin, improvements in personal safety, employment, community participation, and education decreased poverty. This might reflect that recent policies on these domains have been effective, though testing this is out of the scope of this paper. The result that non-pecuniary dimensions of disadvantage are important drivers of poverty and poverty trends, more so than income itself, is of particular significance. This implies that any policies and intervention programs designed to improve social wellbeing in Australia should move away from a narrow focus on income, and incorporate other dimensions, particularly health, social support networks, safety and skills.

However, caution must be exerted not to make *naïve* extrapolations from our findings: some dimensions of wellbeing may be more malleable by or responsive to public policy. For instance, policy levers aimed at enhancing opportunities in the domain of education would not result in immediate changes in poverty levels, given the time necessary to acquire and put to use new skills gained. Similarly, promoting community participation or social support amongst certain social strata might be more difficult than improving their income levels. Our research points towards the domains hampering overall performance, but says nothing about the feasibility of investment in those domains. Careful judgements, involving trade-offs, need to me made in that regard. Our contribution is to provide the necessary evidence so that such discussions are adequately informed.

Australia is one of the industrialized countries with the highest intergenerational mobility rates (OECD 2010), as evidenced by its relative positioning in Alan Krueger's Great Gatsby curve (Krueger, 2012). Compared to other developed countries, the relationship between a person's socio-economic standing and that of her parents is relatively weak and the distribution of welfare-improving socio-economic opportunities is more equally distributed. We find mixed results about the relationships between changes in the socio-economic returns to parental resources and changes in poverty rates. After the GFC, these had an inflationary net effect on poverty for the older cohort, which suggests that older individuals living in Australia have suffered the consequences of inequality during the GFC more than younger individuals living in Australia. Although it would be interesting to investigate the underlying mechanisms that drive this trend, what seems clear is that persistent forms of inequalities are on the rise in Australia and economic growth has done little to help the vulnerable groups.

Despite our contributions, there are nevertheless *caveats* to our approach that point towards avenues for refinement. First and foremost, as other longitudinal studies, we restrict our analyses to a balance sample of respondents who participated in all survey waves. Hence, if non-random panel attrition is correlated with poverty and poverty dynamics – i.e. the higher or lower propensity for the poor people and people who become poor tend to stop participating in surveys (Vandecasteele and Debels 2007; Jenkins 2011), this may bias our results. Nevertheless, we mitigate the impact of attrition bias by using the longitudinal survey weights provided in HILDA Survey. Furthermore, it is worth pointing out that the HILDA Survey is known to have low attrition rates relative to other national and international surveys (Watson and Wooden 2009).

More fundamentally, truly disadvantaged individuals – such as those who are homeless, incarcerated, in mental institutions, or in nursing home – are out of the survey scope. As a consequence, ours are downward-biased estimates of the true extent of disadvantage in Australia. Second, the HILDA Survey may not fully tap all dimensions of wellbeing. Dimensions such as Sen's notion of people's rights to make choices, exert control over their lives, and have an equal say in their community are missing altogether, whereas some domains (e.g. employment or education) are arguably better measured than others (e.g. safety or social support). Third, some domains may have 'cascading' effects on others (e.g., health on employment). In other words, the assumption that one can fix one domain at a time when computing its contribution to poverty changes may be restrictive. Further research might overcome this issue by deploying orthogonal transformations that would ensure that component indices are independent from each other. Finally, it would be enlightening to compare the observed trends cross-nationally, as this would provide important evidence on the role of macro-level factors in poverty dynamics. Further research should establish such comparisons using other comparable household panel surveys, such as the British Household Panel Survey, the Panel Study of Income Dynamics, and the German Socio-Economic Panel.

Altogether, our findings underscore the importance of taking a more holistic approach to tackling poverty and disadvantage in Australia. This, we argue, can only be realised by leveraging methodological innovation in multidimensional poverty measurement and monitoring. Poverty and disadvantage in Australia are clearly against the national ideal of a 'fair go' and remain an 'unfinished' policy agenda, hampering national social progress and presenting true challenges to sustainable economic growth. Researchers, policy makers and other stakeholders need to redouble their efforts to ensure that the benefits of current

economic growth become accessible to all Australians; else this benevolent economic spell will be remembered historically as a lost opportunity to balance the social system.

6. References

Alkire, S. and Foster, J. 2011. Counting and Multidimensional Poverty Measurement, *Journal of Public Economics, 95(7-8), pp. 476-487*.

Altman, J., Biddle, N. and Hunter, B. 2008. How realistic are the prospects for 'closing the gaps' in socioeconomic outcomes for Indigenous Australians? Centre for Aboriginal Economic Policy Research Discussion Paper No. 287. Canberra: Australian National University

Australian Bureau of Statistics. 2012. Report on Australian Social Trends, First Quarter 2012.

Australian Council of Social Service (ACOSS). 2013. Poverty in Australia 2012. Australian Council of Social Service, New South Wales.

Australian Government. 2006. A Plan to Simplify and Streamline Superannuation

Azevedo, J., Nguyen, M. and Sanfelice, V. 2012. ADECOMP: Stata module to estimate Shapley Decomposition by Components of a Welfare Measure. *Statistical Software Components* S457562, Boston College Department of Economics.

Azevedo, J., Inchauste, G., Olivieri, S., Saavedra, J. and Winkler, H. 2013. Is labor income responsible for poverty reduction? A decomposition approach. WB Policy Research Working Paper No. 6414. The World Bank: Washington.

Azpitarte, F. 2013. Has Economic Growth in Australia Been Good for the Income-Poor? And for the Multidimensionally Poor? *Social Indicators Research, 113(1), pp. 1-37*.

Blinder, A. 1973. Wage Discrimination: Reduced Form and Structural Variables. *Journal of Human Resources*, 8, pp. 436-455

Bourguignon, F. and Ferreira, F. 2008. Beyond Oaxaca-Blinder: accounting for differences in household income distributions. *Journal of Economic Inequality*, 6(2), pp. 117-148.

Bourguignon, F., Ferreira, F. and Lustig, N. 2005. The Microeconomics of Income Distribution in East Asia and Latin America. World Bank Publications, Washington, United States.

Bourguignon, F., Goh, C., and Kim, D. 2004. Estimating Individual Vulnerability to Poverty with Pseudo-Panel Data. Policy Research Working Paper No. 3357. Washington, DC: The World Bank.

Callander, E., Schofield, D., and Shrestha, R. 2011. Mutidimensional poverty in Australia and the barriers ill health imposes on the employment of the disadvantaged. *The Journal of Socio-Economics, 40, pp. 736-742*.

Callander, E., Schofield, D., and Shrestha, R. 2013. Chronic health conditions and poverty: a cross-sectional study using a multidimensional poverty measure. *The Journal of Socio-Economics, 40, pp. 736-742*.

Carmody, C. 2013. Slowing Productivity Growth – A Developed Economy Comparison. Australian Government Treasury Department Economic Roundup Issue 2.

Cuervo, Y. and Pudney, S. 2013. Measuring poverty persistence with missing data with an application to Peruvian panel data. Institute for Social Science Research Working Paper No. 22. Essex: University of Essex.

Dang, H., Lanjouw, P., Luoto, J. and McKenzie, D. 2014. Using repeated cross-sections to explore movements into and out of poverty. *Journal of Development Economics, 107*, 112-128.

Dartanto, T. and Nurkholis. 2013. The determinants of poverty dynamics in Indonesia: evidence from panel data. *Bulletin of Indonesian Economic Studies, 49(1)*, 61-84.

Diaz-Cuervo, B. and Pudney, S. 2013. Measuring poverty persistence with missing data with an application to Peruvian panel data. Institute for Social and Economic Research Working Papers No. 2013-22. University of Essex.

Edwards, J. 2010. Australia after the global financial crisis. *Australian Journal of International Affairs*, 64(3), 359-371.

Hagenaars, A. and K. de Vos. 1988. The Definition and Measurement of Poverty. *Journal of Human Resources*, 23(2), pp. 211-221.

Harding, A. and Szukalska, A. 2000. Trends in child poverty in Australia, 1982 to 1995-96. *The Economic Record, 76(234), pp. 236-254*.

Harding, A., McNamara, J., Tanton, R., Daly, A. and Yap, M. 2006. Poverty and disadvantage among Australian children: a spatial perspective. National Centre for Social and Economic Modelling. Paper presented at the 29th General Conference of the International Association for Research in Income and Wealth.

Krebs, T., Krishna, P. and Maloney, M. 2013. Income Mobility and Welfare. Working Paper No. 2013-1. International Monetary Fund.

Laderchi, C., Saith, R. and Stewart, F. 2003. Does it matter that we don't agree on the definition of poverty? A comparison of four approaches.

Jakobsen, S. 2014. Australia not lucky just isolated says Saxo Bank chief economist Steen

Jakobsen by Baker, P. Available at: http://www.smh.com.au/business/the-economy/australia-not-lucky-just-isolated-says-saxo-bank-chief-economist-steen-jakobsen-20140331-35tav.html

Jenkins, S. 2011. Changing Fortunes: Income Mobility and Poverty Dynamics in Britain. Oxford: Oxford University Press.

King, E., Montenegro, C., and Orazem, P. 2012. Economic Freedom, Human Rights, and the Return to Human Capital: An Evaluation of the Schultz Hypothesis. *Economic Development and Cultural Change*, 61(1), pp. 39-72.

Kostenko, W., Scutella, R. and Wilkins, R. 2013. Intensity and persistence of individuals' social exclusion in Australia. *Australian Journal of Social Issues*, 48(3), pp. 273-298.

Krueger, A. 2012. The rise and consequences of inequality. Presentation made to the Center for American Progress, 12 January 2012. Washington, DC.

Leigh, A. 2013. *Battlers and billionaires: the story of inequality in Australia*. Black Inc. Publishing.

McLachlan, R., G. Gilfillan and J. Gordon. 2013. Deep and Persistent Disadvantage in Australia. Productivity Commission Staff Working Paper.

McKenzie, D. 2003. Measure inequality with asset indicators. Bureau for Research and Economic Analysis of Development Working Paper No. 42, Harvard University, Boston, The United States of America.

Montgomery, M., Gragnolati, K., Burke, A., and Paredes, E. 2000. Measuring living standards with proxy variables. *Demography*, 37, 155-174.

Nussbaum, M. and Sen, A. 1993. The Quality of Life. Oxford University Press, Oxford.

Oaxaca, R. (1973). Male-Female Wage Differentials in Urban Labor Markets. *International Economic Review*, 14, pp. 693-709.

O'Boyle, E. 1999. Toward an Improved Definition of Poverty. *Review of Social Economy*, 57(3), pp. 281-301.

Organisation for Economic Co-operation and Development. 2014. OECD Statistics Database. http://stats.oecd.org/.

Organisation for Economic Co-operation and Development. 2014. Society at a Glance – OECD Social Indicators (The aftermath of the crisis).

Organisation for Economic Co-operation and Development. 2014. OECD Economic Surveys 2014: Australia.

Organisation of Economic Co-operation and Development. 2013. How's Life? Measuring Wellbeing.

Organisation of Economic Co-operation and Development. 2012. Economic Surveys of Australia 2012.

Organisation of Economic Co-operation and Development. 2011. Society at a Glance – OECD Social Indicators: Australia.

Organisation of Economic Co-operation and Development. 2010. A Family Affair: Intergenerational Social Mobility across OECD Countries.

Organisation of Economic Co-operation and Development. 2008. Growing Unequal? Income Distribution and Poverty in OECD Countries.

Saunders, P. 2011. *Down and out: poverty and exclusion in Australia*. Studies in Poverty, Inequality and Social Exclusion Series. Policy Press Publishing.

Saunders, P. 1992. Economic Inequality in Australia. Social Policy and Research Centre, New South Wales, Australia.

Saunders, P., Naidoo, Y. and Griffiths, M. 2008. Towards New Indicators of Disadvantage: Deprivation and Social Exclusion in Australia. *Australian Journal of Social Issues*, 43(2), pp. 175-194.

Saunders, P. and Wong, M. 2012. Estimating the impact of the global financial crisis on poverty and deprivation. *Australian Journal of Social Issues*, 47(4), pp. 485-503.

Schultz, T. 1975. The Value of Ability to Deal with Disequilibria. *Journal of Economic Literature*, 13(3), pp. 827-846.

Sen, A. 1999. Development as Freedom. Oxford University Press, Oxford.

Sen, A. 1989. Development as Capability Expansion. *Journal of Development Planning*, 6(2), pp. 179-191

Sen, A. 1985. Commodities and Capabilities. Oxford University Press, Oxford.

Smith, D. 2005. Indicators of the risk to the wellbeing of Australian Indigenous children. *Australian Review of Public Affairs*, 6(1), pp. 39- 47.

Solow, G. 1957. Technical change and the aggregate production function. *Review of Economics and Statistics, 39*, pp. 312-320.

United Nations Development Programme. 2008. Human Development Report. United Nations, New York.

Vandecasteele, L. and Debels, A. 2007. Attrition in Panel Data: The Effectiveness of Weighting. *European Sociological Review*, 23(1), pp. 81-97.

Vyas, S. and Kumaranayake, L. 2006. Constructing socio-economic status indices: how to use principal components analysis. *Health Policy and Planning*, 21(6), pp. 459-468.

Watson, N. and Wooden, M. 2009. Identifying Factors Affecting Longitudinal Survey Response. In P. Lynn (Ed.), Methodology of Longitudinal Surveys (pp. 157-181). Chichester: John Wiley and Sons.

Whiteford, P. 2013. Australia: Inequality and Prosperity and their Impacts in a Radical Welfare State. Social Policy Action Research Centre, Crawford School of Public Policy, The Australian National University.

(The) World Bank. 2014. World Development Report 2014. The World Bank, Washington.

World Development Indicators Database. 2014. The World Bank's World Development Indicators. Available at http://data.worldbank.org/data-catalog/world-development-indicators

7. Appendices

Appendix 1. Decomposition of changes in multidimensional poverty

Dimension	2001-2002			2002-2003			2003-2004		
	FGT0	FGT1	FGT2	FGT0	FGT1	FGT2	FGT0	FGT1	FGT2
Material Resources	0.6248	0.4972	0.2709	-0.4654	-0.2135	-0.1135	0.2968	0.2391	0.1554
Employment	0.2902	0.4661	0.4295	0.2894	0.1944	0.1428	0.2083	0.2769	0.2346
Education / Skills	0.0483	0.1057	0.0808	-0.0279	0.0138	0.0130	0.0328	0.0615	0.0481
Health	-0.0255	-0.0115	-0.0156	-0.9410	-0.7213	-0.5373	0.2555	-0.1689	-0.1743
Social Support	0.0544	0.1043	0.0655	1.4126	0.5528	0.2965	-0.3193	-0.0432	-0.0048
Community Participation	-0.7730	-0.2984	-0.1476	0.7499	0.4824	0.2879	0.1987	0.0844	0.0910
Safety	1.0714	0.3351	0.1615	0.5396	0.2140	0.1271	0.1479	0.0715	0.0357
Total change	1.2905	1.1985	0.8449	1.5572	0.5225	0.2164	0.8207	0.5213	0.3856
Dimension	2004-2005			2005-2006			2006-2007		
	FGT0	FGT1	FGT2	FGT0	FGT1	FGT2	FGT0	FGT1	FGT2
Material Resources	0.0801	-0.0505	-0.0277	-0.1669	-0.1165	-0.0689	-0.6758	-0.3777	-0.2919
Employment	-0.1009	0.0646	0.0939	0.0984	0.2280	0.1892	-0.0132	0.2043	0.2569
Education / Skills	0.0644	0.0289	0.0226	0.0498	0.0793	0.0561	0.0607	0.0767	0.0689
Health	-1.0988	-0.4572	-0.2811	0.6228	0.1649	0.1143	-0.6390	-0.1301	-0.0672
Social Support	-1.2238	-0.6698	-0.4341	1.2708	0.7549	0.5086	-1.9087	-1.0473	-0.6873
Community Participation	0.1892	-0.0736	-0.1552	0.7171	0.0681	-0.0749	-0.3878	0.0204	0.0897
Safety	0.1974	0.0338	0.0104	0.0986	0.0621	0.0369	-0.0451	-0.0146	0.0005
Total change	-1.8924	-1.1238	-0.7713	2.6907	1.2409	0.7612	-3.6089	-1.2684	-0.6305
Dimension	2007-2008			2008-2009			2009-2010		
	FGT0	FGT1	FGT2	FGT0	FGT1	FGT2	FGT0	FGT1	FGT2
Material Resources	-0.1044	0.0288	0.0298	-0.1487	-0.2848	-0.1850	0.6915	0.1110	-0.0622
Employment	0.6021	0.2277	0.1498	-0.2917	-0.0013	0.0467	0.2326	0.0301	0.0154
Education / Skills	0.1225	0.1022	0.0672	-0.0022	0.0653	0.0386	0.0647	0.1102	0.0771
Health	0.1343	-0.2242	-0.2129	-0.3489	-0.5268	-0.4619	-0.6680	-0.2737	-0.1394
Social Support	-0.9019	-0.4931	-0.3302	0.0043	0.0760	0.0991	1.8711	0.8814	0.5441
Community Participation	0.6146	0.7820	0.6417	-0.8705	-0.6750	-0.5111	0.0568	-0.0863	-0.0314
Safety	0.3389	0.1248	0.0537	-0.0433	-0.0176	-0.0052	-0.1466	-0.0650	-0.0401
Total change	0.8061	0.5482	0.3992	-1.7009	-1.3642	-0.9788	2.1021	0.7077	0.3635
Dimension	2010-2011			2011-2012					
	FGT0	FGT1	FGT2	FGT0	FGT1	FGT2			
Material Resources	-0.9615	-0.3437	-0.1593	-0.7088	-0.1397	-0.0140			
Employment	0.3140	0.3549	0.2961	0.1139	-0.0139	-0.0335			
Education / Skills	0.1867	0.0783	0.0361	-0.0945	-0.0391	-0.0128			
Health	-0.5034	-0.1363	-0.0216	-0.1347	-0.2565	-0.2923			
Social Support	-0.7483	-0.5394	-0.4232	0.1673	0.2270	0.1967			
Community Participation	-0.1190	-0.2926	-0.2606	-0.7285	-0.7355	-0.5783			
Safety	0.3283	0.0839	0.0287	-0.2428	-0.0542	-0.0233			
Total change	-1.5032	-0.7949	-0.5039	-1.6280	-1.0119	-0.7575			

Appendix 2. Decomposition of changes in multidimensional poverty (SER and SECS)

Dimension	2001-2002			2002-2003			2003-2004		
	FGT0	FGT1	FGT2	FGT0	FGT1	FGT2	FGT0	FGT1	FGT2
Socio-demographic	0.1119	0.0863	0.0338	0.1803	-0.0296	-0.0436	-0.1298	0.1297	0.1512
Rsocio-demographic	-1.0548	-1.1556	-1.0771	0.0138	0.6681	0.6452	3.1071	3.4016	3.0695
Location	0.0136	0.0082	0.0052	0.0327	0.0037	0.0029	-0.0004	-0.0078	-0.0081
Rlocation	2.3305	2.2070	1.9990	0.7509	0.4739	0.4322	-1.7594	-1.6717	-1.5231
Parental characteristics	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Rparental characteristics	-0.2884	0.1671	0.1501	0.3935	-0.2153	-0.2112	-1.2123	-1.2127	-1.1195
Residuals	0.1093	-0.1145	-0.2660	1.0950	-0.3784	-0.6091	0.0032	-0.1178	-0.1844
Dimension	2004-2005			2005-2006			2006-2007		
	FGT0	FGT1	FGT2	FGT0	FGT1	FGT2	FGT0	FGT1	FGT2
Socio-demographic	0.3273	0.0954	0.1079	0.0089	0.1624	0.1163	0.3770	0.4453	0.4290
Rsocio-demographic	-0.8557	-0.9998	-0.8868	0.2763	0.8292	0.7599	-3.1015	-2.2803	-2.0485
Location	0.0143	-0.0218	-0.0193	0.0133	-0.0104	-0.0112	-0.0395	-0.0094	-0.0066
Rlocation	0.8304	0.4400	0.4062	0.6405	0.3855	0.3372	0.1828	0.0766	0.0681
Parental characteristics	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Rparental characteristics	-0.1940	-0.1693	-0.1805	0.0569	-0.1097	-0.0897	0.5332	0.3454	0.3373
Residuals	-0.7820	-0.4683	-0.1988	1.3493	-0.0162	-0.3514	-1.6312	0.1540	0.5902
Dimension	2007-2008			2008-2009			2009-2010		
	FGT0	FGT1	FGT2	FGT0	FGT1	FGT2	FGT0	FGT1	FGT2
Socio-demographic	0.4287	0.4046	0.3292	0.1313	0.3893	0.3772	0.4466	0.5447	0.4880
Rsocio-demographic	0.5529	-0.1836	-0.2121	-1.5864	-1.5505	-1.4059	2.2223	2.9877	2.7379
Location	-0.0299	-0.0153	-0.0121	-0.0038	-0.0186	-0.0218	0.0118	0.0076	0.0037
Rlocation	-0.5354	-0.4074	-0.3664	-0.6259	-0.3373	-0.2915	0.7557	0.7233	0.6181
Parental characteristics	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Rparental characteristics	0.4611	1.0801	1.0311	0.1895	-0.1267	-0.1308	-1.5170	-1.7100	-1.5901
Residuals	0.0745	-0.3301	-0.3706	-0.1716	0.2796	0.4940	-0.2748	-1.8456	-1.8941
Dimension	2010-2011			2011-2012					
	FGT0	FGT1	FGT2	FGT0	FGT1	FGT2			
Socio-demographic	0.3567	0.5333	0.5200	0.5269	0.6616	0.5889			
Rsocio-demographic	-2.2013	-3.2434	-2.9533	-2.3967	-2.4742	-2.1926			
Location	0.0013	0.0102	0.0084	-0.0123	-0.0101	-0.0086			
Rlocation	0.5255	0.4119	0.3607	-0.4430	-0.2736	-0.2410			
Parental characteristics	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			
Rparental characteristics	-0.3808	0.3868	0.3788	0.9347	0.7622	0.6939			
Residuals	0.0422	1.1063	1.1815	-0.0713	0.3221	0.4017			

Appendix 2. Technical notes on the ANS algorithm

Like the Oaxaca-Blinder decomposition, the procedure outlined in steps 1 and 2 is path-dependent. The idea behind the ANS algorithm is to construct a counterfactual distribution for Y_t by changing the values of F_{it}^c from the observed value at the initial time period to the observed value at the succeeding time period, one at a time. In the example above, this was done chronologically from F_{it}^1 to F_{it}^C. Thus, the values of (14) and (15) depend on this specific ordering of the factors. However, had we started from F_{it}^C to F_{it}^1 or followed any other ordering, the results would have been different. To address this issue, the third step entails computing the contribution of each factor across all possible permutations or "paths" and using the average to estimate the factor's contribution on $M_1(Y_1) - M_0(Y_0)$.

The approach entails estimating the contribution of one factor at a time by holding the values of all other factors constant. Hence, the decomposition methodology does not reflect economic equilibrium because it simplistically assumes that factors can be changed one at a time while the rest remain fixed (Azevedo et al. 2013). Nevertheless, the potential interactions between factors are partially taken into account by estimating the contribution of a specific factor as the difference between the cumulative counterfactuals.

While the methodology can be used to explain the temporal differences in various forms of $M(Y_t)$, this study defines $M_t(Y_t)$ in terms of multidimensional poverty only. In most of the analyses, poverty measures are computed using one (or more) deprivation as the poverty threshold. Nevertheless, future studies might be interested to define $M_t(Y_t)$ in terms of quantiles or inequality of Y_t.

Fourth, to be able to construct counterfactual poverty distributions, the ANS algorithm requires panel data. If repeated cross-sectional data is available, the algorithm can be modified by making additional assumptions as outlined in Azevedo et al. (2013).

To estimate the contribution of the changes in SEC and SER to multidimensional poverty dynamics using the ANS algorithm, each of the X_{it}^c terms (SECs) and each of the model parameters (β_t^c , SERs) as well as the error term (ε_{it}) can be considered a contributing factor (F_{it}^c). Given that SECs have multiple indicators (e.g. socio-demographic characteristics include age, sex, marital status, household type, etc.), estimation of the ANZ method can be very computationally-intensive, due to its iterative nature, if each indicator is treated as a separate F_{it}^c. To prevent this, we construct an index variable for each SEC by estimating a multidimensional poverty regression model and using the corresponding coefficients as

weights (see UN, 2005). In particular, we regressed the multidimensional poverty index on the various SECs. Since we are interested in measuring the impacts of changes in SEC levels on poverty dynamics, we do not want the changes in the SEC indices to be artificially contaminated by the changes in the weights of the component indicators. Thus, we use data from the initial survey year only to derive the weights. These are then multiplied to the value of each component indicator for the initial survey year and the succeeding time periods. The resulting indices are then used as inputs within the ANS algorithm.