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Compliance with ethical standards

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Abstract

Inequality between generations is a central feature of human societies. Moreover, many institutions have developed within human societies that mould and shape intergenerational inequality, including the state. Nevertheless, intergenerational inequality remains ill-defined as a concept and is rarely directly measured empirically. This paper examines intergenerational inequality – in particular, intergenerational inequality in income. In order to provide greater definition to the concept of intergenerational inequality, the paper introduces a new measure of intergenerational inequality: the *IGI* index. With this new index added to its methodological toolkit, the paper examines the empirical evidence on intergenerational inequality in income, as well as how the state works to alter intergenerational inequality through the redistributive effect of public transfers. The empirical evidence examined is drawn from the recently developed Australian National Transfer Accounts, which include data on the incomes and public transfers paid and received by different ages and generations in Australia during the 28-year time period between 1981–82 and 2009–10. The analyses presented suggest that there are substantial inequalities in the incomes received by different generations, with earlier generations generally receiving less income in real terms over their lifetimes than later generations. As the state has operated through time – receiving public transfers from some individuals and paying public transfers to others – it has worked to increase intergenerational inequality. This implies that the state has worked to decrease the incomes of earlier generations relative to those of later generations. In this way, the state could be described as exhibiting a bias in favour of later generations.

Keywords

Australia, government, income, inequality, intergenerational transfers, life cycle

Introduction

Inequality is one of the central concerns of contemporary social science research. One of the central features of human societies is the division of societies into different generations, each living contemporaneously with other generations and yet living through the human life cycle in its own particular time and with its own particular experiences. The amalgamation of these two phenomena – inequality between generations, or intergenerational inequality – is itself a central feature of human societies worthy of study by social scientists.

Interest in intergenerational inequality has risen as existing systems of transfers between generations have been challenged by social and demographic processes such as population ageing. Despite this rising interest, intergenerational inequality remains ill-defined as a concept and is rarely directly measured empirically.

A taxonomy of indicators of economic sustainability and intergenerational fairness has been developed by Gál and Monostori (2014). Economic sustainability and intergenerational fairness are distinct concepts, although they are often conflated by social scientists who presume that a lack of economic sustainability will lead to unfair or unequal effects on later generations (Gál and Monostori 2014: 15). A review of Gál and Monostori's taxonomy quickly reveals that, while indicators of economic sustainability are commonplace, indicators that focus clearly and specifically on intergenerational fairness are few and far between. Some indicators – such as the net transfer rate, the benefit/tax ratio, and the implicit tax rate – do focus on intergenerational fairness, but none of these focus on intergenerational fairness across the entire economy or across the entire population (Gál and Monostori 2014: 28, 30). This is a significant gap in the literature on indicators of economic sustainability and intergenerational fairness.

Interest in intergenerational inequality is not limited to social scientists. The wider population also has beliefs and opinions about intergenerational inequality. Very substantial numbers of Australians, for example, say that lifelong opportunities have been better for Baby Boomers than for younger people. Moreover, very substantial numbers of Australians say that lifelong opportunities have been better for Baby Boomers than for older people who have already retired. Relatedly, most Australians think that older people are getting less than their fair share of government benefits (Kendig, O'Loughlin, Hussain, and Cannon 2017; Kendig, Hussain, O'Loughlin, and Cannon 2019).

Intergenerational inequality can be assessed along a range of dimensions. It can relate, for example, to the distribution of wealth between generations or the material standards of living experienced by different generations as measured through income or consumption. Intergenerational inequality is one aspect of the "generational economy", for which Mason and Lee offer the following definition:

> **Generational economy** *n* (1) the social institutions and economic mechanisms used by each generation or age group to produce, consume, share, and save resources; (2) the economic flows across generations or age groups that characterize the generational economy; (3) explicit and implicit contracts that govern intergenerational flows; (4) the intergenerational distribution of income or consumption that results from the foregoing. (Mason and Lee 2011b: 7)

Given the interest of the wider population in intergenerational inequality, as well as the centrality of intergenerational inequality to human societies, it is hardly surprising that many institutions and conventions have developed within human societies that mould and shape intergenerational inequality. One of the most important of these is the state. As the state operates through time – receiving taxes and other public transfers from some individuals and paying social protection and other public transfers to others – it works to alter intergenerational inequality. How the state works to alter intergenerational inequality is one aspect of the "intergenerational state" (Folbre and Wolf 2012; Miller 2011), which can be conceptualised as that aspect of the state that moulds and shapes the generational economy.

This paper examines intergenerational inequality – in particular, intergenerational inequality in income. In order to provide greater definition to the concept of intergenerational inequality, the paper introduces a new measure of intergenerational inequality – the *IGI* index. With this new index added to its methodological toolkit, the paper examines the empirical evidence on intergenerational inequality in income, as well as how the intergenerational state works to alter intergenerational inequality in income through the redistributive effect of public transfers. The empirical evidence examined in this paper is drawn from the recently developed Australian National Transfer Accounts (NTA), which include data on the incomes and public transfers paid and received by different ages and generations in Australia during the 28-year time period between 1981–82 and 2009–10.

The main body of this paper is divided into the following sections: (1) data source and methods; (2) income and public transfers, including (a) cross-sectional perspectives and (b) cohort perspectives; (3) intergenerational inequality in income, including (a) a new index of intergenerational inequality and (b) results; (4) the redistributive effect of public transfers; (5) trends in intergenerational inequality in income and the redistributive effect of public transfers; and (6) discussion.

Data source and methods

The analyses presented in this paper are based on data from the Australian NTA. The Australian NTA itself is based on concepts and methods developed by the global NTA project led by Ronald Lee and Andrew Mason, the goal of which is to deepen understanding of the generational economy (Lee and Mason 2011; United Nations Department of Economic and Social Affairs 2013). NTA have been described as:

> A system of macroeconomic accounts that measures current economic flows by age in a manner consistent with the United Nations System of National Accounts. NTA measures age-specific labour income, asset income, consumption, transfers and saving, accounting for flows within households, between households, through the public sector and with the rest of the world. (United Nations Department of Economic and Social Affairs 2013: 199)

NTA focus on these economic flows as they affect the individuals resident in a particular country. Economic flows to and from these individuals can take place through three institutional sectors: the public sector, the private sector, and the rest of the world (Mason and Lee 2011a; United Nations Department of Economic and Social Affairs 2013). In the Australian NTA, the public sector consists of general government and public corporations (that is, corporations that are controlled by government and mainly engaged in the production of goods or services for sale in the market) that are resident in Australia. The private sector includes households, non-profit institutions serving households (NPISHs), unincorporated businesses, and private corporations that are resident in Australia. The rest of the world consists of anything and anybody not resident in Australia.

NTA focus on economic flows to and from individuals. The institutions that make up the institutional sectors just mentioned are conceptualised as agents of individuals or as intermediaries between individuals (United Nations Department of Economic and Social Affairs 2013). General government, for example, is treated as an agent of taxpayers and as an intermediary between taxpayers and the recipients of social protection. Private corporations, to take another example, are treated as agents of their owners and as intermediaries between their owners and their customers. (In the case of private corporations paying taxes to general government, which uses these taxes to fund social protection, private corporations and general government are treated as intermediaries between the owners of private corporations and the recipients of social protection.)

The Australian NTA consists of 67 detailed account items that measure current economic flows by age. More specifically, these detailed account items describe mean or per capita amounts for these economic flows among individuals, broken down by single year of age. A wide range of methods and data sources were marshalled in order to construct these detailed

accounts items. Of the data sources used, the most crucial were the surveys of household expenditure, income, and housing that have been conducted by the Australian Bureau of Statistics (ABS), as well as the Australian System of National Accounts (ABS 1985; 1986; 1988; 1991; 1994; 1997; 2000; 2007; 2008a; 2008b; 2012; 2013). The methods and data sources used to construct these detailed account items are described in detail in Rice, Temple, and McDonald (2014) and Temple, Rice, and McDonald (2017).

For this paper, a series of variables relating to income and public transfers are derived from these detailed account items. These variables are, specifically: public transfer inflows, public transfer outflows, net public transfers, pre-public-transfer income, and post-public-transfer income.

Public transfer inflows are inflows of transfers received from the public sector. These transfers include those received in kind as well as in cash. They also include transfers for collective as well as individual consumption. Public transfer inflows include transfers received for social protection, education, health, housing, child care, and residential aged care, as well as transfers in other areas such as defence and public order and safety.

Public transfer outflows are outflows of transfers paid to the public sector. These transfers include current taxes on income and wealth, such as income taxes levied on individuals and income taxes levied on enterprises. They also include taxes on production and imports, such as employers' payroll taxes, taxes on property, Goods and services tax (GST) as well as other taxes on the provision of goods and services, and taxes on the use of goods and performance of activities.

Net public transfers is equal to public transfer inflows minus public transfer outflows.

Pre-public-transfer income comprises all income apart from net public transfers. It includes labour income, capital income (including capital income from owner-occupied housing), property income received net of property income paid, and private transfers received net of private transfers paid (including private transfers within households as well as between households).

Post-public-transfer income is equal to pre-public-transfer income plus net public transfers. (In NTA, it is also equal to consumption plus saving.)

Data from the Australian NTA is currently available for six different financial years during the 28-year time period between 1981–82 and 2009–10. These years are, specifically: 1981–82, 1988–89, 1993–94, 1998–99, 2003–04, and 2009–10. This time series data can be used to examine how economic flows for different age groups have changed over time. It can also be used to investigate how economic flows for different generations or birth cohorts have changed as these generations or birth cohorts have aged.

Australian NTA data is particularly appropriate for the analyses presented in this paper for a number of reasons. Firstly, this data is broken down by single year of age, which means that comparisons between different age groups and between different generations or birth cohorts can be very finely delineated. Secondly, this data includes information on a wide range of

types of income and public transfers, including, for example, public transfer inflows received in kind, public transfer inflows for collective consumption, public transfer outflows in the form of taxes on production and imports, capital income from owner-occupied housing, and private transfers within households. This facilitates comparisons of income and public transfers that can be very comprehensive in scope.

In order to facilitate comparisons over time (and between generations or birth cohorts), the income and public transfer variables for all years have been adjusted for inflation. In particular, these variables have been converted into 2009–10 dollars (per year) through the use of chain price indices for expenditure on Gross Domestic Product (for 1981–82, chain price indices were used in combination with implicit price deflators for expenditure on Gross Domestic Product) (ABS 2000; ABS 2013). Changes over time (and differences between generations or birth cohorts) are thus presented in real or constant dollar terms.

Missing data for the income and public transfer variables is imputed in the following way. Firstly, for each income or public transfer variable, a two-way table of means by age and birth cohort is constructed. Secondly, based on this initial two-way table, for each birth cohort values for missing data are imputed by linear interpolation between ages. Thirdly, once again based on the initial two-way table, for each age values for missing data are imputed by linear interpolation between birth cohorts. Fourthly, the means of the values from these two imputations are calculated and the final values for missing data are set to these means.

In this paper birth cohorts, defined by year of birth, are grouped into generations. The groupings of birth cohorts are as follows (with the associated generations in parentheses): 1906–1925 (the Greatest Generation), 1926–1945 (the Silent Generation), 1946–1965 (the Baby Boomers), 1966–1985 (Generation X), and 1986–2005 (the Millennials). These groupings and generational names are derived from a range of sources (for example: ABS 2009; Pew Research Center 2010).

Income and public transfers

Rice, Temple, and McDonald (2017) distinguish two different temporal perspectives on material living standards and intergenerational equity. The first – a "cross-sectional" perspective – focuses on material living standards at a particular point in time and how these living standards vary between people of different ages. The second – a "cohort" perspective – focuses on material living standards over a lifetime and how these living standards vary between people of different generations or birth cohorts. Here income and public transfers will be discussed first from a "cross-sectional" perspective and then from a "cohort" perspective.

Cross-sectional perspectives

Cross-sectional per capita age profiles are presented in Figures 1 and 2. These age profiles are derived from Australian NTA data for the 28-year time period between 1981–82 and 2009–10 and consist of means for different age groups during six different years during this time period. Figure 1 presents age profiles for pre-public-transfer income, while Figure 2 presents age profiles for post-public-transfer income.

Fig. 1

Per capita pre-public-transfer income by age, 1981–82 to 2009–10 (2009–10 dollars per year)

Source: Authors' calculations from Australian NTA data

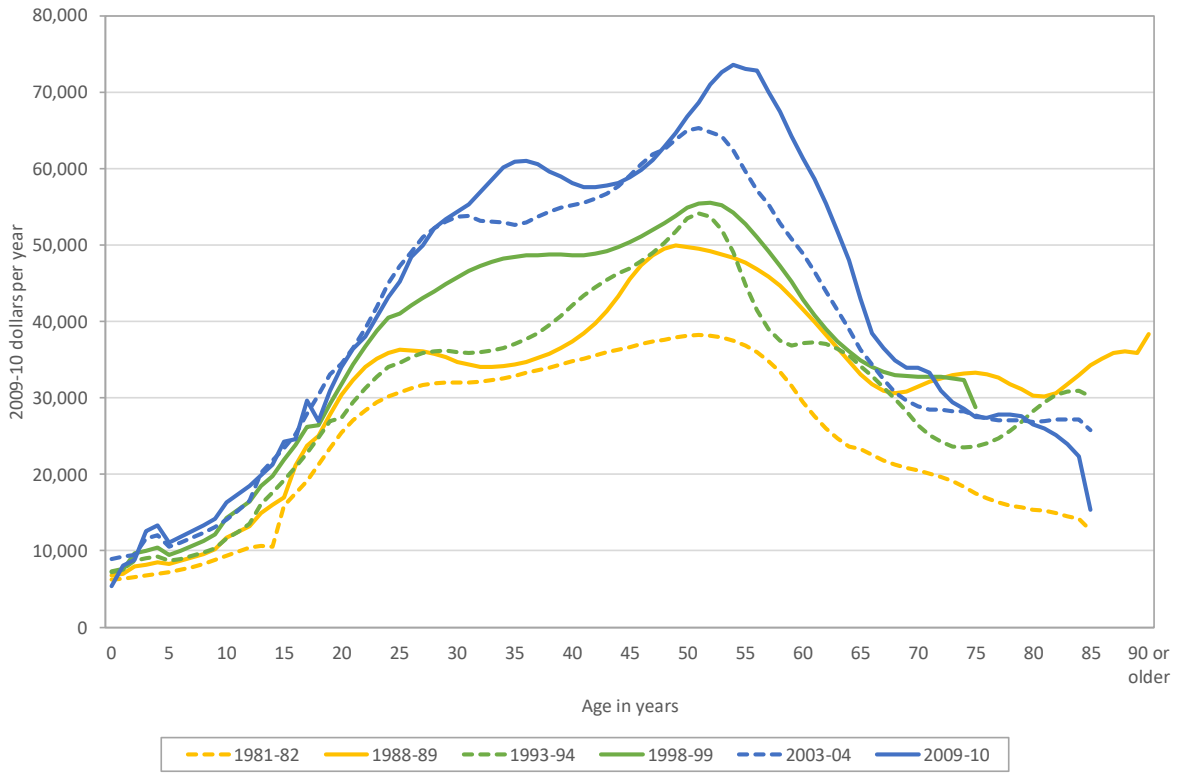
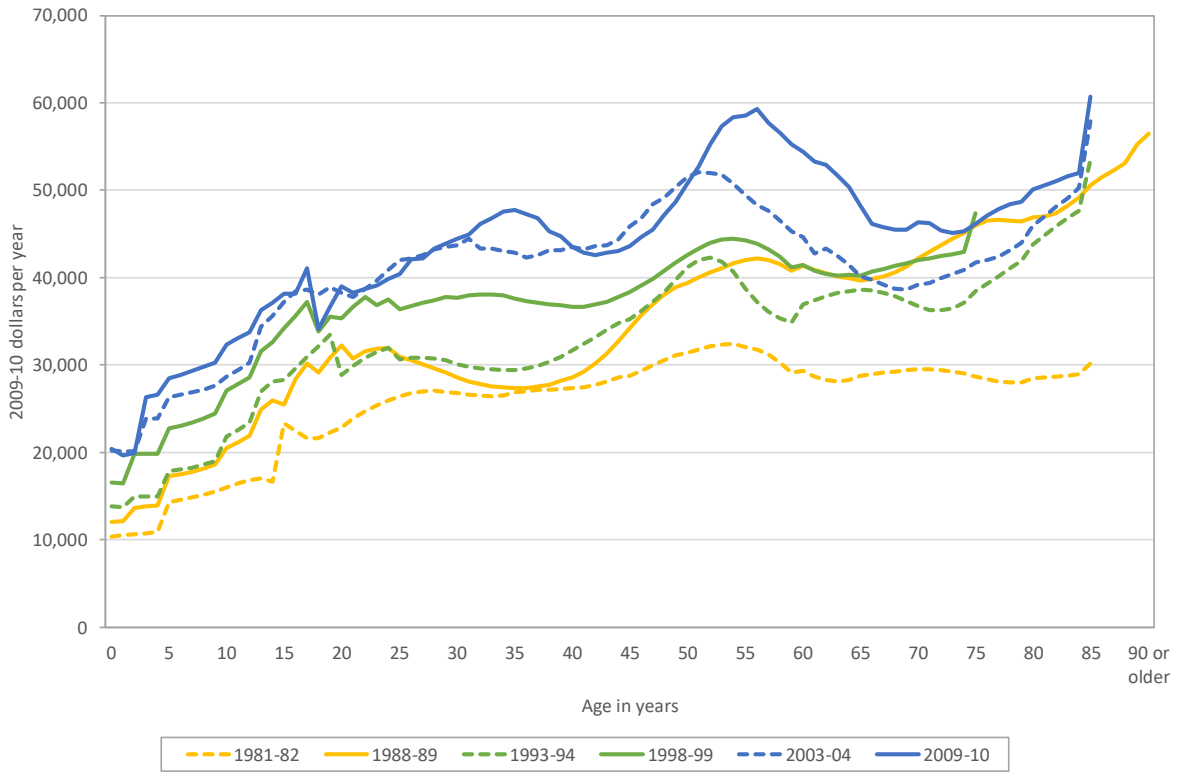


Fig. 2

Per capita post-public-transfer income by age, 1981–82 to 2009–10 (2009–10 dollars per year)

Source: Authors' calculations from Australian NTA data



Throughout the time period between 1981–82 and 2009–10, the cross-sectional age profile for pre-public-transfer income has roughly the shape of an upside-down "U". Pre-public-transfer income is low among younger people, is highest among those aged between the late 40s and the mid-50s, and is middling among older people. Pre-public-transfer income appears to plateau or form a mini-peak among those aged between the mid-20s and mid-30s.

In contrast, the cross-sectional age profile for post-public-transfer income is low among younger people, rises to a mini-peak among those aged in their 50s, and then falls and rises again among older people. The oldest people generally receive the most post-public-transfer income.

Between 1981–82 and 2009–10, pre-public-transfer income rose in real terms among most age groups, as did post-public-transfer income. To a large extent this reflects the fact that economic growth – mean growth in GDP per capita was 1.9 per cent per annum in real terms between 1981–82 and 2009–10 (authors' calculations from ABS 2013) – has benefitted most age groups over time. (Economic growth itself is driven by a wide range of developments: rises in labour productivity, increases in female labour force participation, demographic change, and so on).

The difference between post-public-transfer and pre-public-transfer income is, of course, net public transfers, which in turn is equal to public transfer inflows minus public transfer outflows. Figures 3 and 4 present cross-sectional per capita age profiles for public transfer inflows and public transfer outflows, respectively.

Fig. 3

Per capita public transfer inflows by age, 1981–82 to 2009–10 (2009–10 dollars per year)

Source: Authors' calculations from Australian NTA data

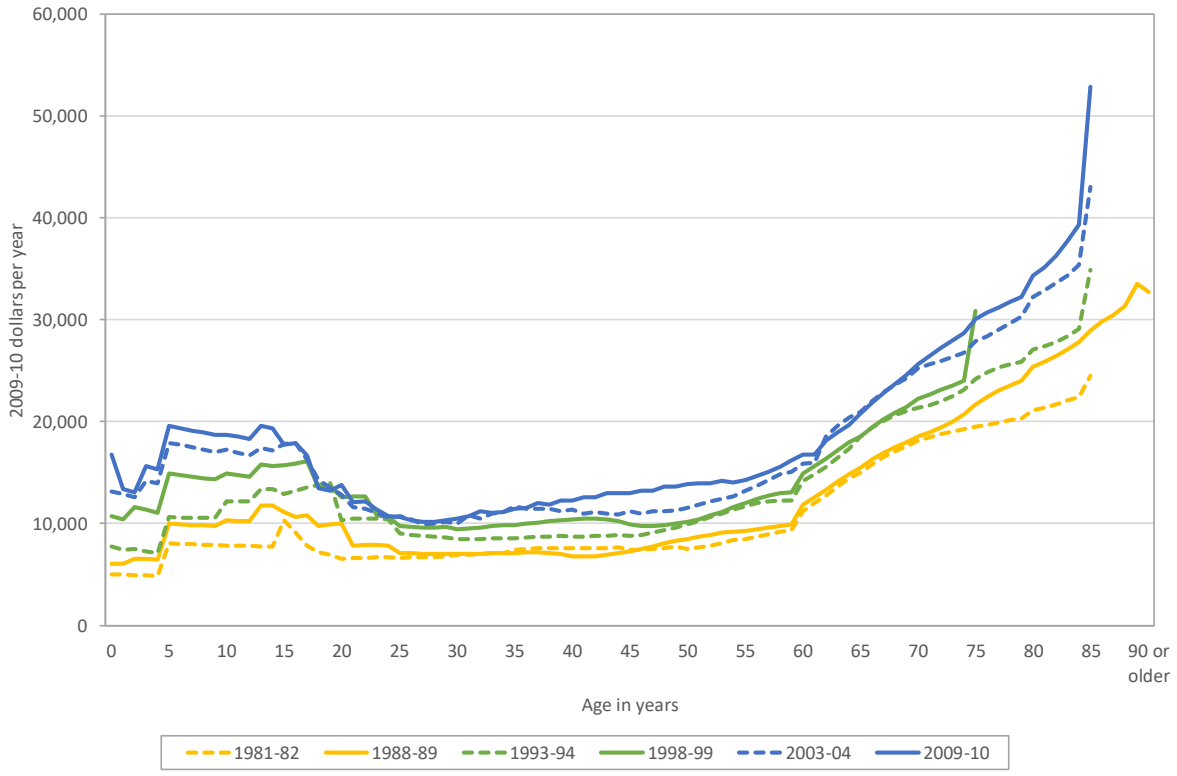
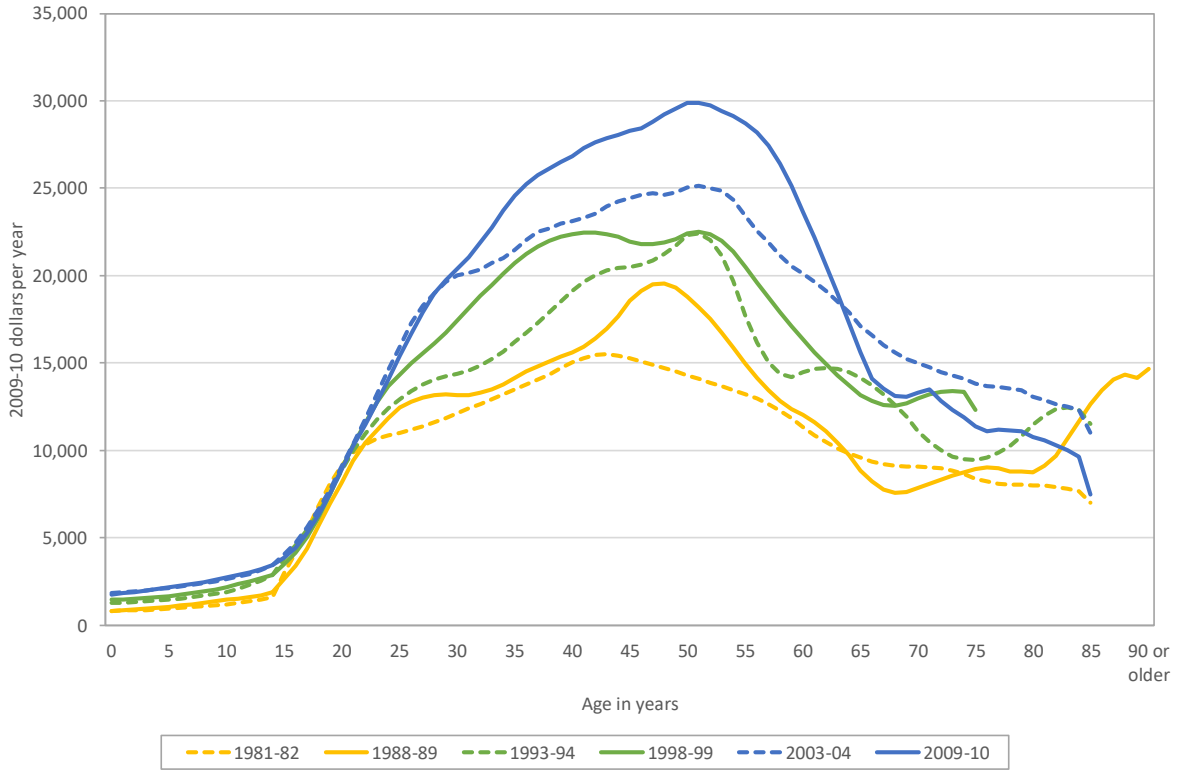


Fig. 4

Per capita public transfer outflows by age, 1981–82 to 2009–10 (2009–10 dollars per year)

Source: Authors' calculations from Australian NTA data



Public transfer inflows are large for younger people, reflecting younger people's receipt of public transfers for education, child care, and social protection (in 2009, this social protection included Youth Allowance, as well as the share of Parenting Payment, Family Tax Benefits, and Baby Bonus Payment allocated to younger people). Public transfer inflows are also large for older people, reflecting older people's receipt of public transfers for health, housing, residential aged care, and social protection (in 2009, this social protection included the Age Pension, Senior Supplement, Special Benefit, and Carer Payment, as well as the Service Pension, Disability Pension, and War Widows Pension from the Department of Veterans' Affairs).

The cross-sectional age profile for public transfer outflows is similar to that for pre-public-transfer income, with roughly the shape of an upside-down "U". Public transfer outflows are small among younger people, are largest among those aged between the early 40s and the early 50s, and are middling among older people. Many of the cross-sectional age profiles for specific public transfer outflows have roughly the shape of an upside-down "U", including the age profile for income taxes levied on individuals, which are the largest type of public transfer outflow.

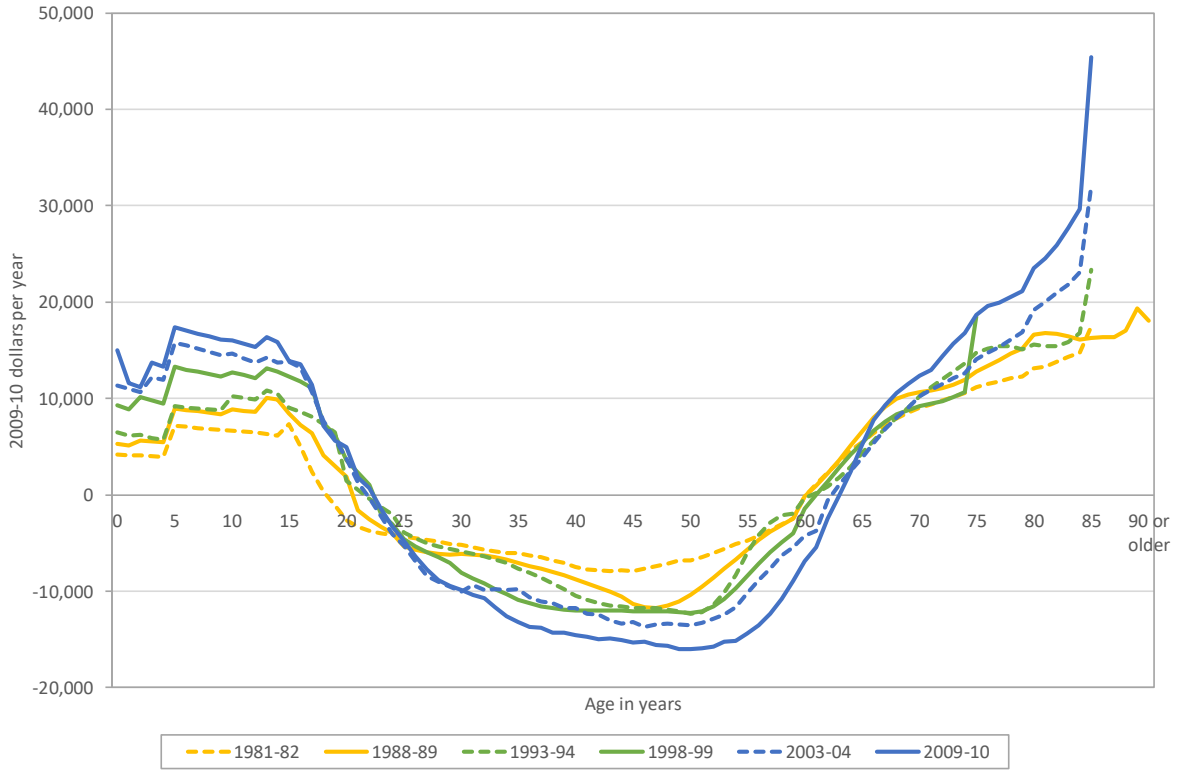
Generally speaking, public transfer inflows and outflows increased in real terms among all age groups between 1981–82 and 2009–10. The only major exception to this is that public transfer outflows decreased substantially among older people between 2003–04 and 2009–10 (due to a large extent to falls in income taxes levied on enterprises owned by older people).

Cross-sectional per capita age profiles for net public transfers are presented in Figure 5. Among younger people, net public transfers are positive, because younger people receive more in public transfer inflows than they pay in public transfer outflows. In other words, younger people are net recipients of public transfers. Among people in the prime working ages, net public transfers are negative, because people in these ages pay more in public transfer outflows than they receive in public transfer inflows. That is to say, people in these ages are net payers of public transfers. Older people, like younger people, are net recipients of public transfers.

Fig. 5

Per capita net public transfers by age, 1981–82 to 2009–10 (2009–10 dollars per year)

Source: Authors' calculations from Australian NTA data



People aged in their late 70s or older receive larger amounts of net public transfers than people of all other ages. On the basis of this kind of cross-sectional pattern, many states have been

described, from a cross-sectional perspective, as exhibiting a bias in favour of older people (Gál, Vanhuysse, and Vargha 2018; Tapper, Fenna, and Phillimore 2013; Wood, Griffiths, and Emslie 2019).

Over time, the boundaries between net recipients of public transfers and net payers of public transfers have shifted upwards. Between 1981–82 and 2009–10, the younger boundary has shifted from between 18 and 19 years of age to between 22 and 23. Over the same time, the older boundary has shifted from between 60 and 61 to between 63 and 64. While these shifts were taking place, it was also generally the case that the amounts of net public transfers received by net recipients increased, while the amounts of net public transfers paid by net payers also increased.

These cross-sectional age profiles, as well as change in these age profiles, influence the income received and the public transfers received and paid by people as they age through time. This will be explored in the following section.

Cohort perspectives

Cohort per capita age profiles are presented in Figures 6, 7, and 8. These age profiles are derived from Australian NTA data for the 28-year time period between 1981–82 and 2009–10 and consist of means for different birth cohorts at different ages (with the different birth cohorts belonging to different generations). Ten particular birth cohorts, born at 10-year intervals between 1915 and 2005, are delineated. Figures 6, 7, and 8 report age profiles for pre-public-transfer income, net public transfers, and post-public-transfer income, respectively.

Fig. 6

Per capita pre-public-transfer income by birth cohort (generation), 1981–82 to 2009–10 (2009–10 dollars per year)

Source: Authors' calculations from Australian NTA data

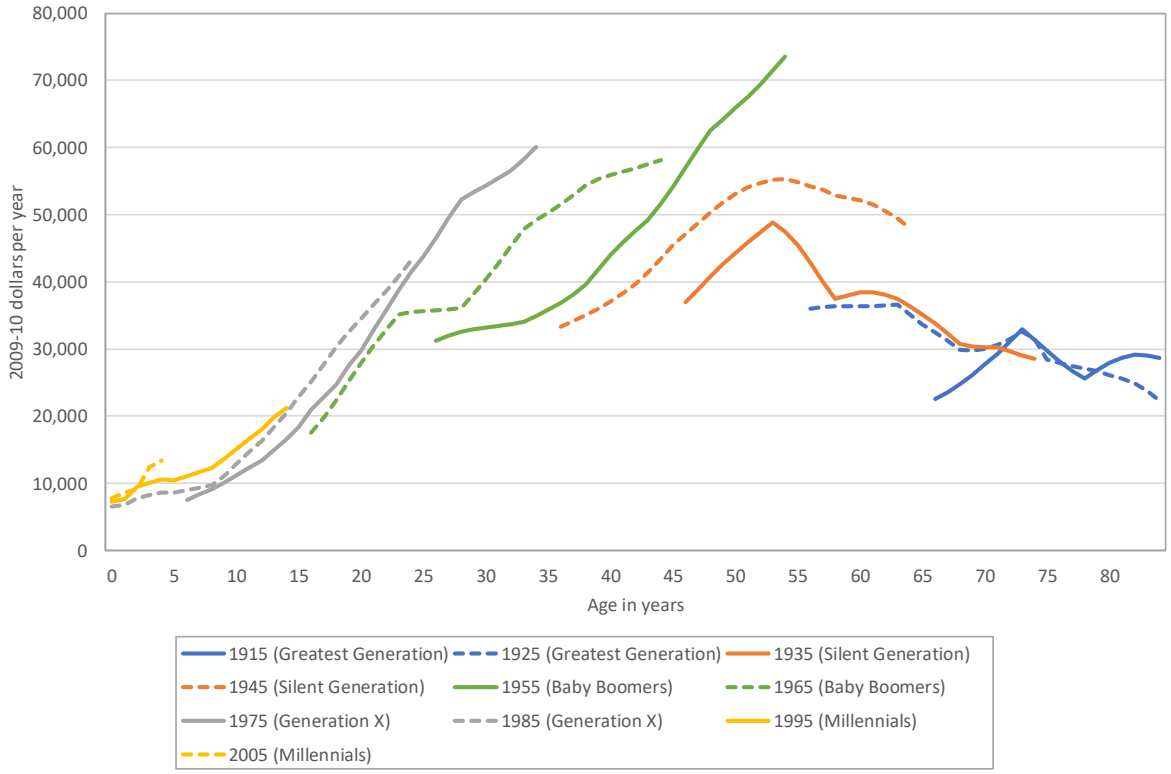


Fig. 7

Per capita net public transfers by birth cohort (generation), 1981–82 to 2009–10 (2009–10 dollars per year)

Source: Authors' calculations from Australian NTA data

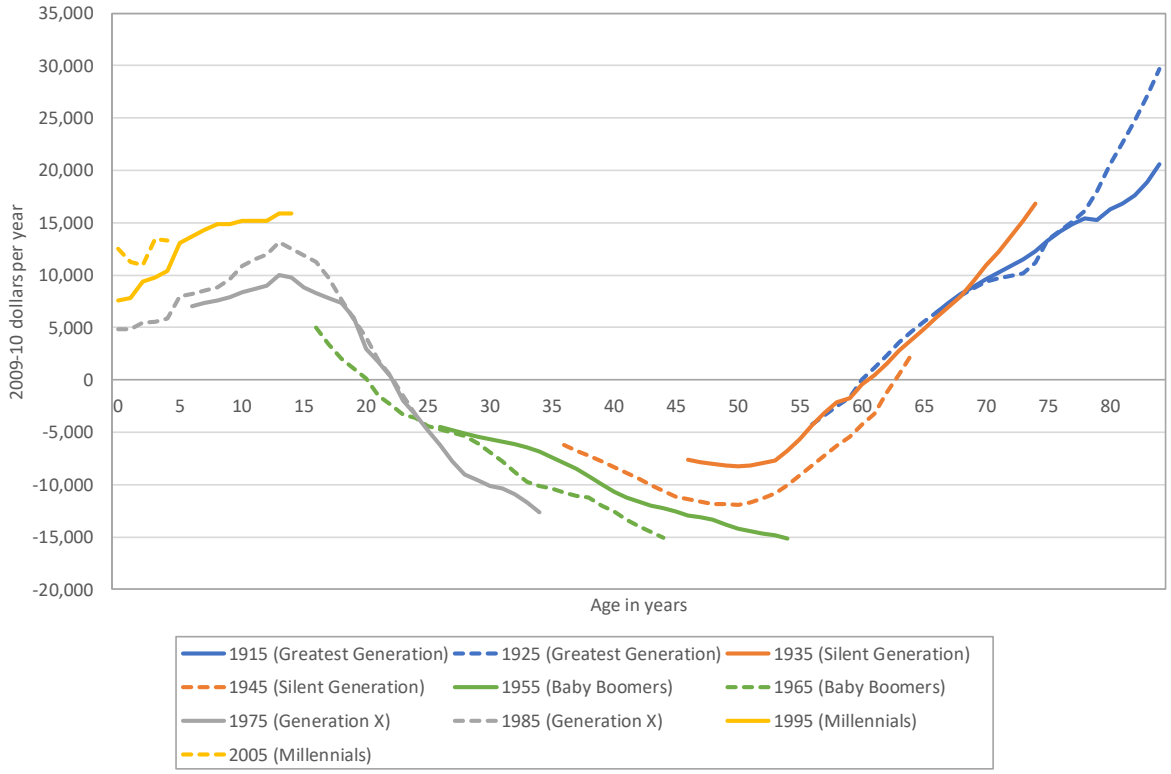
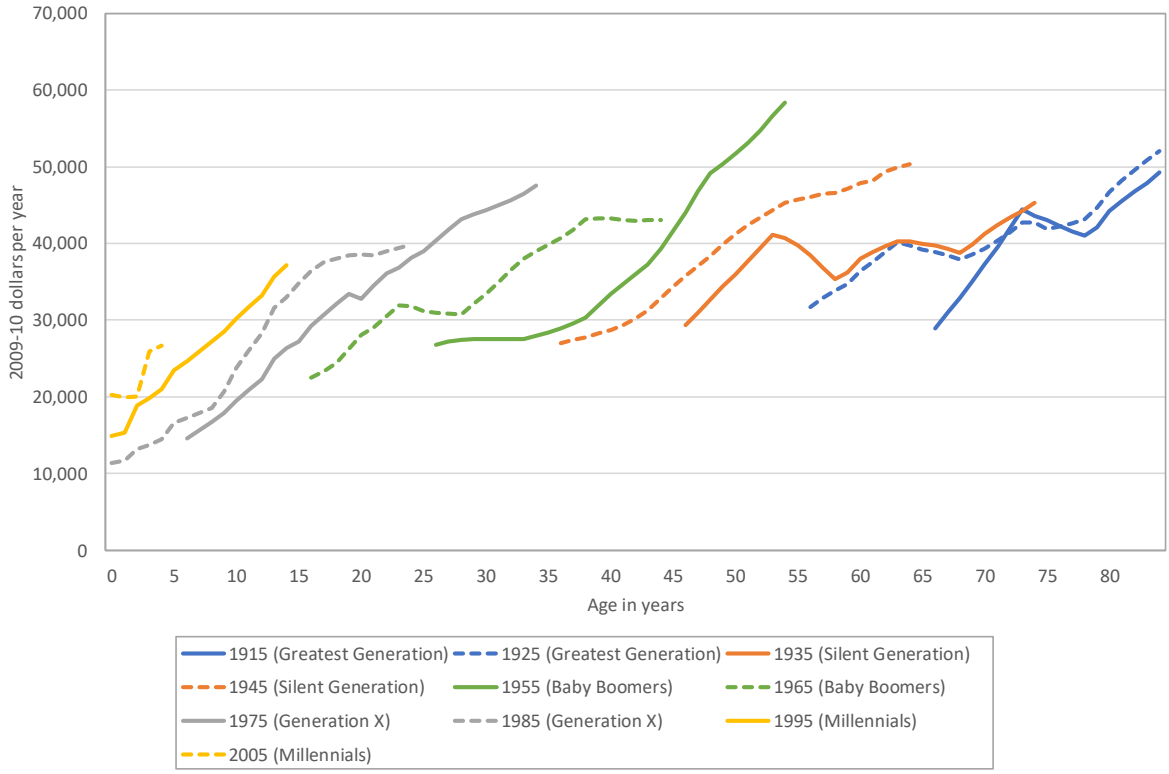


Fig. 8

Per capita post-public-transfer income by birth cohort (generation), 1981–82 to 2009–10 (2009–10 dollars per year)

Source: Authors' calculations from Australian NTA data



The cohort age profiles for pre-public-transfer income in Figure 6 suggest that there are substantial inequalities in the pre-public-transfer incomes received by different birth cohorts or generations. Almost without exception, earlier birth cohorts at a particular age received less pre-public-transfer income in real terms than later birth cohorts received at the same age. For example, members of the Greatest Generation born in 1915 received $27,623 in pre-public-transfer income when they were 70 years of age, while members of the Silent Generation born in 1935 received $30,298 when they were 70 (9.7 per cent more). These members of the Silent Generation received $44,262 when they were 50, while Baby Boomers born in 1955 received $65,907 when they were 50 (48.9 per cent more). These Baby Boomers received $33,196 when they were 30, while members of Generation X born in 1975 received $54,399 when they were 30 (63.9 per cent more). These members of Generation X received $11,197 in pre-public-transfer income when they were 10, while Millennials born in 1995 received $15,060 when they were 10 (34.5 per cent more). (The pre-public-transfer income received by 10 year olds largely takes the form of transfers of goods and services received from parents.) If these inequalities between birth cohorts at particular ages are assumed to be representative of inequalities across all ages, these results imply that Millennials born in 1995 received pre-

public-transfer income that was something of the order of 2.2 times greater than that received by Baby Boomers born in 1955 and 3.6 times greater than that received by members of the Greatest Generation born in 1915.

The cohort age profiles for net public transfers in Figure 7 suggest that, when young, later birth cohorts received larger amounts of net public transfers in real terms than earlier birth cohorts. Later birth cohorts also transitioned from net recipients of public transfers to net payers of public transfers at older ages than earlier birth cohorts. During the prime working ages, later birth cohorts paid larger amounts of net public transfers than earlier birth cohorts and also transitioned from net payers to net recipients of public transfers at older ages. When old, later birth cohorts generally received larger amounts of net public transfers than earlier birth cohorts.

The cohort age profiles for post-public-transfer income in Figure 8 suggest that, almost without exception, earlier birth cohorts at a particular age received less post-public-transfer income in real terms than later birth cohorts received at the same age. For example, members of the Greatest Generation born in 1915 received $37,262 in post-public-transfer income when they were 70 years of age, while members of the Silent Generation born in 1935 received $41,236 when they were 70 (10.7 per cent more). These members of the Silent Generation received $36,008 when they were 50, while Baby Boomers born in 1955 received $51,735 when they were 50 (43.7 per cent more). These Baby Boomers received $27,516 when they were 30, while members of Generation X born in 1975 received $44,288 when they were 30 (61.0 per cent more). These members of Generation X received $19,528 in post-public-transfer income when they were 10, while Millennials born in 1995 received $30,217 when they were 10 (54.7 per cent more). (The post-public-transfer income received by 10 year olds largely takes the form of transfers of goods and services received from parents and governments.) If these inequalities between birth cohorts at particular ages are assumed to be representative of inequalities across all ages, these results imply that Millennials born in 1995 received post-public-transfer income that was something of the order of 2.5 times greater than that received by Baby Boomers born in 1955 and 4.0 times greater than that received by members of the Greatest Generation born in 1915.

There are substantial inequalities in the post-public-transfer incomes received by different birth cohorts or generations, just as there are in relation to pre-public-transfer incomes. The extent of these inequalities, however, are different. Based on the comparisons just discussed between a handful of birth cohorts at a handful of ages, inequality in pre-public-transfer income appears to be lower than inequality in post-public transfer income, which suggests that public transfers have worked to increase intergenerational inequality.

In order to come to firmer conclusions about this, however, an index of intergenerational inequality is needed that is based on comparisons between a more comprehensive range of birth cohorts at a more comprehensive range of ages. An index of this kind is introduced in the following section.

Intergenerational inequality in income

A new index of intergenerational inequality

In this section a new index of intergenerational inequality will be presented that originates from a cohort perspective on material living standards and intergenerational equity. That is to say, the aim of the index is to measure the extent of inequality in the living standards experienced by people of different generations or birth cohorts over their lifetimes. (In this the index echoes, and expands on, the second indicator of intergenerational equity described in d'Albis, Badji, El Mekkaoui, and Navaux 2017).

The difficulty with this aim is that information is rarely available on the entirety of the lifetimes of different birth cohorts. Typically information is only available for a limited number of years. Inequalities between birth cohorts must be estimated on the basis of this limited information. The approach adopted in this paper is to assume that inequalities between birth cohorts over their lifetimes are approximated by inequalities across the limited number of years for which information is available. More specifically, inequalities between birth cohorts over their lifetimes are assumed to be approximated by inequalities between birth cohorts when these birth cohorts are at the same ages, across the limited number of years for which information is available.

The starting point for calculating the index of intergenerational inequality presented here (the *IGI* index) is the construction, for a particular time period, of a two-way table of mean income by age and birth cohort. A table of this kind can be constructed from any time series of surveys that includes data on income by age, with missing data being imputed if required.

Based on this table, the first (that is, the earliest) birth cohort and the second (that is, the second earliest) birth cohort can be compared by calculating, for each age for which data is available for both birth cohorts, the ratio of the second birth cohort's mean income to the first birth cohort's mean income. The mean of these ratios across all the ages for which data is available for both birth cohorts is an indicator of the second birth cohort's income expressed as a proportion of the first birth cohort's income. This indicator is assumed to approximate the inequality between these two birth cohorts over their lifetimes. More specifically, this indicator is assumed to approximate the inequality between these two birth cohorts in terms of the mean annual incomes they receive over their lifetimes. Inequalities in lifetime income due to inequalities in longevity are not taken into account.

The second and third birth cohorts can be compared in the same way, on the basis of these birth cohorts' overlapping ages, as can all later pairs of birth cohorts. This leads to a series of indicators of one birth cohort's income expressed as a proportion of the preceding birth cohort's income.

By chaining this series of indicators together, it is possible to calculate a related series of indicators (L_1, L_2, L_3, and so on) in which the incomes of all birth cohorts are expressed as a

proportion of the income of the first birth cohort. This series of indicators (L_1, L_2, L_3, and so on) is assumed to approximate the inequalities between these birth cohorts over their lifetimes. If desired, this series of L indicators can then be recalibrated so that the incomes of all birth cohorts are expressed as a proportion of some other number, including the income of some other birth cohort.

Once this series of L indicators has been calculated, the index of intergenerational inequality (the *IGI* index) is estimated by calculating the Gini coefficient across this series of indicators. The Gini coefficient is chosen as a summary measure of income inequality because of its many attractive properties, the most important of which, for the purposes of this paper, are as follows. Firstly, the Gini coefficient is equal to half of the mean of the absolute values of the differences in income between all possible pairs of people in a population, expressed as a proportion of mean income. The fact that the Gini coefficient is based on differences in income between all possible pairs of people in a population makes it an intuitively meaningful measure of income inequality. Secondly, the Gini coefficient satisfies the principle of transfers, which is also known as the Pigou–Dalton condition. That is to say, whenever income is transferred from one person to another person with a lower income, this is registered by the Gini coefficient as a decrease in income inequality. Conversely, whenever income is transferred from one person to another person with a higher income, this is registered by the Gini coefficient as an increase in income inequality. Thirdly, the Gini coefficient is scale invariant. That is to say, it takes on values which remain unchanged if all incomes are multiplied by the same number. As a result, its value remains the same despite possible differences in the unit in which income is measured, for example, dollars, cents, or a unit based on the income of the first birth cohort. When all incomes are non-negative, the Gini coefficient has a lower bound equal to 0 and an upper bound that approaches 1 in large populations. The lower bound is attained in the extreme case of absolute equality, while the upper bound in attained at the other extreme in which all income is received by one person (Allison 1978; Atkinson 1983; Sen and Foster 1997).

The following equation gives a definition of the *IGI* index:

$$IGI = \frac{\sum_{i=1}^{n} \sum_{j=1}^{n} \left| L_i - L_j \right|}{2n^2 \mu}$$

where L = the L indicators; n = the number of birth cohorts; and μ = the mean of the L indicators across all birth cohorts. If the L indicators for all of the birth cohorts are equal, the *IGI* index will equal 0. If the L indicator for one birth cohort is positive, but the L indicators for all of the other birth cohorts are 0, the *IGI* index will approach 1.

As described earlier, the *IGI* index is constructed on the foundation of inequalities between birth cohorts when these birth cohorts are at the same ages. As a result, the *IGI* index is purged of age effects on income, which are likely to have a strong influence on a birth cohort's current income but only a weak influence on a birth cohort's lifetime income. The *IGI* index remains

buffeted by period and cohort effects on income, as it should be, since these effects are likely to have a strong influence on a birth cohort's lifetime income.

In this section the series of *L* indicators and the *IGI* index have been presented as they apply to income. However, the *L* indicators and the *IGI* index can be applied to other dimensions of intergenerational inequality, including, for example, wealth and consumption.

Within the taxonomy of indicators developed by Gál and Monostori, the *IGI* index would be classified as an intergenerational fairness indicator of long-term horizon disaggregated at the level of the population. When estimated for post-public-transfer income, the scope of the *IGI* index would be the market economy.

Results

The series of *L* indicators and the *IGI* index were estimated for post-public-transfer income on the basis of Australian NTA data for the 28-year time period between 1981–82 and 2009–10. Figure 9 describes the distribution of the *L* indicators for post-public-transfer income by birth cohort (with the different birth cohorts belonging to different generations). The *L* indicators are calibrated so that the incomes of all birth cohorts are expressed as a proportion of the income of the 1915 birth cohort.

Fig. 9

The indicators of lifetime post-public-transfer income (*L*) by birth cohort (generation), 1981–82 to 2009–10 (1915 = 1)

Source: Authors' calculations from Australian NTA data

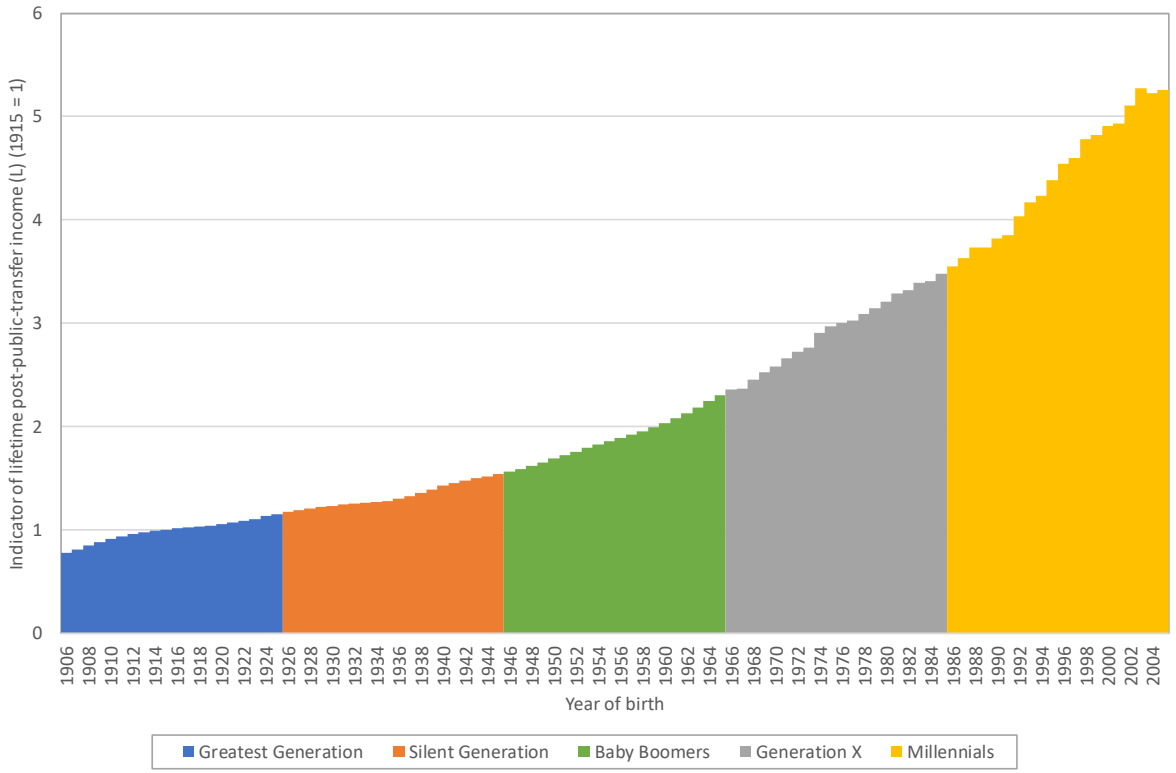


Figure 9 suggests that the post-public-transfer incomes received by birth cohorts over their lifetimes generally increase in real terms with year of birth. In other words, earlier birth cohorts generally receive less lifetime income in real terms than later birth cohorts. The curve in Figure 9 is relatively flat between 1909 and 1938, which suggests that there is a comparatively low level of inequality in lifetime income between the birth cohorts born in these years. (This comparatively low level of inequality is also suggested by the relative closeness of the curves for the 1915, 1925, and 1935 birth cohorts in Figure 8.) Similar observations can be made in relation to the birth cohorts born between 1940 and 1948 and from 2003 onwards.

The curve in Figure 9 translates into substantial inequalities between different birth cohorts in terms of lifetime post-public-transfer income. It suggests, for example, that the lifetime income received by members of the Silent Generation born in 1935 was 1.3 times more than the lifetime income received by members of the Greatest Generation born in 1915. It also suggests that the lifetime incomes received by Baby Boomers born in 1955, members of Generation X born in 1975, and Millennials born in 1995 were or will be 1.9, 3.0, and 4.4 times

more, respectively, than the lifetime income received by members of the Greatest Generation born in 1915.

To a large extent the inequalities between birth cohorts in terms of lifetime post-public-transfer income reflect the fact that economic growth has benefitted all birth cohorts over time. Economic growth generally leads to rising material living standards as one year follows another, so that later birth cohorts generally end up benefitting more from economic growth than earlier birth cohorts.

The *IGI* index for post-public-transfer-income – which is equivalent to the Gini coefficient for the distribution described in Figure 9 – is equal to 0.345.

A value of 0.345 on the *IGI* index corresponds to a substantial level of intergenerational inequality in income. In comparison, in Australia in 2009–10 the Gini coefficient for equivalised disposable household income was 0.320, while the Gini coefficient for equivalised final household income was 0.252 (final income is equal to disposable income plus social transfers in kind minus taxes on production) (ABS 2018). This suggests that income inequality across generations is greater than income inequality across the population at a particular point in time.

Earlier it was suggested that public transfers have worked to increase intergenerational inequality. This will now be discussed in further detail.

The redistributive effect of public transfers

A robust tradition of research has measured the extent to which public transfers work to alter inequality by comparing inequality in post-public-transfer income with inequality in pre-public-transfer income. Many measures of the redistributive effect of public transfers have been derived from this comparison (see, for example, Fritzell 1993; Korpi and Palme 1998; Mitchell 1991).

Following this tradition, the extent to which public transfers work to alter intergenerational inequality in income can be measured by comparing the *IGI* index for post-public-transfer income with the *IGI* index for pre-public-transfer income. A measure of the redistributive effect of public transfers on intergenerational inequality in income can then be calculated as the *IGI* index for post-public-transfer income minus the *IGI* index for pre-public-transfer income. The redistributive effect of public transfers measured in this way would be negative when public transfers work to decrease intergenerational inequality and positive when public transfers work to increase intergenerational inequality.

Based on Australian NTA data for the 28-year time period between 1981–82 and 2009–10, the *IGI* index for pre-public-transfer income is estimated to be 0.311. As mentioned earlier, the *IGI* index for post-public-transfer-income is equal to 0.345. Consequently, the redistributive effect

of public transfers on intergenerational inequality in income is estimated to be 0.035 – which suggests that public transfers have indeed worked to increase intergenerational inequality.

Since earlier birth cohorts generally receive less lifetime income in real terms than later birth cohorts, this implies that public transfers have worked to decrease the lifetime incomes of earlier birth cohorts relative to those of later birth cohorts (or to increase the lifetime incomes of later birth cohorts relative to those of earlier birth cohorts). From a cohort perspective, the state could be described as exhibiting a bias in favour of later birth cohorts.

Trends in intergenerational inequality in income and the redistributive effect of public transfers

The results presented so far have been based on Australian NTA data for the 28-year time period between 1981–82 and 2009–10. It is possible to report results based on shorter time periods. While these results are likely to be less accurate indicators of intergenerational inequality in income, they are able to convey a sense of how intergenerational inequality has ebbed and flowed over time.

(It is important to note that the length of the time period on which the *IGI* index is based can be an important parameter of the *IGI* index. Extending the time period to include earlier years will usually also incorporate earlier birth cohorts, who will generally be comparatively poor as measure by the *L* indicators. Similarly, extending the time period to include later years will usually also incorporate later birth cohorts, who will generally be comparatively rich as measured by the *L* indicators. Because of this, *IGI* indices based on longer time periods will usually be higher than those based on shorter time periods.)

Figure 10 presents the *IGI* index for pre-public-transfer income and post-public transfer income estimated on the basis of Australian NTA data for a series of 10-year time periods between 1981–82 and 2009–10. The redistributive effect of public transfers on intergenerational inequality in income, estimated on the basis of this series of 10-year time periods, is also reported in this figure.

Fig. 10

The index of intergenerational inequality (*IGI*) for pre-public-transfer income and post-public transfer income and the redistributive effect of public transfers, 10-year time periods between 1981–82 and 2009–10

Source: Authors' calculations from Australian NTA data

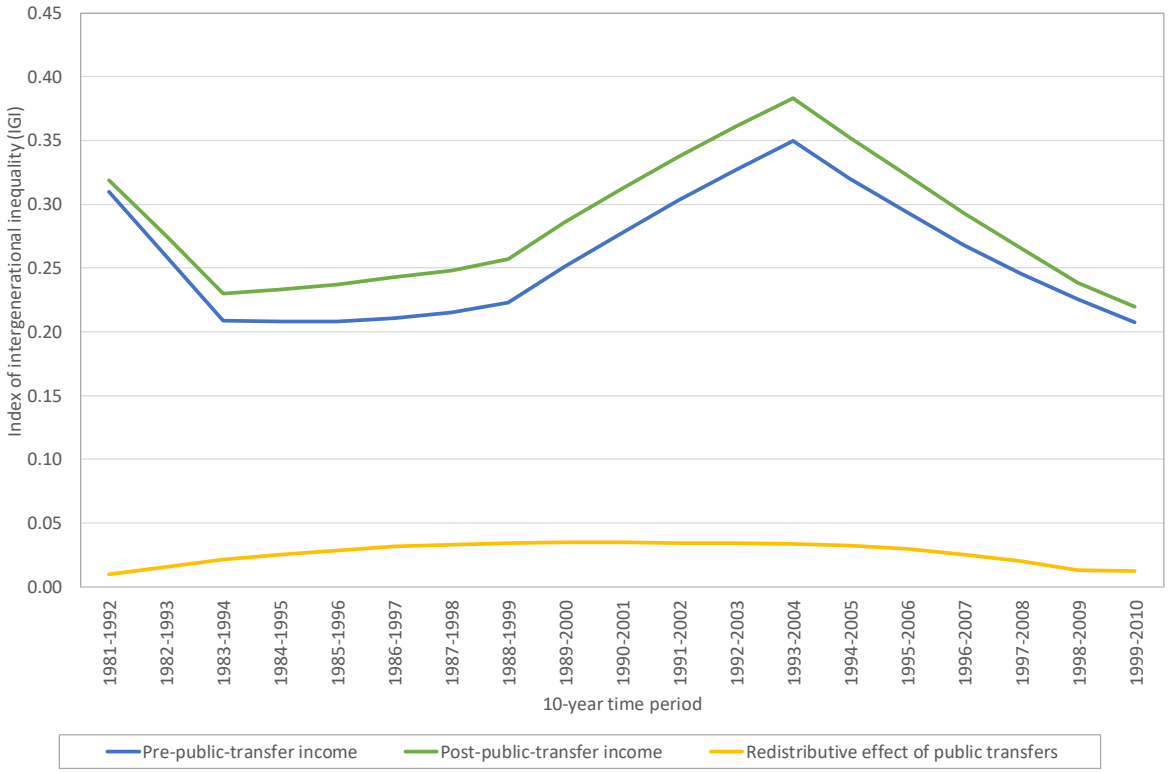


Figure 10 suggests that intergenerational inequality in pre-public-transfer income and post-public-transfer income was comparatively high during the decade between 1993–94 and 2003–04. During this decade, richer birth cohorts as measured by the *L* indicators (who were generally the later birth cohorts) were comparatively more rich (or, alternatively, poorer birth cohorts, who were generally the earlier birth cohorts, were comparatively more poor). During the 28-year time period between 1981–82 and 2009–10, economic growth (as measured by mean growth in GDP per capita in real terms) was the highest during the time period between 1991–92 and 2003–04, which excluded the early 1990s recession and the Global Financial Crisis but included the beginning of the mining boom (authors' calculations from ABS 2013). This period of high economic growth is likely to have had greater positive impacts on the incomes of later birth cohorts (who are younger) than it did on the incomes of earlier birth cohorts (who are older).

One of the reasons for this differential response is that employment outcomes for younger people are more sensitive to economic cycles than are those for older people. Employment

outcomes for younger people deteriorate more during economic downturns, but they also improve more during economic upswings (Borland 2015).

Intergenerational inequality in pre-public-transfer income and post-public-transfer income was comparatively low during the time period between 1983–84 and 1995–96, as well as during the decade between 1999–2000 and 2009–10. During these time periods, richer birth cohorts as measured by the *L* indicators (who were generally the later birth cohorts) were comparatively less rich (or, alternatively, poorer birth cohorts, who were generally the earlier birth cohorts, were comparatively less poor). Between 1981–82 and 2009–10, economic growth (as measured by mean growth in GDP per capita in real terms) was comparatively low during the time period between 1981–82 and 1995–96, which included the early 1980s and early 1990s recessions. Economic growth was also relatively low during the time period between 1998–99 and 2009–10, which included the Global Financial Crisis (authors' calculations from ABS 2013). These periods of low economic growth are likely to have had greater negative impacts on the incomes of later (younger) birth cohorts than they did on the incomes of earlier (older) birth cohorts.

Figure 10 also suggests that the redistributive effect of public transfers on intergenerational inequality in income has consistently been positive (and was highest during the decade between 1989–90 and 1999–2000). That is to say, public transfers have consistently worked to increase intergenerational inequality.

Discussion

It is worth noting that, in the estimations of the *IGI* index and the redistributive effect of public transfers presented in this paper, each birth cohort is given an equal weight. Weighting birth cohorts by their population sizes during the time period on which these estimations are based was also explored. Under this weighting scheme, the earliest birth cohorts (who are also the oldest) are given the least weight. Doing this leads to values for the *IGI* index that are lower than those reported in this paper, as is to be expected given that the earliest birth cohorts are also generally the poorest. The same patterns relating to the *IGI* index and the redistributive effect of public transfers emerge, however. The redistributive effect of public transfers, for example, continues to be positive. (Results available on request.)

The analyses presented in this paper suggest that there are substantial inequalities in the pre-public-transfer and post-public-transfer incomes received by different birth cohorts or generations. Almost without exception, earlier birth cohorts at a particular age received less pre-public-transfer and post-public-transfer income in real terms than later birth cohorts received at the same age. These intergenerational inequalities for income in Australia echo those for consumption in Australia (Rice, Temple, and McDonald 2017), as well as those for income and consumption in other countries (see, for example, d'Albis and Badji 2017; d'Albis, Bonnet, Navaux, Pelletan, and Wolff 2017).

To a large extent these intergenerational inequalities in pre-public-transfer and post-public-transfer income reflect the fact that economic growth has benefitted all birth cohorts over time. Because economic growth generally leads to rising material living standards as one year follows another, later birth cohorts generally end up benefitting more from economic growth than earlier birth cohorts.

Economic growth – in fact, any general change in economic phenomena such as production, consumption, income, or wealth – has consequences for intergenerational inequality. The takeaway is not that economic growth should be avoided in the interests of intergenerational equality, but rather that the consequences of economic growth for intergenerational inequality should be recognised. Once these consequences are recognised, discussions about whether and to what extent these consequences should be ameliorated can take place.

The intergenerational inequalities in post-public-transfer income are also, to an extent, due to the operation of the intergenerational state. As the state has operated through time – receiving taxes and other public transfers from some individuals and paying social protection and other public transfers to others – it has worked to increase intergenerational inequality.

The cohort age profiles for net public transfers presented earlier suggest that, as a birth cohort lives through the human life cycle, it receives larger amounts of public transfers than earlier birth cohorts when young, pays larger amounts of public transfers than earlier birth cohorts during the prime working ages, and again receives larger amounts of public transfers than earlier birth cohorts when old. Since this birth cohort will generally receive more pre-public-transfer income than earlier birth cohorts, that it receives larger amounts of public transfers than earlier birth cohorts when young works to increase intergenerational inequality (or is "regressive" in intergenerational terms). In contrast, that this birth cohort pays larger amounts of public transfers than earlier birth cohorts during the prime working ages works to decrease intergenerational inequality (or is "progressive" in intergenerational terms). That this birth cohort receives larger amounts of public transfers than earlier birth cohorts when old again works to increase intergenerational inequality (or is "regressive"). The overall redistributive effect of public transfers on intergenerational inequality depends on the balance between these effects across all birth cohorts.

The analyses presented in this paper suggest that earlier birth cohorts generally receive less income in real terms than later birth cohorts and that the intergenerational state has worked to increase intergenerational inequality. This implies that the state has worked to decrease the incomes of earlier birth cohorts relative to those of later birth cohorts (or to increase the incomes of later birth cohorts relative to those of earlier birth cohorts). In this way, from a cohort perspective, the state could be described as exhibiting a bias in favour of later birth cohorts. In contrast, the intergenerational state has been described, from a cross-sectional perspective, as exhibiting a bias in favour of older people (Gál, Vanhuysse, and Vargha 2018; Tapper, Fenna, and Phillimore 2013; Wood, Griffiths, and Emslie 2019). These two different perspectives on the intergenerational state contrast with but do not strictly contradict one another. The state can be both biased in favour of older people and biased in favour of later

birth cohorts. A full description of the intergenerational state would include accounts from both of these perspectives.

Australian NTA data is particularly appropriate for the analyses presented in this paper for a number of reasons, as discussed earlier. However, this data is not without its limitations.

Firstly, this data does not take into account the different needs of people of different ages. For example, children typically need less resources than adults, while older adults typically need more health and residential aged care resources than younger adults (Atkinson 1983; United Nations Department of Economic and Social Affairs 2013). After adjusting for different needs, the incomes of children are likely to be higher than suggested in this paper, while the incomes of older people are likely to be lower (in a comparative sense).

Secondly, this data does not take into account economies of scale in consumption, which are of more benefit to people who live in larger households, but of less benefit to people who live in smaller households (Atkinson 1983; United Nations Department of Economic and Social Affairs 2013). Children tend to live in larger households than older people. Similarly, earlier birth cohorts or generations tend to live in larger households than later birth cohorts or generations. After adjusting for economies of scale, the incomes of children are likely to be higher than suggested in this paper, while the incomes of older people are likely to be lower. The incomes of earlier birth cohorts are also likely to be higher than suggested, while the incomes of later birth cohorts are likely to be lower.

Thirdly, this data can be affected by changes in the composition of people of different ages, which can occur through processes such as selective mortality and migration. These compositional changes have not been modelled in this paper.

Fourthly, this data does not provide a completed cohort view of income over a lifetime. The approach adopted in this paper is to assume that inequalities between birth cohorts over their lifetimes are approximated by inequalities between birth cohorts when these birth cohorts are at the same ages, across the limited number of years for which information is available. This assumption is likely to be inaccurate to some extent. As discussed earlier, inequalities between birth cohorts can be altered by factors such as economic growth and the operation of the intergenerational state. The extent to which this assumption is accurate depends on the degree to which, for example, economic growth and the operation of the intergenerational state during the limited number of years for which information is available approximate economic growth and the operation of the intergenerational state over birth cohorts' lifetimes. The exact extent to which this assumption is accurate will become more apparent as information for more years becomes available.

Conclusion

This paper has examined the empirical evidence on intergenerational inequality in income, as well as how the intergenerational state works to alter intergenerational inequality in income

through the redistributive effect of public transfers. As part of this examination, a new measure of intergenerational inequality – the *IGI* index – has been introduced.

Within the taxonomy of indicators of economic sustainability and intergenerational fairness developed by Gál and Monostori, the *IGI* index would be classified as an intergenerational fairness indicator of long-term horizon disaggregated at the level of the population. When estimated for post-public-transfer income, the scope of the *IGI* index would be the market economy. As an indicator with these properties, the *IGI* index fills a significant gap in the literature on indicators of economic sustainability and intergenerational fairness.

In this paper the *IGI* index has been presented as it applies to income. It can, however, be applied to other dimensions of intergenerational inequality, such as wealth and consumption. To be even more specific, in this paper the *IGI* index has been presented as it applies to the mean annual incomes received by birth cohorts over their lifetimes. Inequalities in lifetime income due to inequalities in longevity are not taken into account. One way to incorporate inequalities in longevity would be to weight the mean annual income received by each birth cohort by each birth cohort's life expectancy. Since earlier birth cohorts generally receive less mean annual income and experience shorter life spans than later birth cohorts, the impact of this incorporation of inequalities in longevity would be to heighten measured intergenerational inequality.

In this paper the *IGI* index has been applied to the case of Australia. The *IGI* index can, of course, be applied to other countries as well. It would be an interesting task to examine the extent to which intergenerational inequality – as well as the redistributive effect of public transfers – vary across countries with different political economies and welfare regimes (Castles and Mitchell 1993; Esping-Andersen 1999; Hall and Soskice 2001; Istenič, Vargha, and Sambt 2019, Korpi 2000; Rice, Goodin, and Parpo 2006).

As mentioned in the introduction to this paper, very substantial numbers of Australians say that lifelong opportunities have been better for Baby Boomers than for younger people and for older people who have already retired. The empirical evidence on intergenerational inequality in income examined in this paper suggests that these beliefs and opinions about intergenerational inequality are only partly correct. This evidence suggests that Baby Boomers have received more income over their lifetimes than older people who have already retired, but have received or will receive less income over their lifetimes than younger people.

Beliefs and opinions about intergenerational inequality, among social scientists as well as the wider population, do not necessarily accord with the reality of intergenerational inequality. This reflects the fact that intergenerational inequality has been ill-defined as a concept and rarely directly measured empirically. There is a great opportunity for social science research to shine a light on this central feature of human societies. This paper has sought to help brighten the light.

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