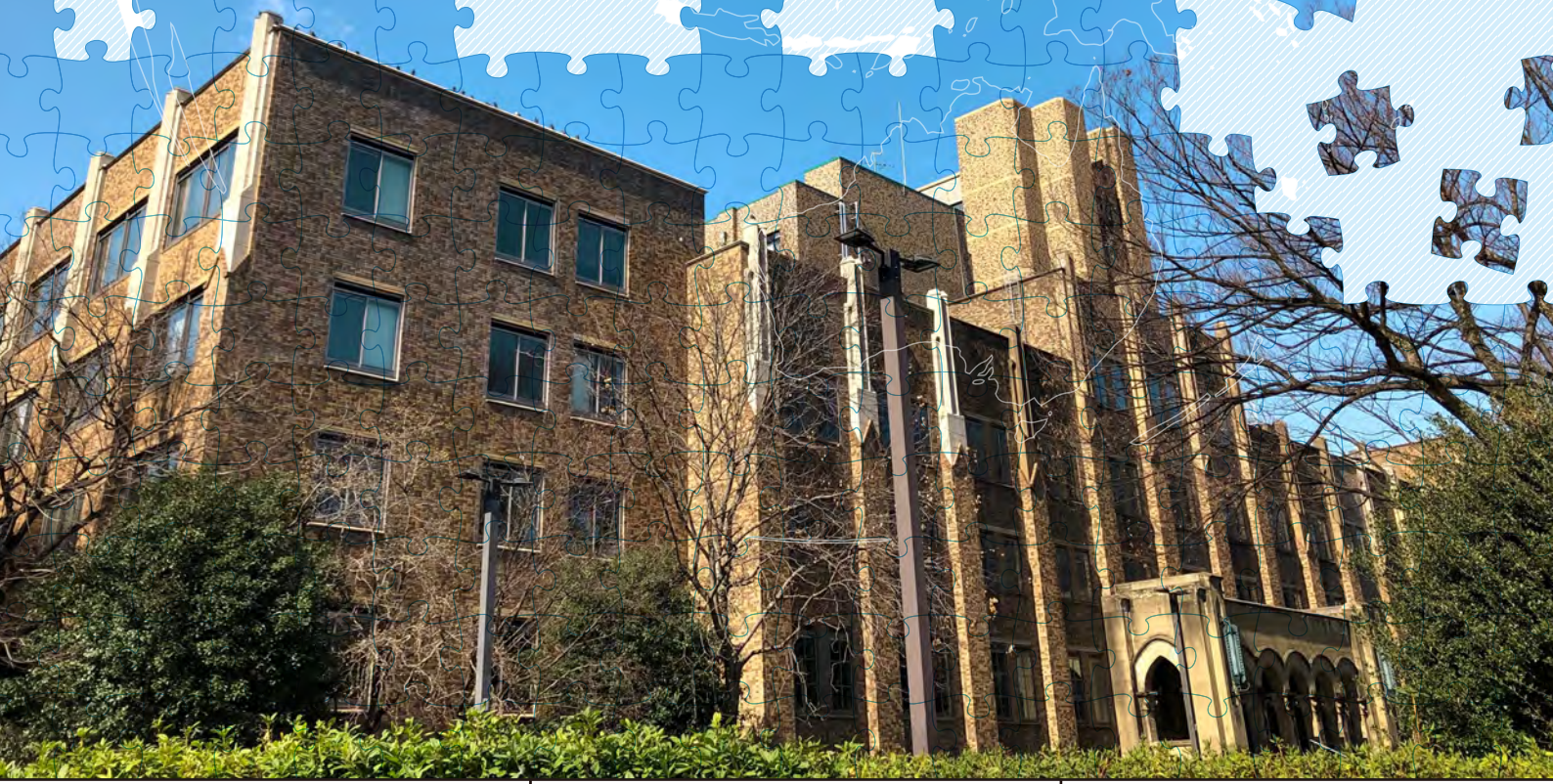
CSRDA
Center for Social Research and Data Archives, Institute of Social Science, The University of Tokyo
SUSTAINABLE DEVELOPMENT GOALS
CSRDA supports the Sustainable Development Goals

CSRDA Discussion Paper

Multigenerational Perspective on Trends in the Inequality of Educational Opportunity in Japan



No. 63
Date Oct. 2023
SDGs 4 QUALITY EDUCATION 5 GENDER EQUALITY 10 REDUCED INEQUALITIES

Name Ryota Mugiyama, Aguru Ishibashi

Multigenerational Perspective on Trends in the Inequality of Educational Opportunity in Japan

Ryota Mugiyama*

Aguru Ishibashi**

* Department of Political Studies, Gakushuin University. ryota.mugiyama@gakushuin.ac.jp

** Institute of the Humanities, Senshu University. ishi14.a@gmail.com

October 24, 2023

Running head: Multigenerational perspective on trends in intergenerational mobility

Word count: 7,256

Acknowledgments

The data used in this paper—1998 and 2008 National Family Research of Japan (NFRJ) by the National Family Research Working Group, Japan Society of Family Sociology; 2015 Social Stratification and Mobility Survey of Japan (SSM) by the 2015 Survey Management Committee; and the 2013 Education, Social Stratification, and Social Mobility survey in Japan (ESSM) by the Education, Social Stratification, and Social Mobility Survey 2013 Research Project—were provided by the Social Science Japan Data Archive, Center for Social Research and Data Archives, Institute of Social Science, The University of Tokyo. A previous version of this paper was presented in the 74th meeting of the Japanese Association for Mathematical Sociology at Tsukuba University and the 2023 RC28 Summer Meeting at the University of Michigan. We appreciate the participants for their helpful comments.

Abstract

Trends in the inequality of educational opportunity have been studied by measuring social origin through parental socioeconomic positions. However, recent studies suggest that the influences of grandparents' socioeconomic resources may have increased, indicating that the parent-child association does not accurately reflect the influence of parents per se over time. To examine this change, we demonstrate how associations between parents' and grandparents' educational attainment and their (grand)child's educational attainment have changed across cohorts by utilizing three-generation data from multiple nationally representative social surveys in Japan. The results reveal that the influence of grandparents' educational attainment has increased across cohorts for grandsons, indicating that the declining influences of parents' educational attainment will be underestimated when the grandparental generation is not considered. No increasing trends in the grandparent-granddaughter association of educational attainment are found. Incorporating other familial members into the measurement of social origin allows us to disentangle the (un)changes in parent-child intergenerational association over time.

Keywords

multigenerational perspectives, inequality of educational opportunity, intergenerational mobility, trend, Japan

Introduction

Trends in the inequality of educational opportunity by social origin, as measured by parental socioeconomic positions, have been examined in numerous studies. Educational attainment mediates people's social origin and destination in industrial societies (Blau and Duncan 1967), which also influences the degree of intergenerational mobility (Breen and Jonsson 2005; Beller and Hout 2006; Breen and Müller 2020). Studies have shown that the inequality of educational opportunity by parental class can change across periods. While several studies have suggested that educational inequality by parental class has decreased across cohorts (Breen et al. 2009, 2010), it is still debated whether the relationship between parental socioeconomic positions and children's educational attainment has declined or remained stable, as has been suggested by many studies (Ballarino et al. 2009; Boliver 2011; Breen and Müller 2020; Bukodi and Goldthorpe 2016; Erikson and Jonsson 1996; Fujihara and Ishida 2016; Pfeffer 2008; Reimer and Pollak 2010; Rotman et al. 2016; Shavit et al. 2007; Torche 2010; Triventi et al. 2016; van Doorn et al. 2011).

However, these studies have measured social origin based solely on parental attributes, which is an approach that may have obscured the actual changes in parental influences on their offspring's educational attainment. Multigenerational views on intergenerational mobility suggest that intergenerational associations between parents and children may neglect the influences of other familial origins (Mare 2011, 2014). Among the other familial origins, grandparental influences have received much attention. Studies have indicated that grandparents' resources, in addition to parents' resources, are associated with their grandchildren's educational attainment (Anderson et al. 2018). Moreover, various societal changes, such as prolonged life expectancy (Bengtson 2001; Song and Mare 2019), increasing grandparental financial resources

(Coall and Hertwig 2010), and an increase in working mothers among the parental generation (Buchanan and Rotkirch 2018) can also augment the intergenerational relationships of grandparents with their grandchildren. This suggests that the influences of the socioeconomic resources of not only parents but also of grandparents on their (grand)child's educational attainment have also changed over time.

Introducing grandparental generations provides renewed insights into the trends in two-generational intergenerational mobility. Figure 1 presents the differences in the model of parent-child associations (i.e., two-generation model) and of grandparent-parent-child associations (i.e., three-generation model). The two-generation model reveals the unconditioned association between parents' socioeconomic positions and their child's attainment (β_{23}). In the three-generation model, the parent-child association is decomposed to the net parent-child association given grandparental socioeconomic positions ($\beta_{23|G1}$), plus grandparent-child association given parental positions ($\beta_{13|G2}$) multiplied by the grandparent-parent association (β_{12}). Observed stable trends in the two-generational association do not necessarily indicate that parental influences have been stable. If the unconditioned parent-child association, as gauged by two-generation models, remains stable across cohorts, then the trends may be accounted for by a decreased influence of parents and an increased influence of grandparents, or vice versa. The three-generation model unveils more detailed pathways that underlie ostensibly observed stable/changing patterns in inequality of educational opportunity or intergenerational mobility.

In this paper, we demonstrate how the associations of parents' and grandparents' educational attainment with their (grand)child's educational attainment have changed across cohorts by exploiting three-generation data from nationally representative social surveys conducted in Japan. Many studies in Japan have reported that the inequality of educational

opportunity by parental class or education has not decreased since the early 20th-century cohorts for both men and women (Aramaki 2000; Fujihara and Ishida 2016; Hamamoto 2020; Ishida 2007; Nakamura 2022; Treiman and Yamaguchi 1993), which is inconsistent with the trends found in European countries and the United States (Ballarino et al. 2009; Breen et al. 2009; Breen and Müller 2020). During this period, Japan also experienced an increase in life expectancy, slowed economic growth, and an increase in mothers' employment rates, all of which are factors expected to enhance the influences of grandparents on their grandchildren's educational attainment. We can suspect that the nondecreasing associations of parental socioeconomic positions with their child's educational attainment may result from the offsetting increasing influences of grandparental socioeconomic positions. While there is some literature that focuses on direct associations between grandparents' and their grandchildren's educational attainment net of parental generation (Aramaki 2012, 2019), little is known about the changes in grandparental influences and thus the potential related impacts on trends in parent-child associations. We reveal how the influence of parents' and grandparents' educational attainment, as a measurement of their socioeconomic positions, on their (grand)children's educational attainment changed between the 1950 and 1989 cohorts.

This study contributes to the literature on trends in the inequality of educational opportunity and intergenerational mobility by unveiling the changing influences of grandparents, or potentially other familial members, in these trends. Our results show that the increasing cross-cohort associations between grandparents' and their grandson's educational attainment have masked the decreased direct associations between parents' and their son's educational attainment. Considering that several studies have suggested that the association between grandparent's and grandchildren's educational attainment may have increased in recent years

(Bengtson 2001; Buchanan and Rotkirch 2018; Song and Mare 2019), the results suggest that the increasing grandparent-grandchild association also augment the parent-child association without controlling for grandparental factors, which has been stylized as a measurement of intergenerational mobility. Recent studies conducted in Europe and the United States have found that the pace of decreasing inequalities by parental class or education in their child's educational attainment has slowed in recent cohorts (Barone and Ruggera 2018; Breen and Müller 2020), which may be attributable to an increase in influences from other relatives, such as grandparents, rather than parents. Solely looking at the trends in parent-child associations may overlook the underlying changes in the sources of social-origin influences.

Literature Review

Theory and trends in the inequality of educational opportunity

There are several theses that propose (un)changes in the inequality of educational opportunity by social origin. The industrialization thesis (Blau and Duncan 1967; Treiman 1970) and increased merit selection thesis (Jonsson 1992) insist that individual achievement becomes the dominant determinant for access to educational institutions, along with cultural changes, intensifying economic competition, or technological changes. These theses suggest that the association between social origin and educational attainment becomes weaker over time. Other theories suggest that the dependence of educational attainment on ascribed status will persist. The maximally maintained inequality (MMI) thesis argues that social-origin differentials in access to educational institutions will not decline until the educational aspirations of upper-class individuals have been saturated (Raftery and Hout 1993). Cultural reproduction theories also

suggest that upper-class individuals retain their advantage of educational achievement by leveraging their cultural superiority relative to their lower-class counterparts during educational expansion, which maintains the social-origin differentials in educational attainment (Bourdieu and Passeron 1977; Collins 1971). Finally, the effectively maintained inequality (EMI) thesis postulates that upper-class individuals would distinguish themselves from other classes by enrolling in elite schools or majors that lead to higher socioeconomic status, even if access to higher education became universal (Lucas, 2001).

Studies have investigated the trends in the association between educational attainment and parental class or education to test these theoretical expectations. Shavit and Blossfeld (1993) and Shavit et al. (2007) revealed that the inequality of educational attainment as viewed by fathers' class and education has been persistent across cohorts in most countries they examined, at least until educational expansion reaches a certain point of saturation, which is also known as MMI. In contrast, Breen and colleagues (Breen et al. 2009, 2010) showed that educational inequality by parental class has decreased across cohorts in eight European countries. Recent studies analyzing various European countries and the United States have shown that the inequality of educational opportunity decreased across cohorts in the first half of the 20th century but stagnated in the latter half (Barone and Ruggera 2018; Breen and Müller 2020). Other studies have reported mixed findings by country, cohort coverage or measurement; some have shown that the inequality of educational opportunities by parental class or education has been stable over time (Bar Haim and Shavit 2013; Blossfeld et al. 2015; Boliver 2011; Fujihara and Ishida 2016; Gabay-Egozi and Yaish 2021; Pfeffer 2008; Reimer and Pollak 2010; Sartor 2022; Torche 2010), while others have reported decreasing trends (Ballarino et al. 2009; Erikson and Jonsson 1996; Triventi et al. 2016; van Doorn et al. 2011). Another study found that the inequality of

educational opportunity increased under the transition from a state-socialist to a market-based economy (Betthäuser 2019; Bukodi and Goldthorpe 2010; Gerber and Hout 2004; Gruijters et al. 2019; Jackson and Evans 2017).

These studies on trends measure social origin by using parental socioeconomic position; however, they do not reflect the direct influence of parental socioeconomic positions on children's educational attainment. Even if the associations between parental socioeconomic positions and the child's educational attainment were to change, we cannot say that the examined trends indicate solely the influence of such positions because these trends are also affected by changes related to the influence of other familial members. Individuals are surrounded by broad kinship networks (Kolk et al. 2023), which will also affect the educational advantages of children (Mare 2011, 2014). As introduced in the following section, grandparents' socioeconomic resources have distinct influences that extend beyond the parental generation. Thus, the exclusive focus on parental resources as a measurement of social origin may obscure the changes in the influence of parents on a child's attainment.

Influences of grandparents and the expected changes

Grandparents' socioeconomic positions can be associated with their grandchildren's educational attainment beyond parental socioeconomic positions. Grandparents may transmit their cultural or economic resources to their grandchildren in various ways. Grandparents transfer or cultivate their grandchildren's cultural resources via social contacts such as chatting, caring, or parenting (Bengtson 2001; Song and Mare 2019; Zeng and Xie 2014). Economic advantages acquired in grandparents' generation may have a persistent impact on their descendants' status attainment

through cumulative advantages (DiPrete and Eirich 2006; Hällsten and Kolk 2023; Mare 2011), wealth transmissions or financial support for their descendants' educational success.

Empirical studies have also found a positive association between grandparents' resources and their grandchildren's educational attainment, even after controlling for parental resources. As shown by a review study (Anderson et al. 2018), over half of studies regarding three-generational associations show significantly positive associations between variables related to grandparents' socioeconomic background such as education, occupation, income, or wealth and their grandchildren's educational attainment net of parental attributes. Such associations have been found in various social contexts, including Chile (Celhay and Gallegos 2015), China (Li and Cao 2023; Zeng and Xie 2014), Denmark (Møllegaard and Jæger 2015), Finland (Erola et al. 2018; Lehti et al. 2018), Japan (Aramaki 2012), Sweden (Hällsten and Pfeffer 2017), Taiwan (Chiang and Park 2015), the United Kingdom (Zhang and Li 2018), the United States (Erola et al. 2018; Song and Mare 2019), and samples from various European countries (Colagrossi et al. 2020; Deindl and Tieben 2016; Sheppard and Monden 2018).

Moreover, studies have argued that the influence of grandparents may have increased in recent periods, in line with multiple societal changes. The prolonged life expectancies experienced throughout the 20th century (Riley 2005) have increased the chance of interaction between grandparents and their grandchildren (Bengtson 2001). Grandparents with fewer functional limitations can provide grandchild care (Luo et al. 2012), which enables them to transmit their cultural resources to their grandchildren. The increase in shared time between grandparents and grandchildren over periods brought about by longevity can contribute to the increasing association between grandparents' and their grandchildren's educational attainment (Song and Mare 2019). Moreover, economic growth experienced by grandparental generations

(i.e., around the early to mid-20th century) has increased their financial resources not only for their own lives but also to invest their descendants (Gale and Scholz 1994; Pfeffer and Schoeni 2016). In fact, grandparents with greater economic resources tend to invest or transmit these resources to their grandchildren (Coall and Hertwig 2010). Furthermore, among parental generations, more women with children have become employed in recent years, which also suggests an increased role of grandparents in childcare and parenting (Buchanan and Rotkirch 2018). Parents' reduced time for childcare and parenting time due to increased working hours outside the home is compensated for by increased grandparents' involvement in many countries (Bordone et al. 2017; Di Gessa et al. 2016; Geurts et al. 2015; Yoda and Shintani 2018). These arguments suggest that the role of grandparental socioeconomic resources in educational attainment has become stronger in more recent cohorts.

There are limited studies that focus on the trends in the association between grandparents' socioeconomic positions and their grandchildren's educational attainment after industrialization periods. Regarding the trends in preindustrial periods, Knigge (2016) showed that the influence of grandparents' resources had been stable, whereas Celhay and Gallegos (2015) found that the influence has decreased. In more recent periods, Ziefle (2016) compared the 1973–1982 and 1983–1992 cohorts in East Germany, while Li and Cao (2023) compared the mid-1950s and 1980s cohorts in China; the authors found no significant changes. However, these studies did not simultaneously estimate the trends in parental and grandparental influences on their (grand)children's educational attainment. In contrast, we analyze cross-cohort trends in the association of grandparents' educational attainment and that of parents with their (grand)children's educational attainment in the same model.

The Japanese Context

Japan experienced rapid educational expansion over the course of decades; while those who received a tertiary education (i.e., junior college or university) comprised 10% of the same cohort in 1960, the rate increased to approximately 50% in 2000 (Ministry of Education, Culture, Sports, Science and Technology-Japan 2021). Reflecting the changes in the composition of educational degrees, the relative distances between each type of educational institution within the educational stratification vary by cohort (Fujihara and Ishida 2016). Additionally, the educational institution and thus the pace of educational expansion is differentiated by gender. Whereas most men in higher education went on to four-year universities from the 1960s to the early 1990s, the majority of women in tertiary education went to two-year junior colleges, which were mainly established to educate women (Brinton and Lee 2001; Ishida 2007). Since the 1990s, the proportion of women going to junior colleges has declined and been replaced by an increase in the proportion of women going to universities; however, the proportion of women's university enrollment is still lower than that of men (Ministry of Education, Culture, Sports, Science and Technology-Japan 2021).

Studies have not shown clear decreasing trends in the inequality of educational opportunities over time. Many studies have reported that the inequality of educational opportunity by parental class or education exhibits stable or trendless fluctuations across 20th-century cohorts for both men and women (Aramaki 2000; Fujihara and Ishida 2016; Hamamoto 2020; Ishida 2007, 2022; Nakamura 2022; Treiman and Yamaguchi 1993), with the exception of Kondo and Furuta (2009) showing decreasing trends across cohorts. A recent study even suggested that the educational inequalities in educational opportunities have increased among

men in a very recent cohort (Nakamura 2022). Importantly, all these studies have measured the social origin of respondents according to their parental socioeconomic positions.

Studies have also reported that grandparents' socioeconomic positions are positively associated with their grandchildren's educational attainment (Aramaki 2012, 2019). This is often interpreted in the context of extended families in Japan. Many grandparents live with their children, their spouses, and their grandchildren, which is a popular living arrangement in Japan. Grandparents provide social or emotional support to both their child and their grandchildren (Morgan and Hirosima 1983; Yamato 2021). Also, in recent years, married women with children have tended to live with or live close by their parents or parents-in-law to receive support for their childrearing (National Institute of Population and Social Security Research 2017).

Japan's social changes over the late 20th century are consistent with the expectations of the increased influence of grandparental resources on their grandchildren's educational attainment that was noted in the previous section. First, the average life expectancy has significantly increased over the latter part of the 20th century. Life expectancy has increased from 59.6 in 1950 to 75.9 in 1990 for men and 63.0 to 81.9 for women, as shown in Figure 1a. The healthy life expectancy has also increased (Yong and Saito 2009), which allows stable contacts to extend across generations (Bengtson 2001; Luo et al. 2012). Second, the economy grew rapidly in the mid-20th century, and the standard of living among older people significantly improved. Figure 1b shows that the GDP per capita rapidly increased until the 1980s; however, since then, the speed of this increase has slowed. During this period, economic well-being among older people has improved over that found in recent decades (Shirahase 2015), which enables older individuals to transfer their own financial resources to their grandchildren (Gale and Scholz 1994; Pfeffer and Schoeni 2016). Such financial resources can be spent on grandchildren's

educational success, such as meeting expenses for extracurricular activities, supplementary education, or tuition fees, particularly in Japan, where private education prevails (Dawson 2010). Third, more mothers have become employed in recent years, which will result in a reduction in the amount of contact that parents have with their children (see Figure 1c). While most women quit their job when they get married or give birth (Brinton 1993), an increasing number of women have been re-entering the workforce as part-time workers after giving birth (Nishimura 2016; Yu 2002), which contributes to the increased employment rate of married women with children. Such decreased childcare or parenting time is compensated for by the involvement of grandparents (Morgan and Hirosima 1983; Yoda and Shintani 2018). These trends are consistent with the argument of the increasing direct influence of grandparental socioeconomic positions on their grandchildren's educational attainment.

To our knowledge, no previous studies have analyzed the cross-cohort trends in grandparents' and their grandchildren's educational attainment simultaneously with parental educational attainment in Japan.[1] We expect that these societal changes may have increased the influences of grandparents' socioeconomic positions on their grandchildren's educational attainment, even when controlling for the influence of the parental generation across cohorts. By analyzing this relationship, we demonstrate how the changes in the influences of grandparental socioeconomic positions are confounded with the trends in the parent-child associations.

Methods

Data

[1] As an exception, Kataoka (1990) suggested that direct association between male grandparents and grandsons has become weaker in the post-WWII cohort than in the before-WWII cohort, but this change is not statistically tested.

We use data derived from multiple nationally representative social surveys in Japan, namely, the National Family Research of Japan (NFRJ) Survey in 1998 and 2008; the Education, Social Stratification, and Mobility (ESSM) Survey in 2013; and the Social Stratification and Mobility (SSM) Survey in 2015. These surveys collect information on the educational attainment of respondents, their parents, and either their first to third children (NFRJ and ESSM) or first to fourth children (SSM), enabling us to construct three-generation educational attainment data. Detailed information on each survey is provided in the Appendix. Using these data, we construct a three-generation dataset that links the education of grandparents (respondents' parents; G1), parents (respondents; G2), and children (respondents' children; G3). The data are converted to a format in which multiple children are nested within each respondent.

The analytical sample is restricted to children who were born between 1950 and 1989 and who were 20 years of age or older at the time of the surveys. Since the surveys do not collect information regarding whether the children graduated from or dropped out of their last educational institution, we cannot ascertain whether the children graduated, which may overestimate the children's educational attainment. However, the bias would not be significant due to Japan's very high school completion rates; nearly all of Japan's new university entrants (the highest educational attainment in our analysis) are between the ages of 18 and 19, and more than 90% of them successfully graduate from university, which is the second highest percentage found among OECD countries (OECD 2019). Thus, we assume that the individuals' last educational institution or enrolled institution as age 20 will, in most cases, be consistent with their educational attainment.

The sample is separated by gender following previous studies (e.g., Fujihara and Ishida 2016; Kondo and Furuta 2009; Nakamura 2022), which reflects the differential pace of

educational expansion in Japan (Brinton and Lee 2001; Ishida 2007). The original sample contains 11,416 sons for 8,114 respondents and 10,571 daughters for 7,694 respondents. Note that respondents who have both sons and daughters are included in both samples. After the listwise deletion of the observations with some missing values, the resultant sample size contains 9,384 sons for 6,720 respondents and 8,722 daughters for 6,377 respondents.[2]

Variables

Children's (G3) educational attainment. The dependent variable, children's (G3) educational attainment, is measured as the last educational institution that the child attended.[3] The educational categories are divided into four categories: 1) junior high, 2) high school, 3) vocational school and junior college (junior college hereafter), and 4) university.[4] When estimating linear regression models, discussed later, we code these categories as 9, 12, 14, and 16. The measurement of educational attainment follows that used in previous studies (e.g., Fujihara and Ishida 2016).

[2] Most of the missing data stems from respondents who did not report their parents' educational attainment, which is a common occurrence in social surveys. To assess if the results are affected by the way of treating missing values, we also employ multiple imputation techniques (the number of imputations is 20). The results show substantially similar results for the results presented in this paper; thus, we present the results obtained from listwise deletion. The results obtained by multiple imputation are available upon request.

[3] Since the survey does not collect whether the children graduated from their last educational institution or not, we could not distinguish if the children graduated from the educational institution or not, which may overestimate the children's educational attainment. However, the bias would not be so significant because of the Japan's very low high school and college dropout rates (OECD 2019).

[4] In the CASMIN educational classification (Brauns et al. 2003), junior high school corresponds to 1bc (compulsory education), high school corresponds to 2ab (intermediate education), vocational school and junior college correspond to 3a (lower tertiary education), and university corresponds to 3b (higher tertiary education).

Respondents' (G2) and parents' (G1) educational attainment. We use respondents' and their parents' educational attainment as a measure of their child's social origin. The educational attainment of the parental generation is measured by the highest educational degrees of the respondent and their spouses, following a dominance approach (Erikson 1984). If one of the respondent's educational attainment values is missing, then the valid response from the other spouse is used. The educational attainment of the grandparental generation is determined by either the respondents' mothers or fathers.[5] If neither is not reported, then valid responses of the other parents are used. The respondents' and their parents' education are classified into primary (junior high), secondary (high school), and tertiary (junior college, vocational school, and university), which also follows previous studies (Fujihara and Ishida 2016). We code primary, secondary, and tertiary to continuous values that range from 1 to 3 to simplify the interpretation of the results. We confirm that the results obtained from models using categorical measures of G2 and G1 educational attainment do not substantially vary (see Figure A1 and A2 in Appendix).

Children's (G3) cohort. Trends in intergenerational educational mobility are measured using a child's year of birth, which is separated into 10-year intervals: 1950–1959 (1950s), 1960–1969 (1960s), 1970–1979 (1970s), and 1980–1989 (1980s).

Other controls. Control variables for G3 include the number of siblings and birth order, as they are associated with educational attainment (Barclay, 2015; Choi et al., 2020; Hauser and Sewell, 1985). The number of siblings for G3 is measured by the number of children that respondents (G2) had at the time of the survey. The birth order for children (G3) is also

[5] The respondents who do not report their fathers' educational attainment are coded as missing in the NFRJ1998 since the survey does not collect the respondents' mother's educational attainment.

introduced, categorized as first, second, third, or fourth.[6] As control variables for G2, we account for the respondents' (G2) number of siblings to address the resource intensification from the G1 to G3 generation across cohorts due to the decrease in sibship size; If the respondent's sibship size decreases across cohorts, the grandparents' resource allocations may become more concentrated on their smaller number of children and their grandchildren, which would increase their influence on their grandchildren. The number of siblings for G2 is measured by the respondents' number of siblings.[7] We also control for respondents' (G2) marital status since the survey does not collect the respondents' partner's educational attainment if the respondents are divorced or separated at the time of survey, which may underestimate the parental educational attainment due to the lack of the partner's educational attainment information. Marital status is classified into two groups: married or not married at the time of the survey. The respondents' (G2) gender is also controlled. Finally, survey dummies are introduced to control for the survey-specific effect.

The descriptive statistics are shown in Table 1.

Analytical strategy

Studies have argued that the trends of inequality of educational opportunity may depend on the measurement of children's educational attainment. Human capital theories assume that the value of educational investment, in terms of status attainment, remains fixed regardless of the societal

[6] We cannot control for the G2 birth order because the NFRJ1998 does not collect the respondents' own birth order among siblings.
[7] We note that while the ESSM2013 and SSM2015 ask respondents the number of siblings they had when they were 15 years old, the NFRJ1998 and NFRJ2008 ask respondents the total number of siblings they ever had. This indicates that the number of siblings may be larger for the NFRJ than for the ESSM and SSM.

distribution of educational degrees (Becker 1964), implying that education has absolute value as the years of education increase. In contrast, positional value theories assert that the returns to education depend on the extent to which educational degrees are offered to others in the same groups, such as cohorts or periods (Hirsch 1977; Sørensen 1979; Ultee 1980), suggesting that the relative distance between educational categories, in terms of leading to higher labor market status, should change as education expands. Studies have reported that trends in educational inequality differ when educational attainment is measured in absolute or relative terms (Bukodi and Goldthorpe 2016; Fujihara and Ishida 2016; Rotman et al. 2016; Triventi et al. 2016). Table 2 shows that the level of child's (G3) educational attainment has increased across cohorts, reflecting educational expansion during the periods for both men and women.[8] Following these arguments, we examine whether the results are consistent between absolute and relative measurements of children's educational attainment.

To gauge the trends in absolute terms, we employ a linear regression model. For a child i (G3) nested within respondents j, the estimated model is as follows:

$$Y_{ij}^{continuous} = \tau + \alpha C_i + \beta_1 E_j^{G2} + \beta_2 E_j^{G2} \times C_i + \gamma_1 E_j^{G1} + \gamma_2 E_j^{G1} \times C_i + \delta X_{ij}, \qquad (1)$$

where $Y_{ij}^{continuous}$ refers to the years of education of child i (which can take values of 9, 12, 14, or 16); τ refers to an intercept; C_i refers to child's birth cohort; $G1_j$ and $G2_j$ refer to grandparents' and parents' educational attainment, respectively; and X_{ij} refers to the child's or the family's control variables. To facilitate the observation of how the magnitude of the effect

[8] We note that children's educational attainment between the 1950s and 1960s cohort did not increase because there were stagnant periods in educational expansion experienced in the late 1970s to the early 1990s (Ministry of Education, Culture, Sports, Science and Technology-Japan 2021).

changes across the G3 cohorts, we present the coefficients of G1 and G2 education by G3 cohorts in figures.

Furthermore, we use a generalized ordered logit model (Williams 2006) to account for the changing relative values of education across child cohorts. The estimated models are as follows:

$$\log\frac{\Pr\left(Y_{ij}^{discrete} > k\right)}{\Pr\left(Y_{ij}^{discrete} \leq k\right)} = \tau_{kc} + \beta_1 E_j^{G2} + \beta_2 E_j^{G2} \times C_i + \gamma_1 E_j^{G1} + \gamma_2 E_j^{G1} \times C_i + \delta X_{ij},$$

$$Y_{ij}^{discrete} = \begin{cases} 1, & Y_{ij}^{*} < \tau_{1c} \\ 2, & \tau_{1c} \leq Y_{ij}^{*} < \tau_{2c} \\ 3, & \tau_{2c} \leq Y_{ij}^{*} < \tau_{3c} \\ 4, & \tau_{3c} \leq Y_{ij}^{*} \end{cases}$$

where $Y_{ij}^{discrete}$ refers to the educational attainment of child i on a categorical scale (1: junior high, 2: senior high, 3: vocational school or junior college, 4: university), and τ_{kc} refers to cohort-specific parameters of the threshold between educational categories k and $k+1$. By allowing thresholds to vary by cohort, we can assume that the relative distances between educational categories, net of independent variables, change across cohorts. The method is applied to measure the trends in the inequality of educational opportunity in relative terms (Ballarino et al. 2009; Breen et al. 2009; Fujihara and Ishida 2016; Kondo and Furuta 2009; Nakamura 2022).[9]

We estimate two specifications for both linear regression and generalized ordered logit to illustrate the differences between the two-generation and three-generation models. One does not include G1 education and the interactions with the child's cohort (Model 1), while the other

[9] We confirm that the model fit significantly improved when using generalized ordered logit models compared to the models that do not allow varying thresholds (see Table A2 in Appendix).

introduces G1 education and the interactions with the child's cohort (Model 2). For all models, the standard errors are calculated using robust standard errors clustered within respondents.

Results

Trends in associations of parents' and grandparents' education with (grand)sons' educational attainment

Figure 3 presents the estimated trends in the influences of G2 and G1 educational attainment on educational attainment for G3 men. The first row indicates the results for linear regression models predicting years of education. Model 1, which estimates the association between G2 and G3 educational attainment, indicates that the positive association decreased between the 1950s and 1960s cohorts and then gradually increased afterward (see the upper-left panel), suggesting that the parent-child associations have not consistently decreased across cohorts. These results are generally consistent with previous findings that show that the father-son associations of educational attainment decreased from the early 1900s to around the 1960s cohorts and then became stable (Fujihara and Ishida, 2016).

In contrast, Model 2 reveals that the association between G3 and G1 education, net of G2 education, has increased across cohorts (see the upper-right panel). In the 1950s cohorts, there were no significant associations between G1 and G3 educational attainment. However, the association has become positive and stronger in more recent cohorts.[10] Additionally, by

[10] We conduct post hoc tests that incorporate the interaction between linearly parameterized cohort variables (i.e., we code the 1950s as 1, the 1960s as 2, the 1970s as 3, and the 1980s as 4) and G1 education in the replacement of the interactions with categorical G3 cohorts. The model fit (AIC and BIC) is better for models that use linearly parameterized cohort variables, which is reported in Table A4 in the Appendix. This is also true for the generalized ordered logit models.

controlling for the increasing trends in the grandparental influences, the trends of reduced associations between G2 and G3 between the 1950s and subsequent cohorts become more apparent than in Model 1. This indicates that without controlling for the increasing influences of grandparents, the reduced influences of parents' educational attainment may be underestimated.

The second row presents the results for generalized ordered logit models predicting categorical educational attainment. Model 1 reveals stable trends in the G2-G3 association; the association slightly declined for the 1960s and 1970s cohorts and then increased for the 1980s cohorts (see the lower-left panel). This increased association is in line with a recent study that used a relative measure of educational attainment, suggesting that the association between parental occupational status and men's educational attainment increased around the 1980s cohorts (Nakamura 2022).

Model 2, however, suggests that the stable trends in G2-G3 associations can be partially attributed to the increasing direct associations between G1 and G3 educational attainment (see the lower-right panel). While the association between G1 and G3, net of G2 educational attainment, was not statistically significant in the 1950s cohorts, the strength of the association has been increasing in more recent cohorts. Controlling for the trends in G1-G3 associations makes the reduced G2-G3 association between the 1950s and the 1960-1970s cohorts statistically significant (see Table A3 in Online Supplements). In this model, there are no clear increasing trends in the G2-G3 association.

In summary, regarding the trends of the inequality of (grand)sons' educational attainment, both linear regression and generalized ordered logit models reveal similar results.

The coefficient of interaction term is .069 (the standard error is .035) in the linear regression and .090 (the standard error is .043) in the generalized ordered logit model.

The reduced direct parent-child associations of educational attainment are masked if the trends in grandparent-child associations are not introduced due to the increased associations across cohorts.

Trends in associations of parents' and grandparents' education with (grand)daughters' educational attainment

Figure 4 presents the results for G3 women. When using the absolute measurement, the positive association between G2 and G3 educational attainment, without introducing G1 educational attainment, appears to have remained stable across cohorts (see the upper-left panel), which is in line with previous studies (e.g., Hamamoto 2020; Nakamura 2022). Higher parental educational attainment is also linked to more years of education for daughters.

Different from the men's results, Model 2 shows that a positive association between G1 and G3 educational attainment, net of G2 education, was significant in the earliest cohorts and remained stable throughout the subsequent cohorts (see the upper-right panel). Even after controlling for G2 educational attainment, a higher grandparent's educational attainment is found to be linked to more years of education for granddaughters. Because of the stable trends in G1-G3 associations, introducing G1 does not change the stable trends of G2-G3 associations observed in Model 1.

We can also reach the same conclusions when using the relative measurement of educational attainment. Model 1 in the generalized ordered logit model shows stable trends in the association between G2 and G3 educational attainment (see the lower-left panel), and these stable trends are not affected regardless of the introduction of G1 educational attainment (see the

lower-right panel). There are significant positive associations between G1 and G3 educational attainment, net of G2 educational attainment, across these cohorts.

There are significant positive associations for both G2-G3 associations of educational attainment given G1 educational attainment and G1-G3 associations given G2, but no clear increased or decreased trends are found. The results suggest that omitting G1 educational attainment may overestimate the influences of parents' educational attainment. However, the assessment of the direction of the trends is not affected by including grandparental attributes in the models.

Discussion and Conclusion

Trends in the inequality of educational opportunity have been studied using parental socioeconomic positions as the measurement of individuals' social origin. Studies have suggested that grandparental socioeconomic positions may be confounded with parent-child associations, and the direct influence of grandparents on the grandchild's educational attainment may have increased. If so, we cannot attribute the trends in parent-child associations, which is the stylized method of analyzing the trends of intergenerational mobility, to changes in parental influences without controlling for grandparental socioeconomic positions. Thus, we have examined how the associations between grandparents and the grandchild, as well as between parents' and the child's educational attainment, have changed across 1950–1989 cohorts in Japan, where the parent-child educational associations have been reported as stable over time, to assess how the omission of grandparental socioeconomic positions affects the two-generational trends of inequality of educational opportunity.

The results showed that the positive associations between grandparents' and their grandson's educational attainment have become stronger in recent cohorts, regardless of the measurement of the child's educational attainment (i.e., in absolute or relative terms). The association between parents' and sons' educational attainment, without introducing grandparental educational attainment, has exhibited stable trends. However, after controlling for the increasing grandparent-grandchild associations, the decline in the associations between the 1950s and the subsequent cohorts became more apparent. This suggests that we may overlook the reduced parent-child associations if we do not account for the grandparental influences over time. While most previous studies in Japan have suggested that the trends in the inequality of educational opportunity have not decreased since the latter 20th-century cohorts (Aramaki 2000; Fujihara and Ishida 2016; Hamamoto 2020; Nakamura 2022), our results suggest that we cannot regard the stable trends as stable parental influences. Rather, increased grandparent-grandson associations may have contributed to the stable levels of gross parent-son associations.

We found that there are significant positive associations between grandparents' and their granddaughter's educational attainment evident throughout the cohorts. In contrast to the results for males, the association for females was already significant in the earliest cohorts (i.e., the 1950s), and the strength did not increase across cohorts. Thus, we interpreted that the positive grandparent-grandchild association in the earliest cohorts may have been accounted for by the greater differentials among socioeconomic backgrounds of daughters in the older cohorts. Families in the older cohorts may have prioritized the educational attainment of their sons, whose economic returns to educational attainment were seen as greater, rather than that of their daughters (Brinton 1993; Shavit and Blossfeld 1996); thus, a limited number of upper-class families could afford to invest in their daughter's educational attainment. Several studies have

suggested that the inequality of educational opportunities between service class parents and other class parents was larger in the older cohorts (Hara and Seiyama 2005; Ojima and Kondo 2000). Grandparental education differentiates parents with the same levels of education, which are linked to their daughter's higher educational attainment. Further research is required in this regard. Importantly, the stable grandparent-grandchild associations for women across cohorts indicate that the omission of grandparental socioeconomic positions in the study of trends in the inequality of educational opportunity does not alter the trends in parent-child association. This is also unaffected by the measurement of the child's educational attainment in absolute or relative terms.

Studies have presumed that the influences of grandparents' socioeconomic resources on their grandchildren's educational attainment may have increased in many countries. Drawing on our results, increased grandparent influences may contribute to the trends of parental class gaps in educational attainment. Recent studies in the United States have shown that the differences in a son's educational attainment by parental class have not decreased; in fact, they have even increased (Hertel and Pfeffer 2020; Pfeffer and Hertel 2015). This increased educational inequality may be accounted for by increased grandparental influences over time (Song and Mare 2019) rather than parental influences per se. Our results corroborate that introducing grandparent-grandchild associations into two-generational studies on trends in the inequality of educational opportunity or intergenerational mobility will allows to disaggregate trends beyond parental generations.

We have also contributed to the literature on multigenerational inequality studies by providing direct evidence of the increased grandparent-grandchild association of educational attainment for grandsons. While previous studies have suggested that various societal changes,

such as increased longevity, improved economic well-being, or increased mothers' employment in recent decades, will enhance the role of grandparents in the process of intergenerational transmissions of inequality (Bengtson 2001; Buchanan and Rotkirch 2018; Coall and Hertwig 2010; Song and Mare 2019), few studies have explicitly examined these expectations. The findings related to men's results in Japan are consistent with these expectations. It would be worthwhile for future studies to isolate to what extent these societal changes, or other changes, have contributed to the changes found in the grandparent-grandchild associations.

We acknowledge several limitations. First, due to the relatively small sample size, particularly in the 1950s cohorts, the observed trends in our analysis may be unstable. Second, we did not consider the horizontal stratification of education due to the lack of detailed information on respondents' child's attended educational institutions. While horizontal stratification (Lucas 2001) by school selectivity within universities is an important dimension of inequality of educational opportunity in Japan (Fujihara and Ishida 2016), we could not incorporate this dimension. Third, our three-generational dataset was obtained from surviving parents at the time of the survey, which may have introduced some biases into the estimates. If lower-educated parents with fewer socioeconomic resources are more likely to cease attending school than those with greater resources, the coefficients of parents' and grandparents' educational attainment may be underestimated. Japan's relatively longer life expectancies (OECD 2023) and small socioeconomic gradients in health and mortality (Kagamimori et al. 2009) may mitigate these risks, but the impact of these factors on the results is uncertain.

Despite these limitations, we have contributed to the literature on trends in the inequality of educational opportunity and intergenerational mobility by introducing a multigenerational perspective. While social origin has traditionally been measured using parents' socioeconomic

positions, the related trends may not necessarily align with the trend of parents' direct influences on their children's attainment. We can broaden our understanding of the changes in the intergenerational reproduction of inequality by incorporating grandparents and potentially other kinship members into the measurement of social origin.

References

Anderson, L., Sheppard, P., & Monden, C. (2018). Grandparent effects on educational outcomes: A systematic review. *Sociological Science*, *5*, 114–142.

Aramaki, S. (2000). Kyoiku kikai no kakusa ha shukusho shitaka. In H. Kondo (Ed.), *Nihon no kyoiku syakai* (pp. 15–35). University of Tokyo Press.

Aramaki, S. (2012). Effects of grandparents' education on grandchildren's education: Interactions by paternal/maternal distinction, gender, and birth order. *Japanese Journal of Family Sociology*, *24*(1), 84–94.

Aramaki, S. (2019). *Kouiku kakusa no kakureta haikei: Oya no pasonaru nettowaku to gakureki shikou*. Keiso Shobo.

Ballarino, G., Bernardi, F., Requena, M., & Schadee, H. (2009). Persistent inequalities? Expansion of education and class inequality in Italy and Spain. *European Sociological Review*, *25*(1), 123–138.

Bar Haim, E., & Shavit, Y. (2013). Expansion and inequality of educational opportunity: A comparative study. *Research in Social Stratification and Mobility*, *31*, 22–31.

Barclay, K. J. (2015). Birth order and educational attainment: evidence from fully adopted sibling groups. *Intelligence*, *48*, 109–122.

Barone, C., & Ruggera, L. (2018). Educational equalization stalled? Trends in inequality of educational opportunity between 1930 and 1980 across 26 European nations. *European Societies*, *20*(1), 1–25.

Becker, G. S. (1964). *Human capital: A theoretical and empirical analysis, with special reference to education*. Natiolnal Bureau of Economic Research.

Bengtson, V. L. (2001). Beyond the nuclear family: The increasing importance of multigenerational bonds. *Journal of Marriage and the Family*, *63*(1), 1–16.

Betthäuser, B. A. (2019). The effect of the post-socialist transition on inequality of educational opportunity: Evidence from German unification. *European Sociological Review*. https://doi.org/10.1093/esr/jcz012

Blau, P. M., & Duncan, O. D. (1967). *The American occupational structure*. Free Press.

Blossfeld, P. N., Blossfeld, G. J., & Blossfeld, H.-P. (2015). Educational expansion and inequalities in educational opportunity: Long-term changes for East and West Germany. *European Sociological Review*, *31*(2), 144–160.

Boliver, V. (2011). Expansion, differentiation, and the persistence of social class inequalities in British higher education. *Higher Education*, *61*(3), 229–242.

Bordone, V., Arpino, B., & Aassve, A. (2017). Patterns of grandparental child care across Europe: the role of the policy context and working mothers' need. *Ageing & Society*, *37*(4), 845–873.

Bourdieu, P., & Passeron, J. C. (1977). *Reproduction in education, society and culture*. SAGE Publications.

Brauns, H., Scherer, S., & Steinmann, S. (2003). The CASMIN educational classification in international comparative research. In J. H. P. Hoffmeyer-Zlotnik & C. Wolf (Eds.),

Advances in cross-national comparison: A European working book for demographic and socio-economic variables (pp. 221–244). Springer US.

Breen, R., & Jonsson, J. O. (2005). Inequality of opportunity in comparative perspective: Recent research on educational attainment and social mobility. *Annual Review of Sociology*, *31*, 223–243.

Breen, R., Luijkx, R., Müller, W., & Pollak, R. (2009). Nonpersistent inequality in educational attainment : Evidence from eight European countries. *American Journal of Sociology*, *114*(5), 1475–1521.

Breen, R., Luijkx, R., Müller, W., & Pollak, R. (2010). Long-term trends in educational inequality in Europe: Class inequalities and gender differences. *European Sociological Review*, *26*(1), 31–48.

Breen, R., & Müller, W. (2020). Social mobility in the twentieth century in Europe and the United States. In R. Breen & W. Müller (Eds.), *Education and intergenerational social mobility in Europe and the United States* (pp. 251–296). Stanford University Press.

Brinton, M. C. (1993). *Women and the economic miracle: Gender and work in postwar Japan*. University of California Press.

Brinton, M. C., & Lee, S. (2001). Women's education and the labor market in Japan and South Korea. In M. C. Brinton (Ed.), *Women's working lives in East Asia* (pp. 125–150). Stanford University Press.

Buchanan, A., & Rotkirch, A. (2018). Twenty-first century grandparents: Global perspectives on changing roles and consequences. *Contemporary Social Science*, *13*(2), 131–144.

Bukodi, E., & Goldthorpe, J. H. (2010). Market versus meritocracy: Hungary as a critical case. *European Sociological Review*, *26*(6), 655–674.

Bukodi, E., & Goldthorpe, J. H. (2016). Educational attainment - relative or absolute - as a mediator of intergenerational class mobility in Britain. *Research in Social Stratification and Mobility*, *43*, 5–15.

Celhay, P., & Gallegos, S. (2015). Persistence in the transmission of education: Evidence across three generations for Chile. *Journal of Human Development and Capabilities*, *16*(3), 420–451.

Chiang, Y.-L., & Park, H. (2015). Do grandparents matter? A multigenerational perspective on educational attainment in Taiwan. *Social Science Research*, *51*, 163–173.

Choi, S., Taiji, R., Chen, M., & Monden, C. (2020). Cohort trends in the association between sibship size and educational attainment in 26 low-fertility countries. *Demography*, *57*(3), 1035–1062.

Coall, D. A., & Hertwig, R. (2010). Grandparental investment: Past, present, and future. *The Behavioral and Brain Sciences*, *33*(1), 1–19; discussion 19-40.

Colagrossi, M., d'Hombres, B., & Schnepf, S. V. (2020). Like (grand)parent, like child? Multigenerational mobility across the EU. *European Economic Review*, *130*, 103600.

Collins, R. (1971). Functional and conflict theories of educational stratification. *American Sociological Review*, *36*(6), 1002–1019.

Dawson, W. (2010). Private tutoring and mass schooling in East Asia: reflections of inequality in Japan, South Korea, and Cambodia. *Asia Pacific Education Review*, *11*(1), 14–24.

Deindl, C., & Tieben, N. (2016). Cultural and material resources of parents and grandparents and the educational outcome of grandchildren in Europe. In *Max Planck Institute for Social Law and Social Policy Discussion Paper* (No. 1). https://doi.org/10.2139/ssrn.2884092

Di Gessa, G., Glaser, K., Price, D., Ribe, E., & Tinker, A. (2016). What drives national differences in intensive grandparental childcare in Europe? *Journals of Gerontology: Series B, Psychological Sciences and Social Sciences*, *71*(1), 141–153.

DiPrete, T. A., & Eirich, G. M. (2006). Cumulative advantage as a mechanism for inequality: A review of theoretical and empirical developments. *Annual Review of Sociology*, *32*, 271–297.

Erikson, R. (1984). Social class of men, women and families. *Sociology*, *18*(4), 500–514.

Erikson, R., & Jonsson, J. (1996). *Can Education Be Equalized?: The Swedish Case In Comparative Perspective*. Westview Press.

Erola, J., Kilpi-Jakonen, E., Prix, I., & Lehti, H. (2018). Resource compensation from the extended family: Grandparents, aunts, and uncles in Finland and the United States. *European Sociological Review*, *34*(4), 348–364.

Fujihara, S., & Ishida, H. (2016). The absolute and relative values of education and the inequality of educational opportunity: Trends in access to education in postwar Japan. *Research in Social Stratification and Mobility*, *43*, 25–37.

Gabay-Egozi, L., & Yaish, M. (2021). Trends in intergenerational educational mobility in Israel: 1983–2008. *British Journal of Sociology of Education*, *42*(5–6), 752–774.

Gale, W. G., & Scholz, J. K. (1994). Intergenerational transfers and the accumulation of wealth. *Journal of Economic Perspectives*, *8*(4), 145–160.

Gerber, T. P., & Hout, M. (2004). Tightening up: Declining class mobility during Russia's market transition. *American Sociological Review*, *69*(5), 677–703.

Geurts, T., Van Tilburg, T., Poortman, A.-R., & Dykstra, P. A. (2015). Child care by grandparents: changes between 1992 and 2006. *Ageing & Society*, *35*(6), 1318–1334.

Gruijters, R. J., Chan, T. W., & Ermisch, J. (2019). Trends in educational mobility: How does China compare to Europe and the United States? *Chinese Journal of Sociology*, *5*(2), 214–240.

Hällsten, M., & Kolk, M. (2023). The shadow of peasant past: Seven generations of inequality persistence in Northern Sweden. *American Journal of Sociology*, *128*(6), 1716–1760.

Hällsten, M., & Pfeffer, F. T. (2017). Grand advantage: Family wealth and grandchildren's educational achievement in Sweden. *American Sociological Review*, *82*(2), 328–360.

Hamamoto, S. (2020). Long-term gender gap trends in educational attainment in japan: Are transition specific and class specific gender gaps persistent? *Japanese Sociological Review*, *71*(3), 377–393.

Hara, J., & Seiyama, K. (2005). *Inequality amid affluence: Social stratification in Japan* (B. Williams, Trans.). Trans Pacific Press.

Hauser, R. M., & Sewell, W. H. (1985). Birth order and educational attainment in full sibships. *American Educational Research Journal*, *22*(1), 1–23.

Hertel, F. R., & Pfeffer, F. T. (2020). The land of opportunity? Trends in social mobility and education in the United States. In R. Breen & W. Müller (Eds.), *Education and intergenerational social mobility in Europe and the United States* (pp. 29–68). Stanford University Press.

Beller, E., & Hout, M. (2006). Intergenerational social mobility: The United States in comparative perspective. *Future of Children*, *16*(2), 19–36.

Hirsch, F. (1977). *Social limits to growth*. Harvard University Press.

Ishida, H. (2007). Japan: Educational expansion and inequality in access to higher education. In Y. Shavit, R. Arum, & A. Gamoran (Eds.), *Stratification in higher education: A comparative study* (pp. 63–86). Stanford University Press.

Ishida, H. (2022). Class structure, education, and social mobility in post-war Japan. In S. Shirahase (Ed.), *Social stratification in an aging society with low fertility: The case of Japan* (pp. 7–34). Springer Nature Singapore.

Jackson, M., & Evans, G. (2017). Rebuilding walls: Market transition and social mobility in the post-socialist societies of Europe. *Sociological Science*, *4*, 54–79.

Jonsson, J. O. (1992). *Towards a merit-selective society?* Swedish Institute for Social Research.

Kagamimori, S., Gaina, A., & Nasermoaddeli, A. (2009). Socioeconomic status and health in the Japanese population. *Social Science and Medicine*, *68*(12), 2152–2160.

Kataoka, E. (1990). Sansedai kan gakureki ido no kouzou to henyou. In K. Seiyama (Ed.), *Gendai nihon no kaisou kouzou 1: Shakai kaisou no kouzou to katei* (pp. 57–83). University of Tokyo Press.

Knigge, A. (2016). Beyond the parental generation: The influence of grandfathers and great-grandfathers on status attainment. *Demography*, *53*(4), 1219–1244.

Kolk, M., Andersson, L., Pettersson, E., & Drefahl, S. (2023). The Swedish kinship universe: A demographic account of the number of children, parents, siblings, grandchildren, grandparents, aunts/uncles, nieces/nephews, and cousins using national population registers. *Demography*. https://doi.org/10.1215/00703370-10955240

Kondo, H., & Furuta, K. (2009). Socioeconomic differences in educational attainment: Trends and mechanisms. *Japanese Sociological Review*, *59*(4), 682–698.

Lehti, H., Erola, J., & Tanskanen, A. O. (2018). Tying the extended family knot—Grandparents' influence on educational achievement. *European Sociological Review*, *35*(1), 29–48.

Li, M., & Cao, J. (2023). Multi-generational educational mobility in China in the twentieth century. *China Econ. Rev.*, *80*, 101990.

Lucas, S. R. (2001). Effectively maintained inequality: Education transitions, track mobility, and social background effects. *The American Journal of Sociology*, *106*(6), 1642–1690.

Luo, Y., LaPierre, T. A., Hughes, M. E., & Waite, L. J. (2012). Grandparents providing care to grandchildren: A population-based study of continuity and change. *Journal of Family Issues*, *33*(9), 1143–1167.

Mare, R. D. (2011). A multigenerational view of inequality. *Demography*, *48*(1), 1–23.

Mare, R. D. (2014). Multigenerational aspects of social stratification; Issues for further research. *Research in Social Stratification and Mobility*, *35*, 121–128.

Ministry of Education, Culture, Sports, Science and Technology-Japan. (2021). *School Basic Survey*. E-Stat. https://www.e-stat.go.jp/stat-search/files?page=1&toukei=00400001&tstat=000001011528

Møllegaard, S., & Jæger, M. M. (2015). The effect of grandparents' economic, cultural, and social capital on grandchildren's educational success. *Research in Social Stratification and Mobility*, *42*, 11–19.

Morgan, S. P., & Hirosima, K. (1983). The persistence of extended family residence in Japan: Anachronism or alternative strategy? *American Sociological Review*, *48*(2), 269–281.

Nakamura, T. (2022). Relative indices of educational attainment and trend analysis of inequality of educational opportunity using the 2015 SSM survey data. In S. Shirahase (Ed.), *Social*

stratification in an aging society with low fertility: The case of Japan (pp. 51–76). Springer Nature Singapore.

National Institute of Population and Social Security Research. (2017). *Marriage and childbirth in Japan today: The fifteenth Japanese National Fertility Survey, 2015*. National Institute of Population and Social Security Research.

Nishimura, J. (2016). *Motherhood and work in contemporary Japan*. Routledge.

OECD. (2019). *Education at a glance 2019*. OECD Publishing.

OECD. (2023). *Life expectancy at birth*. OECD Data. https://data.oecd.org/healthstat/life-expectancy-at-birth.htm

Ojima, F., & Kondo, H. (2000). Gendered structure of educational attainment. In K. Seiyama (Ed.), *Stratification system in Japan 4: Gender, market, and family* (pp. 27–46). University of Tokyo Press.

Pfeffer, F. T. (2008). Persistent inequality in educational attainment and its institutional context. *European Sociological Review*, *24*(5), 543–565.

Pfeffer, F. T., & Hertel, F. R. (2015). How has educational expansion shaped social mobility trends in the United States? *Social Forces*, *94*(1), 143–180.

Pfeffer, F. T., & Schoeni, R. F. (2016). How wealth inequality shapes our future. *The Russell Sage Foundation Journal of the Social Sciences*, *2*(6), 2–22.

Raftery, A., & Hout, M. (1993). Maximally maintained inequality: Expansion, reform, and opportunity in Irish education. *Sociology of Education*, *66*(1), 41–62.

Reimer, D., & Pollak, R. (2010). Educational expansion and its consequences for vertical and horizontal inequalities in access to higher education in West Germany. *European Sociological Review*, *26*(4), 415–430.

Riley, J. C. (2005). Estimates of regional and global life expectancy, 1800-2001. *Population and Development Review*, *31*(3), 537–543.

Rotman, A., Shavit, Y., & Shalev, M. (2016). Nominal and positional perspectives on educational stratification in Israel. *Research in Social Stratification and Mobility*, *43*, 17–24.

Sartor, S. (2022). Educational mobility in Canada, 1969-2016: Evidence from the longitudinal and international study of adults. *Canadian Review of Sociology*. https://doi.org/10.1111/cars.12393

Shavit, Y., Arum, R., & Gamoran, A. (2007). *Stratification in higher education: A Comparative Study*. Stanford University Press.

Shavit, Y., & Blossfeld, H.-P. (1993). *Persistent inequality: Changing educational attainment in thirteen countries*. Westview Press.

Shavit, Y., & Blossfeld, H.-P. (1996). Equalizing educational opportunity: Do gender and class compete? In R. Erikson & J. O. Jonsson (Eds.), *Can education be equalized?: The Swedish case in comparative perspective* (pp. 233–254). Westview Press.

Sheppard, P., & Monden, C. (2018). The additive advantage of having educated grandfathers for children's education: Evidence from a cross-national sample in Europe. *European Sociological Review*, *34*(4), 365–380.

Shirahase, S. (2015). Income inequality among older people in rapidly aging Japan. *Research in Social Stratification and Mobility*, *41*, 1–10.

Song, X., & Mare, R. D. (2019). Shared lifetimes, multigenerational exposure, and educational mobility. *Demography*, *56*(3), 891–916.

Sørensen, A. B. (1979). A model and a metric for the analysis of the intragenerational status attainment process. *American Journal of Sociology*, *85*(2), 361–384.

Torche, F. (2010). Economic crisis and inequality of educational opportunity in Latin America. *Sociology of Education*, *83*(2), 85–110.

Treiman, D. J. (1970). Industrialization and social stratification. *Sociological Inquiry*, *40*(2), 207–234.

Treiman, D. J., & Yamaguchi, K. (1993). Trends in educational attainment in Japan. In Y. Shavit & B. Hans-Peter (Eds.), *Persistent inequality: changing educational attainment in thirteen countries* (pp. 229–249). Westview press.

Triventi, M., Panichella, N., Ballarino, G., Barone, C., & Bernardi, F. (2016). Education as a positional good: Implications for social inequalities in educational attainment in Italy. *Research in Social Stratification and Mobility*, *43*, 39–52.

Ultee, W. C. (1980). Is education a positional good?: An empirical examination of alternative hypotheses on the connection between education and occupational level. *Netherlands Journal of Sociology*, *16*(2), 135–153.

van Doorn, M., Pop, I., & Wolbers, M. H. J. (2011). Intergenerational transmission of education across European countries and cohorts. *European Societies*, *13*(1), 93–117.

Williams, R. (2006). Generalized ordered logit/partial proportional odds models for ordinal dependent variables. *The Stata Journal*, *6*(1), 58–82.

Yamato, R. (2021). *Intergenerational relationships between married children and their parents in 21st century Japan: How are patrilineal tradition and marriage changing?* Brill.

Yoda, S., & Shintani, Y. (2018). Maternal employment and childcare support from grandparents: A comparison of within-subject and between-subject effects. *Journal of Population Problems*, *74*(1), 61–73.

Yong, V., & Saito, Y. (2009). Trends in healthy life expectancy in Japan: 1986 - 2004. *Demographic Research*, *20*, 467–494.

Yu, W.-H. (2002). Jobs for mothers: Married women's labor force reentry and part-time, temporary employment in Japan. *Sociological Forum*, *17*(3), 493–523.

Zeng, Z., & Xie, Y. (2014). The effects of grandparents on children's schooling: evidence from rural China. *Demography*, *51*(2), 599–617.

Ziefle, A. (2016). Persistent educational advantage across three generations: Empirical evidence for Germany. *Sociological Science*, *3*, 1077–1102.

Figures and Tables

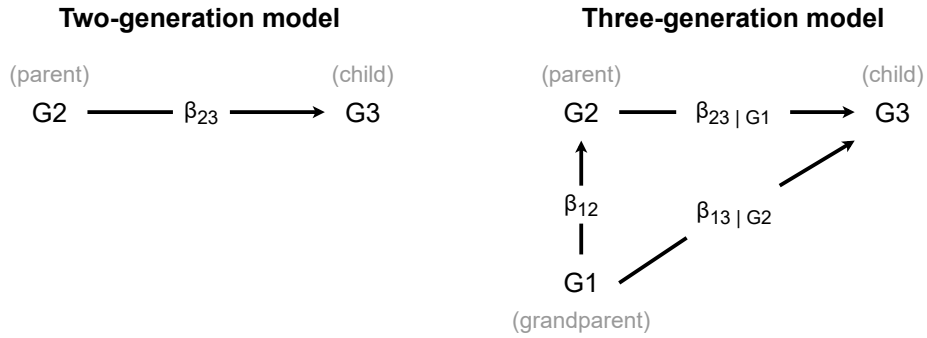


Figure 1. The differences between the two-generation and the three-generation models

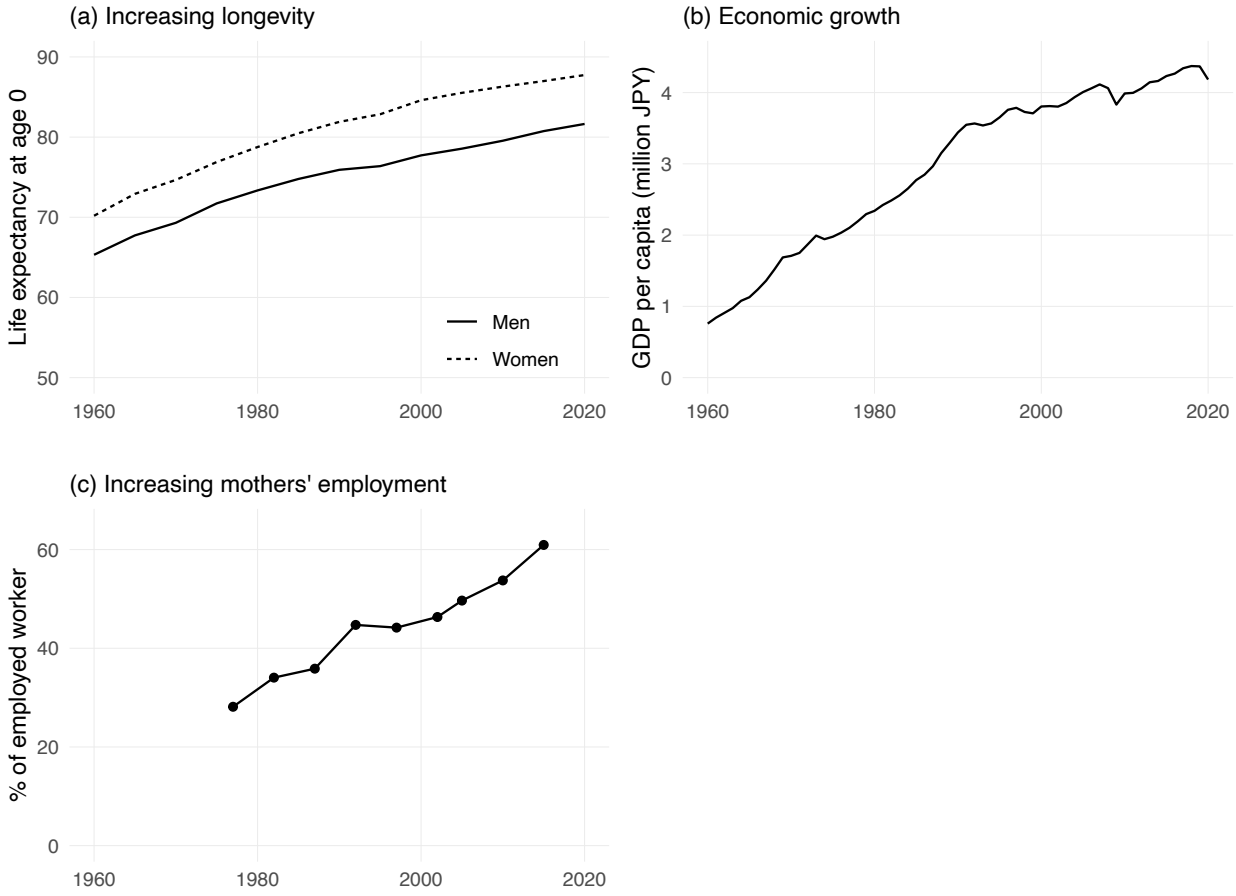


Figure 2. Several trends in Japan are potentially related to the influence of grandparents.
Notes. (a) The values were retrieved from the Complete Life Table (National Institute of Population and Social Security Research, https://www.ipss.go.jp/syoushika/tohkei/Popular/Popular2021.asp?chap=0).
(b) The values were retrieved from the World Bank (https://data.worldbank.org/indicator/NY.GDP.PCAP.KD.ZG?locations=JP).
(c) The values represent the proportion of those who are employed among married women aged 18-49 with children. Self-employed and family workers are not included in the employed group. The data were retrieved from the National Fertility Survey (National Institute of Population and Social Security Research 2017).

Table 1 *Descriptive statistics by G3 gender*

	G3 men	G3 women
G3 educational attainment		
1 Junior high	.026	.014
2 High school	.335	.325
3 Junior college	.173	.391
4 University	.466	.269
G3 birth cohorts		
1950s	.094	.086
1960s	.237	.235
1970s	.396	.401
1980s	.273	.278
G2 educational attainment		
1 Junior high	.164	.161
2 High school	.512	.518
3 Tertiary education	.324	.321
G1 educational attainment		
1 Junior high	.641	.639
2 High school	.243	.236
3 Tertiary education	.116	.124
G3 number of siblings	2.458 (.745)	2.485 (.768)
G3 birth order		
1st	.492	.481
2nd	.384	.389
3rd	.120	.125
4th	.004	.005
G2 number of siblings	3.332 (2.167)	3.312 (2.177)
G2 not married	.129	.127
G2 age	62.362 (8.139)	62.173 (8.033)
G2 women	.553	.546
Survey		
NFRJ1998	.344	.343
NFRJ2008	.235	.237
ESSM2013	.335	.335
SSM2015	.086	.086
N	9,384	8,722

Notes: Proportions or means are reported. Standard deviations are in parentheses.

Table 2 *Distributions of G1, G2, and G3 educational attainment by G3 gender and cohort*

	G3 men				G3 women			
	1950s	1960s	1970s	1980s	1950s	1960s	1970s	1980s
G1 educational attainment								
1 Junior high	.803	.711	.649	.512	.825	.741	.630	.510
2 High school	.144	.186	.236	.339	.103	.161	.240	.335
3 Tertiary education	.054	.104	.115	.149	.072	.098	.130	.155
G2 educational attainment								
1 Junior high	.476	.265	.122	.030	.473	.277	.118	.027
2 High school	.380	.521	.561	.478	.374	.520	.571	.484
3 Tertiary education	.144	.214	.318	.492	.152	.203	.310	.489
G3 educational attainment								
Years of education	13.869	13.986	14.053	14.459	13.246	13.464	13.815	14.283
	(2.171)	(1.992)	(1.940)	(1.840)	(1.741)	(1.575)	(1.589)	(1.621)
1 Junior high	.056	.027	.025	.016	.040	.015	.012	.009
2 High school	.379	.380	.347	.263	.463	.416	.312	.226
3 Junior college	.112	.152	.192	.187	.311	.385	.425	.373
4 University	.453	.441	.436	.533	.186	.184	.251	.391
N	880	2236	3513	1993	751	2057	3320	1891

Notes: Proportions or means are reported. Standard deviations are in parentheses.

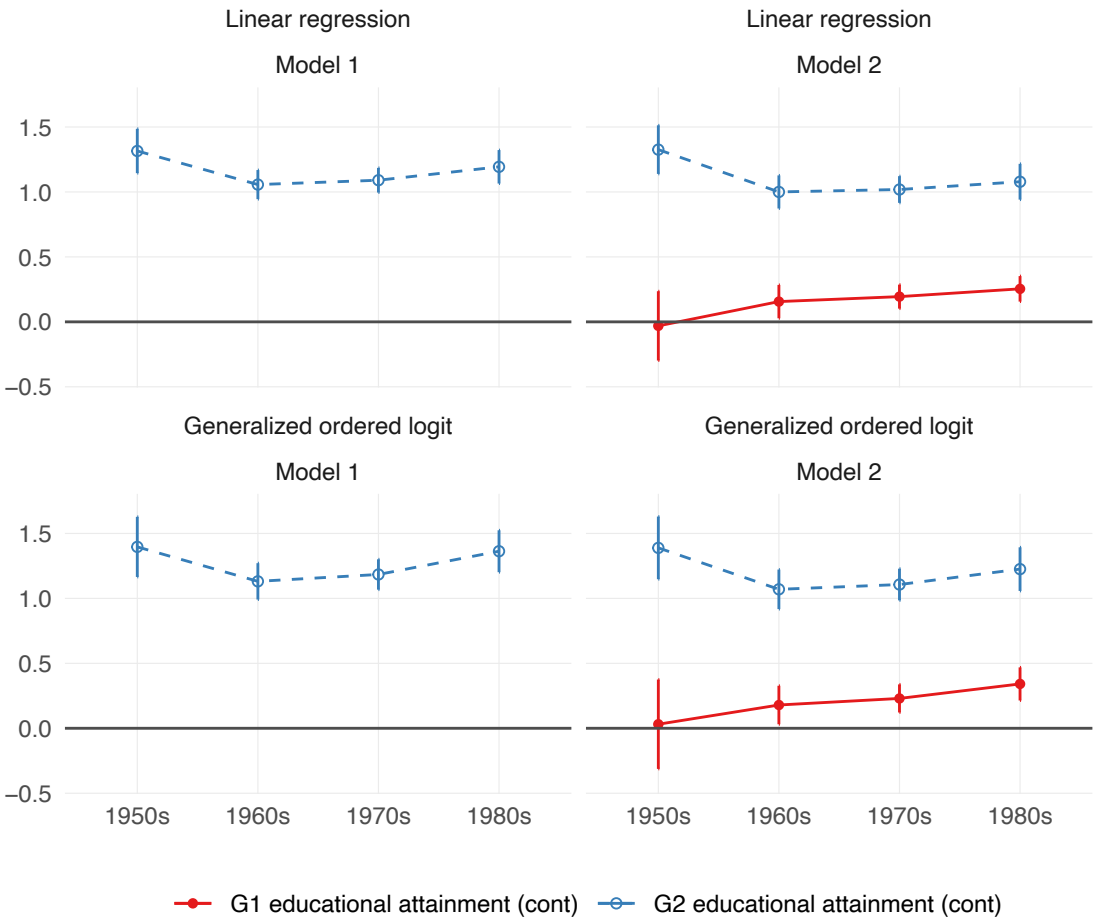


Figure 3 *Trends in the associations of G2 and G1 educational attainment with G3 educational attainment across the G3 cohorts for G3 men*

Notes. The analytical sample consists of respondents' sons. OLS or log-odds coefficients and the 95% confidence intervals (calculated by individual-clustered robust standard errors) are shown. The upper row reports the estimated coefficients of G2 and G1 educational attainment by the G3 cohorts in regression models (Equation 1). The lower row reports the estimated coefficients of G2 and G1 educational attainment by G3 cohorts in generalized ordered logit models (Equation 2). Model 1 includes G2 educational attainment, G3 cohorts, interaction of G2 educational attainment with G3 cohorts, G3 number of siblings, G3 birth order, G2 number of siblings, G2 marital status, G2 age, G2 age-squared, G2 gender, and survey dummies. Model 2 includes G1 educational attainment and the interaction with G3 cohorts into Model 1. Thresholds in generalized ordered logit are varied by G3 birth cohorts. These models' coefficients and the standard errors are presented in Table A3 in the Appendix.

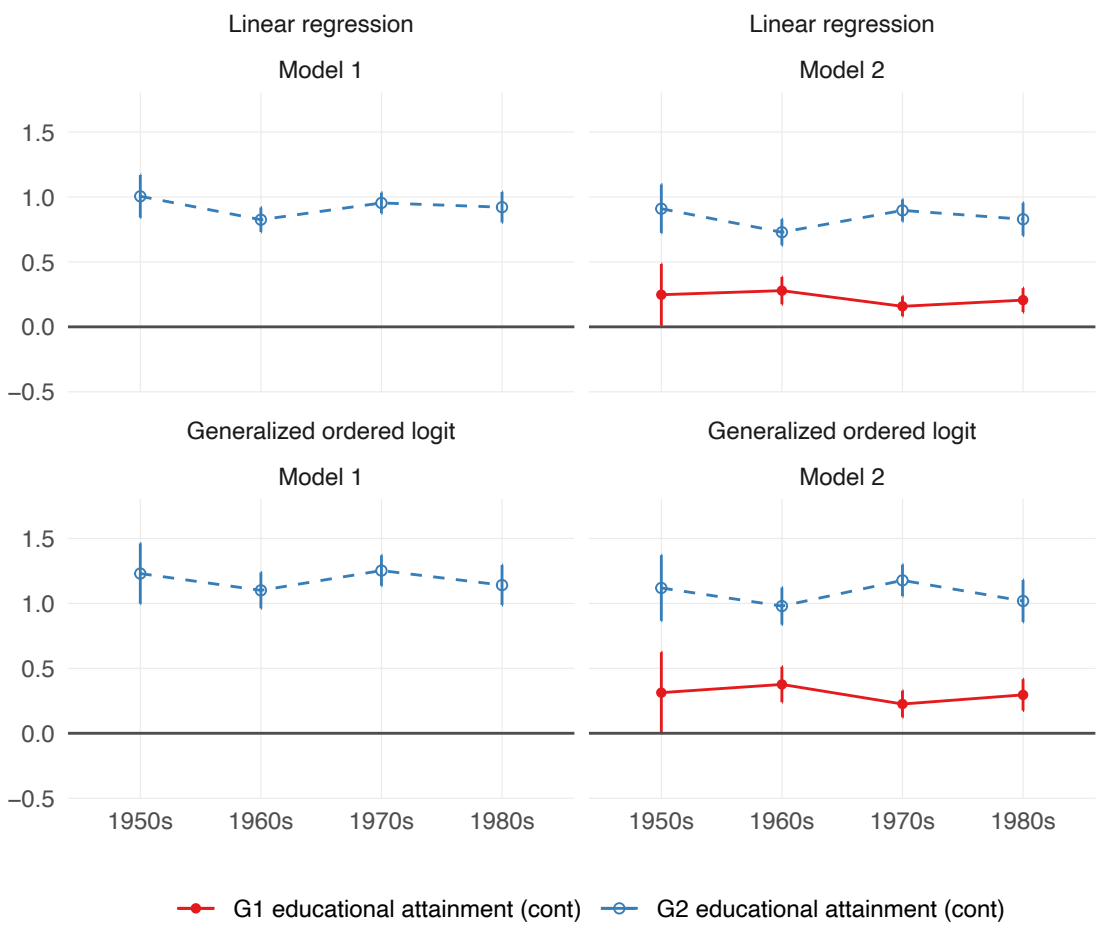


Figure 4 *Trends in the associations of G2 and G1 educational attainment with G3 educational attainment across the G3 cohorts for G3 women*
Notes. The analytical sample consists of respondents' daughters. See the details provided in the notes of Figure 3. The models' coefficients and the standard errors are presented in Table A5 in the Appendix.

Multigenerational Perspective on Trends in the Inequality of Educational Opportunity in Japan

Online Appendix

Detailed Information on Survey Data

We used three different sources of data, namely, the National Family Research of Japan Survey (NFRJ), the Education, Social Stratification, and Mobility (ESSM) Survey, and the Social Stratification and Mobility (SSM) Survey. The NFRJ has been conducted by the Japan Society of Family Sociology since 1998, and it collects information on respondents' family-related attributes. The ESSM was conducted by the Survey of Education, Social Stratification, and Social Mobility in Japan 2013 Research Project. In both of the utilized surveys, the respondents were recruited by two-stage stratified sampling, and the responses were collected by a self-administered questionnaire. The questionnaires were distributed to respondents and then collected by interviewers. The SSM was conducted by the 2015 SSM Survey Management Committee. The respondents were recruited by two-stage stratified sampling, and the responses were collected by interviews and self-administered questionnaires. While the SSM survey has been conducted every 10 years since 1955, the question regarding both male and female respondents' child's educational attainment was first asked in the 2015 survey. Thus, we did not utilize the surveys conducted before 2005. All these surveys well represent the composition of the population; for more detail, see Inaba et al. (2016) for the NFRJ, Nakamura et al. (2018) for the ESSM, and Shirahase (2018) for the SSM. Table A1 shows detailed information on each survey.

Supplementary Tables and Figures

Table A1 *List of surveys*

Survey	Respondents' age range	Respondents' birth cohort	Response rate (%)	Original sample size	Analytical sample size per respondents	Analytical sample size per children
NFRJ1998	28–77	1921–1970	66.5	6985	3227	6218
NFRJ2008	28–72	1936–1980	55.4	5203	2102	4265
ESSM2013	30–64	1949–1973	60.3	2893	814	1555
SSM2015	20–79	1935–1994	50.1	7801	2908	6068

Notes: NFRJ refers to the National Family Research in Japan Survey, SSM refers to the Social Stratification and Mobility Survey of Japan, and ESSM refers to the Education, Social Stratification, and Mobility Survey of Japan.

Table A2 *Model comparison between proportional odds ordered logit models and models with varied thresholds by G3 cohorts*

	Log likelihood	*d.f.*	*Δ*	AIC	BIC
G3 men (N = 9,384)					
Model 1					
Proportional odds	-9560.19	22		19164.37	19321.60
Varied thresholds by G3 cohorts	-9534.39	28	0.000	19124.77	19324.88
Model 2					
Proportional odds	-9531.48	26		19114.96	19300.78
Varied thresholds by G3 cohorts	-9504.96	32	0.000	19073.91	19302.61
G3 women (N = 8,722)					
Model 1					
Proportional odds	-8991.61	22		18027.21	18182.83
Varied thresholds by G3 cohorts	-8977.19	28	0.000	18010.38	18208.44
Model 2					
Proportional odds	-8950.09	26		17952.17	18136.09
Varied thresholds by G3 cohorts	-8935.64	32	0.000	17935.28	18161.63

Notes: Δ indicates p values of the likelihood ratio tests between proportional odds model and model with varied thresholds by G3 birth cohorts.

Table A3 *Models predicting G3 educational attainment in terms of absolute and relative terms of education for G3 men*

	Linear regression		Generalized ordered logit	
	Model 1	Model 2	Model 1	Model 2
G2 educational attainment	1.315***	1.326***	1.397***	1.389***
	(0.087)	(0.095)	(0.118)	(0.123)
x 1960s (ref: 1950s)	-0.259*	-0.326**	-0.265	-0.319*
	(0.101)	(0.113)	(0.136)	(0.143)
x 1970s (ref: 1950s)	-0.225*	-0.307**	-0.212	-0.282*
	(0.099)	(0.108)	(0.132)	(0.138)
x 1980s (ref: 1950s)	-0.122	-0.247*	-0.033	-0.163
	(0.109)	(0.118)	(0.144)	(0.150)
G1 educational attainment		-0.031		0.031
		(0.136)		(0.176)
x 1960s (ref: 1950s)		0.187		0.148
		(0.150)		(0.189)
x 1970s (ref: 1950s)		0.225		0.198
		(0.144)		(0.184)
x 1980s (ref: 1950s)		0.285*		0.310
		(0.145)		(0.187)
G3 number of siblings	-0.212***	-0.215***	-0.232***	-0.237***
	(0.031)	(0.031)	(0.034)	(0.034)
G3 birth order (ref: 1st)				
2nd	-0.187***	-0.179***	-0.225***	-0.217***
	(0.037)	(0.037)	(0.042)	(0.042)
3rd	-0.270***	-0.266***	-0.296***	-0.292***
	(0.066)	(0.066)	(0.072)	(0.072)
4th	-0.493	-0.498	-0.610	-0.621
	(0.286)	(0.284)	(0.342)	(0.343)
G2 number of siblings	-0.031**	-0.025*	-0.038**	-0.031*
	(0.011)	(0.012)	(0.012)	(0.012)
G2 not married	-0.541***	-0.554***	-0.586***	-0.602***
	(0.068)	(0.068)	(0.073)	(0.073)
G2 age	0.110**	0.109**	0.126***	0.126***
	(0.034)	(0.033)	(0.037)	(0.037)
G2 age squared	-0.001*	-0.001*	-0.001*	-0.001*
	(0.000)	(0.000)	(0.000)	(0.000)
G2 women	0.167***	0.155***	0.189***	0.179***
	(0.044)	(0.044)	(0.050)	(0.050)
Survey dummy (ref: NFRJ1998)				
NFRJ2008	-0.159*	-0.158*	-0.201*	-0.201*
	(0.076)	(0.076)	(0.084)	(0.084)
SSM2015	-0.307**	-0.311**	-0.394***	-0.406***
	(0.096)	(0.095)	(0.105)	(0.106)
ESSM2013	-0.257*	-0.234*	-0.327**	-0.310*

	(0.107)	(0.107)	(0.122)	(0.123)
G3 cohorts (ref: 1950s)				
1960s	0.384	0.258	0.954**	0.856**
	(0.217)	(0.241)	(0.296)	(0.332)
1970s	0.311	0.161	0.872**	0.742*
	(0.229)	(0.253)	(0.302)	(0.338)
1980s	0.347	0.193	0.818*	0.657
	(0.279)	(0.299)	(0.369)	(0.401)
Constant	7.858***	7.927***	-3.499**	-3.532**
	(1.066)	(1.069)	(1.181)	(1.194)
Threshold: 2				
1960s			0.400	0.303
			(0.251)	(0.295)
1970s			0.399	0.271
			(0.262)	(0.304)
1980s			0.347	0.178
			(0.317)	(0.355)
Constant			-6.430***	-6.464***
			(1.170)	(1.183)
Threshold: 3				
1960s			0.245	0.146
			(0.261)	(0.304)
1970s			0.058	-0.074
			(0.271)	(0.314)
1980s			-0.038	-0.215
			(0.326)	(0.365)
Constant			-6.997***	-7.032***
			(1.171)	(1.185)
N	9384	9384	9384	9384
R^2/*Pseudo* R^2	0.187	0.191	0.094	0.097
Log likelihood	-18654.940	-18630.284	-9534.386	-9504.956

Note: * $p < .05$; ** $p < .01$; *** $p < .001$ (two-tailed tests). Linear regression columns report the estimated coefficients in regression models (equation 1). Generalized ordered logit models report estimated log-odds coefficients (equation 2). Individual-clustered robust standard errors in parentheses.

Table A4 Model comparison between categorical and continuous trend of the effect of G1 education for G3 men

Model	*N*	Log likelihood	*d.f.*	AIC	BIC
Linear regression, Model 2					
Categorical trend of G1 education	9,384	-18630.3	24	37308.6	37480.1
Continuous trend of G1 education	9,384	-18630.7	22	37305.4	37462.6
Generalized ordered logit, Model 2					
Categorical trend of G1 education	9,384	-9504.96	32	19073.9	19302.6
Continuous trend of G1 education	9,384	-9505.09	30	19070.2	19284.6

Table A5 *Models predicting G3 educational attainment in terms of absolute and relative terms of education for G3 women*

	Linear regression		Generalized ordered logit	
	Model 1	Model 2	Model 1	Model 2
G2 educational attainment	1.005***	0.910***	1.230***	1.119***
	(0.084)	(0.095)	(0.118)	(0.129)
x 1960s (ref: 1950s)	-0.180	-0.181	-0.129	-0.139
	(0.095)	(0.107)	(0.137)	(0.147)
x 1970s (ref: 1950s)	-0.051	-0.013	0.023	0.059
	(0.093)	(0.104)	(0.133)	(0.143)
x 1980s (ref: 1950s)	-0.084	-0.081	-0.089	-0.100
	(0.103)	(0.115)	(0.142)	(0.153)
G1 educational attainment		0.247*		0.313*
		(0.120)		(0.159)
x 1960s (ref: 1950s)		0.031		0.063
		(0.130)		(0.171)
x 1970s (ref: 1950s)		-0.089		-0.088
		(0.127)		(0.167)
x 1980s (ref: 1950s)		-0.042		-0.017
		(0.129)		(0.170)
G3 number of siblings	-0.198***	-0.198***	-0.260***	-0.263***
	(0.025)	(0.025)	(0.034)	(0.034)
G3 birth order (ref: 1st)				
2nd	-0.155***	-0.157***	-0.208***	-0.213***
	(0.033)	(0.033)	(0.043)	(0.043)
3rd	-0.246***	-0.249***	-0.331***	-0.333***
	(0.055)	(0.055)	(0.072)	(0.072)
4th	-0.701**	-0.705**	-0.873**	-0.884**
	(0.243)	(0.245)	(0.315)	(0.321)
G2 number of siblings	-0.025**	-0.018*	-0.036**	-0.026*
	(0.009)	(0.009)	(0.012)	(0.012)
G2 not married	-0.352***	-0.373***	-0.446***	-0.478***
	(0.058)	(0.058)	(0.078)	(0.078)
G2 age	0.128***	0.126***	0.147***	0.145***
	(0.031)	(0.031)	(0.039)	(0.039)
G2 age squared	-0.001**	-0.001**	-0.001**	-0.001**
	(0.000)	(0.000)	(0.000)	(0.000)
G2 women	0.131***	0.127***	0.161**	0.156**
	(0.037)	(0.037)	(0.049)	(0.049)
Survey dummy (ref: NFRJ1998)				
NFRJ2008	-0.156*	-0.159*	-0.203*	-0.210*
	(0.062)	(0.062)	(0.082)	(0.083)
SSM2015	-0.237**	-0.251**	-0.307**	-0.330**
	(0.079)	(0.079)	(0.106)	(0.106)
ESSM2013	-0.219*	-0.215*	-0.283*	-0.278*
	(0.091)	(0.091)	(0.120)	(0.121)

G3 cohorts (ref: 1950s)				
1960s	0.428*	0.393	1.068**	1.014**
	(0.185)	(0.201)	(0.350)	(0.369)
1970s	0.461*	0.512*	0.876**	0.937**
	(0.194)	(0.208)	(0.340)	(0.358)
1980s	0.928***	0.989***	1.220**	1.288**
	(0.245)	(0.256)	(0.412)	(0.427)
Constant	7.162***	7.046***	-3.551**	-3.714**
	(0.961)	(0.960)	(1.239)	(1.245)
Threshold: 2				
1960s			0.396	0.332
			(0.266)	(0.288)
1970s			0.528	0.581*
			(0.274)	(0.295)
1980s			1.147***	1.208***
			(0.329)	(0.346)
Constant			-7.104***	-7.261***
			(1.232)	(1.237)
Threshold: 3				
1960s			0.149	0.071
			(0.309)	(0.334)
1970s			0.189	0.242
			(0.312)	(0.334)
1980s			1.108**	1.167**
			(0.362)	(0.381)
Constant			-8.893***	-9.063***
			(1.240)	(1.246)
N	8722	8722	8722	8722
R^2/*Pseudo* R^2	0.208	0.214	0.102	0.107
Log likelihood	-15696.518	-15660.018	-8977.190	-8935.639

Note: * $p < .05$; ** $p < .01$; *** $p < .001$ (two-tailed tests). Linear regression columns report the estimated coefficients in regression models (equation 1). Generalized ordered logit models report estimated log-odds coefficients (equation 2). Individual-clustered robust standard errors in parentheses.

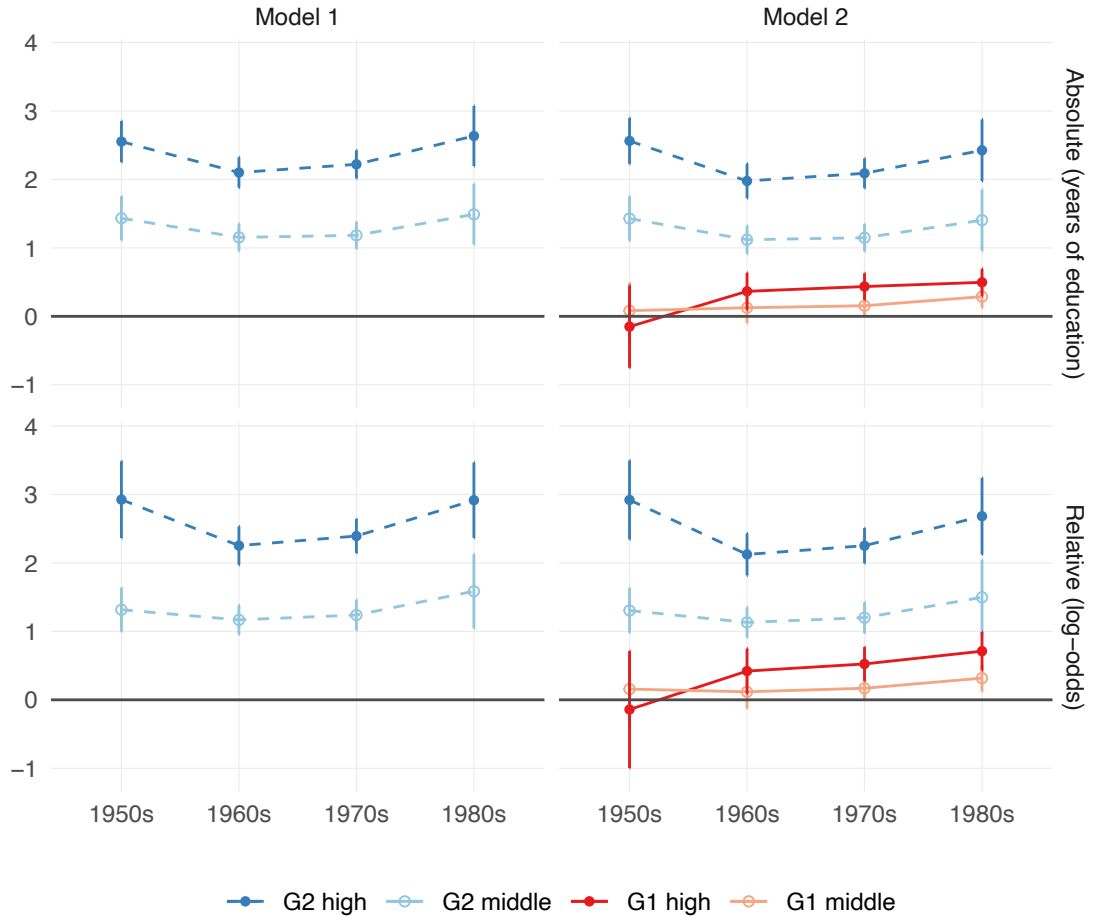


Figure A1 *Trends in the associations of G2 and G1 educational attainment with G3 educational attainment across the G3 cohorts for G3 men*

Notes. OLS or log-odds coefficients and the 95% confidence intervals (calculated by individual-clustered robust standard errors) are shown. Rows denoted as "Absolute (years of education)" report the estimated coefficients of G2 and G1 educational attainment by G3 cohorts in regression models (equation 1). Rows denoted as "Relative (log-odds)" report the estimated coefficients of G2 and G1 educational attainment by G3 cohorts in generalized ordered logit models (equation 2). Model 1 includes G2 educational attainment, G3 cohorts, interaction of G2 educational attainment with G3 cohorts, G3 number of siblings, G3 birth order, G2 number of siblings, G2 marital status, G2 age, G2 age-squared, G2 gender, and survey dummies. Model 2 includes G1 educational attainment and the interaction with G3 cohorts in the previous model. Thresholds in generalized ordered logit are varied by G3 birth cohorts.

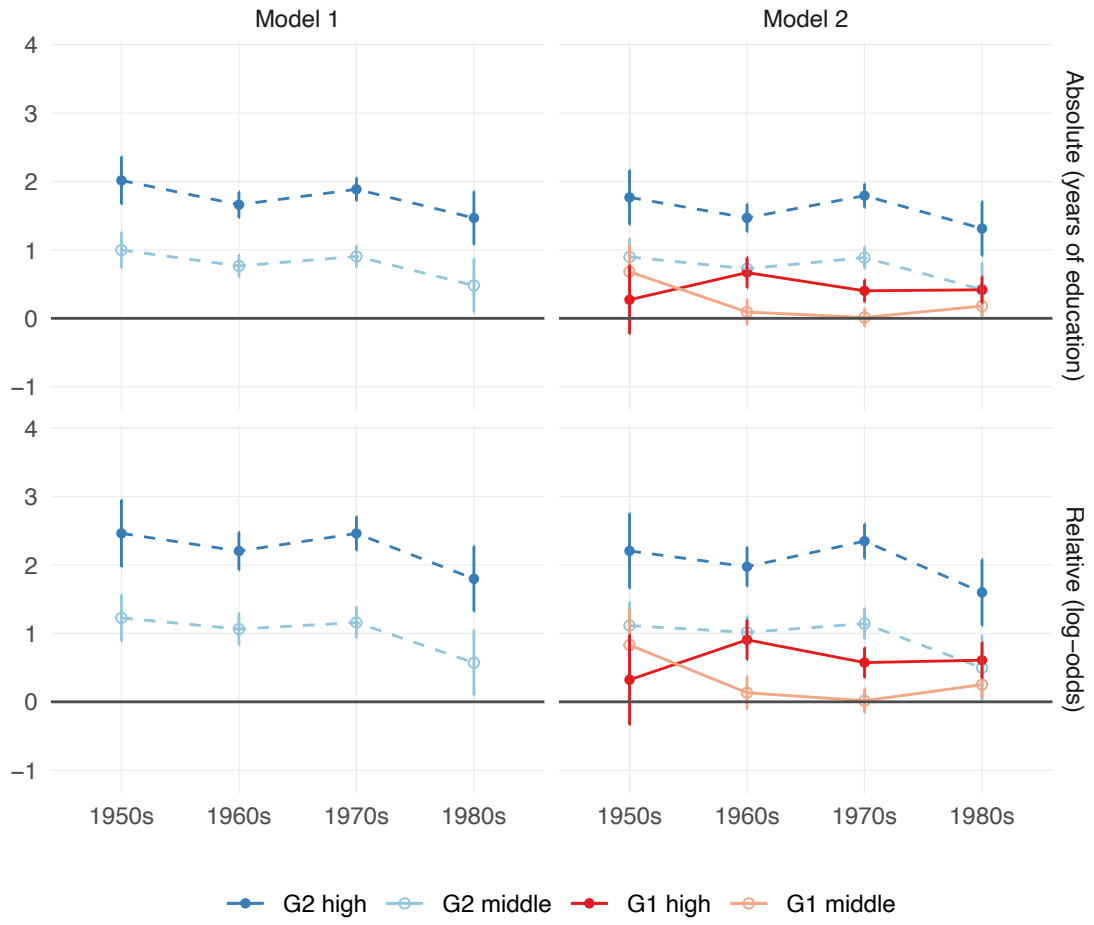


Figure A2 *Trends in the associations of G2 and G1 educational attainment with G3 educational attainment across the G3 cohorts for G3 women*

Notes. OLS or log-odds coefficients and the 95% confidence intervals (calculated by individual-clustered robust standard errors) are shown. Rows denoted as "Absolute (years of education)" report the estimated coefficients of G2 and G1 educational attainment by G3 cohorts in regression models (equation 1). Rows denoted as "Relative (log-odds)" report the estimated coefficients of G2 and G1 educational attainment by G3 cohorts in generalized ordered logit models (equation 2). Model 1 includes G2 educational attainment, G3 cohorts, interaction of G2 educational attainment with G3 cohorts, G3 number of siblings, G3 birth order, G2 number of siblings, G2 marital status, G2 age, G2 age-squared, G2 gender, and survey dummies. Model 2 includes G1 educational attainment and the interaction with G3 cohorts into Model 1. Thresholds in generalized ordered logit are varied by G3 birth cohorts.

References in Online Appendix

Inaba, A., Yasuda, T., Tabuchi, R., & Tanaka, S. (Eds.). (2016). *Families in Japan, 1999–2009: Quantative sociology by National Family Research of Japan*. University of Tokyo Press.

Nakamura, T., Hirasawa, K., Aramaki, S., & Nakazawa, W. (Eds.). (2018). *Education and social stratification: Analysis based on the ESSM2013 survey in Japan*. University of Tokyo Press.

Shirahase, S. (2018). Overview of the 2015 National Survey of Social Stratification and Social Mobility. In T. Yasuda (Ed.), *2015 SSM Research Report 1: Survey Methods and Overview* (pp. 1–12). 2015 SSM Committee.