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Necessity-Rich, Leisure-Poor: The Long-Term Relationship between Income Cohorts and Consumption through Age-Period-Cohort Analysis

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Abstract:
The main aim of this study is to analyse household consumption patterns in the highest and lowest income quintiles and explore how they have changed over time and generations. Thus, the article explores whether social inclusivity through consumption has truly increased. This study utilises the cross-sectional time-series data of the Finnish Household Expenditure Surveys (HESs), covering the period 1966–2016. We use the Age-Period-Cohort Gap/Oaxaca (APCGO) model with logitrank dependent variables as the main statistical method. Our results indicate that an overall high income is advantageous with respect to income and spending, though the gap between high- and low-income groups has remained stagnant over cohorts. A more in-depth analysis reveals that the expenditure gap, in terms of necessities, food, and groceries consumption, has narrowed. Instead, income elastic-oriented spending on culture and leisure time has significantly increased in the high-income group, where the expenditure gap has expanded 60 percentage points over the cohorts. Simply put, expenditures on necessities have become more inclusive, but low-income groups are increasingly more 'leisure-poor'. Overall, high-income classes are spending an increasing amount of money on culture and leisure time over cohorts.

Keywords:
Age-period-cohort modelling, cohort analysis, consumption, expenditure distribution, income groups

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1. Introduction

Inclusive growth has become the central point of many current poverty reduction policies, including the Europe 2020 strategy. The main objective of inclusive growth is built on the premise that growth, before poverty reduction or a focus on post-growth redistribution, is not an optimal and sustainable poverty reduction strategy. The central idea is to create an economic environment that is built on economic inclusivity for all people (Ranieri and Ramos 2013). As income inequality has increased in the OECD area, researchers have asked whether this has also led to inequality of consumption. As inclusive growth and social inclusion policy work hand in hand to focus on low-income groups' growth as participatory growth, the main area of interest is the equal access to services and goods across income groups, in terms of both necessities and income-elastic goods. To map out the main outcome of these policies, we analyse the economic resources of high- and low-income groups.

The use of current income in studies of inequality is open to the obvious criticism that current income might not reflect the longer-term level of resources available to a household or individual. Temporarily high or low incomes can exaggerate the real position of the household when borrowing or saving is allowed to smoothen the stream of consumption. Thus, household expenditures are clearly a better measurement of a household's well-being than pure absolute income: expenditure inequality tells us more about the longer-term differences in people's living standards, whereas measures of income merely provide us with a snapshot of income differences across the population (Blundell and Preston, 1995; Blundell and Preston, 1998). Several studies have argued that consumption inequality has risen less than income inequality (Cutler et al. 1991; J. D. Fisher et al. 2013; Heathcote et al. 2010; Krueger and Perri 2006; Meyer and Sullivan 2013), whereas others have argued that the rise has been fairly similar (Aguiar and Bils 2015; O. Attanasio et al. 2014; Bils and Aguiar 2010; J. Fisher et al. 2015).

However, the development of expenditure inequality at the aggregate level cannot reveal the intricacies of expenditure dynamics in terms of inter-cohort inequalities. This situation would benefit from a life course perspective that identifies and controls the effects of age, time, and generation. In this study, we define life course as life events, transitions, and trajectories with cohort variation in expenditure development (Elder, 1997), as developmental patterns that are structured by events and other biological and social constraints and that vary by historical time. An individual is defined as being a part of a certain historical period or an event by his/her birth year. The impact of a historical event is contingent on the point of intersection in the life stage of the cohort (Elder, 1997). Such a perspective emphasises that expenditure changes can be associated with such dimensions as a generation's cultural context, periodic economic shocks, and age-related needs.

Existing studies on expenditures and the social stratification of consumption are mostly concerned with age group differences and have rarely measured cohort differences. The main shortcoming of previous research on expenditure inequality is that studies have usually employed narrower models that only consider two factors of the age-period-cohort (APC) combination, eliminating the possibility of estimating true cohort effects (Attanasio et al., 2014; Bils and Aguiar, 2010; Fernandez-Villaverde and Krueger, 2002; Heslop, 1987; Rindfleisch, 1994; Twigg and Majima, 2014). In addition, because of methodological limitations, it was not possible, until recently, to use APC analysis to estimate between-group differences, which has prevented more elaborate consumption analysis. What makes our contribution vital is our use of a new method of age-period-cohort modelling, the Age-Period-Cohort Gap/Oaxaca

(APCGO) model, which is capable of measuring the absolute gap between two groups; standard APC models can only produce estimates of one sample at (Bar-Haim et al. 2017; L. Chauvel and Schroder 2014; Chen et al. 2001; Freedman 2017; Karonen and Niemelä 2019). With the improved model, we can expand the understanding of expenditure differences between high- and low-income groups.

The budget constraints of income groups differ, and it is general knowledge that the extremes of income groups tend to consume a different mix and amount of products (Deaton 1992; Deaton and Muellbauer 1980). Here, we assert that the improvement in the between-groups gap is a change to the social inclusion effects on markets as a result of increased participation possibilities. Therefore, the relationship and gap between lower and higher deciles becomes more evident as we measure expenditures on such necessities as food and such income-elastic goods as cultural and leisure-time activities. The gap itself reveals more if economic growth has yielded either more inclusive or more exclusive outcomes. Thus, we measure high- and low-income groups' income distribution fluctuations or consumer behaviour changes in expenditure profiles. By considering the primary needs and more luxury-oriented expenditures of households, we can determine how inclusive a society is in terms of its different socioeconomic groups.

This article measures the relationship of low- and high-income cohorts in Finland through consumption and income, utilising a highly advanced ACP framework. This article contributes to the body of consumption studies by answering *two primary research questions*. *First*, the article investigates how intercohort income and spending profiles in high- and low-income deciles have changed over the years 1966–2016. *Second*, it examines to what extent intercohort consumption profiles between high- and low-income households differ in specific categories of consumption.

2. Theoretical framework and previous studies

2.1. Theory of consumer research and consumption

One of the main lines of consumer research is focused on consumption potential, which analyses the ability of a household to maintain a certain standard of living (Spilerman 2000). Slesnick (Slesnick 1991; Slesnick 1993) has stated that, ideally, we should characterise and construct the concept of economic well-being in terms of consumption expenditures and the consumption of different commodities. Consumer-based measures can produce different results in terms of the level and direction of inequality (Johnson and Shipp 1997; Slesnick 1991). The theoretical literature that emphasises the importance of consumption in the stratification process argues that consumption is not only a means of acquiring necessities or daily needs but also a mechanism that organises social structures (Douglas and Isherwood 1996; Slater 1999). Thus, consumption habits and patterns reproduce elements of social stratification through the structural location of households. The concept of consumption frames a multifaceted phenomenon that creates new hierarchies by which people are measured, resources are distributed and competed for, and inequalities are created (Katz-Gerro and Talmud 2005). Therefore, the complexity of the link between consumption and inequality should be explored through the complex relationship between consumption patterns and other social domains, which are well-known links to stratification, including the stratification of different income groups.

The major elements of household stratification are linked to the relative position of a household by the dimensions of time, age, and date of birth. *Cohorts*, or generations, are shaped and defined by their particular age-related involvement with prominent historical events during the lifetime of the members of the cohort (Howe and Strauss 1992). Cohorts carry a unique imprint—which includes such traits as consumption habits and preferences—that is acquired through shared socialisation, caused in part by growing up in similar historical circumstances (Mannheim, 1928). In addition to cohort effects, *age effects* are variations resulting from the biological and social processes of aging that are specific to individuals, such as physiological changes and the accumulation of social experience (Reither et al. 2009). We can assume that as wealth accumulates as a person ages various consumptions options become available that are not necessarily available to younger people. *Period effects* are defined as external variations across time periods that simultaneously influence all age groups. Period effects encompass a wide range of historical and social factors: examples of such factors include the occurrence of an economic crisis (Dutt and Padmanabhan 2011; Mckenzie et al. 2011; Räsänen 2003; Reither et al. 2009; Zurawicki and Braidot 2005) or changes in income and relative prices. Hence, time-sensitive events, such as cultural shifts (Rindfleisch 1994), can play an enormous role in how a given generation adopts different consumption habits in relation to the resources available. For these reasons, we utilise an APC model to untangle these three dimensions, as they all play a role in household consumption preferences.

Consumption patterns reflect dimensions of APC effects and inequality in two ways. *First*, economic resources like income, occupation, and access to wealth or loans stratify consumption options. *Second*, consumer culture promotes hierarchies of taste that are constantly being created and changing (Douglas and Isherwood 1996; Katz-Gerro and Talmud 2005). These hierarchies both reconstitute and challenge social cleavages based on gender, occupation, class, age, or education. Several variables are strongly associated with expenditure patterns: income (Bihagen 1999; Blundell and Preston 1995; Cohen 2016; Heslop 1987; Katz-Gerro 2003; Katz-Gerro and Talmud 2005; Koelln et al. 1995; Salcedo and Izquierdo Llanes 2020); household composition variables such as number of adults, their ages, and number of children (Bihagen 1999; Deutsch et al. 2015; Fernandez-Villaverde and Krueger 2002; Koelln et al. 1995; Raper et al. 2002; Toivonen 1992; Uusitalo 1980); and class and occupation (Bihagen 1999; Cohen 2016; Tomlinson 1994; Uusitalo 1980; Wittmayer et al. 1994). Although household consumption behaviour correlates strongly with income, it, alone, is an unsatisfactory predictor of consumption style differences as measured by budget allocation (Blundell and Preston 1998; Uusitalo 1980). In addition to the way that socio-demographic variables are linked to expenditure patterns, research also indicates the significance of identification with group preference and the lack of commercial opportunities (Fan and Lewis 1999; Semyonov et al. 1996; Semyonov and Lewin-Epstein 2013).

To conclude, this paper contributes to the research field by investigating whether consumption opportunities have increased over time for the low-income group in comparison to its high-income counterpart. Thus,, we trace the long-term changes in expenditures and consumption goods of low- and high-income groups to determine whether societal participation through consumption has become equal.

2.2. Previous studies

Previous research has formally tested the life cycle hypothesis of consumption patterns. Sociologists have reached the consensus that consumption profiles change during a life cycle and that acquiring a certain consumer good is more desirable at certain times than at others,

depending on the consumer culture and the consumer market (Felson 1976; Hirsch 2005; Nicosia and Mayer 1976). Studies have indeed shown how consumption preferences change during life course events (Gourinchas and Parker 2002; Kolsrud et al. 2017), such as during health changes and parenthood (Stöver 2012). For example, Lührmann (Lührmann 2006) has found that households without children spend less on clothing and food than those with children but invest excess resources in leisure time and dining out. Thus, at these life stages, people change their needs and wants in accordance with the constraints of their household budgets. In addition, research shows that the life cycle model holds, as the sensitivity of consumption growth to labour income disappears when demographic variables (such as age) and business cycle variables are controlled. This indicates a need for an APC analysis (O. P. Attanasio and Browning 1993) because periodic and cohort changes must also be taken into account.

Previous empirical sociological studies have usually focused on single countries and have explored levels and structures of consumption and relevant trends (Blow et al. 2004; Bögenhold and Fachinger 2000; Gardes and Starzec 2004; Herpin and Verger 2000; Langlois 2001; Langlois 2002, 2003; Noll and Weick 2005; Schettkat and Deelen 2004). Overall, evidence on consumption has shown that households diversify their spending as their income and wealth increase; hence, resource optimising behaviour tendencies are thought to drive this process. In low-income groups, households have relatively concentrated spending patterns, but they tend to diversify as their income increases. In addition, the level of heterogeneity in expenditure diversity grows along with income (Chai 2015). An interesting question is whether institutional change in consumption has affected the expenditure patterns of these groups.

Overall, it seems that, over time, expenditure has increased in real terms but become more unequal, as people are now spending much more of their money on income-elastic goods than on necessities (Blow et al. 2004). One of the few true APC consumption studies, conducted by Segall (2013), analysed household basic expenditure categories, including food and nondurable goods. The results indicated that the expenditure share of nondurable goods, such as leisure-time goods, had an especially high share of consumption, while necessities such as food had a decreasing share of the expenditure budget. In a more in-depth study conducted during an economic crisis, consumers time-sensitively smoothened their expenditures across categories of consumer goods (Dutt and Padmanabhan 2011). Additional research findings suggest that the smoothing process during a crisis differs from a corresponding change in income and prices (Mckenzie et al. 2011). Middle-class consumers seem to spend more time shopping, even though total consumption expenditures decline in real terms, because consumers seek out lower prices and spend more time locating substitutes (Dutt and Padmanabhan 2011; Zurawicki and Braidot 2005). In addition, consumer behaviour changes during economic fluctuations can be observed from a cohort perspective (e.g. Chet et al. 2001; Kerr et al. 2003; Sagell 2013). For example, Urbonavičius and Pikturnienė (Urbonavičius 2010) analysed consumer response to an economic crisis based on the behaviour of two generations of Lithuanian consumers; their findings indicate that the younger generation tried to maintain its consumption level, while the older generation aimed to cut consumption expenditures. Thus, it is essential to track different income groups' expenditures and determine whether we observe changes in terms of expenditure on necessities and income-elastic goods.

In summary, social change is defined as a continuous process of institutional adjustment and transformation, during which a community experiences constantly changing circumstances that modify the structural foundations of the community. From a practical perspective, these institutional adjustments include social policy measures that aim to raise living standards to more optimal level within a given society. In such circumstances, inclusivity aims to advance

equitable opportunities for all economic participants during economic growth to increase benefits for all income groups.

3. Research design

When choosing the appropriate metric for the three dimensions of time in APC analysis, consumption is clearly a better measure of a household's well-being than absolute income: expenditure inequality tells us more about the long-term differences in people's living standards, whereas measures of income provide us with only a snapshot of income differences across the population (Blundell and Preston, 1995; Blundell and Preston, 1998). Temporarily high or low incomes may exaggerate the real position of a household when borrowing or saving is allowed to smoothen the stream of consumption (e.g. Uusitalo, 1980). In addition, it is imperative to compare different socio-demographic groups, like high- and low-income groups, as their budgetary limitations and needs are linked to expenditure patterns; such comparison is necessary for the identification of these groups' preferences or lack of economic opportunities (Semyonov et al., 1996; Fan and Lewis, 1999).

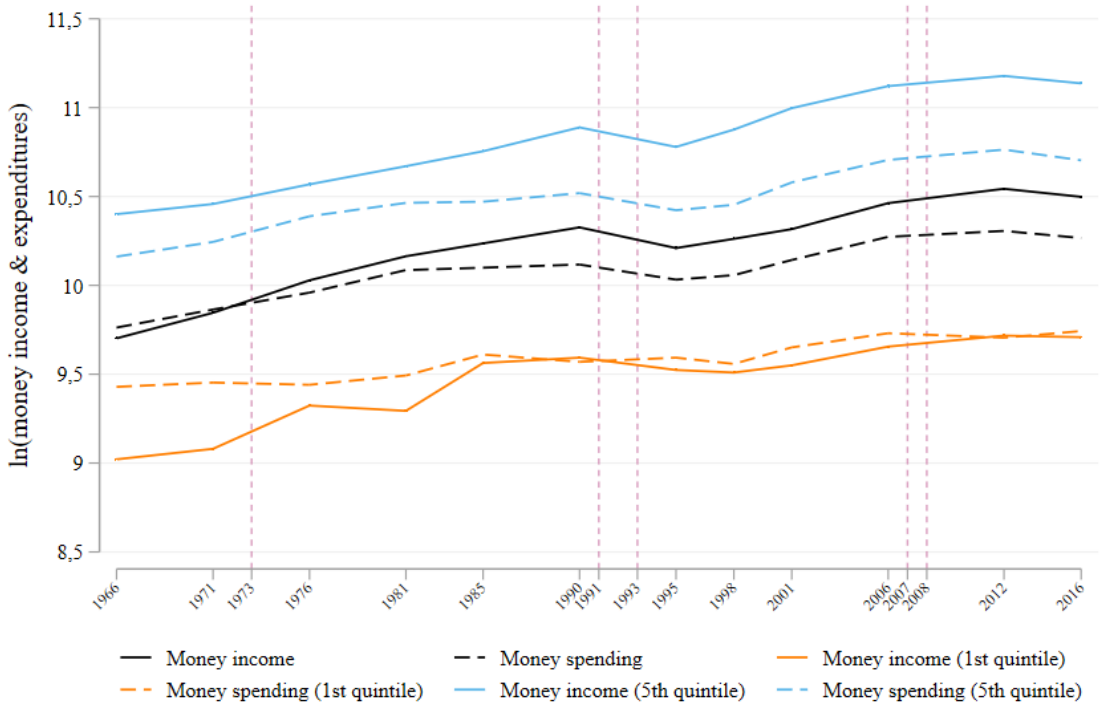


Fig. 1 Logarithm of income and expenditures by income class in Finland, 1966–2016.
Note: Vertical lines represent economic recessions.

We base our measurement scale of high- and low-income quintiles on Figure 1, which shows clear descriptive differences between these two groups. The high-income group has a similar profile to the money income and money spending trajectory of the population as a whole, in which money income is higher than money spending. On the other hand, the low-income group has a polarised money income and money spending profile, in which income is lower than the spending trajectory. This indicates that the low-income group is struggling more to make ends meet: this has major implications for the societal participation of this group. A one-fifth measure is a moderate sample of income distribution. From a social inclusion perspective, this also makes sense: optimising the distribution of economic resources provides greater population access to a variety of products and services that would otherwise not be accessible.

Spending on goods can serve as a proxy for societal participation through consumption, whereas comparing high- and low-income households offers a window onto how social inclusivity and economic opportunities have developed over time. We denote our first hypothesis on the overall development of income and spending as follows: *the relative money expenditure gap between high-income and low-income groups has widened in favour of the high-income group* (H1).

The consumption gap between high- and low-income groups is time sensitive, as needs and the supply of income-elastic goods changes over time. We might imagine that if people today are richer than they were a hundred years ago, they might demand different goods and different quantities of those goods. In particular, they might come to cultivate tastes for high-quality or luxury goods, especially in the high-income group. As average Finnish incomes have risen over the past century, we can anticipate that households' optimal allocation of expenditures will shift towards more income-elastic luxury goods. Treating consumption patterns as one dimension along which this generational logic can operate allows us to test whether different cohorts actually spend differently and whether those differences coincide with our prior understandings of economic history, social inclusion, and the placement of a household in the institutional network of the time.

Cohort differences in expenditures on necessities indicate whether increased income can be allocated to other expenditures. As Engel's law states, the increase in a necessity good is less than proportional to the rise in income; so, the proportion of expenditure on such goods falls as income rises. The more necessary a good is, the lower is the price elasticity of demand, as people will attempt to buy the good regardless of the price. Consumption of food serves as one of the proxies of necessity goods. Based on these considerations, we hypothesise that *relative consumption of food and groceries between high-income and low-income groups has achieved spending equality over time* (H2). In other words, we assume that the food consumption 'gap' has been equalised over time because real income has risen considerably and the share of food has diminished in overall expenditures.

As mentioned above, as a household's income increases, the percentage of income spent on food decreases, whereas the proportion spent on other goods, such as luxury goods, increases. In other words, if the expenditure rise includes all income groups, it can also serve as an inclusive public good, especially for income-elastic goods. Opportunities to engage with cultural and societal interest solidify a household's inclusion in society through participation rather than by merely making ends meet. Our last hypothesis is the following: *relative spending on culture and leisure time between high-income and low-income groups has risen favour of the high-income group* (H3). If the null hypothesis is true, this would indicate that society has succeeded in achieving an inclusive policy or even surpassed this by decreasing the gap between low- and high-income groups.

4. Data and variables

Our empirical analyses are based on the Finnish Household Expenditure Surveys (HESs) conducted by Statistics Finland. This dataset belongs to the series the Official Statistics of Finland (OSF) and the European Statistical System (ESS). The HESs provide data on households' annual use of money for a variety of purposes, such as food or transport. There is also a wealth of information on households' structures, activities, durable goods, housing conditions, income, and social services benefits.

From 1966 to 1990, the survey was conducted regularly at five-year intervals. From 1994 to 1996, the survey was conducted annually. Thereafter, the Household Expenditure Surveys were conducted in 1998, 2001 2006, 2012 and 2016. Data are partially derived from interviews and, since the 1971 survey, from official registers. The household budget survey data are collected via interviews, diaries, and purchase receipts kept by the households and from administrative registers. The body of data is collected via interviews that inquire about a household's background data, its ownership and purchase of durable goods, residential costs, and several other kinds of information. After the main interview, the households keep a diary about their consumption expenditures and retain receipts from their purchases for a fortnight. Demographic as well as income data are derived from registers.

The basic unit of analysis is the household. Households most often form economic relationships through co-residence, pooling of resources, and shared consumption behaviour. Households are a social unit and a consumption unit: major economic decisions are shared and formed in relation to household status. Thus, most of the daily decisions are made within a larger unit rather than by an individual (Katz-Gerro and Talmud 2005). Economic behaviour is constrained by available resources, which limits how household units can operate as a consumption unit. Regarding household assets, the individual with the highest personal income was chosen as the reference person who would serve as a proxy for the household's demographic and background status. The income variables measure the household's income and the individual income of the household's reference person. Consumption expenditure is classified according to the national Classification of Individual Consumption by Purpose Adapted to the Needs of Household Budget Surveys.

Dependent variables are inflation adjusted, and money income, money spending, food and grocery expenditures, and cultural and leisure-time expenditures are equivalised (see table 2 for descriptives). We use aggregate food and grocery expenditures, which are constructed from 282 separate food item variables, that include details on every aspect of food items from specific types of meat to different types of cabbage. Culture and leisure time are also used as aggregates and contain the total expenditures of 133 variables. For example, cultural subcategories include details about items as varied as hockey sticks and theatre tickets. It is to be noted that household income is not top-coded and is a representative sample of the Finnish population. In addition, as is common practice in empirical applications, we have bottom-coded all negative income values as zeroes because it makes little sense to apply equivalisation to negative values (see OECD 2013; 2015).

For the independent variables, we use education, main type of economic activity, and household structure (Table 1). Education can be seen as a resource that provides one with culture, credentials, and identity, all of which are connected to cultural status, the attainment of a certain income level, and lifestyle choices. The main type of economic activity also reflects spending habits and possible out-of-work status, both of which define overall resource allocation. The household structure is used as a control to account for the different consumption needs and preferences of singles as compared to, for example, couples with children.

We coded education as basic education, secondary education, and higher education. The reference group for the main type of economic activity is workers; the other categories are higher- and lower-salary workers, entrepreneurs, agricultural workers, and individuals who are unemployed or outside the workforce. The household structure is treated as a categorical variable; the most typical households are standalone categories, and rarer ones (such as families with over five children) are combined into one category. In addition, our methodological choice

comes with certain requirements retarding data structure and coding, which is described in the methodology section below.

5. Methodology

5.1. Age-period-cohort model

We use a special variation of the APC model, which is designed to measure differences between two distinct groups (for a discussion of this methodology, see (Yang et al. 2004). This variation is a major improvement over previous models; which allows us to measure only one group at a time (see e.g. L. Chauvel and Schroder 2014; Chen et al. 2001; Freedman 2017; Reither et al. 2009). Between-group analyses are made possible through an analytical design built on interactions, even though methodological reasons prevent a comparison of results for age, period, or cohort.

The purpose of the APCGO model is to measure the change between two groups (e.g. high- and low-income groups) across birth cohorts in the gap in a dependent variable *y* (e.g. income and expenditures) (Bar-Haim et al. 2018). Data fitted to the APCGO model are structured in a Lexis table. In our dataset, we use an age by period table (e.g. cross-sectional) of data with matching grouping intervals between age and period variables (e.g. a five-year age grouping). Each cell of the Lexis table is indexed by its age A and a period P, as these pertain to cohorts, yielding $C = P - A$. Through the APCGO model, we identify a vector of 'net' income quintile gaps (measured by the classical Oaxaca 'unexplained difference' of y by relevant covariates), where the gaps are indexed by cohorts. This cohort indexed gap is a vector showing the intensity of the gap (the average value of the vector coefficients), the trend (the general linear slope of coefficients across cohorts), and their fluctuations (their nonlinear shape); it measures a possible closing gap from social generation to generation.

The process is *twofold*. *First*, with the base of the Oaxaca-Blinder models of γ by relevant control variables in each (age by period) cell of the initial Lexis table y_{apc}, we compute a matrix u_{apc} of 'unexplained' differences and the 'Oaxaca-Lexis table' of income and expenditure gaps between the highest and lowest deciles. *Second*, the Oaxaca-Lexis table is decomposed on the basis of a specific trended APC model to obtain a measure of the cohort-specific nonexplained gap in income (Bar-Haim et al. 2018).

In the first step, we apply the Blinder-Oaxaca decomposition method (Blinder 1973; Jann 2008; R. Oaxaca 1973; Oaxaca and Ransom 1994) to each cell of the initial Lexis table to obtain the income quintile gaps in household expenditures (HSE) (un)explained by independent variables. We consider incomes for the first (QU_1) and fifth quintiles (QU_5), a linear combination of endowments and sum of errors.

$$\overline{\log(HSE)}_c^{QU1} = \overline{X}_c^{QU1} \, b_c^{QU1} + e_1 \quad (1)$$

$$\overline{\log(HSE)}_c^{QU5} = \overline{X}_c^{QU5} \, b_c^{QU5} + e_2 \quad (2)$$

In Equation 1, the $\overline{X}_c^{QU1}$ represents the mean of independent variable X at cohort C for the first quintile; likewise, b in b_c^{QU1} represents the coefficient for the same independent variable and quintile cohort groups. Similarly, in the second equation, the same definitions apply except for the fifth quintile. When we subtract Equations 1 and 2, we express the differences in expenditures to income quintiles for each cohort:

$$\overline{\log(HSE)}_c^{QU1} - \overline{\log(HSE)}_c^{QU5} = b_c^{QU1}\left(\overline{X}_c^{QU1} - \overline{X}_c^{QU5}\right) + \overline{X}_c^{QU5}\left(b_c^{QU1} - b_c^{QU5}\right) \quad (3)$$

In Equation 3, the subtraction of HSE terms is the overall expenditure gap in cohort C between income groups, and $b_c^{QU1}\left(\overline{X}_c^{QU1} - \overline{X}_c^{QU5}\right)$ is the gap explained by independent variable X in a cohort C. The term $\overline{X}_c^{QU5}\left(b_c^{QU1} - b_c^{QU5}\right)$ is the unexplained variation, which contains the effect not observed in the model.

In the twofold decomposition, the mean outcome difference is the difference in the linear prediction at the group-specific means of the regressors of the difference, which can, in the case of the two groups, be decomposed. We apply a specific trended APC model to the Oaxaca Lexis table to obtain the trend measure of the cohort-specific expenditure gap, the APCT-lag coefficient. The new APC-lag approach uses the 'linear age effect' as its baseline (Bar-Haim, Chauvel, and Hartung 2017; Bar-Haim et al. 2018) . Once this constraint is given and the period linear trend is constrained to zero, the cohort effect will absorb the long-term time transformations. This definition means a new, clear baseline, at which the linear slope of age trend measured by the α_a coefficients is designed to equal α, the average shift due to age in the Oaxaca Lexis table across cohorts O_{apc}. Consider this average shift α:

$$\alpha = \sum \frac{(O(\alpha+1, p+1, c) - O_{apc})}{(A-1)(P-1)} \quad (4)$$

where α represents the average shift for a cohort c when it grows one age group older in the next period across the window of observation of a age groups and p periods. Once α is known, APC-lag is identifiable:

$$o^{apc} = \alpha_a + \pi_p + \gamma_c + \varepsilon \quad (5)$$

whereas the full model is denoted as

$$\begin{cases} o^{apc} = \alpha_a + \pi_p + \gamma_c + \beta_0 + \sum_j \beta_j x_j + \varepsilon_i \\ \quad \begin{cases} \sum(\alpha_a) = 0;\ \sum(\pi_p) = 0 \\ Trend(\pi_p) = 0; Trend(\alpha_a) = \alpha \end{cases} \end{cases} \quad (6)$$

The formula of operator trend for age coefficients, when A is the number of age coefficients, is

$$Trend(\alpha_a) = 12\frac{\sum(\alpha_a(2a - A - 1))}{(A-1)A(A+1)} \quad (7)$$

In the APC-lag, γ_c absorbs the constant (larger when the gap is high), its trend shows the variation in the intensity of the gap by cohort for age and period controlled, and the fluctuations show possible nonlinear accelerations or decelerations in the cohort trend.

It should be noted that the complete APCGO method cannot provide direct estimations of confidence intervals due to the complexity of the succession of the Blinder-Oaxaca and APC methods. Therefore, we bootstrap the entire process considered, including the Oaxaca-Blinder decomposition of each cell of the initial Lexis table of y_{apc} to obtain the nonexplained O_{apc} Oaxaca-Lexis table. For a more comprehensive methodological discussion, see the relevant research literature (Bar-Haim, Chauvel, and Hartung 2017; Chauvel et al. 2017).

5.2. Transformation of the dependent variables

For the outcome variable (expenditures) we utilise the percentile rank-based elasticity measure, or 'logitrank' method, on our dependent variables (Chauvel 2016; Chauvel and Bar-Haim 2017). Logitrank offers a standardisation method consistent with the Pareto characteristics of income and consumption distributions that suppresses the mechanical effect of increasing gaps with increasing inequalities. One of these effects is yearly variation, which rank ordering income will control. Thus, we can explain the gap in the means of our outcome variables between the first and fifth quintiles and measure the relative social power of individual I (Copas 1999). Logitrank can be expressed as the following equation:

$$\ln(m_j) = \alpha \ln\left(\frac{p_1}{1-p_i}\right) or\ M_i = \alpha X_i \quad (8)$$

where X_i = logit(p_i) = ln(p_i/(1 –p_i)) and M_i= ln(mi) = ln(y_i/median).

There are two types of strong arguments that support the use of a logitrank as a first approximation of income distributions. In technical terms, *first*, with its two-parameter formula (the median and α), the logitrank is one of the most parsimonious laws with appropriate Pareto-type power tails at both extremes, and its formula is simple. In this model, log medianised income is proportional to the log-odds of the standardised quantile (Table 1). Thus, the coefficient plays a remarkable role in the measurement of inequality since rank positions offer an opportunity to measure changes in wage and consumption structures. *Second*, the logitrank has some important features, such as power tails and the ability to use zero wages. This is an important feature and substantial improvement over previous studies, as the focus on hourly wages can omit certain observations, for example, in female and unemployed populations. In addition, the main benefit is that logitrank measures are counted as infinite and not constrained as percentiles are, where a large increase in the top percentiles only moves the percentile ratio by a minimal amount, thus hindering variation in extreme groups. The logitrank solves this.

Table 1. Example of logit(rank) units (Louis Chauvel and Bar-Haim 2017).

Logit(rank)	**-4**	**-3**	**-2**	**-1**	**0**	**1**	**2**	**3**	**4**
Position in distribution	Low 2%	low quintile	Low decile	Low quartile	p50	Top quartile	Top decile	Top quintile	Top 2%

One downside of logitrank is the added complexity of interpreting results. To counteract this—as a final modification—we obtain *percentiles* from the logitrank estimates by using the inverse

function for more intuitive results. Thus, we report the results of analysis both in units of logitrank and percentiles. The inverse function with the median centred to zero is denoted as follows:

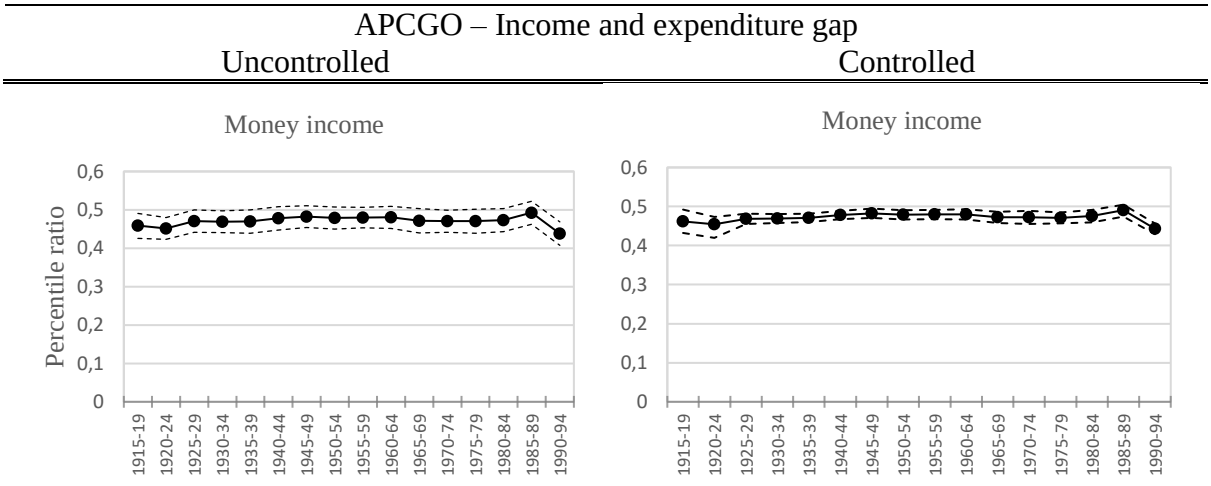
$$Percentile\ Rank\ (PR) = \frac{EXP(\text{Logitrank})}{\left(1 + EXP(\text{Logitrank})\right)} - 0{,}5 \qquad (9)$$

6. Results

6.1. Money income and money spending: the income quintile gap

Figure 2 shows the results of trended cohort effects on income and spending, where zero denotes quintile equality and negative values denote low-income (lowest 20%) advantage. All positive values refer to high-income (highest 20%) advantage. Thus, the APCGO model reveals how money income and money spending have developed across cohort classes. The first part of our analysis focuses on income quintile differences in logitranked money income and money spending with and without control variables.

Results indicate that the long-term money income development has favoured the highest decile. In money income, there is a 48-percentage point gap between the high- and low-income groups. It seems that there has not been any real development in income inequality between the high- and low-income groups over cohorts. Thus, the results suggest that money income growth has equally benefitted high- and low-income quintiles. Any deviation would show an increased gap, which would also indicate growth or decline in income inequality. From the viewpoint of social inclusivity, this development is optimal, in the sense that income development has been a Pareto improvement, although the income gap has not decreased between income deciles over cohorts. Even taking education into account, the main economic activity and the structure of households, there are no real changes in the overall income gap. It should be noted that previous research shows that there was an increase in income inequality in Finland during the 1990s recession, but the effect was mostly due to changes in the taxation system that followed the rise in capital income (Blomgren et al. 2014). The overall resources, as in disposable money assets, have maintained their equality over cohorts.



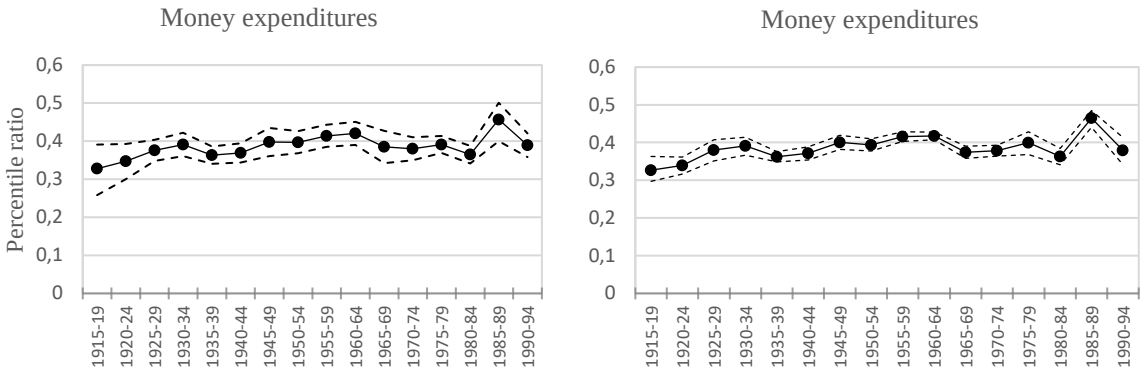


Fig. 2 Income quintile gap in percentile ratio of money income and money spending by birth cohort. Zero denotes quintile equality, and positive values refer to high-income advantage.

Money expenditure shows a similar development. Overall, the expenditure gap between high- and low-income cohorts is 39 percentage points. It seems that the expenditure gap has also maintained its equilibrium over cohorts, although compared to money income, the gap varies slightly. It can be stated that high- and low-income groups have equal expenditure profiles, which also points to inclusive consumption opportunities. There is a small deviation: an expenditure spike (10 percentage points) in the cohort from 1985 to 1989. The most likely explanation for this is the volatility of this cohort group because of a lack of cases. A broader extrapolation would be that the financial crisis of 2007–08 had an impact on this cohort group because it was entering the job market. In Finland, the financial crisis stagnated economic growth, which probably affected the recruitment policies of institutions and companies. Nevertheless, the results show that spending profiles are homogenous over cohorts between high- and low-income groups. This result does not support our first hypothesis of an increased spending gap in favour of the high-income group.

The income and spending gaps offer an overall picture of social inclusion and of how people have been spending and earning over cohorts. Our results show that both overall money income and money expenditures show equal development over cohorts. Thus, the gap in distributive balance in terms of resources and market inclusivity does seem to provide equal footing in the consumption market when budget constraints are taken into account. Nevertheless, this type of analysis does not show how more concrete budgetary investments have been changing between people who are more affluent and people who are on a tighter budget: for example, how the consumption of food and more luxury-oriented goods has changed over different generations, thus appropriately testing the hypotheses regarding Engel's shift to income-elastic goods. This would show the inner structure of expenditures and whether inclusivity profiles have changed and become more unequal between the quintiles in older and younger generations. Next, we analyse how these two expenditure gaps have been fluctuating to provide a more in-depth view of where spending is directed.

6.2. Consumption gap in expenditures between income quintiles

Figure 3 shows the results of the APCGO expenditure gap between the highest and lowest income quintiles. As in the previous analysis of money income and money spending, the zero line denotes quintile equality, and negative values indicate higher low-income expenditures.

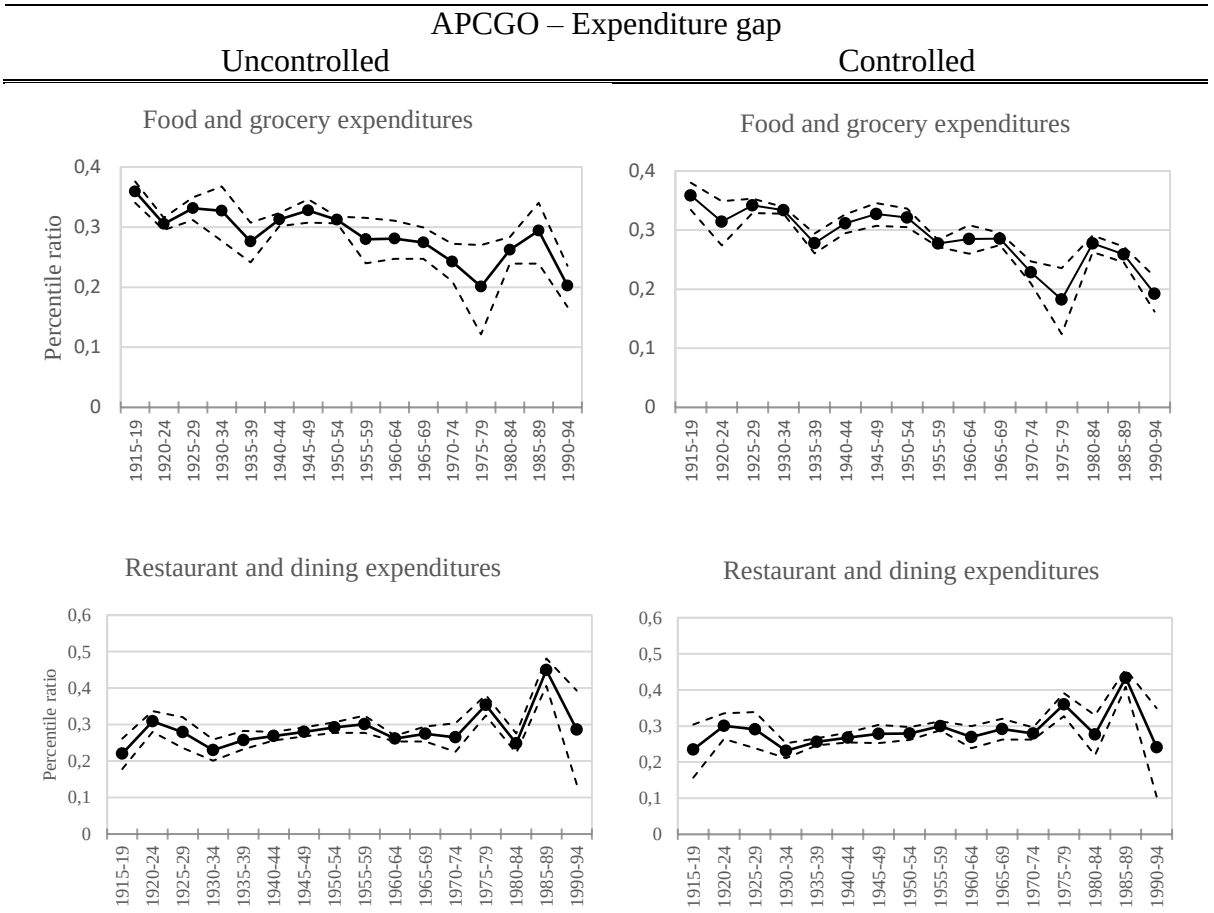


Fig. 3 Income quintile gap in percentile ratio of food and grocery expenditures and restaurant and dining expenditures by birth cohort. Zero denotes quintile equality, and positive values refer to a high-income advantage.

Figure 3 shows how the expenditure gap in food and groceries has decreased by 17 percentage points from the oldest to the youngest cohort and how it is closing in on the expenditure equality of high- and low-income groups. Nevertheless, an 18-percentage point gap between these groups remains. There are two probable explanations for this. *First*, this could be interpreted as an effect of Engel curves, which states that as income rises, the proportion of income spent on food falls. A general increasing income trajectory is shown in Figure 1, which, in combination with food and grocery expenditures, supports the indication of an Engel curve.. *Second*, it is probable that the high-income group does not spend more on food in terms of volume but in terms of quality. Unfortunately, our data do not indicate how much food is purchased in grams or whether the food is of a higher quality. Nevertheless, this is a reasonable extrapolation.

One outlier remains between the cohorts from 1980 to 1989, which shows an increased expenditure gap in high-income households. To explain this phenomenon, we also analysed restaurant and dining expenditures, which could partly explain certain developments in food expenditures, especially in the case of cohorts. The rationale behind this notion is that cohorts could differ from each other in terms of dining culture and access to a much larger selection of dining facilities than previous cohorts. As Figure 3 shows, the restaurant and dining expenditures have been relatively stagnant with a high-income group bias (30 percentage points), but in the younger generations there is an increase in dining expenditures. This could partly explain the food and grocery expenditure increase in younger cohorts.

Although a small expenditure gap remains, the results support our second hypothesis on food and grocery consumption, which assumes that there has been a spending shift from high-income group inequality towards spending equality.

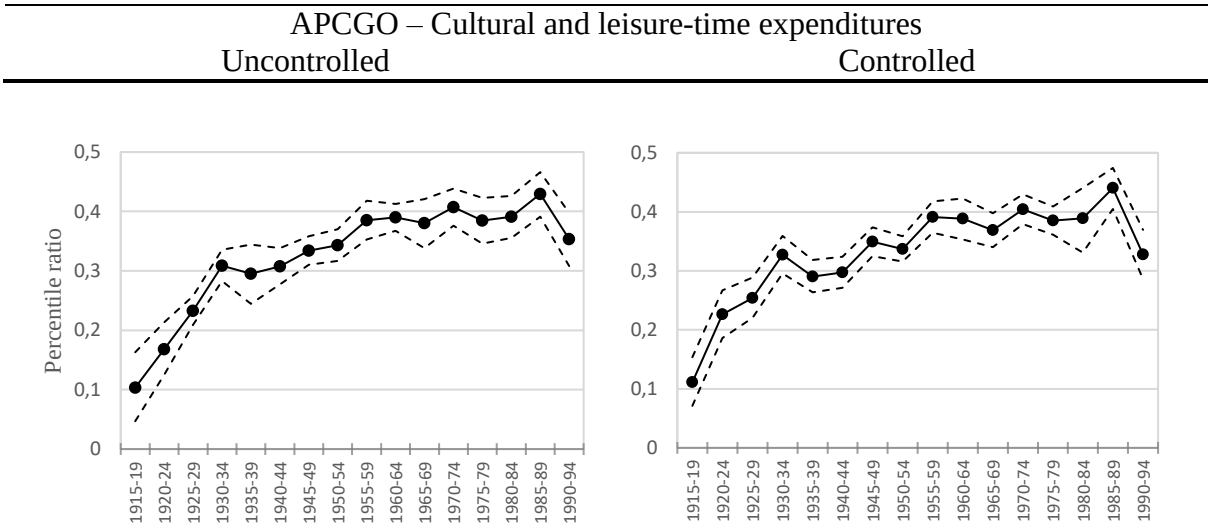


Fig. 4 Expenditure quintile gap in percentile ratio of cultural and leisure-time expenditures by birth cohort. Zero denotes quintile equality, and positive values refer to high-income advantage.

The cultural and leisure-time spending gap has risen significantly over cohorts (Figure 4). Between the oldest and youngest cohorts, the total increase in the expenditure gap is 43 percentage points. In addition, the difference between generations shows an increased demand for culture and leisure time, especially for the affluent younger generations, who tend to spend more on leisure time. This observation supports our third hypothesis on the high-income group's increased incentive to spend resources on income-elastic goods. As Engel curves dictate, the direct interpretation is that high-income groups have a greater excess of resources to spend on income-elastic goods such as culture and leisure time. It is reasonable to assume that there has been a major rise in an interest in culture and leisure time between cohorts in high-earning households, which could be connected to class-based cultural taste. In addition, the historical contexts in which different cohorts live could play a role as could the ever-expanding supply of entertainment and leisure-time activities.

In addition to excess resources, it is intuitively reasonable to assume that high- and low-income groups have different amounts of free time, which is where spending on culture happens. In contrast to such lay conceptions, previous studies have implied that high-wage earners and educated individuals work more hours than low-wage earners (Kuhn and Lozano 2008), whereas our results show increased leisure-time investment by the group with less free time. Thus, investment in culture and leisure time is not connected to free time itself but to availability of resources. As regards the expenditure gap in food and grocery expenditures, it is interesting to note that the decreased investment in necessities does not reflect leisure-time consumption. This is probably connected to other expenditures, such as housing expenditures and the preference for consuming other goods.

From the viewpoint of social inclusion, the results show that the monetary investments in culture and leisure time by the high-income group has increased over cohorts. Thus, participation in income-elastic markets has decreased in the low-income group. Put simply, low-income groups are not only more consumption-poor but also leisure-poor than their high-earner counterparts.

Next, we observe the difference between the mean differences across income quintiles with a set of control variables. By observing total differences (sum of the explained and the unexplained) in comparison to the unexplained wage gap, we can see how much these gaps persist in the general versus the explained control variable effects. This reveals how much of the gap is due to factors other than the variables that are part of the model. In other words, we gain knowledge about which factors explain why the quintile gap exists.

6.3.Total gap Blinder-Oaxaca decomposition of the income quintile gap

Figure 5 shows the total quintile gaps in the Oaxaca-Blinder decomposition with the predictors of education, main economic activity, and household structure. The results show that there is a persistent unexplained portion in all measured categories.

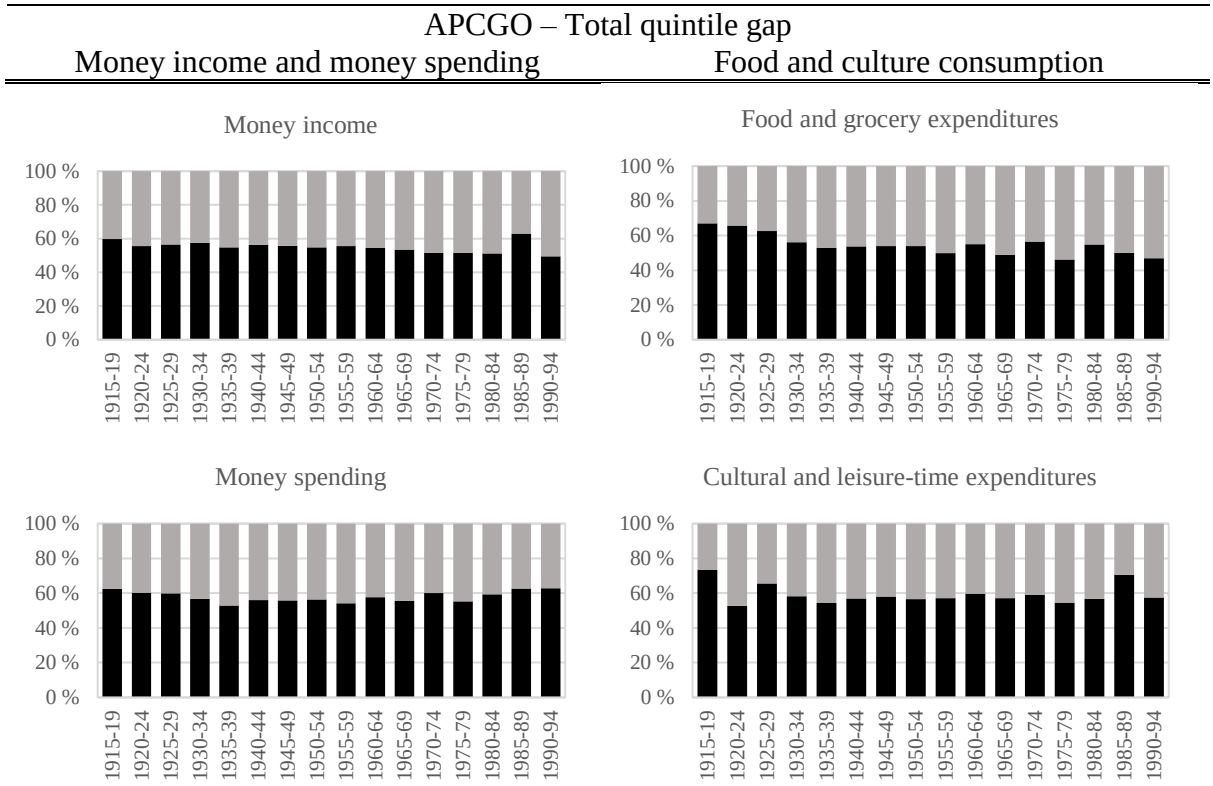


Fig. 5 Percentage share of the Blinder-Oaxaca decomposition of the income quintile gap controlled by education, main economic activity, and the structure of the household. Darker grey denotes the total quintile gap and lighter grey the unexplained quintile gap. The difference shows how much the control variables account for the gap.

The overall control variables explain the income and expenditure gaps well. The decompositions reveal that all control variables over different cohorts explain 60 percent of the total gap between high- and low-income groups. Regarding food and grocery expenditures, it seems that the control variables explain slightly less of these for the younger generations, although the difference is 10 percentage points. In conclusion, the income and expenditure gap

is explained mostly by differences in education, main economic activity, and household structure. The unexplained gap could include structural factors, such as rural or urban household location and the ages of any children. In addition, psychological consumer behaviours, such as personal taste and the effects of advertisements, could interact with consumer behaviour, but these data cannot measure such (see, e.g. Becker and Murphy 2009; Blundell 1988; Haugtvedt et al. 1992; van Raaij 2016).

7. Conclusion

Our study aimed to analyse the inclusive nature of long-term economic participation by measuring the level of consumption between high- and low-income groups. By separating necessities (primary utility goods) and income-elastic goods (secondary utility goods), we found that the glass of economic inclusivity is half empty and half full.

The overall change between high- and low-income economic groups seems not to have changed at the aggregate level, which comprises the 'the glass is half full' thesis. *First*, our data suggest that at the aggregate level, consumption and income have maintained a stagnant gap between both extremes of the income groups. This supports the idea that overall household expenditures follow the trend of household income, which in turn does not support our *first hypothesis*, where we asserted that the relative money expenditures between high-income and low-income groups have risen slightly in favour of the high-income group, but not in a major way. The results clearly show that expenditure and income gaps between high- and low-income cohorts have maintained their overall stagnant nature, which indicates that the income and expenditure development has maintained its inclusive balance in aggregate measures. This was to be expected, as Finland has a strong redistributive taxation model, especially when compared to other systems like the United States (see e.g. Autor et al. 2005; Dew-Becker and Gordon 2005; Goldin and Katz 2007). The stagnant gap tells us that this redistributive system has been working as intended for a long period of time, and at the surface level, it seems that long-term economic opportunities have been balanced for both high- and low-income groups and that growth trends are at similar levels.

Second, in contrast to aggregate income and expenditures, a more in-depth analysis reveals an inequality between the two income groups. Our data support the idea of increased consumption inequality compared to income but at a more intricate level. While aggregate income and consumption have been stagnant over different cohorts, the investment in necessities (food and groceries) and income-elastic goods (culture and leisure time) shows changes in consumption inequality. This can indicate a change in consumption habits, interacting with the resources available.

The second hypothesis, which derived its premise from Engel curves and which we denoted as relative consumption of food and groceries between high-income and low-income groups, indicates more equal spending profiles over time. The cohort profiles support this hypothesis, and show a decrease in the spending gap between high- and low-income groups on necessities. The results show Engel's law in action and indicate that long-term increases in income have equalised people's expenditures on necessities, regardless of their socioeconomic position. The results show that inclusivity has risen in terms of necessities: food and grocery expenditures have improved over cohorts, which indicates that investment in necessities has improved in terms of inclusivity over time. One drawback of this analysis is the lack of data on the remaining gap, which could be explained by the quality of the food between high- and low-income groups.

Our *third hypothesis* was that relative spending on culture and leisure time between high-income and low-income groups has risen in favour of the high-income group, which our results confirm. In other words, this is the 'the glass is half empty' side of inclusivity. The inclusivity gap is seen in cultural and leisure-time expenditures, which serve as a proxy for income-elastic consumption. The results show that consumption inequality has risen significantly between high- and low-income groups in terms of leisure time. This indicates that the high-income group has more resources available for consumption and that high-income groups tend to use surplus resources for more income-elastic goods, such as culture and leisure time. When taking into account the long-term stagnant aggregate income and expenditure gaps between high- and low-income groups, the focus shifts to the internal structure of expenditures. It seems that an abundance of resources provides more freedom to invest in leisure time, while the low-income group remains 'leisure-poor'. It could be stated that there is a divide in inclusion in terms of culture, which creates an institutional divide between cultural classes. In conclusion, from a social inclusion standpoint, Finnish society seems to be equal in terms of access to necessary resources, but the leisure options seem to divide the high- and low-income earners. As a new insight into previous research, this could be interpreted as consumption inequality being in effect even if overall consumption and income trends maintain their uniform levels.

While overall trends in consumer behaviour do follow previous results, such as the gap between overall income and expenditures, we observe several new findings compared to the extant body of work on this topic. Compared to Segall's (2013) APC study, we can separate income groups, and we found that expenditures on leisure time goods have increased but in favour of individuals with greater economic resources. Thus, we can state that, indeed, households from older to younger cohorts invest more in leisure time but increasingly only those that are economically prosperous. This finding indicates, as previous research suggests (Semyonov et al., 1996; Fan and Lewis, 1999), that there is a lack of consumption opportunities between socio-demographic groups. In other words, while income has risen overall, resource spending does not follow a similar trend between high- and low-income groups; this is a contribution to previous APC studies because it disentangles interest groups. In addition, unlike previous studies (Urbonavičius and Pikturnienė, 2010; Dutt and Padmanbhan 2011; Mckenzie et al., 2011), our study does not find an association between economic crises and the expenditures of high- and low-income cohorts, as both income and consumption gap trends remain unaffected.

In addition, methodologically, APC modelling offers a unique perspective on consumption studies where various time-sensitive factors are important. In our introduction, we highlighted how previous research showed polarised results on consumption inequality in relation to income trends, where the problem was in the varying parameters of measuring standards. Our empirical findings suggest that *both* consensuses on consumption inequality could be on the right track. The ability to separate two groups with an APC methodology was not possible before, and the decomposing method revealed a long-term expenditure gap that showed that previous analyses may have been inadequate. Measuring both income and expenditure levels simultaneously reveals that both of these assertions are right in terms of their agreement. Thus, by taking modelling limitations into account, this methodological approach offers a major advantage in terms of solving the APC conundrum with regard to income and expenditures, whereas traditional models only utilise two of the three APC components and cannot decompose measures by interest groups.

Appendix

Table 2 Descriptive Statistics

Dependent variables		
	Mean	Std. Dev
Money income	33,368.74	21,737.83
Logarithmic money income	10.23	0.64
Money spending	29,034.43	18,284.44
Logarithmic money spending	10.09	0.63
Food and grocery expenditures	33,368.74	21,737.83
Logarithmic food and grocery expenditures	8.10	0.52
Culture and leisure-time expenditures	1,297.49	2,128.81
Logarithmic culture and leisure-time expenditures	6.53	1.73
Independent variables		
	Mean	Std. Dev
Education		
Basic education	0.45	0.50
Secondary education	0.30	0.46
Higher education	0.25	0.43
Main type of economic activity		
Worker	0.30	0.46
Higher and lower salariats	0.06	0.23
Entrepreneurs	0.30	0.46
Agriculture	0.09	0.28
Not working or outside the workforce	0.29	0.44
Structure of the household		
Single parent households	0.02	0.14
Couples with children	0.36	0.48
Couples without children	0.36	0.48
Single households	0.18	0.38
Other households	0.08	0.27
N	Size:	78.038

Note: Dependent variables equivalised and inflation adjusted Population weight added

Table 3 APCGO estimates without control variables.

	Money income			Money spending			Food and groceries			Culture and leisure time		
	Unexplained	$\bar{x}-z\sigma_{\bar{x}}$	$\bar{x}+z\sigma_{\bar{x}}$	Unexplained	$\bar{X}-z\sigma_{\bar{X}}$	$\bar{X}+z\sigma_{\bar{X}}$	Unexplained	$\bar{x}-z\sigma_{\bar{x}}$	$\bar{x}+z\sigma_{\bar{x}}$	Unexplained	$\bar{x}-z\sigma_{\bar{x}}$	$\bar{x}+z\sigma_{\bar{x}}$
1920	4.499	4.33	4.668	2.991	2.376	3.605	1.688	1.278	2.099	1.647	1.38	1.914
1925	4.388	4.139	4.636	2.838	2.358	3.318	1.832	1.564	2.101	1.631	1.208	2.054
1930	4.486	4.38	4.591	2.739	2.423	3.055	1.47	1.281	1.658	1.733	1.569	1.897
1935	4.58	4.494	4.666	2.625	2.43	2.82	1.254	1.099	1.41	1.667	1.436	1.898
1940	4.788	4.636	4.939	2.401	2.055	2.746	1.181	1.02	1.342	1.728	1.539	1.916
1945	4.875	4.774	4.976	2.623	2.506	2.739	1.269	1.023	1.514	1.87	1.768	1.972
1950	4.808	4.713	4.903	2.547	2.417	2.678	1.048	0.77	1.325	1.939	1.737	2.14
1955	4.666	4.558	4.774	2.642	2.471	2.813	0.799	0.672	0.925	2.248	2.11	2.385
1960	4.82	4.615	5.024	2.585	2.334	2.835	0.764	0.509	1.018	2.14	1.88	2.399
1965	4.555	4.391	4.72	2.193	1.936	2.449	0.916	0.732	1.1	2.171	2.044	2.298
1970	4.533	4.333	4.732	2.075	1.905	2.245	0.347	-0.051	0.745	2.393	2.07	2.715
1975	4.756	4.455	5.057	1.774	0.583	2.964	0.182	-0.094	0.457	2.093	1.383	2.803
20	0.176	-0.118	0.469	-0.095	-1.072	0.882	1.135	0.562	1.709	-0.502	-0.673	-0.331
25	-0.225	-0.364	-0.085	-0.194	-0.367	-0.021	-0.013	-0.242	0.216	-0.76	-0.982	-0.539
30	-0.214	-0.268	-0.16	-0.211	-0.331	-0.091	-0.108	-0.4	0.184	-0.489	-0.709	-0.269
35	-0.204	-0.253	-0.155	0.03	-0.093	0.153	-0.048	-0.286	0.19	-0.347	-0.592	-0.103
40	-0.156	-0.211	-0.101	0.03	-0.157	0.217	-0.038	-0.142	0.065	0.128	0.012	0.245
45	-0.159	-0.323	0.005	-0.001	-0.101	0.099	-0.141	-0.413	0.132	0.297	0.213	0.38
50	0.148	0.074	0.223	0.224	0.138	0.311	-0.04	-0.212	0.133	0.454	0.135	0.773
55	0.352	0.201	0.503	0.083	-0.282	0.448	-0.317	-0.43	-0.205	0.611	0.434	0.787
60	0.281	0.015	0.547	0.133	-0.373	0.639	-0.43	-0.621	-0.239	0.609	0.371	0.847
1975	0.012	-0.193	0.216	0.2	-0.001	0.4	0.234	0.002	0.465	0.082	-0.011	0.174
1980	0.021	-0.208	0.251	0.045	-0.256	0.345	0.196	0.068	0.323	0.028	-0.223	0.279
1985	0.009	-0.06	0.078	-0.185	-0.325	-0.045	-0.486	-0.688	-0.283	-0.057	-0.232	0.118
1990	-0.087	-0.157	-0.018	-0.296	-0.386	-0.207	-0.287	-0.496	-0.077	-0.18	-0.254	-0.106
1995	0.005	-0.063	0.073	-0.029	-0.146	0.087	0.079	-0.03	0.188	0.01	-0.107	0.128
2000	0.04	-0.031	0.111	0.266	0.167	0.365	0.264	0.108	0.42	0.117	0.009	0.225
	Gap	$\bar{x}-z\sigma_{\bar{x}}$	$\bar{x}+z\sigma_{\bar{x}}$	Gap	$\bar{x}-z\sigma_{\bar{x}}$	$\bar{x}+z\sigma_{\bar{x}}$	Gap	$\bar{x}-z\sigma_{\bar{x}}$	$\bar{x}+z\sigma_{\bar{x}}$	Gap	$\bar{x}-z\sigma_{\bar{x}}$	$\bar{x}+z\sigma_{\bar{x}}$
1920	4.499	4.329	4.668	2.991	2.376	3.605	1.688	1.278	2.099	1.647	1.38	1.914
1925	4.387	4.139	4.636	2.838	2.358	3.318	1.832	1.564	2.101	1.631	1.208	2.054
1930	4.486	4.381	4.591	2.739	2.424	3.055	1.47	1.281	1.658	1.733	1.569	1.897
1935	4.58	4.494	4.666	2.625	2.43	2.82	1.254	1.098	1.41	1.667	1.436	1.898
1940	4.788	4.636	4.939	2.401	2.055	2.746	1.181	1.02	1.341	1.728	1.539	1.916
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1950	4.808	4.713	4.903	2.547	2.417	2.678	1.048	0.77	1.325	1.939	1.737	2.14
1955	4.666	4.558	4.774	2.642	2.471	2.813	0.799	0.672	0.925	2.248	2.11	2.385
1960	4.819	4.615	5.024	2.585	2.334	2.835	0.764	0.509	1.018	2.14	1.88	2.399
1965	4.555	4.391	4.72	2.193	1.936	2.449	0.916	0.731	1.1	2.171	2.044	2.298
1970	4.533	4.333	4.732	2.075	1.905	2.245	0.347	-0.051	0.745	2.393	2.07	2.715
1975	4.756	4.454	5.057	1.773	0.582	2.964	0.181	-0.094	0.457	2.093	1.383	2.803
20	0.176	-0.117	0.469	-0.095	-1.072	0.882	1.135	0.562	1.709	-0.502	-0.673	-0.331
25	-0.224	-0.364	-0.084	-0.194	-0.367	-0.021	-0.013	-0.242	0.216	-0.76	-0.982	-0.539
30	-0.214	-0.268	-0.16	-0.211	-0.331	-0.091	-0.108	-0.4	0.184	-0.489	-0.709	-0.269
35	-0.204	-0.253	-0.156	0.03	-0.094	0.153	-0.048	-0.286	0.19	-0.347	-0.592	-0.103
40	-0.156	-0.211	-0.101	0.03	-0.157	0.217	-0.038	-0.142	0.065	0.128	0.012	0.245
45	-0.159	-0.324	0.006	-0.001	-0.101	0.099	-0.141	-0.414	0.132	0.297	0.213	0.381
50	0.148	0.074	0.223	0.224	0.138	0.311	-0.04	-0.212	0.133	0.454	0.135	0.773
55	0.352	0.201	0.503	0.083	-0.282	0.448	-0.317	-0.43	-0.205	0.611	0.434	0.788
60	0.281	0.015	0.548	0.133	-0.372	0.639	-0.43	-0.621	-0.239	0.609	0.372	0.847
1975	0.012	-0.192	0.216	0.2	-0.001	0.4	0.234	0.002	0.465	0.082	-0.01	0.174
1980	0.021	-0.208	0.251	0.045	-0.256	0.345	0.196	0.069	0.323	0.028	-0.223	0.279
1985	0.009	-0.06	0.078	-0.185	-0.325	-0.045	-0.486	-0.688	-0.283	-0.057	-0.232	0.117
1990	-0.087	-0.157	-0.018	-0.296	-0.386	-0.207	-0.287	-0.496	-0.077	-0.18	-0.254	-0.106
1995	0.005	-0.062	0.073	-0.029	-0.146	0.088	0.079	-0.03	0.188	0.01	-0.107	0.128
2000	0.04	-0.031	0.111	0.266	0.167	0.365	0.264	0.108	0.42	0.117	0.009	0.225

Table 4 APCGO estimates with control variables.

	Money income			Money spending			Food and groceries			Culture and leisure time		
	Explained	$\bar{X}-z\sigma_{\bar{X}}$	$\bar{X}+z\sigma_{\bar{X}}$	Explained	$\bar{X}-z\sigma_{\bar{X}}$	$\bar{X}+z\sigma_{\bar{X}}$	Explained	$\bar{X}-z\sigma_{\bar{X}}$	$\bar{X}+z\sigma_{\bar{X}}$	Explained	$\bar{X}-z\sigma_{\bar{X}}$	$\bar{X}+z\sigma_{\bar{X}}$
1920	0.45	0.312	0.589	0.768	0.413	1.122	1.049	0.539	1.559	-0.343	-0.431	-0.256
1925	0.563	0.473	0.654	0.475	0.073	0.876	0.503	0.319	0.688	0.397	0.206	0.588
1930	0.73	0.62	0.841	0.492	0.396	0.587	0.39	0.004	0.776	0.15	-0.288	0.588
1935	0.354	0.104	0.603	0.354	0.226	0.482	0.164	-0.157	0.485	0.032	-0.165	0.23
1940	0.365	0.251	0.479	0.463	0.289	0.637	0.207	0.022	0.393	0.237	-0.053	0.528
1945	0.421	0.316	0.526	0.613	0.526	0.7	0.158	0.092	0.224	0.398	0.35	0.446
1950	0.334	0.253	0.415	0.648	0.487	0.81	0.251	0.123	0.379	0.392	0.213	0.571
1955	0.219	0.062	0.375	0.483	0.405	0.561	-0.102	-0.236	0.031	0.615	0.408	0.822
1960	0.133	0.064	0.203	0.858	0.734	0.983	-0.065	-0.277	0.148	0.781	0.498	1.065
1965	0.187	0.044	0.33	0.533	0.503	0.563	-0.189	-0.495	0.117	0.646	0.418	0.874
1970	0.206	0.105	0.307	0.614	0.049	1.179	0.009	-0.431	0.448	0.753	0.432	1.074
1975	-0.202	-0.326	-0.077	1.156	0.862	1.45	-0.289	-0.714	0.136	0.839	0.684	0.993
20	0.839	0.631	1.048	-0.73	-0.965	-0.494	0.682	0.095	1.269	-0.849	-1	-0.699
25	0.144	0.058	0.23	-0.157	-0.38	0.065	0.042	-0.145	0.229	-0.571	-0.705	-0.436
30	0.039	-0.087	0.166	-0.191	-0.268	-0.113	0.026	-0.274	0.325	-0.424	-0.595	-0.252
35	-0.013	-0.148	0.122	-0.083	-0.124	-0.043	0.008	-0.226	0.242	-0.083	-0.193	0.027
40	0.068	-0.045	0.18	0.006	-0.075	0.087	-0.133	-0.298	0.033	0.056	0.019	0.093
45	-0.146	-0.203	-0.088	0.165	-0.036	0.365	-0.202	-0.392	-0.012	0.048	0.018	0.077
50	-0.222	-0.372	-0.073	0.228	0.062	0.394	-0.03	-0.195	0.136	0.335	0.225	0.444
55	-0.313	-0.389	-0.237	0.308	0.184	0.433	-0.22	-0.553	0.113	0.717	0.568	0.865
60	-0.396	-0.606	-0.187	0.454	0.188	0.719	-0.173	-0.652	0.307	0.772	0.573	0.971
1975	-0.037	-0.095	0.022	-0.015	-0.04	0.011	-0.003	-0.157	0.151	-0.096	-0.107	-0.085
1980	-0.013	-0.041	0.015	-0.086	-0.135	-0.037	0.139	0.02	0.257	0.21	0.112	0.308
1985	0.107	0.03	0.184	0.161	0.147	0.174	-0.133	-0.364	0.098	-0.143	-0.293	0.007
1990	0.02	-0.039	0.08	0.028	-0.046	0.101	-0.066	-0.183	0.051	0.026	0.021	0.031
1995	-0.126	-0.185	-0.067	-0.12	-0.223	-0.017	-0.009	-0.22	0.202	0.02	-0.055	0.094
2000	0.049	-0.006	0.103	0.032	-0.013	0.078	0.072	-0.109	0.253	-0.016	-0.05	0.018
	Unexplained	$\bar{X}-z\sigma_{\bar{X}}$	$\bar{X}+z\sigma_{\bar{X}}$	Unexplained	$\bar{X}-z\sigma_{\bar{X}}$	$\bar{X}+z\sigma_{\bar{X}}$	Unexplained	$\bar{X}-z\sigma_{\bar{X}}$	$\bar{X}+z\sigma_{\bar{X}}$	Unexplained	$\bar{X}-z\sigma_{\bar{X}}$	$\bar{X}+z\sigma_{\bar{X}}$
1920	4.064	3.735	4.393	2.395	2.051	2.74	0.465	0.142	0.787	1.709	1.163	2.255
1925	3.845	3.681	4.008	2.541	2.344	2.737	1.279	1.07	1.487	1.109	0.943	1.275
1930	3.77	3.576	3.964	2.276	2.096	2.455	1.178	0.738	1.618	1.596	1.432	1.761
1935	4.162	3.961	4.362	2.368	2.054	2.683	1.086	0.691	1.481	1.417	1.244	1.59
1940	4.421	4.294	4.548	2.005	1.937	2.072	0.881	0.724	1.038	1.334	1.04	1.629
1945	4.423	4.278	4.567	1.963	1.868	2.058	1.073	0.835	1.312	1.362	1.34	1.384
1950	4.421	4.372	4.47	1.742	1.603	1.881	0.843	0.715	0.97	1.466	1.32	1.613
1955	4.491	4.378	4.605	2.03	1.666	2.394	0.958	0.709	1.207	1.692	1.367	2.018
1960	4.684	4.611	4.757	1.493	1.212	1.774	0.846	0.522	1.169	1.544	1.275	1.814
1965	4.359	4.207	4.512	1.619	1.391	1.848	1.046	0.561	1.532	1.52	1.478	1.561
1970	4.451	4.296	4.606	1.388	1.104	1.671	0.376	0.062	0.691	1.77	1.152	2.388
1975	4.981	4.501	5.461	0.518	-0.353	1.389	0.225	-0.896	1.346	1.874	1.068	2.68
20	-0.633	-0.823	-0.442	0.9	0.341	1.459	0.582	-0.264	1.429	-0.264	-0.898	0.37
25	-0.391	-0.53	-0.252	0.094	0.012	0.176	-0.059	-0.414	0.297	-0.257	-0.392	-0.122
30	-0.35	-0.47	-0.23	0.125	-0.13	0.38	-0.121	-0.382	0.141	0.016	-0.097	0.13
35	-0.267	-0.356	-0.179	0.192	-0.036	0.421	-0.198	-0.444	0.049	-0.183	-0.312	-0.054
40	-0.174	-0.287	-0.061	0.034	-0.137	0.204	0.043	-0.116	0.203	0.13	-0.095	0.354
45	0.105	0.063	0.146	-0.128	-0.296	0.04	0.047	-0.156	0.25	0.461	0.307	0.615
50	0.397	0.206	0.587	-0.155	-0.232	-0.079	-0.046	-0.252	0.159	0.043	-0.165	0.25
55	0.583	0.549	0.616	-0.362	-0.685	-0.039	-0.034	-0.436	0.368	0.124	-0.156	0.405
60	0.731	0.622	0.84	-0.699	-1.167	-0.232	-0.216	-0.804	0.372	-0.07	-0.381	0.241
1975	0.015	-0.098	0.129	0.303	0.199	0.408	0.261	-0.063	0.585	0.212	0.155	0.269
1980	0.045	-0.037	0.127	0.034	-0.016	0.085	0.015	-0.196	0.226	-0.147	-0.204	-0.09
1985	-0.045	-0.169	0.08	-0.34	-0.508	-0.172	-0.365	-0.567	-0.162	-0.007	-0.207	0.192
1990	-0.122	-0.158	-0.087	-0.367	-0.432	-0.302	-0.209	-0.367	-0.051	-0.204	-0.349	-0.06
1995	0.121	0.071	0.171	0.098	-0.002	0.198	0.145	-0.131	0.421	-0.042	-0.123	0.038
2000	-0.015	-0.119	0.089	0.271	0.16	0.381	0.152	-0.189	0.494	0.189	0.098	0.279
	Gap	$\bar{X}-z\sigma_{\bar{X}}$	$\bar{X}+z\sigma_{\bar{X}}$	Gap	$\bar{X}-z\sigma_{\bar{X}}$	$\bar{X}+z\sigma_{\bar{X}}$	Gap	$\bar{X}-z\sigma_{\bar{X}}$	$\bar{X}+z\sigma_{\bar{X}}$	Gap	$\bar{X}-z\sigma_{\bar{X}}$	$\bar{X}+z\sigma_{\bar{X}}$

1920	4.515	4.247	4.782	3.163	3.139	3.187	1.514	1.252	1.776	1.366	0.847	1.885
1925	4.408	4.246	4.57	3.015	2.733	3.298	1.782	1.746	1.817	1.506	1.15	1.862
1930	4.5	4.4	4.6	2.767	2.657	2.877	1.568	1.466	1.67	1.746	1.308	2.185
1935	4.515	4.462	4.569	2.722	2.526	2.919	1.25	1.149	1.35	1.449	1.352	1.547
1940	4.786	4.706	4.867	2.468	2.357	2.578	1.088	0.903	1.273	1.572	1.567	1.576
1945	4.843	4.772	4.915	2.576	2.527	2.625	1.231	1.042	1.421	1.76	1.72	1.801
1950	4.755	4.625	4.885	2.39	2.326	2.455	1.093	0.931	1.255	1.858	1.54	2.176
1955	4.71	4.55	4.869	2.513	2.224	2.801	0.856	0.665	1.046	2.307	2.07	2.545
1960	4.818	4.675	4.96	2.352	2.008	2.695	0.781	0.595	0.968	2.326	2.018	2.633
1965	4.546	4.535	4.557	2.153	1.94	2.365	0.857	0.626	1.089	2.166	1.915	2.417
1970	4.657	4.519	4.795	2.002	1.702	2.301	0.385	0.259	0.511	2.523	2.077	2.968
1975	4.779	4.375	5.184	1.674	1.081	2.267	-0.064	-0.783	0.654	2.713	1.833	3.592
20	0.207	0.11	0.304	0.17	-0.363	0.703	1.264	0.958	1.57	-1.114	-1.597	-0.63
25	-0.247	-0.309	-0.186	-0.063	-0.366	0.24	-0.017	-0.342	0.308	-0.827	-0.95	-0.705
30	-0.311	-0.404	-0.218	-0.066	-0.336	0.205	-0.095	-0.185	-0.006	-0.408	-0.467	-0.348
35	-0.28	-0.445	-0.115	0.109	-0.127	0.345	-0.19	-0.239	-0.141	-0.266	-0.473	-0.059
40	-0.106	-0.128	-0.084	0.04	-0.099	0.178	-0.089	-0.155	-0.023	0.185	-0.063	0.434
45	-0.041	-0.073	-0.01	0.036	-0.167	0.24	-0.154	-0.199	-0.11	0.509	0.365	0.653
50	0.174	0.119	0.229	0.073	-0.104	0.25	-0.076	-0.146	-0.007	0.377	0.1	0.655
55	0.27	0.226	0.314	-0.053	-0.253	0.146	-0.254	-0.323	-0.184	0.841	0.656	1.026
60	0.335	0.229	0.441	-0.246	-0.459	-0.032	-0.388	-0.504	-0.272	0.702	0.226	1.177
1975	-0.022	-0.116	0.073	0.289	0.159	0.419	0.258	0.088	0.429	0.116	0.063	0.17
1980	0.033	-0.049	0.114	-0.052	-0.148	0.045	0.154	-0.008	0.316	0.062	-0.045	0.17
1985	0.062	-0.02	0.145	-0.179	-0.342	-0.016	-0.498	-0.573	-0.422	-0.151	-0.224	-0.077
1990	-0.102	-0.139	-0.064	-0.339	-0.361	-0.318	-0.275	-0.391	-0.159	-0.179	-0.32	-0.038
1995	-0.006	-0.086	0.075	-0.022	-0.032	-0.012	0.136	-0.087	0.359	-0.023	-0.059	0.014
2000	0.034	-0.054	0.122	0.303	0.235	0.371	0.225	0.003	0.446	0.173	0.114	0.232

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