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Older or Wealthier? The Impact of Age Adjustment on Cross-Sectional Inequality Measures

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Older or Wealthier?
The Impact of Age Adjustment on Cross-Sectional Inequality Measures

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March 9, 2010

Abstract

Differences in individual wealth holdings are widely viewed as a driving force of economic inequality. However, as this finding relies on cross-section data, a concern is that one confuses older with wealthier. We propose a new method to adjust for age effects in cross-sections, which eliminates wealth inequality due to age, yet preserves inequality arising from other factors. Using a new cross-country comparable database, we examine the impact of age adjustments on wealth inequality across countries and over time. We find that the most widely used method yield a substantially different picture of age adjusted wealth inequality than our method.

(*JEL:* D31, D63, D91, E21. *Keywords*: Wealth inequality, Life cycle, Age adjustments, Gini coefficient.)

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1 Introduction

The distribution of wealth is an important determinant of overall economic inequality as well as a marker for what types of activities that are rewarded in an economy. Wealth inequality is also a matter of considerable interest in the literatures on economic growth, institutions and development, occupational choice and entrepreneurship, as well as in asset pricing.[1] New sources of cross-country comparable microdata suggest that individuals' wealth holdings vary substantially within and across countries. In most countries, the Gini coefficient for wealth is reported to be twice that of income. Moreover, the world distribution of wealth is found to be much more concentrated than the world distribution of income.[2]

Because of data availability, however, this recent evidence on wealth inequality is based on cross-sectional data. This is potentially problematic as both theoretical models and empirical results suggest a strong age–wealth relationship (see e.g. Davies and Shorrocks, 2000). The age–wealth profile is firmly established as increasing during the working lifespan and usually declining somewhat after retirement. Hence, a snapshot of wealth inequality within a country runs the risk of confusing older with wealthier, and thereby providing a misleading picture of the differences in the lifetime wealth of its citizens.

For this reason, it has long been argued that age adjustments of cross-sectional measures of inequality are necessary (see e.g. Atkinson, 1971). Age adjustment allows us to utilize the cross-sectional data at our disposal, while avoiding some of the potential pitfalls associated with its use. In particular, age-adjusted inequality measures may be used to evaluate whether changes in wealth inequality over time occur because of changes in the age structure or whether there are other forces at play. Moreover, age adjustments can be useful when comparing wealth inequality across countries, by controlling for differences resulting from cross-country variation in age-wealth profiles and age structure.

In this paper, we investigate whether cross-sectional wealth inequality measures are sen-

[1] See e.g. Gollier (2001) for a study of wealth inequality and asset pricing; Mookherjee and Ray (2002) for a review of the literature on wealth inequality and economic growth, institutions and development; and Meh (2005) for a recent analysis of wealth inequality in relation to occupational choice and entrepreneurship.

[2] See e.g. Wolff (1996), Davies and Shorrocks (2000), Davies et al. (2006), and Sierminska et al. (2006).

sitive to differences in wealth holdings over the life cycle, and how age adjustments may influence the wealth inequality ranking of countries as well as the time trend in wealth inequality in a country. In some respects, our approach goes back to Paglin's (1975) pioneering paper which first raised the question of the age effect on inequality and its trend. While the validity of the Paglin-Gini (PG) has been questioned from several perspectives, which we address in our analysis, the issue of age adjustment of inequality measures remains an important research question.[3] In fact, given the aging of the large baby boom cohorts born post World War II, the issue may be viewed as potentially more important now than in the earlier period (1947-1972) considered by Paglin.

Our first contribution is that we propose a new method to adjust for age effects that, unlike existing methods, addresses the fact that individuals differ both with respect to age and with respect to other wealth generating factors. For example, an individual's education level is not only an important determinant of his wealth, but also correlated with his age. Existing methods assume that the unconditional distribution of mean wealth by age represents the age effects and will, therefore, not only eliminate wealth inequality attributable to age but also differences because of factors correlated with age, such as education. By contrast, the method proposed in this paper eliminates inequality because of age, yet preserves inequality arising from other wealth generating factors. To this end, a multivariate regression model is employed, allowing us to isolate the net age effects while holding other determinants of wealth constant. Next, we derive a new, age-adjusted Gini coefficient, where perfect equality requires that each individual receives a share of total wealth equal to the proportion of wealth he would hold if all wealth generating factors except age were the same for everyone in the society. Our method may be viewed as a generalization of the approach to age adjustments proposed by Wertz (1979) and it is important in situations where omitted variables bias is a major concern.[4]

[3]Paglin's approach to age adjustment was subject to three rounds of comments and replies in the *American Economic Review* (Paglin, 1977, 1979, 1989), has numerous citations, and continuous to be subject to controversy.

[4]Even though Danziger et al. (1977), Minarik (1977), and Kurien (1977) in early comments to Paglin (1975), point out that adjusting appropriately for age effects requires a well-specified multivariate model, we are not aware of any study that adjusts for age effects while controlling for other determinants of individual income or wealth holdings.

Our second contribution is that we provide a theoretical foundation to assess the properties of age-adjusted inequality measures. In particular, we put forward a set of conditions that are similar to those underlying the classical Gini coefficient in all respects but one: the equalizing wealth is not given by the mean wealth in the society as a whole, but depends on the age of the individuals. In the spirit of Paglin (1975), a no age-adjusted inequality in a society requires that all individuals have equal lifetime wealth, but not that individuals at all ages must have equal wealth holding in any given year. Furthermore, we explore the relationship between our age-adjusted Gini coefficient, the classical Gini coefficient, and alternative age-adjusted inequality measures.

Our final contribution is that we examine empirically the impact of age adjustments on the wealth inequality ranking of countries as well as on the time trend for wealth inequality in Italy and the United States. To this end, we use data from Canada, Finland, Germany, Italy, Sweden, the United Kingdom, and the United States, collected from the new, cross-country comparable Luxembourg Wealth Study (LWS) database. We find that the ranking of wealth distributions are quite sensitive to the method used to make age adjustments. In particular, the much-used PG is shown to yield a substantially different picture of wealth inequality than our method. Interestingly, our new age-adjusted Gini coefficient provides a wealth inequality ranking of countries that comes close to the ranking based on the classical Gini coefficient, which disregards age effects. A possible interpretation is that age adjustments might be less important than previous studies have suggested, albeit this conclusion may not necessarily hold true for other applications.

This is the first study to examine the impact of age adjustments on the wealth inequality ranking of countries. However, several studies have investigated the effect of adjusting for age effects on wealth and income inequality in a given country. Paglin (1975) studied the effect of age adjustment on the distribution of income and wealth in the United States. He concluded that the classical Gini coefficient overstates wealth and income inequality and, moreover, that age adjustments convert a flat time trend in income inequality into a declining time profile. Formby et al. (1989) extend this work by analyzing the time period 1980–1986. They found that inequality has risen faster according to PG than the classical Gini coefficient over this period.[5] Mookherjee and Shorrocks (1982) study income inequality in the United Kingdom and find that adjusting for age converts an apparent upward trend in overall income inequality into a declining time profile according to the PG and horizontal when using strictly decomposable inequality measures to make age adjustments. By contrast, Pudney (1993) suggests that only a small part of observed income and wealth inequality in China can be explained by age effects. None of the above studies use methods that adjust for age effects while controlling for other income or wealth generating factors.

Section 2 sets out the proposed method to identify and adjust for age effects, and explores its relationship to the classical Gini coefficient as well as to existing age-adjusted inequality measures. Section 3 describes the data and clarifies definitional issues. Section 4 discusses the results using the different age-adjusted wealth inequality measures, before Section 5 concludes.

2 Age adjustment of inequality

The proposed method for age adjustment of inequality may be described as a three-step procedure. First, a new age-adjusted Gini coefficient (AG) is derived. Second, a multivariate regression model is employed, allowing us to isolate the net age effects on wealth while holding other determinants of wealth constant. Third, the wealth distribution that characterizes perfect equality in age-adjusted wealth is determined.

Below, we describe the three steps of our method, before examining the relationship between AG, the classical Gini coefficient (G), and alternative age-adjusted inequality measures.

[5]Other studies that have attempted to adjust for age effects on income inequality estimates for the United States include Danziger et al. (1977), Minarik (1977), Nelson (1977), and Friesen and Miller (1983). For a review, see Formby et al. (1989).

2.1 A new age-adjusted Gini coefficient

Consider a society consisting of n individuals where every individual i is characterized by the pair $(w_i, \widetilde{w}_i)$, where w_i denotes the actual wealth level and $\widetilde{w}_i$ is the equalizing wealth level in a given year. If actual and equalizing wealth are the same for all individuals and they live equally long, there is perfect equality of lifetime wealth in this society. As will be clear when we define the equalizing wealth level formally in Section 2.3, the equalizing wealth is the same for all individuals belonging to the same age group in this society; it is a function of individual i's age, but not of any other individual characteristics. If no other wealth-generating factor is correlated with age, the equalizing wealth is simply the mean wealth of each age group. Furthermore, if there are no age effects on wealth, the equalizing wealth will be equal to the mean wealth in the society as a whole.

The joint cross-sectional distribution Y of actual and equalizing wealth is given by

$$Y = [(w_1, \widetilde{w}_1), (w_2, \widetilde{w}_2), ..., (w_n, \widetilde{w}_n)].$$

Let Ξ denote the set of all possible joint distributions of actual and equalizing wealth, such that the sum of actual wealth equals the sum of equalizing wealth. Suppose that the social planner imposes the following modified versions of the standard conditions on an inequality partial ordering defined on the alternatives in Ξ, where $A \preceq B$ represents that there is at least as much age-adjusted inequality in B as in A.[6] Let μ denote the mean wealth of the population as a whole, and Δ_i represent the difference between individual i's actual wealth w_i and equalizing wealth $\widetilde{w}_i$. Let the distributions of such differences for the two distributions ($\Delta_i(A) = w_i(A) - \widetilde{w}_i(A)$ and $\Delta_i(B) = w_i(B) - \widetilde{w}_i(B)$) be sorted in ascending order.

Condition 1. ***Scale Invariance:*** *For any $a > 0$ and $A, B \in \Xi$, if $A = aB$, then $A \sim B$.*

Condition 2. ***Anonymity:*** *For any permutation function $\rho\colon n \to n$ and for $A, B \in \Xi$, if $(w_i(A), \widetilde{w}_i(A)) = (w_{\rho(i)}(B), \widetilde{w}_{\rho(i)}(B))$ for all $i \in n$ then $A \sim B$.*

Condition 3. ***Unequalism:*** *For any $A, B \in \Xi$ such that $\mu(A) = \mu(B)$, if $\Delta_i(A) = \Delta_i(B)$ for every $i \in n$, then $A \sim B$.*

[6] See Almås et al. (2007) for analogous conditions imposed to study equality of opportunity.

Condition 4. ***Generalized Pigou–Dalton:*** *For any $A, B \in \Xi$, if there exist two individuals s and k such that $\Delta_s(A) < \Delta_s(B) \leq \Delta_k(B) < \Delta_k(A)$, $\Delta_i(A) = \Delta_i(B)$ for all $i \neq s, k$, and $\Delta_s(B) - \Delta_s(A) = \Delta_k(A) - \Delta_k(B)$, then $A \succ B$.*

Scale invariance states that, if all actual and equalizing wealth levels are rescaled by the same factor, then the level of age-adjusted inequality remains the same. Anonymity implies that the ranking of alternatives should be unaffected by a permutation of the identity of individuals. Unequalism entails that the social planner is only concerned with how unequally each individual is treated, defined as the difference between his actual and equalizing wealth.[7] Finally, the generalized version of the Pigou–Dalton criterion states that any fixed transfer of wealth from an individual i to an individual j, where $\Delta_i > \Delta_j$, reduces age-adjusted inequality.

AG is based on a comparison of the absolute values of the differences in actual and equalizing wealth between all pairs of individuals, and is defined as

$$AG = \frac{\sum_j \sum_i |(w_i - \widetilde{w}_i) - (w_j - \widetilde{w}_j)|}{2\mu n^2}. \tag{1}$$

It is straightforward to see that AG satisfies Conditions 1–4. Note that these conditions are similar to those underlying G in all respects but one: the equalizing wealth is not given by the mean wealth in the society as a whole, but depends on the age of the individuals.

Because it is straightforward to construct age-adjusted Lorenz curves based on the distribution of differences between actual and equalizing wealth, it is by no means necessary to focus on the Gini coefficient: other inequality indices that are based on the Lorenz curve, such as the Bonferroni index, can also form the basis for age adjustments.

2.2 Identifying the net age effects

Suppose that the wealth level of individual i at a given point in time, depends on the age group a that he belongs to as well as his lifetime resources given as a function h of a vector X of individual characteristics

[7] This condition may therefore be viewed as analogous to the Focus axiom in poverty analysis, stating that a poverty index should focus entirely on the incomes of the poor. See e.g. Foster and Shorrocks (1991).

$$w_i = f(a_i)h(X_i). \tag{2}$$

The functional form of f depends on the underlying model of wealth accumulation. In the simplest life cycle model, there is no uncertainty, individuals earn a constant income until retirement, and the interest rate as well as the rate of time preference is zero. In this model, the wealth of an individual increases up to retirement and declines afterwards. If the earnings profile is upward sloping, the model predicts borrowing in the early part of the life cycle. The fact that this is not always observed could be explained by credit market imperfections. Introducing lifetime uncertainty and noninsurable health hazards induce the elderly to hold assets for precautionary purposes, which reduces the rate at which wealth declines during retirement. If the sole purpose of saving is to leave a bequest to one's children, individuals behave as if their horizons were infinite and wealth does not decline with age.

Given the theoretical ambiguity of f, we specify a flexible functional form, yielding the wealth generating function

$$\ln w_i = \ln f(a_i) + \ln h(X_i) = \delta_i + X_i' B, \tag{3}$$

where δ_i gives the percentage wealth difference of being in the age group of individual i relative to some reference age group, holding all other variables constant. Because of the right skewness combined with the sparse tail of the wealth distribution, our log-linear specification is preferable to a linear specification. As net wealth may be negative, we therefore add to each wealth observation a constant equal to the absolute value of the minimum wealth observation when estimating the log-linear specification. This is simply a matter of adjusting the location of the distribution.[8] Equation (3) is estimated by OLS separately for each country. The key assumption underlying this estimation is that there are no omitted factors correlated with age that determine individual wealth holding. In

[8] In this regard, it should be noted that the properties of inequality measures based on the Gini coefficient are preserved when applied to distributions with zero and negative values (see e.g. Amiel et al., 1996).

that case, we obtain consistent estimates of the net age effects on wealth.

It is important to emphasize that the objective of the estimation of equation (3) is not to explain as much variation as possible in wealth holdings, but simply to get an empirically sound estimate of the effects of age on wealth. Drawing on the findings of Jappelli (1999) and Hendricks (2007) of individual characteristics correlated with wealth, X includes educational attainment in our baseline specification. When performing robustness analysis, we extend the set of controls to include sex, number of children, industry and occupation of household head, region of residence, marital status, immigration status, and spouse's characteristics. The reasons for not including these variables in the baseline specification are twofold. First, we do not have data on all the variables for every country under study. In addition, some of the variables are potentially endogenous to individuals' wealth holding. In any case, we show that our results are robust to the inclusion of the additional controls.

Existing age-adjusted inequality measures, discussed in detail in Section 2.5, implicitly assume a stationary economy, implying no cohort effects. Consequently, they risk confounding age effects with cohort effects, as these factors are perfectly collinear in a cross-section. A novelty of this paper is that we make an effort to separate age effects from cohort effects. As pointed out by Heckman and Robb (1985), it is necessary to impose some structure on the cohort effects in order to address this identification problem. Jappelli (1999) and Kapteyn et al. (2005) explore reasons why different cohorts accumulate different amounts of wealth. They found that productivity growth is the primary determinant of differences in wealth across cohorts; productivity growth generates differences in permanent incomes across cohorts, which feeds into the wealth accumulation of individuals belonging to different generations. Following Masson (1986), we assume that the age cross-sections and the cohort profiles of wealth (in constant prices) coincide except for a constant state of real growth. If wealth grows at the rate g, then the typical profile for any given cohort is $(1+g)$ times larger than that for the one-year-older cohort. When estimating equation (3), we therefore inflate each individual's wealth value by the factor $(1+g)^{age}$. Mirer (1979) shows that under commonly accepted assumptions in life cycle theory, the growth rate of wealth is equal to the growth rate of income between successive cohorts. To adjust the observed wealth levels for economic growth across cohorts, we use an annual growth rate of 2.5 percent. Our results are robust to other choices of growth rates.

The assumption of a stationary economy also implies no intra-cohort mobility in individual wealth holdings, which has been criticized by e.g. Johnson (1977) and Friesen and Miller (1983). By conditioning on individual characteristics, the assumption of parallel age–wealth profiles may be more reasonable for AG than for existing age-adjusted inequality measures. However, just as any other study measuring inequality using cross-sectional data, this paper admittedly comes short of fully accounting for the effects of intracohort mobility. Yet, it is reassuring that several studies suggest that accounting for mobility has little impact on country rankings by income inequality (see e.g. Burkhauser and Poupore, 1997; Aaberge et al., 2002).

2.3 Defining equalizing wealth

Identifying the net age effect is only part of the job; we also need to find a consistent way of adjusting for age effects when there are other wealth generating factors. There is a considerable literature concerning the problem of how to adjust for some, but not all, income generating factors when the income function is not additively separable (see e.g. Bossert and Fleurbaey (1996) and Kolm (1996)). The problem of adjusting for age effects on wealth is analogous. To eliminate wealth differences attributable to age but preserve inequality arising from all other factors, we employ the so-called general proportionality principle proposed by Bossert (1995) and Konow (1996), and further studied in Cappelen and Tungodden (2007). Then, the absence of age-adjusted inequality requires that any two individuals belonging to a given age group have the same wealth level. Moreover, in any situation where everyone has the same wealth generating factors except age, there should be no lifetime wealth inequality.

Specifically, the equalizing wealth level of individual i depends on his age as well as every other wealth generating factor of all individuals in the society, and is formally defined as

$$\widetilde{w}_i = \frac{\mu n \sum_j f(a_i)h(X_j)}{\sum_k \sum_j f(a_k)h(X_j)} = \frac{\mu n e^{\delta_i}}{\sum_k e^{\delta_k}}, \tag{4}$$

where e^{δ_k} gives the net age effect of belonging to the age group of individual k after integrating out the effects of other wealth generating factors correlated with age. No age-adjusted inequality corresponds to every individual i receiving $\widetilde{w}_i$, which is the share of total wealth equal to the proportion of wealth an individual from his age group would hold if all wealth generating factors except age were the same for everyone in the population. If there is no age effect on wealth, the equalizing wealth level is equal to the mean wealth level in the society.

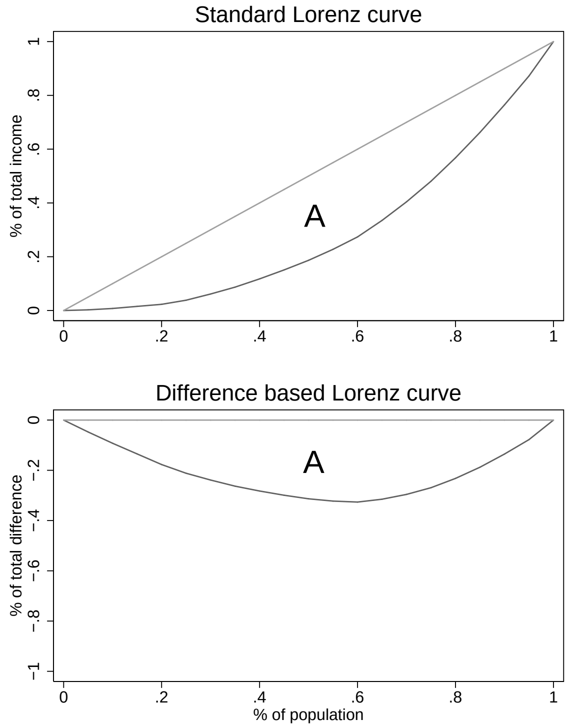
2.4 Relationship to the classical Gini coefficient

The classical Gini coefficient is defined in equation (5). By comparing this expression to equation (1), we can see there is a very close link between G and AG. Both measures are based on a comparison of the absolute values of the differences in actual and equalizing wealth levels between all pairs of individuals. The distinguishing feature is how equalizing wealth is defined. For G, the equalizing wealth level is assumed to be μ: perfect equality requires not only equal lifetime wealth, but additionally that individuals of all ages must have the same wealth holding in any given year, which can be realized only if there is a flat age–wealth profile.

$$G(Y) = \frac{\sum_j \sum_i |(w_i - \mu) - (w_j - \mu)|}{2\mu n^2}, \tag{5}$$

However, a flat age–wealth profile runs counter to both consumption needs over the life cycle and productivity variation depending on human capital investment and experience. Indeed, the relationship between wealth and age can produce wealth inequality at a given point in time even if everyone is completely equal in all respects but age. As transitory wealth differences even out over time, a snapshot of inequality produced by G runs the risk

Figure 1: **Standard and difference based representations of the classical Lorenz curve.**



of producing a misleading picture of actual variation in lifetime wealth. In comparison, AG abandons the assumption of a flat age-wealth profile and allows equalizing wealth to depend on the age of the individuals. In doing so, AG purges the cross-sectional measure of inequality of its inter-age or life cycle component. If $\widetilde{w}_i = \mu$ for all individuals in every age group, the age–wealth profile is flat and AG coincides with G.

To get further intuition on the similarities and differences between G and AG, it is helpful to see the correspondence between the standard representation of the Lorenz curve and a Lorenz curve expressed in differences between actual wealth and mean wealth in the society as a whole. Figure 1 displays standard and difference based Lorenz curves for the same wealth distribution. The area between the standard Lorenz curve and the diagonal of the upper diagram (the line of equality) is identical to the area between the difference based Lorenz curve and the horizontal axis (the line of equality) in the lower diagram. In both cases, G is equal to twice the area A, between the Lorenz curve and the line of equality.

In a similar way, we can draw the age-adjusted Lorenz curve underlying AG, expressing the differences between actual wealth and the equalizing wealth in the population. And just as for G, AG is equal to twice the area between this difference based Lorenz curve and the horizontal axis (line of equality). When drawing age-adjusted Lorenz curves, however, individuals are ordered not by their wealth per se, as in Figure 1, but according to the difference between actual and equalizing wealth.

Both G and AG reach their minimum value of 0, if everyone receives their equalizing wealth. Moreover, both measures take their maximum when the difference between actual and equalizing wealth is at its highest possible level. Specifically, G reaches its maximum value of 1, if one individual holds all wealth. In comparison, AG takes its maximum of 2 in the hypothetical situation where the equalizing wealth of the individual who has all the wealth is zero, and the equalizing wealth of one of the individuals with no wealth is equal to the aggregate wealth in the economy. The fact that AG and G range over different intervals is therefore a direct result of their different views of perfect equality: Age-adjusted inequality is not only a result of differences in individuals' actual wealth holding, but also a result of differences in equalizing wealth between individuals at different points in the life cycle.

By the same token, AG will be smaller (greater) than G whenever the differences in individuals' wealth holding because of age is positively (negatively) correlated with differences in individuals' wealth attributable to other wealth generating factors.[9] For example, an individual with zero wealth will contribute less to inequality in AG than in G whenever his equalizing wealth level is lower than the mean wealth in the society.

2.5 Relationship to existing age-adjusted inequality measures

There are two distinguishing aspects of age-adjusted inequality measures. First, they hold different views on how equalizing wealth should be measured. Second, they differ in the way they aggregate up the differences between actual and equalizing wealth. In this paper, we consider two alternative age-adjusted inequality measures: PG and the Wertz' Gini (WG). They both have the same objective as AG, namely to purge G applied to snapshots

[9] To see this, let $\epsilon_i = w_i - \widetilde{w}_i$ for any individual i, and note that AG and G have the same denominator. While the numerator of AG aggregates $|\epsilon_i - \epsilon_j|$ over all pairs of individuals, the numerator of G aggregates $|(\widetilde{w}_i + \epsilon_i) - (\widetilde{w}_i + \epsilon_j)|$ of all pairs of individuals. Hence, $G > AG$ whenever $cov(\widetilde{w}, \epsilon > 0)$.

of wealth inequality of its inter-age or life cycle component. In particular, the condition of a flat age-wealth profile is relaxed. Below, we use Conditions 1–4 to assess the properties of PG and WG, and to characterize their relationship to AG.

Because of its close relationship to AG, it is convenient to first consider WG, which was proposed by Wertz (1979). He claims that PG fails to adjust properly for age effects, but his comment has been largely ignored, perhaps because Wertz does not put up conditions that allow a formal assessment of the properties of PG and WG. Let WG be defined by

$$WG(Y) = \frac{\sum_j \sum_i |(w_i - \mu_i) - (w_j - \mu_j)|}{2\mu n^2}, \tag{6}$$

where μ_i and μ_j denote the mean wealth level of all individuals belonging to the age group of individual i and j, respectively. Like AG, WG is based on a comparison of the absolute values of the differences in actual and equalizing wealth levels between all pairs of individuals and ranges over the interval $[0, 2]$. It is also straightforward to see that it satisfies Conditions 1–4.

The distinguishing feature between AG and WG is that the latter measure defines the equalizing wealth of an individual i as the unconditional mean wealth levels in his age group, μ_i, whereas the former measure defines his equalizing wealth as the net age effect of belonging to his age group after integrating out the effects of other wealth generating factors correlated with age, $\widetilde{w}_i$. Any differences between AG and WG is therefore a result of omitted variables bias in using μ_i to measure equalizing wealth. As is well known, the omitted variables bias in μ_i is given by the effect of the omitted variables on wealth times the regression of omitted variables on age (see e.g. Angrist and Pischke, 2009). For example, an individual's birth cohort is perfectly collinear with his age and will therefore bias the age effects insofar as it is correlated with wealth. Another example is education, which is correlated with both age and wealth. The omitted variables bias formula tells us that WG will be equal to AG whenever age is uncorrelated with omitted wealth generating factors. Hence, AG may be viewed as a generalization of WG, and is important in situations where omitted variables bias is a major concern.

Next, consider the much used PG, which can be expressed as

$$PG(Y) = \frac{\sum_j \sum_i (|w_i - w_j| - |\mu_i - \mu_j|)}{2\mu n^2}, \tag{7}$$

where μ_i and μ_j denote the mean wealth level of all individuals belonging to the age group of individuals i and j, respectively. Applying the standard Gini decomposition, PG can be rewritten as

$$PG = G - G_b = \sum_i \theta_i G_i + R, \tag{8}$$

where G_b represents the Gini coefficient that would be obtained if the wealth of each individual in every age group were replaced by the relevant age group mean μ_i, G_i represents the Gini coefficient of wealth within the age group of individual i, θ_i is the weight given by the product of this group's wealth share $\frac{n_i\mu_i}{\mu n}$ and population share $\frac{n_i}{n}$ (n_i is the number of individuals in the age group of individual i), and R captures the degree of overlap in the wealth distributions across age groups (see e.g. Lambert and Aronson, 1993).[10]

Both WG and PG defines the equalizing wealth of an individual as the mean wealth level of the age groups he belongs to, disregarding that other wealth generating factors are correlated with age. Unlike AG, they may not only eliminate inequality due to age but also inequality because of these other factors.

In addition, PG stands out in the way it aggregates up the differences in actual and equalizing wealth. Specifically, PG is based on a comparison of differences in the absolute values of actual and equalizing wealth levels between all pairs of individuals, $|(w_i - w_j)| - |(\mu_i - \mu_j)|$. This runs counter to the Unequalism condition, because $|(w_i - w_j)| - |(\mu_i - \mu_j)| = 0$ does not necessarily imply that $|(w_i - \mu_i) - (w_j - \mu_j)| = 0$. The following numerical ex-

[10]Overlap implies that the wealth holding of the richest person in an age group with a relatively low mean wealth level exceeds the wealth holding of the poorest person in an age group with a higher mean wealth level, that is, $w_i < w_j$ and $\mu_i > \mu_j$ for at least one pair of individuals i and j.

ample shows that PG violates this condition. Consider two countries A and B with two age groups, each consisting of two individuals. Suppose that country $A's$ distribution of actual and equalizing wealth, $(w_i(A), \mu_i(A))$, is given by

$$A = [(20, 60), (100, 60), (60, 80), (100, 80)],$$

whereas country $B's$ distribution of $(w_i(B), \mu_i(B))$ is given by

$$B = [(0, 40), (80, 40), (80, 100), (120, 100)].$$

In both countries, the distribution of differences between the actual and equalizing wealth, $w_i - \mu_i$, is given by $[\{-40, 40\}, \{-20, 20\}]$. According to the Unequalism condition, age-adjusted inequality measures should be the same when the distributions of differences between actual and equalizing wealth are the same. While WG satisfies this condition, PG violates it.[11]

Arguably, the Unequalism condition is an intuitively appealing condition as it ensures that age-adjusted inequality measures follow G in measuring inequality according to the differences in actual and equalizing wealth, between all pairs of individuals, rather than the aggregated differences in actual wealth minus the aggregated differences in equalizing wealth.[12]

As $|(w_i - w_j) - (\mu_i - \mu_j)|$ provides an upper bound for $|(w_i - w_j)| - |(\mu_i - \mu_j)|$, it follows that $WG \geq PG$. This begs the question: under which conditions will WG be equal to PG, and subsequently, can we be sure that the two measures produce the same inequality ranking? As stated in Proposition 1, PG will differ from WG if there is any age effect on wealth, provided that there is some within age group wealth variation.

[11] Specifically, $WG(A) = WG(B) = 0.25$, whereas $PG(A) = 0.179 \neq PG(B) = 0.107$.

[12] Our numerical example illustrates the difference. Consider distribution A and the contribution to age-adjusted inequality from the comparison of the richest individuals in the two age-groups, for which $(w_i(A), \mu_i(A))$ is given by $(100, 60)$ and $(100, 80)$. Paglin advocates that perfect equality corresponds to everyone receiving the mean wealth of their age-group. A wealth comparison of this pair of individuals should thus contribute with 20 to age-adjusted inequality, which is captured by the numerator of WG. By contrast, the numerator of PG records a -20 contribution to age-adjusted inequality – the rationale for which is hard to grasp.

Proposition 1. *For any distribution Y, $WG(Y) \geq PG(Y)$, with strong inequality whenever $\mu_i \neq \mu_j$ for at least one pair of individuals and $w_i \neq \mu_i$ or $w_j \neq \mu_j$ for at least one of these individuals.*

(The proof is provided in Appendix A.)

As shown in the proof of Proposition 1, overlap in the wealth distributions across age-groups, that is, $R > 0$, is a sufficient, but not a necessary, condition for $WG > PG$. A corollary to Proposition 1 is therefore that PG is likely to yield a different ranking than WG in situations where countries differ substantially in the degree of overlap. This result relates to a major controversy surrounding PG, namely whether or not R should be treated as an inter-age or a within age-groups component.[13] Until recently, the issue was unsettled simply because little was known about the overlap term; Shorrocks and Wan (2005), for example, refer to R as a "poorly specifie" element of the Gini decomposition. However, Lambert and Decoster (2005) provide a novel characterization of the properties of R, showing first that R unambiguously falls as a result of a within-group progressive transfer, and second that R increases when the wealth holding in the poorer group is scaled up, and reaches a maximum when means coincide. This makes Lambert and Decoster (2005, p. 378) conclude that "The overlap term in R is at once a between-groups and a within-groups effect: it measures a between-groups phenomenon, overlapping, that is generated by inequality within groups". Therefore, $R = 0$ is necessary (although not sufficient) for PG to net out the inter-age component, and nothing but the inter-age component, from cross-sectional inequality measures.

3 Data and definitions

Recently, the availability and quality of data on household wealth has improved. Household surveys of assets and debt have previously suffered from nonsampling errors because of high nonresponse and misreporting rates. In addition, comparative studies of wealth

[13]Nelson (1977) and others argue that R is part of inter-age inequality and should thus be netted out when constructing age-adjusted inequality measures. Paglin (1977), however, maintains that R is capturing within-group inequality and that PG is accurately defined.

distributions have been haunted by comparability problems because of methodological and data issues ranging from the basic problem of index numbers to differences in the methods and definitions used in the various countries. Today, the data problems are mitigated by oversampling of wealthy people in surveys as well as by utilizing supplementary information such as administrative data from tax and estate registers. The LWS—an international project to collect and harmonize existing microdata on household wealth into a coherent database—has reduced the comparability problems. We use the LWS database, and select the following seven countries because of data availability: Canada, Finland, Germany, Italy, Sweden, the United Kingdom, and the United States.[14]

It should be noted that we follow previous studies of wealth distributions using the LWS database in excluding Austria, Norway and Cyprus from the analysis (see e.g. Sierminska, 2006). We drop Norway because of the inconsistency stemming from valuing real estate on a taxable basis and debt at market prices,[15] Cyprus because over 60 percent of the observations lack information on net wealth, and Austria because it lacks data on net wealth. Finland's 1994 survey is also excluded because this data set lacks information on education.

We follow common practice and focus on the distribution of household net wealth, which refers to material assets that can be sold in the marketplace less any debts, thereby excluding pension rights as well as human capital. Net wealth consists of financial assets and nonfinancial assets net of total debt. Total debts refer to all outstanding loans. Financial assets include deposit accounts, stocks, and mutual funds, whilst nonfinancial assets consist of the principal residence and other real estate investments.[16] Business assets are not included.

[14]See Sierminska et al. (2006) and the LWS homepage http://www.lisproject.org/lwstechdoc.htm for a detailed description of the LWS database.

[15]Statistics Norway estimates that in the 1990s the taxable value of houses was, on average, less than a third of their market values (see Harding et al., 2004). The majority of Norwegians are therefore registered with negative net wealth.

[16]The self-assessed current value of the principal residence and other real estate investments is reported for all countries except for Sweden, where the tax value is reported. However, Statistics Sweden calculates the ratios of purchase prices to tax values for different types of houses and geographical location, and uses them to inflate the tax values. For comparability issues it is also comforting that the principal residence represents almost the same share of total assets in Sweden as in neighboring country Finland (61 vs. 64 percent).

This paper uses the household as the economic unit. This is in part because assets are recorded at the household level but also to conform to previous studies of wealth distributions. Households with missing values for wealth, education, or age of household head are dropped. To compare the wealth holdings of singles and couples, we assign each married/cohabiting spouse a wealth level equal to his or her net household wealth divided by the square root of two. Robustness analysis demonstrates that our results are unaffected by the choice of equivalence scale.

To define age groups, we follow common practice and rely on information about the age of the household head. To be specific, we define seven age groups: 24 years and younger, 25–34 years, 35–44 years, 45–54 years, 55–64 years, 65–74 years, and 75 years and older.[17] There are no household heads older than 75 years in the Swedish data. In all countries, we categorize the education variable into four educational groups. The four groups correspond as close as possible to the following categories: 'High school dropout', 'High school graduate', 'Non-university post-secondary certificate', and 'University degree or certificate'.

In the robustness analysis, we run a battery of specification checks, adding further controls to equation (3), including number of children, marital status, region of residence, immigrant status, as well as sex, occupation, and industry of household head. Marital status is divided into five categories: 'single without children', 'single with children', 'couple without children', 'couple with children', and 'others'. Industry and occupation are included using the countries' own categories.

[17]Formby et al. (1989) and Paglin (1989) discuss the theoretical effects of the choice of the widths of the age groups on age adjustments of inequality. The results of Formby et al. (1989) suggest, however, that age-adjusted inequality estimates are not substantially different for age groups of one, five, and 10 year intervals.

4 Empirical analysis

4.1 Descriptive statistics

Overall, the descriptive statistics are consistent with previous evidence in showing substantial variation among OECD countries in the age structure (Burkhauser et al., 1997; Banks et al., 2003) as well as savings patterns (Borsch-Supan, 2003).[18]

Table 1 demonstrates that there is considerable variation in the demographic structure of the six OECD countries examined in this study. First and foremost, the age structure differs substantially across the countries. For instance, Italy has on average older household heads, which may be because Italians move out from their parents' house later in life than what is typical in most OECD countries (see e.g. Manacorda and Moretti, 2006). By contrast, Canada as well as the Nordic countries, Sweden and Finland, have relatively young household heads. The fact that the age structure differs means that the inequality ranking of countries may be affected by age adjustments, even if countries have the same age–wealth profile.

Table 1 also reveals a considerable change over time in the age structure in the United States. As a results of the large, but temporary, increase in the population growth rate following World War II, the population shares of middle-aged and older household heads have increased significantly from 2000 to 2006. Because the middle-aged and elderly have, on average, accumulated more wealth than the young, changes in age composition may potentially affect the trend in inequality.

Furthermore, Table 1 demonstrates significant cross-country differences in educational attainment. In particular, the educational level is substantially lower in Italy compared with the United States and Germany. The United States also stands out with the highest mean wealth, whereas Canada and the Nordic countries have the lowest. This may come as no surprise given the differences in the scope of the public savings programs between these countries (see e.g. Klevmarken et al., 2003).

Figure 2 reveals that there is not only a considerable variation in the age structure

[18] See Sierminska et al. (2006) for detailed discussion of the descriptive statistics of the LWS database.

Table 1: **Descriptive statistics by country**

	Canada 1999	Germany 2001	Italy 2002	Italy 2004	Sweden 2002	UK 2000	USA 2000	USA 2003	USA 2006	Finland 1998
Mean age	48.6	50.6	55.7	55.9	47.2	49.1	50.4	50.9	51.8	47.2
Age comp.(%)										
24 and younger	4.32	2.44	0.52	0.66	4.10	5.84	3.56	3.25	3.08	4.30
25–34 years	16.99	13.44	7.17	7.14	16.57	17.16	13.21	12.25	12.02	15.47
35–44 years	24.27	23.43	18.60	18.47	21.86	21.81	21.43	19.59	18.39	25.10
45–54 years	20.51	21.41	21.83	21.45	24.43	18.47	24.71	24.60	23.47	27.34
55–64 years	14.01	18.78	21.37	20.60	22.84	14.90	17.15	21.16	21.89	16.08
65–74 years	11.52	13.57	18.53	18.62	10.19	12.13	11.50	11.70	12.85	7.30
75 years and older	8.37	6.94	11.98	13.06	NA	9.69	8.44	7.46	8.29	4.41
Education (%)										
High school dropout	27.75	1.48	35.48	33.00	21.48	27.65	6.70	5.96	5.31	30.87
High school graduate	21.83	12.89	28.07	28.41	44.17	24.34	28.81	27.72	28.89	36.49
Post secondary	27.12	50.05	28.28	29.80	6.24	45.37	16.00	15.50	15.13	22.16
University degree	23.30	35.58	8.17	8.80	27.31	2.62	48.49	50.83	50.67	9.44
Female head (%)	NA	31.47	30.59	32.95	29.29	39.69	13.27	13.17	12.34	28.87

Note: Data sources are national household wealth surveys included and harmonized in the LWS database. Household weights are used to ensure nationally representative results. Wealth levels are expressed in 1000 USD (PPP adjusted using Penn World Table 6.3.).

across the countries, but also a substantial variation in the age–wealth relationship. This indicates that cross-country comparisons of inequality could potentially be affected by age effects. In particular, the United States has a markedly more hump-shaped age–wealth profile than the rest of the countries. In contrast, there seems to be relatively little life cycle savings in Sweden, which corresponds to what is found Klevmarken (2006).

4.2 Estimation results

Equation (3) is estimated separately by OLS for each country, and separately for each cross section for the United States and Italy, for which we have data for more than one year.

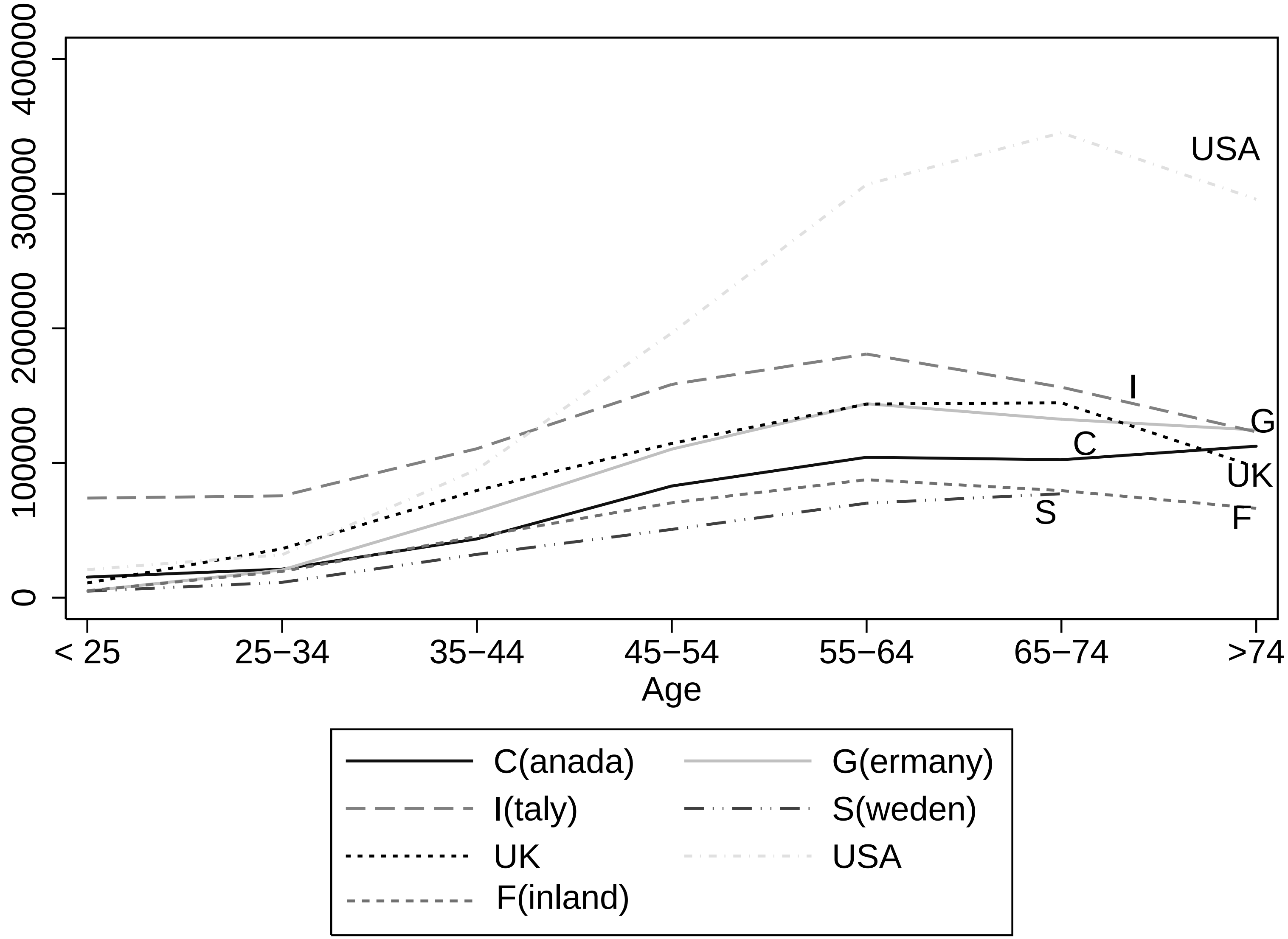
The fairly precise estimation results presented in Table 2 reveal a standard hump-shaped age–wealth profile where wealth increases during the working lifespan and declines somewhat after retirement in most countries. Wealth generally increases with education; the increase is, however, larger in Canada, the United Kingdom, and Italy, than in the other countries.

It is also evident from Table 2 that the explanatory power differs substantially across the countries. Canada and Italy have higher R-squared than the other countries, whereas Sweden has by far the lowest R-squared, mirroring the cross-country differences in life cycle saving. As emphasized in Section 2.2, the main purpose of these regressions is not to explain as much of the wealth generating process as possible, but rather to back out an empirically sound estimate of the net age effect. Hence, variation in goodness of fit measures across countries is a concern insofar as it reflects cross-country differences in omitted variables bias, rather than differences in unobservables unrelated to age. Below, we report results from a battery of robustness checks addressing the concern for omitted variables bias, none of which changes the results of the analysis.

4.3 Age-adjusted estimates of wealth inequality

This section investigates how age adjustments may influence the wealth inequality ranking of countries as well as the time trend in wealth inequality within a country. But first, it should be noted that the age-adjusted inequality measures, like G, are ordinal in nature and

Figure 2: **Age–wealth profile by country**



Note: Data sources are national household wealth surveys included and harmonized in the LWS database. The study for Italy 2002 and the United States 2000 are included. Household weights are used to ensure nationally representative results. Wealth levels are expressed in international dollars from Penn World Table 6.3.

any monotonic transformation of such a measure will preserve its ranking of distributions. This means that the numerical values of these inequality measures are primarily of interest as a way of comparing and ordering the distributions. The fact that the measures range over different intervals is therefore beside the point.[19]

The first row of Table 3 reports wealth inequality results using the G for the seven countries under study. We can see that the reported G for wealth is substantially larger than that for income.[20] It is also evident that Italy has the least unequal wealth distribution followed by Finland, whereas the United States and Sweden have the strongest concentration of wealth among its citizens. Figure 3 shows the time trend in wealth inequality for Italy and the United States. We can see that G suggests a slight decrease in inequality in both countries.

The low wealth inequality in Finland corresponds well to its low income inequality. In comparison, the high wealth inequality in Sweden contrasts with its low income inequality, but conforms to findings from other studies (see e.g. Sierminska et al., 2006, Domeij and Klein, 2002). This is, to a large extent, driven by the large fraction of households with zero or negative net wealth in Sweden compared with other countries. Domeij and Klein (2002) suggest that Sweden's redistributive public pension scheme can account for much of the difference between the degree of inequality in its income and its wealth distribution. However, it is not clear that the public pension scheme explanation is consistent with the evidence that Finland and Sweden have quite similar income inequality but widely different wealth inequality. An alternative explanation for the high wealth concentration in Sweden is that it was not affected by the main economic and geopolitical shocks that have been identified as major causes of decreased top wealth shares in other developed countries: Sweden did not participate in either of the world wars and was little affected by the Great Depression (Roine and Waldenstrom, 2009).

Rows 2–5 of Table 3 report age-adjusted inequality measures for the seven countries

[19] As shown in Section 2.4, G can range from 0 to 1, PG from 0 to G, and AG and WG from 0 to 2. Normalizing these measures so that they range over the same interval is possible, but it will not affect the ranking of the wealth distributions for any of the measures.

[20] G for income for the seven countries under study is reported to be as follows: Canada 0.33 (2000), Finland 0.27 (2000), Germany 0.28 (2000), Italy 0.36 (2000), Sweden 0.25 (2000), the United Kingdom 0.36 (1999), and the United States 0.41 (2001) (WDI; 2010).

Table 2: **Estimation results of the log-linear wealth regression: baseline specification**

	Canada 1999	Germany 2001	Italy 2002	Italy 2004	Sweden 2002	UK 2000	USA 2000	USA 2003	USA 2006	Finland 1998
25–34 years	0.008	-0.003	-0.005	-0.029	0.000	0.027	-0.002	-0.003	-0.001	0.003
	(0.010)	(0.000)	(0.037)	(0.041)	(0.000)	(0.005)	(0.000)	(0.000)	(0.001)	(0.005)
35–44 years	0.155	0.004	0.147	0.138	0.004	0.097	-0.000	0.003	0.007	0.054
	(0.010)	(0.001)	(0.036)	(0.040)	(0.000)	(0.006)	(0.000)	(0.000)	(0.001)	(0.005)
45–54 years	0.365	0.019	0.401	0.373	0.010	0.195	0.006	0.010	0.025	0.103
	(0.012)	(0.001)	(0.037)	(0.041)	(0.000)	(0.007)	(0.000)	(0.000)	(0.001)	(0.015)
55–64 years	0.585	0.037	0.641	0.637	0.017	0.257	0.016	0.028	0.046	0.200
	(0.014)	(0.001)	(0.037)	(0.041)	(0.001)	(0.033)	(0.000)	(0.001)	(0.001)	(0.008)
65–74 years	0.751	0.044	0.750	0.833	0.028	0.377	0.025	0.036	0.075	0.225
	(0.016)	(0.001)	(0.038)	(0.044)	(0.001)	(0.014)	(0.001)	(0.001)	(0.002)	(0.013)
75 years and older	0.879	0.055	0.778	0.841	NA	0.353	0.029	0.047	0.092	0.248
	(0.020)	(0.002)	(0.042)	(0.046)	(NA)	(0.013)	(0.001)	(0.001)	(0.002)	(0.019)
High school graduate	0.125	0.010	0.189	0.192	0.005	0.089	0.007	0.008	0.013	0.039
	(0.009)	(0.002)	(0.016)	(0.017)	(0.000)	(0.009)	(0.000)	(0.001)	(0.001)	(0.008)
Post secondary	0.123	0.016	0.404	0.405	0.010	0.135	0.010	0.014	0.019	0.061
	(0.009)	(0.002)	(0.019)	(0.020)	(0.001)	(0.015)	(0.000)	(0.001)	(0.001)	(0.020)
University degree	0.276	0.032	0.590	0.631	0.010	0.261	0.023	0.032	0.063	0.174
	(0.010)	(0.002)	(0.026)	(0.026)	(0.001)	(0.028)	(0.000)	(0.001)	(0.001)	(0.018)
Constant	12.729	16.418	13.038	13.111	16.526	14.250	17.960	17.594	17.052	14.240
	(0.010)	(0.002)	(0.037)	(0.042)	(0.000)	(0.012)	(0.000)	(0.001)	(0.001)	(0.007)
R-squared	0.309	0.056	0.227	0.243	0.010	0.083	0.090	0.098	0.134	0.065
Number of observations	26035	24731	13386	13240	24640	6953	36935	37355	36840	6737

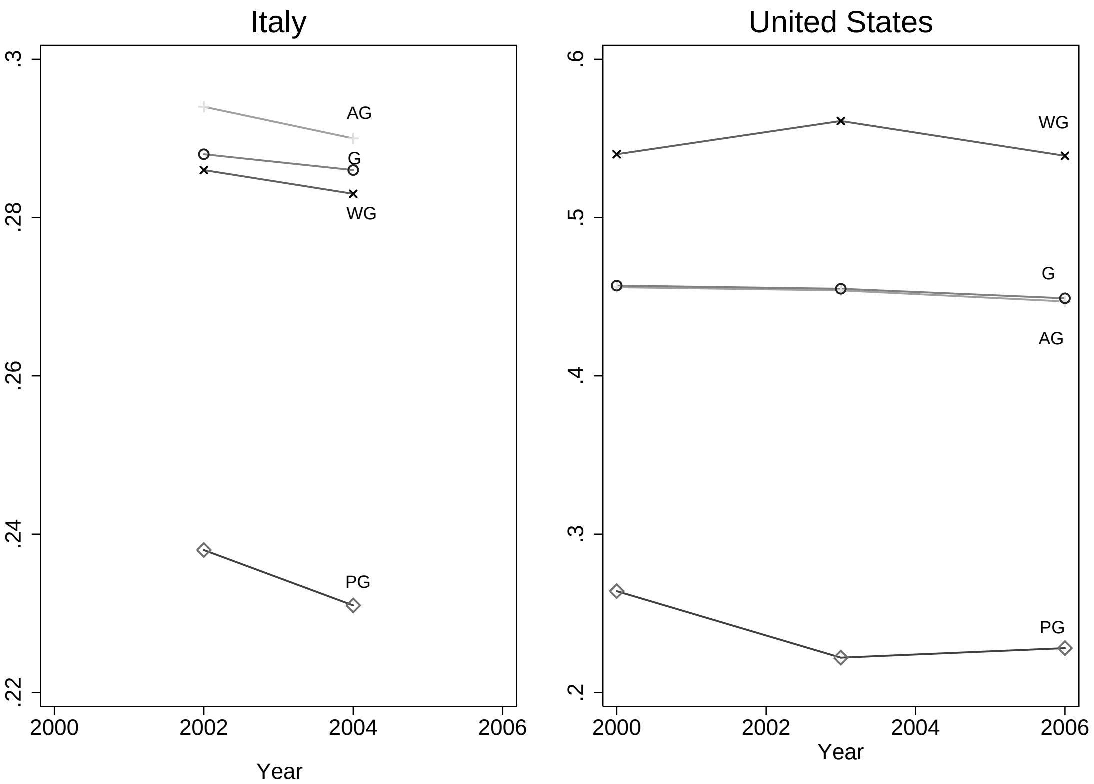
Note: The table reports results from OLS estimation of equation (3). Data sources are national household wealth surveys included and harmonized in the LWS database. Household weights are used to ensure nationally representative results. Reference categories: 24 years and younger and high school dropout. Heteroskedasticity-robust standard errors in parentheses. There are no households in the sample for Sweden with age of household head 75 years and older.

Table 3: **Wealth inequality ranking of countries according to different measures**

	Canada -99	Germany -01	Italy -02	Sweden -02	UK -00	USA -00	Finland -98
G	0.752 (4/5)	0.752 (4/5)	0.576 (1)	0.880 (6)	0.694 (3)	0.914 (7)	0.584 (2)
PG	0.446 (3)	0.500 (5)	0.476 (4)	0.612 (7)	0.428 (2)	0.528 (6)	0.380 (1)
WG	0.760 (5)	0.754 (4)	0.572 (2)	0.862 (6)	0.678 (3)	1.080 (7)	0.548 (1)
$AG^{nocontrols}$	0.728 (4)	0.749 (5)	0.576 (2)	0.878 (6)	0.681 (3)	0.912 (7)	0.572 (1)
AG	0.730 (4)	0.750 (5)	0.587 (2)	0.878 (6)	0.680 (3)	0.912 (7)	0.572 (1)

Note: Data sources are national household wealth surveys included and harmonized in the LWS database. Household weights are used to ensure nationally representative results. Country ranking is given in parentheses.

Figure 3: **Time trend in wealth inequality, United States and Italy**



Note: Data sources are national household wealth surveys included and harmonized in the LWS database. Household weights are used to ensure nationally representative results.

Table 4: **Estimation results of the log-linear wealth regression: no controls**

	Canada 1999	Germany 2001	Italy 2002	Italy 2004	Sweden 2002	UK 2000	USA 2000	USA 2003	USA 2006	Finland 1998
25–34 years	0.048	0.003	0.051	0.010	0.001	0.031	0.001	0.001	0.003	0.019
	(0.009)	(0.000)	(0.044)	(0.041)	(0.000)	(0.004)	(0.000)	(0.000)	(0.000)	(0.002)
35–44 years	0.183	0.010	0.196	0.156	0.005	0.094	0.003	0.007	0.013	0.065
	(0.010)	(0.001)	(0.043)	(0.039)	(0.000)	(0.005)	(0.000)	(0.000)	(0.000)	(0.003)
45–54 years	0.395	0.025	0.418	0.359	0.011	0.176	0.009	0.015	0.031	0.107
	(0.012)	(0.001)	(0.044)	(0.040)	(0.000)	(0.007)	(0.000)	(0.000)	(0.001)	(0.017)
55–64 years	0.586	0.042	0.582	0.549	0.017	0.225	0.018	0.033	0.054	0.190
	(0.014)	(0.001)	(0.045)	(0.040)	(0.001)	(0.030)	(0.000)	(0.001)	(0.001)	(0.007)
65–74 years	0.724	0.048	0.602	0.651	0.027	0.319	0.026	0.037	0.076	0.205
	(0.015)	(0.001)	(0.045)	(0.042)	(0.001)	(0.012)	(0.001)	(0.001)	(0.002)	(0.013)
75 years and older	0.836	0.058	0.597	0.623	NA	0.289	0.029	0.047	0.088	0.222
	(0.020)	(0.002)	(0.048)	(0.043)	(NA)	(0.012)	(0.001)	(0.001)	(0.002)	(0.017)
Constant	12.838	16.433	13.298	13.417	16.531	14.365	17.970	17.607	17.078	14.278
	(0.009)	(0.000)	(0.042)	(0.038)	(0.000)	(0.003)	(0.000)	(0.000)	(0.000)	(0.001)
R-squared	0.276	0.047	0.128	0.148	0.009	0.062	0.055	0.064	0.079	0.050
Number of observations	26035	24731	13386	13240	24640	6953	36935	37355	36840	6737

Note: The table reports results from OLS estimation of equation (3). Data sources are national household wealth surveys included and harmonized in the LWS database. Household weights are used to ensure nationally representative results. Reference category: 24 years and younger. Heteroskedasticity-robust standard errors in parentheses.

under study, while Figure 3 shows the time trends in age-adjusted wealth inequality for Italy and the United States. The insights from these results may be summarized in three conclusions. First, the country ranking of wealth distributions and the time trends in wealth inequality are quite sensitive to the method used to make age adjustments. In particular, the much used PG is shown to yield a substantially different picture of wealth inequality than AG and WG. Second, AG produces a wealth inequality ranking of countries that comes close to the ranking based on WG, albeit the wealth inequality time trend for the United States differs substantially when using AG compared with WG. Nevertheless, the way age-adjusted inequality measures aggregate up the difference between actual and equalizing wealth seems to play a larger role than omitted variables bias, as the inequality rankings differ more between WG and PG than between AG and WG. Third, AG produces a very similar ranking as G. Although this may be reassuring for statistical offices and government agencies, which regularly rely on G to evaluate cross-sectional wealth distributions, this conclusion may not necessarily hold true for other applications.[21]

Turning to a more detailed investigation of the empirical results using the different measures, let us first consider the results using PG, reported in the second row of Table 3. We can see that PG yields a very different picture of wealth inequality than G. For example, according to PG the wealth inequality in Sweden is higher than that in the United States, a result that runs counter to findings from other age-adjusted inequality measures as well as G. Moreover, PG alters the ranking of Italy from having clearly the most equal wealth distribution to being more unequal than Finland, the United Kingdom, and Canada. It is also evident that Canada and Germany change order in the country ranking when using PG. In addition, Figure 3 reveals that PG produces a different time trend of wealth inequality in the United States, compared with G. Overall, our findings for PG conform well to Paglin's (1975) study of income and wealth inequality in the United States over the period 1947-1972, in suggesting that age adjustments change the picture of inequality.

[21]For example, Almås et al. (2010) use the method proposed in this paper to study the time trend in earnings inequality in Norway over the last few decades. They find that G and AG yield substantially different time trends in earnings in Norway. Furthermore, the time trend in AG and WG differ substantially. A possible explanation is that the correlation between education and earnings is in fact much stronger than the correlation between education and wealth.

As shown in equation (8), PG may yield a different wealth inequality ranking than G insofar as there is significant cross-country variation in between-group inequality, G_b. Because G_b is a population share weighted average of the different age-group means, it increases as a result of larger disparity in mean wealth across age groups. For example, Figure 3 shows that the United States has a much stronger age–wealth relationship than Sweden, which explains why PG alters the ranking of the two countries. Furthermore, G_b increases with the number of people in the age groups with relatively low and relatively high mean wealth levels. For instance, Italy has a relatively compressed age distribution compared with Canada, which explains the change in the country ranking when measuring inequality using PG instead of G. In comparison, Canada and the United Kingdom experience a similar decrease from G and PG because their age–wealth profiles and age structure are quite similar.[22]

Next, consider the results using WG, reported in the third row of Table 3 and Figure 3. We can see immediately that the country ranking of wealth distributions and the time trends in wealth inequality are quite sensitive to the way age-adjusted inequality measures aggregate up the differences between individuals' actual and equalizing wealth. In line with Proposition 1, WG is greater than PG for all countries. This is, in part, because of considerable overlap in the wealth distributions across age groups. Indeed, the overlap term R, defined in equation (7), ranges between 0.196 (Finland, 1998) and 0.355 (United States, 2000) in the countries under study. This cross-country variation in the degree of overlap also contributes to explaining the large change in the wealth inequality ranking of countries. For example, WG evaluates Germany as more equal than Canada, whereas PG evaluates Canada as more equal than Germany. At the same time, R is considerably larger in Canada (0.260) than in Germany (0.232).

The two last rows, report the inequality rankings based on AG. Specifically, the last row uses the estimated age effects reported in Table 2 to compute the equalizing wealth levels defined by equation (4) and the associated AG given by equation (1). In comparison, the

[22] Specifically, G_b for the different countries are as follows: 0.306 (Canada 1999), 0.251 (Germany 2001), 0.102 (Italy 2002), 0.110 (Italy 2004), 0.269 (Sweden 2002), 0.268 (United Kingdom 2000), 0.386 (United States 2000), 0.466 (United States 2003), 0.443 (United States 2006), and 0.204 (Finland 1998).

fourth row drops the controls for education in equation (3), so that the only distinguishing feature from WG is the adjustment for economic growth across cohorts in the identification of age-group mean wealth levels. Any difference between WG and AG without controls is therefore attributable to omitted variables bias in the former measure because of cohort effects, whereas the difference between AG without controls and AG with controls is a result of omitted variables bias in the former measure because of education.

We can see that the country rankings according to AG without controls are quite similar to those of WG. The exception is the rankings of Canada and Germany. In addition, Figure 3 reveals that WG suggests a rise in wealth inequality in the United States from 2000 to 2002, whereas AG without controls indicates a small decline. When comparing the last two rows, it is clear that AG with and without controls produces the same picture of wealth inequality. In fact, the point estimates are very similar. This implies that education is not an important source of omitted variables bias in age-adjusted inequality. To understand why, recall that the omitted variables bias depends on the effect of the omitted variables on wealth times the regression of omitted variables on age. Table 2 shows that wealth generally increases with education. Furthermore, when regressing age on education we find that younger cohorts have a higher level of education than older cohorts.[23] However, the magnitude of these effects is too small to change the wealth inequality ranking. The relatively small omitted variables bias is mirrored in Table 4, showing that the estimated age effects on wealth without controls for education are quite similar to those with controls for education, reported in Table 2. We also see that the omitted variable bias is strongest in Italy, because of the relatively strong effects of education on wealth and age on education in that country.

Finally, it should be noted that the country ranking according to AG is quite similar to that produced by G. The exceptions are that the age adjustment makes Finland more equal than Italy and Canada more equal than Germany. As discussed in Section 2, AG will be smaller (greater) than G whenever the differences in individuals' wealth holding because of age is positively (negatively) correlated with differences in individuals' wealth

[23]The regressions results of age on education are reported in Appendix C.

holding attributable to other wealth generating factors. The fact that the estimates of G and AG are generally quite similar therefore implies that the correlation is fairly small. This suggests that individuals who have relatively high equalizing wealth because of the age group they belong to do not have systematically different wealth holdings because of other wealth generating factors.

4.4 Robustness analysis of the age-adjusted inequality measure

We run a battery of robustness checks to examine whether the results from our age-adjusted inequality measure are sensitive to the inclusion of additional controls, choice of growth adjustment, and use of equivalence scale. In some cases, the robustness analysis is performed only for a subset of the countries because of data availability. As summarized in Table 5, the main picture is that the country ranking by wealth inequality is robust to the alternative specifications.[24].

To be specific, the country ranking is unaffected by adding number of children and marital status to the set of controls for all countries (AG(1)). Moreover, extending the set of controls to include occupation, and industry, and sex of household head (AG(2)) do not alter the picture of inequality. The same holds true when we also control for immigration status and region (AG(3)), and when using the subsample of couple households to control for age and education of the spouse (AG(4)). Acknowledging the inherent arbitrariness in the choice of equivalence scale, we use an alternative equivalence scale (AG(6)) and find that the ranking is unchanged. On top of this, we make sure that the choice of economic growth rate does not affect our results by applying alternative growth rates (AG(7)–AG(8)). Finally, we check that using polynomials of continuous age variables instead of age-group dummies does not change the country ranking (AG(9)).

However, when we restrict our sample to singles (AG(5)), the ranking changes somewhat. A motivation for this specification check is that the common practice of using equivalence scales to capture pooling of wealth and economics of scale within the household may be too crude. However, as being single is potentially endogenous to individuals' wealth holding,

[24]The robustness analysis undertaken is described in more detail in Appendix B

Table 5: **Wealth inequality ranking of countries according to AG by specification**

	Canada 1999	Germany 2001	Italy 2002	Sweden 2002	UK 2000	USA 2000	Finland 1998
AG	0.730 (4)	0.750 (5)	0.587 (2)	0.878 (6)	0.680 (3)	0.912 (7)	0.572 (1)
AG(1)	0.731 (4)	0.749 (5)	0.589 (2)	0.878 (6)	0.679 (3)	0.912 (7)	0.572 (1)
AG(2)	NA	0.749 (4)	0.608 (2)	0.880 (5)	0.680 (3)	0.912 (6)	0.572 (1)
AG(3)	NA	0.749 (3)	0.606 (1)	0.878 (4)	0.680 (2)	NA	NA
AG(4)	NA	0.713 (4)	0.568 (2)	0.841 (5)	0.645 (3)	0 .921 (6)	0.548 (1)
AG(5)	0.831 (4)	0.880 (5)	0.687 (1)	1.076 (7)	0.768 (3)	0.983 (6)	0.698 (2)
AG(6)	0.727 (4)	0.751 (5)	0.592 (2)	0.879 (6)	0.683 (3)	0.913 (7)	0.576 (1)
AG(7)	0.728 (4)	0.749 (5)	0.582 (2)	0.878 (6)	0.680 (3)	0.912 (7)	0.572 (1)
AG(8)	0.733 (4)	0.749 (5)	0.593 (2)	0.878 (6)	0.680 (3)	0.912 (7)	0.571 (1)
AG(9)	0.729 (4)	0.749 (5)	0.589 (2)	0.878 (6)	0.678 (3)	0.912 (7)	0.572 (1)

Note: Data sources are national household wealth surveys included and harmonized in the LWS database. Household weights are used to ensure nationally representative results. Country ranking is given in parentheses.
AG: Baseline specification controlling for education.
AG(1): Estimation adding number of children and marital status as a control variables to baseline specification.
AG(2): Estimation adding sex of household head, number of children, occupation, industry, and marital status as control variables to baseline specification.
AG(3): Estimation adding number of children, occupation, industry, marital status, region, and immigration status as control variables to baseline specification.
AG(4): Estimation adding spouses' education and age as control variables to baseline specification.
AG(5): Estimation based on the sub-sample of single households using baseline specification.
AG(6): Estimation based on the EU equivalence scaling using baseline specification.
AG(7): Estimation based on a growth rate of two percent using baseline specification.
AG(8): Estimation based on a growth rate of three percent using baseline specification.
AG(9): Estimation based on polynomials of continuous age variables using baseline specification.

we need to be cautious in interpreting these results. With this caveat in mind, we can see that restricting the sample to singles alters the ranking of Finland from having the most equal distribution to being more unequal than Italy. It is also evident that Sweden and the United States change order in the country ranking when looking only at singles. Furthermore, our results demonstrate that AG is generally higher within the sample of singles compared with the population as a whole. There are several possible explanations. On the one hand, negative marital sorting on wealth could contribute to lower inequality for the full sample compared with the subsample of singles. On the other hand, the high inequality within the sample of singles could simply reflect that this a very heterogeneous group of people, making the comparison difficult both across and within age groups.

In line with the other results above, the time trends in inequality in Italy and the United States are robust to the alternative specifications. However, the results change somewhat when we examine the time trend in the subsample of singles (see Appendix B).

5 Concluding remarks

A strong relationship between age and wealth implies that inequality of wealth at a given point in time is likely to exist even in a society where everyone is completely equal in all respects other than age. It has therefore been argued that age adjustments of inequality measures based on cross-sectional data are necessary.

This paper proposed a method to adjust for age effects in cross-sectional data, which eliminates transitory inequality, but preserves inequality arising from other factors. Applying a cross-country comparable wealth database, we found smaller effects of age adjustment than existing approaches. Interestingly, our new age-adjusted Gini coefficient provides a wealth inequality ranking of countries that comes quite close to the ranking based on the classical Gini coefficient, which disregards age effects. A possible interpretation is that age adjustments are less important than previous studies have suggested, albeit this conclusion may not necessarily hold true for other applications.

There are a number of other applications where life cycle effects matter. For example, theoretical models and empirical results suggest a strong relationship between age and earnings. This raises several interesting questions. Is the substantial increase in earnings inequality in developed countries over the last decades an artifact of the baby boomers growing older? Can reported divergence in global income inequality be explained by increased differences in the age structure of rich and poor countries? Our age-adjusted inequality measure can be used to investigate these questions.

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Appendix A Proof of Proposition 1

Proof. The triangle inequality theorem states that $|x - y| \geq |x| - |y|$, and inequality holds if and only if one of the following conditions is satisfied:

(i) $x > 0$ and $y < 0$

(ii) $x < 0$ and $y > 0$

(iii) $x > y$ and $y < 0$

(iv) $x < y$ and $y > 0$

Let $x = (w_i - w_j)$ and $y = (\mu_i - \mu_j)$. It follows that $WG > PG$ if and only if one of the above conditions holds for at least one pair of individuals i and j.

Without loss of generality (because of the symmetry of the conditions), let the age groups be sorted by mean wealth such that $\mu_i \geq \mu_j$. Let $min(w_i)$ denote minimum wealth in the age group of individual i, and let $max(w_j)$ denote the maximum wealth in the age group of individual j.

Assume that $\mu_i > \mu_j$, implying $y > 0$.

No overlap in age-group distributions: assume that $min(w_i) \geq max(w_j)$. Then, $min(w_i) - \mu_i < max(w_j) - \mu_j$ whenever $w_i \neq \mu_i$ for at least one individual in the age-group of individual i or $w_j \neq \mu_j$ for at least one individual in the age-group of individual j. In that case, $x < y$ and condition (iv) holds.

Overlap in age-group distributions: assume that $min(w_i) < max(w_j)$. Then, $x > 0$ and condition (ii) holds.

Hence, $\mu_i \neq \mu_j$ for at least one pair of individuals and $w_i \neq \mu_i$ or $w_j \neq \mu_j$ for at least one of these individuals are sufficient conditions for $WG > PG$. □

Appendix B Robustness analysis

The results from the robustness analysis are summarized in Table 5 for the cross section ranking and in Table 6 for the trend (Italy and the United States), which both display

Table 6: **Wealth inequality ranking of countries according to AG by specification**

	Italy 2002	Italy 2004	USA 2000	USA 2003	USA 2006
AG	0.587	0.580	0.912	0.908	0.895
AG(1)	0.589	0.582	0.912	0.908	0.895
AG(2)	0.608	0.600	0.912	0.908	0.895
AG(3)	0.606	0.599	NA	NA	NA
AG(4)	0.568	0.577	0.921	0.918	0.905
AG(5)	0.687	0.645	0.983	0.966	1.094
AG(6)	0.592	0.580	0.913	0.910	0.897
AG(7)	0.582	0.577	0.912	0.908	0.895
AG(8)	0.593	0.584	0.912	0.908	0.895
AG(9)	0.589	0.582	0.912	0.908	0.894

Note: Data sources are national household wealth surveys included and harmonized in the LWS database. Household weights are used to ensure nationally representative results. Country ranking is given in parentheses.
AG: Baseline specification controlling for education.
AG(1): Estimation adding number of children and marital status as a control variables to baseline specification.
AG(2): Estimation adding sex of household head, number of children, occupation, industry, and marital status as control variables to baseline specification.
AG(3): Estimation adding number of children, occupation, industry, marital status, region, and immigration status as control variables to baseline specification.
AG(4): Estimation adding spouses' education and age as control variables to baseline specification.
AG(5): Estimation based on the sub-sample of single households using baseline specification.
AG(6): Estimation based on the EU equivalence scaling using baseline specification.
AG(7): Estimation based on a growth rate of two percent using baseline specification.
AG(8): Estimation based on a growth rate of three percent using baseline specification.
AG(9): Estimation based on polynomials of continuous age variables using baseline specification.

measured AG for the different specifications. In line with the results on cross section ranking of inequality, the time trends in inequality in Italy and the United States are robust to the alternative specifications. However, the results change somewhat when we examine the time trend in the subsamples. A detailed description of each of the nine robustness checks and the estimation results are given in subsections below. As can be seen from Table 5, AG changes the country ranking only when we estimate on the sub-sample of singles.

B.1 Controlling for number of children and marital status—AG(1)

The first robustness check (AG(1)) includes the number of children and marital status of the household in the set of controls. As we can see from Table 7, wealth holdings either decrease with the number of children in the household or we are unable to identify a significant effect. We can also see that all included categories have larger wealth holdings than single households with no children (which is the base category not included). We can see from Table 5 that the country ranking is unaffected by adding the number of children and marital status to the set of controls.

B.2 Controlling for number of children, marital status, occupation, industry, and sex of household head—AG(2)

Table 8 presents the regression results from the second robustness check (AG(2)), which extends the set of controls with dummy variables for occupation, industry, sex of household head, number of children, and marital status. For brevity, the coefficients for occupation and industry are excluded from the table.[25] Table 5 shows that this robustness check does not alter the country-ranking of wealth inequality.

B.3 Controlling for number of children, occupation, industry, marital status, region and immigrant status—AG(3)

Table 9 shows the regression results from the third robustness check (AG(3)), where we add number of children, occupation, industry, marital status, region, and immigrant status to the set of controls. This robustness check is only carried out for Germany, Italy, Sweden, and the United Kingdom, as we lack information about these additional controls for the other countries. For brevity, the estimated coefficients for occupation and industry are excluded from the table. Table 5 shows that this robustness check does not alter the country-ranking of wealth inequality.

B.4 Controlling for characteristics of the spouse—AG(4)

Table 10 shows the regression results from the fourth robustness check (AG(4)), studying the sub-sample of households with a couple and it includes the age and education of the

[25] The dummy variables for some of the educational categories are dropped from the sample because of perfect collinearity between education and occupation.

Table 7: **Number of children and marital status as control variables - AG(1)**

	Canada 1999	Germany 2001	Italy 2002	Italy 2004	Sweden 2002	UK 2000	USA 2000	USA 2003	USA 2006	Finland 1998
Number of children	-0.038	-0.001	-0.021	-0.044	0.000	0.016	0.000	0.001	-0.002	-0.012
	(0.012)	(0.000)	(0.010)	(0.010)	(0.000)	(0.009)	(0.000)	(0.000)	(0.000)	(0.006)
25-34 years	-0.035	-0.006	-0.020	-0.036	-0.001	0.016	-0.003	-0.005	-0.000	0.002
	(0.010)	(0.001)	(0.038)	(0.042)	(0.000)	(0.005)	(0.000)	(0.000)	(0.000)	(0.008)
35-44 years	0.105	-0.000	0.120	0.126	0.002	0.087	-0.001	0.001	0.010	0.063
	(0.010)	(0.001)	(0.038)	(0.042)	(0.000)	(0.008)	(0.000)	(0.000)	(0.001)	(0.013)
45-54 years	0.303	0.014	0.355	0.329	0.008	0.193	0.005	0.009	0.028	0.100
	(0.013)	(0.001)	(0.038)	(0.042)	(0.000)	(0.009)	(0.000)	(0.000)	(0.001)	(0.012)
55-64 years	0.521	0.032	0.594	0.584	0.015	0.249	0.015	0.027	0.052	0.190
	(0.015)	(0.001)	(0.039)	(0.043)	(0.001)	(0.031)	(0.000)	(0.001)	(0.001)	(0.008)
65-74 years	0.701	0.040	0.720	0.810	0.026	0.367	0.024	0.034	0.076	0.217
	(0.016)	(0.001)	(0.040)	(0.045)	(0.001)	(0.015)	(0.001)	(0.001)	(0.002)	(0.014)
75 years and older	0.851	0.055	0.775	0.840	NA	0.353	0.030	0.046	0.092	0.248
	(0.021)	(0.002)	(0.042)	(0.047)	(NA)	(0.016)	(0.001)	(0.001)	(0.002)	(0.019)
High school graduate	0.122	0.011	0.178	0.185	0.004	0.086	0.007	0.008	-0.051	0.038
	(0.009)	(0.002)	(0.016)	(0.017)	(0.000)	(0.009)	(0.000)	(0.001)	(0.004)	(0.008)
Post secondary	0.121	0.016	0.399	0.403	0.010	0.133	0.010	0.014	-0.048	0.059
	(0.008)	(0.002)	(0.019)	(0.020)	(0.001)	(0.016)	(0.000)	(0.001)	(0.003)	(0.019)
University degree	0.275	0.031	0.584	0.628	0.010	0.256	0.023	0.032	-0.022	0.170
	(0.010)	(0.002)	(0.026)	(0.026)	(0.001)	(0.028)	(0.000)	(0.001)	(0.003)	(0.018)
Single parent	0.076	0.009	0.020	0.112	0.000	0.023	0.004	0.002	0.009	0.016
	(0.018)	(0.001)	(0.044)	(0.058)	(0.001)	(0.021)	(0.000)	(0.001)	(0.001)	(0.011)
Couple without children	0.154	0.015	0.073	0.043	0.005	0.052	0.006	0.009	0.018	0.050
	(0.010)	(0.001)	(0.018)	(0.019)	(0.001)	(0.010)	(0.000)	(0.001)	(0.001)	(0.007)
Couple with children	0.177	0.016	0.113	0.123	0.004	0.004	0.005	0.005	0.024	0.037
	(0.014)	(0.001)	(0.020)	(0.020)	(0.001)	(0.029	(0.000)	(0.001)	(0.001)	(0.008)
Other	0.219	0.025	NA	NA	-0.007	0.019	NA	NA	NA	0.044
	(0.014)	(0.002)	(NA)	(NA)	(0.001)	(0.018)	(NA)	(NA)	(NA)	(0.011)
Constant	12.657	16.411	13.006	13.086	16.525	14.228	17.957	17.589	17.067	14.217
	(0.010)	(0.002)	(0.039)	(0.044)	(0.001)	(0.016)	(0.000)	(0.001)	(0.001)	(0.007)
R-squared	0.328	0.061	0.231	0.247	0.011	0.085	0.093	0.102	0.088	0.06
Number of observations	26035	24731	13386	13240	24640	6953	36935	37355	36840	6737

Note: Data sources are national household wealth surveys included and harmonized in the LWS database. Household weights are used to ensure nationally representative results. Reference categories: 24 years and younger, high school dropout, and single households without children. Heteroskedasticity-robust standard errors in parentheses.

Table 8: **Children, occupation, industry, marital status, number of children, and sex of household head added as control variables—AG(2)**

	Canada 1999	Germany 2001	Italy 2002	Italy 2004	Sweden 2002	UK 2000	USA 2000	USA 2003	USA 2006	Finland 1998
Number of children	-0.001	-0.027	-0.018	0.000	0.016	0.000	0.002	-0.001	-0.021	-0.011
	(0.000)	(0.018)	(0.020)	(0.000)	(0.009)	(0.000)	(0.000)	(0.000)	(0.012)	(0.006)
Female household head	-0.007	0.035	-0.011	-0.001	-0.010	-0.005	-0.010	-0.016	0.025	-0.013
	(0.001)	(0.028)	(0.028)	(0.001)	(0.007)	(0.001)	(0.001)	(0.001)	(0.028)	(0.007)
25-34 years	-0.006	-0.071	-0.026	-0.001	0.012	-0.003	-0.005	-0.001	0.044	0.000
	(0.001)	(0.077)	(0.086)	(0.000)	(0.006)	(0.000)	(0.000)	(0.001)	(0.072)	(0.009)
35-44 years	-0.001	0.095	0.111	0.003	0.084	-0.001	0.001	0.008	0.048	0.062
	(0.001)	(0.077)	(0.087)	(0.000)	(0.008)	(0.000)	(0.000)	(0.001)	(0.070)	(0.013)
45-54 years	0.012	0.383	0.416	0.009	0.189	0.005	0.009	0.025	0.154	0.098
	(0.001)	(0.079)	(0.088)	(0.000)	(0.010)	(0.000)	(0.000)	(0.001)	(0.074)	(0.012)
55-64 years	0.030	0.675	0.676	0.017	0.242	0.015	0.027	0.050	-0.044	0.208
	(0.001)	(0.082)	(0.095)	(0.001)	(0.033)	(0.000)	(0.001)	(0.001)	(0.155)	(0.010)
65-74 years	0.040	0.936	1.108	0.031	0.348	0.024	0.034	0.078	0.261	0.257
	(0.001)	(0.089)	(0.105)	(0.002)	(0.020)	(0.001)	(0.001)	(0.002)	(0.112)	(0.019)
75 years and older	0.056	0.995	1.014	NA	0.333	0.029	0.048	0.097	0.000	0.289
	(0.002)	(0.113)	(0.114)	(NA)	(0.021)	(0.001)	(0.002)	(0.002)	(.)	(0.023)
High school graduate	0.011	0.000	0.000	0.004	0.087	0.007	0.008	-0.046	0.025	0.036
	(0.002)	(.)	(.)	(0.001)	(0.009)	(0.000)	(0.001)	(0.004)	(0.043)	(0.007)
Post secondary	0.016	-0.154	-0.251	0.008	0.120	0.010	0.014	-0.042	0.046	0.056
	(0.002)	(0.068)	(0.064)	(0.001)	(0.019)	(0.000)	(0.001)	(0.003)	(0.037)	(0.018)
University degree	0.029	0.000	0.000	0.008	0.224	0.023	0.030	-0.011	-0.053	0.167
	(0.002)	(.)	(.)	(0.002)	(0.032)	(0.001)	(0.001)	(0.003)	(0.134)	(0.017)
Single parent	0.011	0.003	0.072	0.000	0.024	0.006	0.004	0.009	0.000	0.016
	(0.001)	(0.073)	(0.090)	(0.001)	(0.021)	(0.000)	(0.001)	(0.001)	(.)	(0.012)
Couple without children	0.013	0.064	0.004	0.003	0.053	0.003	0.004	0.009	-0.017	0.038
	(0.001)	(0.041)	(0.042)	(0.001)	(0.011)	(0.001)	(0.001)	(0.001)	(0.109)	(0.008)
Couple with children	0.014	0.083	0.016	0.003	0.010	0.002	-0.001	0.014	0.094	0.021
	(0.001)	(0.042)	(0.045)	(0.001)	(0.026)	(0.001)	(0.001)	(0.001)	(0.091)	(0.008)
Other	0.025	NA	NA	NA	0.019	NA	NA	NA	NA	0.036
	(0.002)	(NA)	(NA)	(NA)	(0.018)	(NA)	(NA)	(NA)	(NA)	(0.011)
Constant	16.416	13.560	13.825	16.527	14.256	17.959	17.594	17.069	14.317	14.248
	(0.002)	(0.110)	(0.113)	(0.001)	(0.022)	(0.001)	(0.001)	(0.001)	(0.110)	(0.007)
R-squared	0.063	0.298	0.290	0.007	0.090	0.094	0.103	0.099	0.015	0.072
Number of observations	26035	24731	13386	13240	24640	6953	36935	37355	36840	6737

Note: Data sources are national household wealth surveys included and harmonized in the LWS database. Household weights are used to ensure nationally representative results. Reference categories: 24 years and younger, male, and high school dropout. Heteroskedasticity-robust standard errors in parentheses. The coefficients for industry and occupation are omitted for brevity.

Table 9: **Children, occupation, industry, number of children, marital status, immigration status, region, and sex of household head added as control variables—AG(3)**

	Germany 2001	Italy 2002	Italy 2004	Sweden 2002	UK 2000
Number of children	-0.001	-0.018	-0.011	0.001	0.012
	(0.000)	(0.018)	(0.020)	(0.000)	(0.008)
Female household head	-0.005	0.009	-0.045	-0.001	-0.005
	(0.001)	(0.027)	(0.028)	(0.001)	(0.006)
25-34 years	-0.008	0.008	0.004	-0.002	0.001
	(0.001)	(0.066)	(0.079)	(0.000)	(0.007)
35-44 years	-0.003	0.155	0.132	0.002	0.083
	(0.001)	(0.065)	(0.080)	(0.000)	(0.009)
45-54 years	0.011	0.426	0.444	0.009	0.173
	(0.001)	(0.068)	(0.081)	(0.000)	(0.009)
55-64 years	0.029	0.733	0.680	0.016	0.226
	(0.001)	(0.070)	(0.088)	(0.002)	(0.036)
65-74 years	0.037	0.969	1.097	0.030	0.336
	(0.001)	(0.077)	(0.098)	(0.002)	(0.021)
75 years and older	0.051	1.039	1.044	NA	0.325
	(0.002)	(0.105)	(0.110)	(NA)	(0.024)
High school graduate	0.004	NA	NA	0.003	0.093
	(0.002)	(NA)	(NA)	(0.001)	(0.009)
Post secondary	0.009	NA	-0.203	0.007	0.127
	(0.002)	(NA)	(0.062)	(0.001)	(0.018)
University degree	0.024	0.133	NA	0.007	0.244
	(0.002)	(0.065)	(NA)	(0.002)	(0.029)
Single parent	0.011	-0.003	0.053	0.001	0.029
	(0.001)	(0.075)	(0.095)	(0.001)	(0.020)
Couple without children	0.012	0.034	0.003	0.004	0.046
	(0.001)	(0.040)	(0.041)	(0.001)	(0.010)
Couple with children	0.015	0.098	0.058	0.004	0.007
	(0.001)	(0.041)	(0.045)	(0.001)	(0.030)
Other	0.024	NA	NA	NA	0.018
	(0.002)	(NA)	(NA)	(NA)	(0.017)
Constant	16.403	13.288	13.600	16.536	14.228
	(0.005)	(0.070)	(0.111)	(0.001)	(0.105)
R-squared	0.081	0.356	0.334	0.010	0.116
Number of observations	97600	4075	4272	19654	6809

Note: Data sources are national household wealth surveys included and harmonized in the LWS database. Household weights are used to ensure nationally representative results. Reference categories: 24 years and younger, male household head, high school dropout, and single without children. The coefficients for occupation, industry, immigration status, and region are omitted for brevity. Heteroskedasticity-robust standard errors in parentheses.

spouse. This robustness check is carried out for all countries except Canada, as we lack information about the characteristics of spouses for this country. In this robustness check, we have a multi-collinearity problem, as the characteristics of the head of the household and the spouse are significantly correlated. However, most coefficients remain significant when we include the age and education of the spouse. Table 5 shows that this robustness check does not alter the country-ranking of wealth inequality.

B.5 Estimating on the sub-sample of singles—AG(5)

There are a couple of reasons for estimating our model on the sub-sample of singles. First, it can be argued that the use of an equivalence scale is a crude way to capture pooling of wealth and economics of scale within the household. Second, in the main specification, we have followed common practice and used information about the head of the household to determine the age groups. However, the age of the spouse may also be relevant for determining the age or life cycle effects on household wealth holding. Table 11 presents regression results from the fifth robustness check (AG(5)), where we estimate the model on the sub-sample of singles. Table 5 shows a slight change in ranking for the estimation on this subsample.

B.6 The EU equivalence scale—AG(6)

Acknowledging the inherent arbitrariness in the choice of equivalence scale we perform another robustness check (AG(6)), where we use the EU equivalence scale instead of the square root equivalence scale. Table 12 shows the corresponding regression results. As demonstrated by Table 5, the country ranking by wealth inequality is robust to the choice of equivalence scale.

B.7 Alternative growth rates—AG(7) and AG(8)

This paper tries to separate age effects from cohort effects by adjusting for economic growth. In the main specification, we use an annual (real) growth rate of 2.5 percent. As a robustness

Table 10: **Education and age of the spouse added as control variables—AG(4)**

	Germany 2001	Italy 2002	Italy 2004	Sweden 2002	UK 2000	USA 2000	USA 2003	USA 2006	Finland 1998
25-34 years	-0.002	0.030	0.003	-0.000	0.011	-0.001	-0.002	-0.000	0.001
	(0.001)	(0.036)	(0.069)	(0.000)	(0.008)	(0.000)	(0.000)	(0.001)	(0.006)
35-44 years	0.003	0.149	0.110	0.003	0.038	-0.000	0.002	0.004	0.037
	(0.001)	(0.038)	(0.071)	(0.001)	(0.010)	(0.000)	(0.000)	(0.001)	(0.009)
45-54 years	0.019	0.323	0.306	0.006	0.119	0.004	0.006	0.014	0.068
	(0.003)	(0.041)	(0.074)	(0.001)	(0.016)	(0.000)	(0.000)	(0.001)	(0.010)
55-64 years	0.033	0.504	0.589	0.009	0.102	0.009	0.017	0.025	0.140
	(0.004)	(0.046)	(0.078)	(0.004)	(0.075)	(0.000)	(0.001)	(0.001)	(0.017)
65-74 years	0.043	0.625	0.872	0.020	0.214	0.016	0.021	0.046	0.160
	(0.004)	(0.052)	(0.085)	(0.004)	(0.066)	(0.001)	(0.001)	(0.001)	(0.019)
75 years and older	0.072	0.739	0.870	NA	0.203	0.020	0.032	0.062	0.187
	(0.005)	(0.062)	(0.093)	(NA)	(0.073)	(0.001)	(0.001)	(0.002)	(0.026)
Spouse 25-34 years	-0.000	-0.123	0.066	-0.001	0.009	-0.005	-0.004	-0.010	0.007
	(0.001)	(0.042)	(0.064)	(0.001)	(0.007)	(0.000)	(0.001)	(0.001)	(0.006)
Spouse 35-44 years	0.003	-0.078	0.251	0.002	0.077	-0.002	-0.001	-0.001	0.032
	(0.001)	(0.043)	(0.065)	(0.001)	(0.010)	(0.000)	(0.001)	(0.001)	(0.008)
Spouse 45-54 years	0.001	0.066	0.418	0.005	0.080	0.001	0.004	0.008	0.043
	(0.004)	(0.046)	(0.070)	(0.001)	(0.019)	(0.000)	(0.001)	(0.001)	(0.018)
Spouse 55-64 years	0.009	0.141	0.508	0.012	0.246	0.011	0.016	0.028	0.096
	(0.004)	(0.050)	(0.073)	(0.004)	(0.074)	(0.001)	(0.001)	(0.002)	(0.014)
Spouse 65-74 years	0.003	0.118	0.499	0.013	0.219	0.009	0.018	0.032	0.100
	(0.004)	(0.055)	(0.081)	(0.004)	(0.074)	(0.001)	(0.002)	(0.003)	(0.020)
Spouse 75 years and older	0.008	0.089	0.505	NA	0.236	0.016	0.018	0.043	0.092
	(0.005)	(0.066)	(0.090)	(NA)	(0.087)	(0.001)	(0.002)	(0.004)	(0.025)
High school graduate	0.006	0.106	0.130	0.004	0.043	0.006	0.006	0.008	0.025
	(0.001)	(0.019)	(0.025)	(0.001)	(0.013)	(0.000)	(0.001)	(0.001)	(0.006)
Post secondary	0.010	0.245	0.306	0.011	0.071	0.008	0.010	0.012	0.040
	(0.001)	(0.022)	(0.029)	(0.001)	(0.028)	(0.000)	(0.001)	(0.001)	(0.019)
University degree	0.028	0.369	0.477	0.007	0.195	0.018	0.021	0.043	0.157
	(0.001)	(0.035)	(0.043)	(0.002)	(0.040)	(0.000)	(0.001)	(0.001)	(0.024)
Spouse high school graduate	0.014	0.121	0.200	0.004	0.132	0.001	-0.001	0.003	0.016
	(0.001)	(0.020)	(0.025)	(0.001)	(0.037)	(0.000)	(0.001)	(0.001)	(0.007)
Spouse post secondary	0.022	0.240	0.342	0.005	0.159	0.006	0.005	0.007	0.010
	(0.001)	(0.023)	(0.029)	(0.001)	(0.040)	(0.000)	(0.001)	(0.001)	(0.025)
Spouse university degree	0.023	0.331	0.409	0.007	0.240	0.010	0.016	0.029	0.052
	(0.001)	(0.039)	(0.050)	(0.001)	(0.058)	(0.000)	(0.001)	(0.001)	(0.014)
Constant	16.403	13.058	12.334	16.523	14.167	17.892	17.596	17.057	14.235
	(0.001)	(0.044)	(0.073)	(0.001)	(0.019)	(0.000)	(0.001)	(0.001)	(0.009)
R-squared	0.055	0.273	0.300	0.008	0.086	0.103	0.112	0.149	0.056
Number 26035	24731	13386	13240	24640	6953	36935	37355	36840	6737

Note: Data sources are national household wealth surveys included and harmonized in the LWS database. Household weights are used to ensure nationally representative results. Reference categories: 24 years and younger, male, and high school dropout. Heteroskedasticity-robust standard errors in parentheses.

Table 11: **Estimation results based on the sub-sample of singles—AG(5)**

	Canada 1999	Germany 2001	Italy 2002	Italy 2004	Sweden 2002	UK 2000	USA 2000	USA 2003	USA 2006	Finland 1998
25-34 years	-0.018	-0.001	0.132	-0.128	-0.002	0.139	-0.002	-0.001	0.029	-0.019
	(0.010)	(0.001)	(0.165)	(0.072)	(0.001)	(0.040)	(0.001)	(0.001)	(0.019)	(0.019)
35-44 years	0.097	0.004	0.134	0.052	0.005	0.331	-0.000	0.018	0.262	0.071
	(0.012)	(0.001)	(0.157)	(0.074)	(0.001)	(0.045)	(0.001)	(0.002)	(0.019)	(0.035)
45-54 years	0.245	0.018	0.601	0.254	0.018	0.649	0.004	0.037	0.598	0.240
	(0.022)	(0.002)	(0.161)	(0.075)	(0.002)	(0.054)	(0.001)	(0.002)	(0.023)	(0.025)
55-64 years	0.425	0.036	1.218	0.483	0.031	0.857	0.010	0.067	0.687	0.420
	(0.028)	(0.002)	(0.165)	(0.089)	(0.007)	(0.073)	(0.001)	(0.005)	(0.046)	(0.038)
65-74 years	0.645	0.045	1.211	0.640	0.061	1.146	0.015	0.114	1.102	0.469
	(0.030)	(0.002)	(0.198)	(0.081)	(0.004)	(0.071)	(0.001)	(0.007)	(0.038)	(0.048)
75 years and older	0.843	0.046	1.323	0.750	NA	1.181	0.024	0.163	1.482	0.541
	(0.034)	(0.002)	(0.172)	(0.084)	(NA)	(0.059)	(0.001)	(0.007)	(0.034)	(0.064)
High school graduate	0.125	0.007	0.236	0.197	0.007	0.407	0.007	0.043	-0.685	0.124
	(0.019)	(0.004)	(0.141)	(0.045)	(0.003)	(0.054)	(0.001)	(0.008)	(0.219)	(0.037)
Post secondary	0.130	0.010	0.825	0.451	0.016	0.582	0.011	0.061	-0.588	0.170
	(0.018)	(0.004)	(0.094)	(0.055)	(0.003)	(0.051)	(0.001)	(0.008)	(0.171)	(0.046)
University degree	0.253	0.017	0.974	0.731	0.025	0.872	0.018	0.093	-0.270	0.317
	(0.024)	(0.004)	(0.132)	(0.061)	(0.003)	(0.174)	(0.001)	(0.008)	(0.117)	(0.059)
Constant	12.688	16.273	11.630	13.166	15.387	12.043	17.961	16.028	12.676	13.031
	(0.014)	(0.004)	(0.173)	(0.080)	(0.002)	(0.054)	(0.001)	(0.007)	(0.010)	(0.033)
R-squared	0.312	0.072	0.138	0.162	0.021	0.262	0.062	0.108	0.223	0.175
Number of observations	26035	24731	13386	13240	24640	6953	36935	37355	36840	6737

Note: Data sources are national household wealth surveys included and harmonized in the LWS database. Household weights are used to ensure nationally representative results. Reference categories: 24 years and younger, and high school dropout. Heteroskedasticity-robust standard errors in parentheses.

Table 12: **The EU equivalence scale—AG(6)**

	Canada 1999	Germany 2001	Italy 2002	Italy 2004	Sweden 2002	UK 2000	USA 2000	USA 2003	USA 2006	Finland 1998
25-34 years	0.004	-0.003	-0.020	-0.044	-0.000	0.023	-0.002	-0.003	0.004	0.001
	(0.009)	(0.000)	(0.047)	(0.040)	(0.000)	(0.005)	(0.000)	(0.000)	(0.000)	(0.006)
35-44 years	0.131	0.003	0.122	0.082	0.003	0.079	-0.001	0.002	0.014	0.055
	(0.010)	(0.000)	(0.046)	(0.039)	(0.000)	(0.005)	(0.000)	(0.000)	(0.000)	(0.005)
45-54 years	0.336	0.019	0.441	0.325	0.009	0.182	0.004	0.009	0.037	0.135
	(0.011)	(0.001)	(0.047)	(0.040)	(0.000)	(0.007)	(0.000)	(0.000)	(0.001)	(0.015)
55-64 years	0.565	0.040	0.755	0.608	0.017	0.255	0.015	0.028	0.071	0.263
	(0.014)	(0.001)	(0.048)	(0.041)	(0.001)	(0.033)	(0.000)	(0.001)	(0.001)	(0.010)
65-74 years	0.731	0.049	0.887	0.808	0.029	0.379	0.023	0.036	0.102	0.296
	(0.015)	(0.001)	(0.049)	(0.043)	(0.001)	(0.014)	(0.001)	(0.001)	(0.002)	(0.016)
75 years and older	0.862	0.062	0.921	0.821	NA	0.359	0.028	0.048	0.120	0.327
	(0.020)	(0.002)	(0.052)	(0.045)	(NA)	(0.014)	(0.001)	(0.001)	(0.003)	(0.024)
High school graduate	0.121	0.011	0.211	0.184	0.004	0.090	0.007	0.008	-0.066	0.047
	(0.009)	(0.002)	(0.018)	(0.017)	(0.000)	(0.009)	(0.000)	(0.001)	(0.005)	(0.009)
Post secondary	0.118	0.018	0.455	0.384	0.009	0.134	0.010	0.014	-0.060	0.079
	(0.008)	(0.002)	(0.021)	(0.020)	(0.001)	(0.015)	(0.000)	(0.001)	(0.004)	(0.020)
University degree	0.260	0.034	0.658	0.601	0.009	0.251	0.021	0.030	-0.027	0.207
	(0.010)	(0.002)	(0.029)	(0.025)	(0.001)	(0.028)	(0.000)	(0.001)	(0.004)	(0.021)
Constant	12.730	16.265	12.668	13.118	16.467	14.192	17.961	17.535	16.684	13.838
	(0.010)	(0.002)	(0.047)	(0.041)	(0.000)	(0.012)	(0.000)	(0.001)	(0.000)	(0.008)
R-squared	0.323	0.122	0.253	0.264	0.011	0.089	0.091	0.103	0.101	0.104
Number of observations	26035	24731	13386	13240	24640	6953	36935	37355	36840	6737

Note: Data sources are national household wealth surveys included and harmonized in the LWS database. Household weights are used to ensure nationally representative results. Reference categories: 24 years and younger, and high school dropout. Heteroskedasticity-robust standard errors in parentheses.

check, we also experiment with annual growth rates of two percent (AG(7)) and three percent (AG(8)). Tables 13 and 14 show the estimation results based on these alternative assumptions about the economic growth rate. It is evident from Table 3 that the country ranking by wealth inequality is robust to the choice of growth rate.

B.8 Polynomials of continuous age variables—AG(9)

The last robustness check performed in this paper replaces the age-group dummies with polynomials of continuous age variables (AG(9)). Table 15 presents the estimation results with continuous age variables. It is clear from Table 5 that the country ranking is robust, whether we represent the age effects by age-group dummies or polynomials of continuous age variables.

Appendix C Regressing education on age

This appendix presents for each country the results of regressing education on age. Table 16 shows the results for Canada, Table 17 for Germany, Table 18 for Italy, Table 19 for Sweden, Table 20 for the United Kingdom, Table 21 for the United States, and Table 22 for Finland.

Table 13: **Two percent annual growth rate—AG(7)**

	Canada 1999	Germany 2001	Italy 2002	Italy 2004	Sweden 2002	UK 2000	USA 2000	USA 2003	USA 2006	Finland 1998
25-34 years	0.011	-0.002	-0.008	-0.041	0.000	0.030	-0.002	-0.003	0.004	0.004
	(0.010)	(0.000)	(0.039)	(0.046)	(0.000)	(0.005)	(0.000)	(0.000)	(0.000)	(0.005)
35-44 years	0.158	0.004	0.135	0.129	0.005	0.102	0.000	0.004	0.015	0.056
	(0.011)	(0.001)	(0.038)	(0.045)	(0.000)	(0.006)	(0.000)	(0.000)	(0.000)	(0.005)
45-54 years	0.358	0.018	0.368	0.357	0.010	0.197	0.006	0.011	0.034	0.103
	(0.012)	(0.001)	(0.038)	(0.046)	(0.000)	(0.007)	(0.000)	(0.000)	(0.001)	(0.015)
55-64 years	0.558	0.034	0.580	0.606	0.017	0.250	0.016	0.028	0.057	0.192
	(0.014)	(0.001)	(0.039)	(0.046)	(0.001)	(0.033)	(0.000)	(0.001)	(0.001)	(0.008)
65-74 years	0.697	0.039	0.662	0.778	0.026	0.356	0.023	0.033	0.079	0.208
	(0.016)	(0.001)	(0.040)	(0.048)	(0.001)	(0.013)	(0.001)	(0.001)	(0.002)	(0.013)
75 years and older	0.801	0.047	0.667	0.762	NA	0.322	0.026	0.041	0.086	0.220
	(0.020)	(0.001)	(0.043)	(0.050)	(NA)	(0.013)	(0.001)	(0.001)	(0.002)	(0.017)
High school graduate	0.122	0.010	0.178	0.190	0.004	0.084	0.007	0.007	-0.052	0.036
	(0.009)	(0.002)	(0.015)	(0.017)	(0.000)	(0.009)	(0.000)	(0.001)	(0.003)	(0.007)
Post secondary	0.120	0.015	0.387	0.411	0.010	0.131	0.010	0.013	-0.047	0.058
	(0.008)	(0.002)	(0.018)	(0.020)	(0.001)	(0.015)	(0.000)	(0.001)	(0.003)	(0.019)
University degree	0.272	0.029	0.568	0.642	0.010	0.257	0.023	0.030	-0.023	0.170
	(0.010)	(0.002)	(0.025)	(0.026)	(0.001)	(0.027)	(0.000)	(0.001)	(0.003)	(0.017)
Constant	12.505	16.209	12.872	12.838	16.257	13.987	17.677	17.331	16.722	13.993
	(0.011)	(0.002)	(0.038)	(0.047)	(0.000)	(0.012)	(0.000)	(0.001)	(0.000)	(0.007)
R-squared	0.285	0.046	0.208	0.223	0.009	0.074	0.086	0.092	0.076	0.058
Number of observations	26035	24731	13386	13240	24640	6953	36935	37355	36840	6737

Note: Data sources are national household wealth surveys included and harmonized in the LWS database. Household weights are used to ensure nationally representative results. Reference categories: 24 years and younger and high school dropout. Heteroskedasticity-robust standard errors in parentheses.

Table 14: **Three percent annual growth rate—AG(8)**

	Canada 1999	Germany 2001	Italy 2002	Italy 2004	Sweden 2002	UK 2000	USA 2000	USA 2003	USA 2006	Finland 1998
25-34 years	0.006	-0.003	-0.001	-0.020	-0.000	0.024	-0.002	-0.003	0.003	0.001
	(0.009)	(0.000)	(0.035)	(0.036)	(0.000)	(0.004)	(0.000)	(0.000)	(0.000)	(0.005)
35-44 years	0.152	0.003	0.158	0.143	0.004	0.093	-0.000	0.003	0.011	0.051
	(0.010)	(0.001)	(0.034)	(0.035)	(0.000)	(0.006)	(0.000)	(0.000)	(0.000)	(0.005)
45-54 years	0.372	0.019	0.434	0.384	0.010	0.193	0.005	0.010	0.028	0.103
	(0.012)	(0.001)	(0.035)	(0.036)	(0.000)	(0.007)	(0.000)	(0.000)	(0.001)	(0.015)
55-64 years	0.613	0.040	0.704	0.662	0.018	0.263	0.016	0.029	0.051	0.208
	(0.014)	(0.001)	(0.036)	(0.037)	(0.001)	(0.034)	(0.000)	(0.001)	(0.001)	(0.008)
65-74 years	0.807	0.050	0.840	0.882	0.030	0.398	0.026	0.038	0.076	0.243
	(0.016)	(0.001)	(0.037)	(0.040)	(0.001)	(0.014)	(0.001)	(0.001)	(0.002)	(0.014)
75 years and older	0.962	0.066	0.894	0.915	NA	0.387	0.033	0.053	0.093	0.278
	(0.021)	(0.002)	(0.042)	(0.042)	(NA)	(0.014)	(0.001)	(0.002)	(0.002)	(0.021)
High school graduate	0.128	0.011	0.199	0.193	0.005	0.093	0.008	0.009	-0.050	0.041
	(0.009)	(0.002)	(0.017)	(0.017)	(0.001)	(0.009)	(0.000)	(0.001)	(0.004)	(0.008)
Post secondary	0.125	0.018	0.422	0.399	0.010	0.140	0.011	0.015	-0.046	0.063
	(0.009)	(0.002)	(0.019)	(0.020)	(0.001)	(0.016)	(0.000)	(0.001)	(0.003)	(0.020)
University degree	0.279	0.035	0.612	0.621	0.010	0.266	0.024	0.033	-0.020	0.179
	(0.011)	(0.002)	(0.027)	(0.026)	(0.001)	(0.028)	(0.001)	(0.001)	(0.003)	(0.019)
Constant	12.952	16.626	13.203	13.388	16.793	14.513	18.242	17.855	17.434	14.485
	(0.010)	(0.002)	(0.035)	(0.038)	(0.001)	(0.012)	(0.000)	(0.001)	(0.000)	(0.007)
R-squared	0.333	0.067	0.247	0.265	0.012	0.092	0.095	0.105	0.088	0.074
Number of observations	26035	24731	13386	13240	24640	6953	36935	37355	36840	6737

Note: Data sources are national household wealth surveys included and harmonized in the LWS database. Household weights are used to ensure nationally representative results. Reference categories: 24 years and younger, male, and high school dropout. Heteroskedasticity-robust standard errors in parentheses.

Table 15: **Polynomials of continuous age variables—AG(9)**

	Canada 1999	Germany 2001	Italy 2002	Italy 2004	Sweden 2002	UK 2000	USA 2000	USA 2003	USA 2006	Finland 1998
Age	-0.047	-0.005	-0.026	-0.052	-0.001	-0.024	-0.003	-0.002	-0.005	-0.009
	(0.005)	(0.001)	(0.012)	(0.011)	(0.001)	(0.004)	(0.000)	(0.000)	(0.001)	(0.009)
Age^2	0.001	0.000	0.001	0.002	0.000	0.001	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Age^3	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000	(0.000)	(0.000)	(0.000)	(0.000)
High school graduate	0.131	0.011	0.200	0.201	0.005	0.089	0.007	0.009	-0.051	0.042
	(0.009)	(0.002)	(0.016)	(0.017)	(0.000)	(0.009)	(0.000)	(0.001)	(0.004)	(0.008)
Post secondary	0.131	0.017	0.415	0.416	0.010	0.137	0.010	0.015	-0.048	0.062
	(0.008)	(0.002)	(0.018)	(0.020)	(0.001)	(0.015)	(0.000)	(0.001)	(0.003)	(0.020)
University degree	0.285	0.032	0.602	0.640	0.010	0.267	0.024	0.033	-0.021	0.174
	(0.010)	(0.002)	(0.026)	(0.026)	(0.001)	(0.028)	(0.000)	(0.001)	(0.003)	(0.018)
Constant	13.176	16.480	13.013	13.496	16.539	14.500	17.997	17.612	17.142	14.298
	(0.070)	(0.008)	(0.187)	(0.185)	(0.007)	(0.062)	(0.004)	(0.007)	(0.008)	(0.126)
R-squared	0.322	0.056	0.234	0.250	0.011	0.087	0.092	0.103	0.085	0.066
Number of observations	26035	24731	13386	13240	24640	6953	36935	37355	36840	6737

Note: Data sources are national household wealth surveys included and harmonized in the LWS database. Household weights are used to ensure nationally representative results. Reference category: high school dropout. Heteroskedasticity-robust standard errors in parentheses.

Table 16: **The effect of age on level of education – Canada**

	Canada 1999			
	< High school	High school	Post secondary	University
25-34 years	-0.101	-0.152	0.075	0.178
	(0.019)	(0.023)	(0.023)	(0.016)
35-44 years	-0.069	-0.146	0.086	0.128
	(0.019)	(0.023)	(0.022)	(0.015)
45-54 years	-0.027	-0.175	0.030	0.172
	(0.019)	(0.023)	(0.022)	(0.015)
55-64 years	0.110	-0.190	-0.018	0.098
	(0.021)	(0.024)	(0.023)	(0.016)
65-74 years	0.272	-0.223	-0.088	0.039
	(0.022)	(0.023)	(0.023)	(0.016)
75 years and older	0.367	-0.258	-0.123	0.014
	(0.022)	(0.024)	(0.023)	(0.016)
Constant	0.238	0.400	0.263	0.098
	(0.018)	(0.022)	(0.021)	(0.013)
R-squared	0.110	0.014	0.022	0.020
Number of observations	26035	26035	26035	26035

Note: Data sources are national household wealth surveys included and harmonized in the LWS database. Household weights are used to ensure nationally representative results. Reference category: 24 years and younger. Heteroskedasticity-robust standard errors in parentheses.

Table 17: **The effect of age on level of education – Germany**

	Germany 2001			
	< High school	High school	Post secondary	University
25-34 years	-0.023	-0.168	-0.062	0.253
	(0.008)	(0.022)	(0.023)	(0.009)
35-44 years	-0.023	-0.174	-0.129	0.327
	(0.008)	(0.021)	(0.022)	(0.008)
45-54 years	-0.023	-0.149	-0.159	0.331
	(0.008)	(0.021)	(0.022)	(0.008)
55-64 years	-0.015	-0.118	-0.164	0.297
	(0.008)	(0.022)	(0.022)	(0.008)
65-74 years	-0.017	-0.054	-0.149	0.220
	(0.008)	(0.022)	(0.023)	(0.009)
75 years and older	-0.028	0.017	-0.135	0.146
	(0.008)	(0.023)	(0.024)	(0.009)
Constant	0.036	0.262	0.660	0.042
	(0.008)	(0.021)	(0.021)	(0.005)
R-squared	0.002	0.033	0.006	0.026
Number of observations	24731	24731	24731	24731

Note: Data sources are national household wealth surveys included and harmonized in the LWS database. Household weights are used to ensure nationally representative results. Reference category: 24 years and younger. Heteroskedasticity-robust standard errors in parentheses.

Table 18: **The effect of age on level of education – Italy**

	Italy 2002				Italy 2004			
	< High school	High school	Post secondary	University	<High school	High school	Post secondary	University
25-34 years	-0.058	-0.062	0.033	0.087	0.028	-0.013	-0.078	0.063
	(0.051)	(0.054)	(0.054)	(0.034)	(0.044)	(0.049)	(0.049)	(0.031)
35-44 years	-0.046	-0.036	-0.013	0.094	0.033	0.007	-0.097	0.057
	(0.050)	(0.053)	(0.052)	(0.033)	(0.043)	(0.048)	(0.048)	(0.031)
45-54 years	0.078	-0.110	-0.060	0.092	0.134	-0.039	-0.156	0.061
	(0.050)	(0.053)	(0.052)	(0.033)	(0.043)	(0.048)	(0.048)	(0.031)
55-64 years	0.299	-0.175	-0.185	0.061	0.328	-0.104	-0.250	0.027
	(0.050)	(0.053)	(0.052)	(0.033)	(0.043)	(0.048)	(0.048)	(0.031)
65-74	0.526	-0.268	-0.290	0.032	0.594	-0.200	-0.386	-0.008
	(0.050)	(0.053)	(0.052)	(0.033)	(0.043)	(0.048)	(0.048)	(0.031)
75 years and older	0.624	-0.335	-0.328	0.039	0.707	-0.272	-0.427	-0.008
	(0.050)	(0.053)	(0.053)	(0.033)	(0.044)	(0.048)	(0.048)	(0.031)
Constant	0.114	0.443	0.429	0.014	0.023	0.386	0.534	0.057
	(0.049)	(0.052)	(0.052)	(0.033)	(0.042)	(0.047)	(0.047)	(0.030)
R-squared	0.268	0.050	0.076	0.009	0.284	0.045	0.077	0.011
Number of observations	13386	13386	13386	13386	13240	13240	13240	13240

Note: Data sources are national household wealth surveys included and harmonized in the LWS database. Household weights are used to ensure nationally representative results. Reference category: 24 years and younger. Heteroskedasticity-robust standard errors in parentheses.

Table 19: **The effect of age on level of education – Sweden**

	Sweden 2002			
	< High school	High school	Post secondary	University
25-34 years	-0.057	-0.073	-0.042	0.179
	(0.014)	(0.020)	(0.013)	(0.014)
35-44 years	-0.015	-0.086	-0.026	0.135
	(0.014)	(0.019)	(0.013)	(0.013)
45-54 years	0.049	-0.142	-0.062	0.164
	(0.014)	(0.019)	(0.013)	(0.013)
55-64 years	0.156	-0.186	-0.094	0.132
	(0.015)	(0.019)	(0.013)	(0.013)
65-74 years	0.304	-0.253	-0.112	0.060
	(0.017)	(0.020)	(0.013)	(0.014)
Constant	0.157	0.599	0.122	0.108
	(0.013)	(0.018)	(0.012)	(0.011)
R-squared	0.076	0.018	0.019	0.013
Number of observations	24640	24640	24640	24640

Note: Data sources are national household wealth surveys included and harmonized in the LWS database. Household weights are used to ensure nationally representative results. Reference category: 24 years and younger. Heteroskedasticity-robust standard errors in parentheses.

Table 20: **The effect of age on level of education – the United Kingdom**

	United Kingdom 2000			
	< High school	High school	Post secondary	University
25-34 years	-0.016	0.025	-0.025	0.020
	(0.018)	(0.029)	(0.032)	(0.009)
35-44 years	0.043	0.024	-0.088	0.024
	(0.018)	(0.028)	(0.031)	(0.009)
45-54 years	0.172	-0.023	-0.172	0.025
	(0.020)	(0.028)	(0.032)	(0.009)
55-64 years	0.244	-0.022	-0.220	0.001
	(0.022)	(0.029)	(0.032)	(0.008)
65-74 years	0.439	-0.032	-0.405	0.002
	(0.024)	(0.030)	(0.032)	(0.009)
75 years and older	0.479	-0.027	-0.440	-0.010
	(0.025)	(0.030)	(0.032)	(0.008)
Constant	0.083	0.237	0.660	0.017
	(0.015)	(0.026)	(0.028)	(0.007)
R-squared	0.157	0.003	0.089	0.006
Number of observations	6953	6953	6953	6953

Note: Data sources are national household wealth surveys included and harmonized in the LWS database. Household weights are used to ensure nationally representative results. Reference category: 24 years and younger. Heteroskedasticity-robust standard errors in parentheses.

Table 21: **The effect of age on level of education – the United States**

	USA 2000				USA 2003				USA 2006			
	< High school	High school	Post secondary	University	<High school	High school	Post sec	University	<High school	High school	Post sec	University
25-34 years	0.017	-0.198	0.008	0.173	0.004	-0.092	-0.101	0.190	0.042	-0.152	-0.026	0.136
	(0.008)	(0.014)	(0.011)	(0.015)	(0.008)	(0.014)	(0.012)	(0.016)	(0.007)	(0.015)	(0.012)	(0.016)
35-44 years	-0.016	-0.244	-0.049	0.310	-0.003	-0.134	-0.099	0.236	0.011	-0.187	-0.041	0.216
	(0.007)	(0.013)	(0.011)	(0.015)	(0.007)	(0.014)	(0.011)	(0.015)	(0.007)	(0.014)	(0.011)	(0.016)
45-54 years	-0.007	-0.338	-0.044	0.390	-0.030	-0.209	-0.128	0.367	-0.002	-0.216	-0.091	0.309
	(0.007)	(0.013)	(0.011)	(0.014)	(0.007)	(0.014)	(0.011)	(0.015)	(0.007)	(0.014)	(0.011)	(0.015)
55-64 years	0.023	-0.340	-0.072	0.388	-0.025	-0.246	-0.149	0.420	-0.015	-0.281	-0.095	0.392
	(0.007)	(0.014)	(0.011)	(0.015)	(0.007)	(0.014)	(0.011)	(0.015)	(0.007)	(0.014)	(0.011)	(0.016)
>75 years	0.046	-0.318	-0.082	0.354	0.020	-0.180	-0.156	0.316	0.028	-0.249	-0.085	0.306
	(0.008)	(0.014)	(0.012)	(0.015)	(0.008)	(0.014)	(0.012)	(0.016)	(0.007)	(0.015)	(0.012)	(0.016)
25-34 years	0.117	-0.277	-0.080	0.240	0.066	-0.126	-0.185	0.245	0.080	-0.147	-0.116	0.183
	(0.008)	(0.015)	(0.012)	(0.016)	(0.008)	(0.015)	(0.012)	(0.017)	(0.008)	(0.016)	(0.012)	0.017)
Constant	0.051	0.568	0.209	0.172	0.065	0.448	0.282	0.204	0.040	0.498	0.225	0.238
	(0.007)	(0.012)	(0.010)	(0.014)	(0.007)	(0.013)	(0.010)	(0.014)	(0.007)	(0.013)	(0.011)	(0.015)
R-squared	0.021	0.027	0.006	0.037	0.013	0.018	0.009	0.039	0.014	0.017	0.008	0.037
Observations	36935	36935	36935	36935	37355	37355	37355	37355	36840	36840	36840	36840

Note: Data sources are national household wealth surveys included and harmonized in the LWS database. Household weights are used to ensure nationally representative results. Reference category: 24 years and younger. Heteroskedasticity-robust standard errors in parentheses.

Table 22: **The effect of age on level of education – Finland**

	Finland 1998			
	< High school	High school	Post secondary	University
25-34 years	-0.007	-0.276	0.196	0.086
	(0.026)	(0.035)	(0.027)	(0.015)
35-44 years	0.060	-0.317	0.174	0.076
	(0.026)	(0.033)	(0.025)	(0.013)
45-54 years	0.187	-0.392	0.132	0.062
	(0.027)	(0.033)	(0.024)	(0.012)
55-64 years	0.379	-0.509	0.092	0.026
	(0.030)	(0.034)	(0.025)	(0.012)
65-74 years	0.583	-0.614	0.014	0.012
	(0.032)	(0.035)	(0.025)	(0.013)
75 years and older	0.654	-0.641	-0.013	-0.000
	(0.033)	(0.036)	(0.025)	(0.012)
Constant	0.138	0.751	0.089	0.022
	(0.022)	(0.029)	(0.021)	(0.010)
R-squared	0.222	0.112	0.033	0.015
Number of observations	6737	6737	6737	6737

Note: Data sources are national household wealth surveys included and harmonized in the LWS database. Household weights are used to ensure nationally representative results. Reference category: 24 years and younger. Heteroskedasticity-robust standard errors in parentheses.

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