Nordic exceptionalism? Social democratic egalitarianism in world-historic perspective

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Abstract

We ask: In what respect, if any, are the Nordic economies exceptionally egalitarian when viewed from a world historical perspective? We use archaeological, historical and ethnographic as well as contemporary evidence to estimate the degree of wealth inequality over the past three thousand years. Our data set includes measures of inequality of wealth from economies based on foraging, sedentary hunting and gathering, horticulture, herding, and agriculture, and under institutions ranging from communal property, ancient slavery, feudalism, pre-modern centralized authoritarian systems, pre-modern urban economies, as well as contemporary capitalist economies governed by democratic polities.

The countries exemplifying the Nordic model are not exceptionally equal in the ownership of material wealth. Moreover, the advent of social democracy in the Nordic nations did not result in a more equal distribution of years of schooling. But intergenerational economic and social mobility appears to be exceptional in the Nordic nations, and by most measures, inequalities in living standards in the Nordic economies are less than in other advanced economies. The closest Nordic analogy in our data set is the egalitarian distribution of well-being found in some horticultural and (especially) forager economies, in which neither human nor material wealth is strongly transmitted across generations, and one's ownership of material wealth is not very

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important as a source of an individual's livelihood, because one's livelihood depends more on non-material forms of wealth including group membership, independently of material wealth.

Keywords: wealth inequality, redistribution, Nordic model, economic systems, social democracy, horticulturalists, hunter gatherers.

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1. Introduction

Nobody doubts that the Nordic economies are exceptional, and that among other things, they are exceptionally egalitarian.[1] We use archaeological, ethnographic, and historical data to ask in what respects are the Nordic economies exceptionally egalitarian when compared to the vast range of economic systems that humans have experienced over the course of our history and pre-history. While the Nordic economies are not exceptional in the degree of equality in material wealth or human capital, we find two exceptional aspects of Nordic egalitarianism: the limited relevance of differences in wealth on the distribution of living standards and greater intergeneration mobility in economic and social status.

The unusual nature of our data warrants a comment (the data set is described in detail in Fochesato and Bowles (2014).) Because we wish to compare the Nordic economies with a broad spectrum of other economic systems, in addition to contemporary evidence, we include historical data from land and tax records and wills, as well as archaeological data. As a basis for educated guesses about the degree of inequality in Late Pleistocene and early Holocene economies (before and after the domestication of plants and animals about 12 millennia ago) we also use data collected by ethnographers and archaeologists from societies of foragers, sedentary hunter gatherers, horticul-

[1] We will see that the Nordic economies - Denmark, Finland, Norway, and Sweden - differ markedly one from another but share common elements sufficient to motivate our reference generically to the Nordic model. To avoid overlap with other contributions to this issue we do not describe the Nordic model here. Beyond the works cited below and the other papers in this symposium, we have been guided by Moene and Wallerstein (1993, 1995a,b) and Anderson et al. (2007) among other works. We would include Iceland in the Nordic club, but lack adequate data. The term Nordic exceptionalism is associated with the models of welfare capitalism of Esping-Anderson (1990), while the idea of Nordic distinctiveness goes back at least to the representation of Sweden as "the middle way" in Childs (1936).

turalists, herders and small scale farmers whose economies arguably resemble those of pre-historic humans (described in Borgerhoff-Mulder et al. (2009)). (Foragers are mobile hunter gatherers; horticulturalists are low technology farmers loosely distinguished from farmers by the use of only hand tools, land abundance and/or the lack of draft animals.)

Our data set on wealth inequality complements that of Branko Milanovic, Peter Lindert and Jeffrey Williamson on ancient income inequality (Milanovic et al. (2011)). We restrict our analysis to cases for which measures of the entire wealth distribution are available and hence we do not consider partial measures of inequality, such as the share of wealth held by the very wealthiest. Where multiple estimates for a given area at about the same time period exist, we have taken averages, so as to avoid overweighting economies and time periods on which there are a large number of estimates of (approximately) the same quantity.

We consider three types of wealth. Somatic wealth is an individual's strength, cognitive ability, health status and other capacities to produce or provide the goods or services that contribute to well being. Relational wealth is a measure of the extent to which an individual's social connections contribute to well being, as could be measured by the individual's position in social networks or by group membership. Material wealth refers to such things as tools, livestock, and land, and is synonymous with the traditional economic meaning of wealth, measured by a stock of alienable property that contributes to a flow of well being. We focus on wealth rather than income because for most economies in the past we have more adequate measures of wealth than income (even measured for a single time period) and because we are interested in differences in permanent (rather than transient) economic status. Moreover, inequality in annual income may grossly overstate inequality in permanent income (by a factor of 50 percent comparing annual with total income in Sweden over 1951-1989 (Björklund (1993)).

In the next section we provide a model of the dynamics of wealth inequality and its relationship to inequalities in living standards, allowing us to identify four mechanisms that may result in a highly egalitarian distribution of living standards. We then ask which, if any, of these mechanisms may account for Nordic egalitarianism. In section 3 we consider material wealth inequality in the Nordic and other democratic societies as well as in autocratic societies of the past and the small scale economies of the type that characterized human societies though much of our history and prehistory. In section 4 we compare inequalities in somatic wealth across a wide range of

economic systems; and we ask whether the marked equality in human assets in the Nordic nations can be attributed to the social democratic model *per se*, or instead predated its emergence. Section 5 contrasts the degree of intergenerational transmission of economic success in the Nordic economies with similar data from other modern economies and small scale societies. Section 6 extends the analysis of intergenerational transmission to educational attainments; and, as in section 4, we ask if the extensive intergenerational mobility in the Nordic nations today can be attributed to the social democratic model *per se*. In the penultimate section we use the theoretical results in section 2 to show that a variant of Stephen Durlauf's membership model of inequality captures important aspects of Nordic egalitarianism, as well as the egalitarian forager and horticultural economies of human pre history (Durlauf (1999)). We conclude using the model of section 2 to identify which of the four possible ways to be egalitarian might account for the relative equality of living standards in the Nordic nations.

2. Four ways to be egalitarian

To explore the possible distinctiveness of social democratic egalitarianism we offer an accounting framework that identifies four causal mechanisms that could contribute to a relatively equal long term stationary distribution of living standards. We first identify two proximate determinants of the stationary distribution of wealth, and then two (also proximate) determinants of the extent to which wealth inequalities result in inequality of the flow of the goods and services making up the living standard. The purpose of the model is taxonomic, not descriptive; we do not estimate it, but rather use it to define and illustrate the classes of distinct phenomena that impact on the degree of equality in living standards so as to clarify the importance of and relationships among the empirical measures of inequality to be introduced subsequently.

We refer to consumption units (for example, households) as individuals. There are two kinds of wealth, one of which is held equally and from which the flow of services is equal across households. The wealth that may be unequal ("wealth" hereinafter) is held in positive amounts by all members of the population, and is transmitted from parents to offspring to a degree which will vary according to demographic structure, type of wealth, and inheritance practices (including bequest taxation). (We could consider the different wealth types separately and in the aggregate, but this would add

little to the insights of this exercise.) Members of each generation experience idiosyncratic wealth shocks that alter the holdings inherited from their parents. Under conditions to be specified presently, this economy will support a long term stationary distribution of wealth as in Becker and Tomes (1979). An individual's wealth produces a flow of services (called the individual's living standard) the extent of which will depend on first, the goods and services produced and the methods of producing them, which determines the extent to which the unequally held wealth generates the goods and services making up an individual's living standard; and second, the extent of redistributive policies affecting the flow of goods and services associated with privately held wealth, on which we impose an upper bound requiring that increased wealth not be associated with a reduced living standard.

Let an individual's wealth w_i vary with parental wealth $w_i^{'}$ and mean wealth $\underline{w}$ (all measured in natural logarithms, and normalized so that mean wealth is invariant across generations) according to

$$w_i = (1-\beta)\underline{w} + \beta w_i^{'} + \lambda_i \tag{1}$$

where λ_i is a wealth shock uncorrelated with parental wealth, with mean zero and variance σ_λ^2. The parameter β is termed the intergenerational transmission elasticity and $(1-\beta)$ is the extent of regression to the mean. Taking the variance of w_i in (1) setting it equal to the variance of w_i' and solving to find the variance of the stationary distribution of wealth $\sigma_{w^*}^2$, we have

$$\sigma_{w^*}^2 = \sigma_\lambda^2/(1-\beta^2) \tag{2}$$

which means that (for $\beta < 1$) the degree of inequality in the stationary distribution is given by the magnitude of the wealth shocks, expanded by the intergenerational transmission multiplier, $(1-\beta^2)^{-1}$, reflecting the fact that where transmission is substantial, the inequalities introduced by wealth shocks in past persist and hence augment the inequalities induced by contemporaneous shocks.

An individual's per period flow of living standard Y_i acquired as a result of her wealth holding W_i is

$$Y_i = \alpha W_i^{\alpha-\tau} \tag{3}$$

where $\alpha \geq \tau \geq 0$ and $\alpha - \tau$ is the elasticity of the (after redistribution) flow of living standards with respect to the amount of wealth held. The exponent α measures the importance of wealth as a contributor to one's living

standards in the hypothetical absence of redistribution, and τ measures effect of redistributive policies. Denoting y and w as lnY and lnW respectively, and using equation (2), our measure of stationary inequality of living standards is thus

$$\sigma_y^2 = (\alpha - \tau)^2 \sigma_{w^*}^2 = (\alpha - \tau)^2 \sigma_\lambda^2 / (1 - \beta^2) \tag{4}$$

Equation (4) identifies four aspects of an economy that affect the degree of inequality in living standards:

i the extent of wealth shocks, σ_λ^2;
ii the intergenerational transmission multiplier $(1-\beta^2)^{-1}$ which varies with the degree to which wealth is transmitted across generations, β;
iii the importance of the unequally held form of wealth in producing the goods and services making up the living standards of the people, α; and
iv the extent of redistributive policies affecting the relationship between the flow of services produced by wealth and the living standards of the wealth's owner, τ.

We will see that over the course of history, societies have differed substantially in all four of these dimensions. These terms represent the proximate determinants of living standard inequality in the model, through which the influence of the underlying causes of inequality work. For example the nature of the goods and services making up a people's livelihood (wild versus cultivated species, for example) or the technologies by which a livelihood is gained (material capital intensive versus human capital intensive farming, for example) will affect σ_λ^2, $(1 - \beta^2)^{-1}$ and α. The distribution of political power and the institutions regulating how the members of society interact in producing their livelihoods will affect $(1 - \beta^2)^{-1}$, τ and possibly σ_λ^2. Thus when we identify the distinctive aspects of Nordic egalitarianism we will be pointing to proximate determinants, not underlying causes.

To measure the effects of redistributive policies affecting the flow of living standards from an individual's wealth, and to compare the effects of redistribution across economies, we will need a measure of how redistribution affects inequality of living standards conditional on a given level of inequality in wealth. We call this the redistribution ratio, ρ, defined as one minus the ratio of post redistribution inequality of living standards to inequality in living standards that would occur in the hypothetical absence of the redistributional policies captured by τ. Thus in a society with unequally held

wealth and perfect equality in living standards, we have $\rho = 1$; while if living standards are no more equally distributed than would have occurred in the absence of redistribution policies, we have $\rho = 0$. Remarkably, our empirical estimates of ρ cover much of this entire range of possible extents of redistribution. Using equation (4) and representing the presence and hypothetical absence of redistribution by $\tau > 0$ and $\tau = 0$ respectively we have

$$\rho = 1 - [(\alpha - \tau)^2 \sigma_W^2 / (\alpha^2 \sigma_W^2)] = (\tau/\alpha)[2 - (\tau/\alpha)] \quad (5)$$

from which one sees that, as expected, if $\tau = 0$ then $\rho = 0$ and if $\alpha - \tau = 0$ so that variations in private wealth do not affect living standards, then $\rho = 1$.

This measure is restricted in a number of ways. It considers only redistribution policies that may attenuate the living standards effects of disparities in the returns on private wealth, not those policies affecting the extent of private wealth inequality or the extent of returns to wealth that would occur in the absence of redistribution. And defining the hypothetical distribution of living standards in the absence of the forms of redistribution associated with our parameter τ presents all of the usual challenges associated with counter factual assumptions. But bearing these caveats in mind we think that estimates of ρ are informative, for example about the contrast between East Asian and Nordic egalitarianism and the affinities between Nordic and forager egalitarianism.

We now proceed to ask if the Nordic economies are exceptional in four possible respects (all considering, where data allow, material, somatic or relational wealth), namely that a) wealth inequality is low, b) the intergenerational transmission elasticity is low, c) inequality in living standards is low or d) combining our answers to a) and c) ρ is substantial. If we do find Nordic distinctiveness in any of these cases, we will ask, where data allow, whether the distinctiveness can be traced to the mid 20th century implementation of the social democratic model, or instead characterized the Nordic nations before that.

3. Material wealth inequality

We first consider non-human wealth as conventionally measured by economists. The kinds of material wealth on which we have data include such disparate categories as land, various species of livestock, household items, shares in whaling canoes, hunting weapons and other tools, grave goods (the

wealth with which one is buried), and ownership of modern capital goods as conventionally measured. Thus problems of comparability of our data are considerably more challenging than those found in more homogeneous data sets (Piketty et al. (2006)), Ohlsson et al. (2006) and Roine and Waldenström (2009)). Where possible we have adjusted the raw data on individual or family holdings of material wealth to make the resulting estimates more comparable across types of wealth (for example, land, livestock, tools) as well as across historical epochs, and economic systems.

The most important comparability adjustment (and the reason why our data differ from many other estimates) is that in our estimates of the Lorenz curves on which the Gini coefficients are based, we have included as members of the relevant population those holding no wealth of a given type (landless farmers in an agrarian economy, for example, or slaves in a slave owning economy). We have also, where possible, aggregated the estimated wealth of couples, and in non-market societies assigned shadow prices to disparate items of wealth (rather than the common practice of simple item counts). But in much of the pre-modern data (both historical, archaeological, and ethnographic) there is an unavoidable source of mis-estimation due to the fact that typically just a single measure of wealth is available (livestock or land, for example, but not both). Where holdings of different kinds of wealth are highly correlated the resulting errors will be modest, as is the case, for example, among the Kipsigis farmer herders of Kenya (where the Gini coefficients for livestock wealth, land wealth, and a composite total wealth are 0.59, 0.56 and 0.55 respectively.) But where the ownership of wealth of different types is not highly correlated then the use of a single measure will substantially overstate the degree of wealth inequality.

Another source of bias is that errors in measurement (likely to be substantial in the earlier data sets) will add spurious wealth differences. Possible downward biases include the much smaller geographical scope of many of the earlier estimates, often referring to single villages or language communities rather than the considerably more heterogeneous populations of nation states to which the more recent data refer. For example, inequality in grave wealth among the entire population of fishers on Columbia Plateau a millennium ago was 0.497, while the average of the inequality within the villages making up the population was 0.454 (we use the former number). We address possible biases arising from differing population sizes in more detail in Appendix D.

Measures of material wealth inequality are available for three of Nordic economies - Sweden, Norway and Finland - and these (shown in Figure 1)

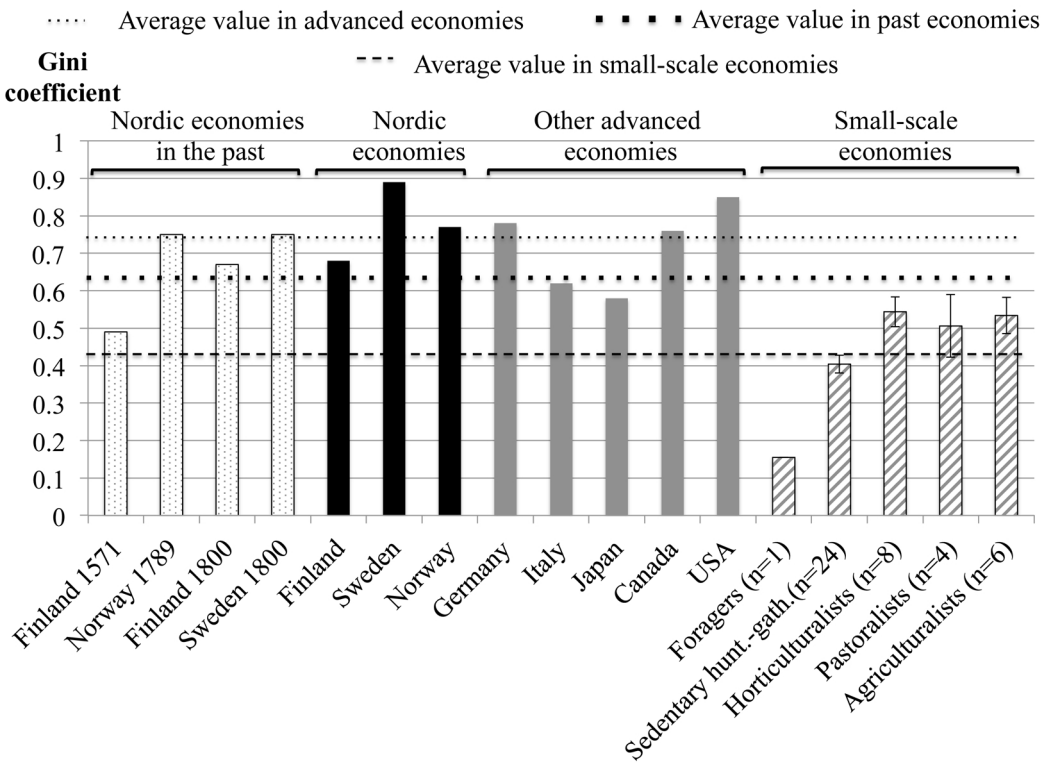

Figure 1: Comparing material wealth inequality in contemporary advanced countries and small-scale societies. The average Gini for past economies (data not shown here) is computed on historical and archaeological sources and excludes the data shown here for both the Nordic economies and the ethnographic evidence from small scale economies. Source: See text and Fochesato and Bowles (2014), LWS (2012), Borgerhoff-Mulder et al. (2009).

rank respectively 4th, 34th and 46th most unequal of the 89 estimates in the data set. (Appendix A.2 presents alternative estimates for Sweden.) If one were to consider our ethnographic estimates from small scale societies as possibly representative of levels of inequality twenty or ten thousand of years ago (in the case of hunter gatherers and those exploiting domesticated species respectively), then the estimates in Figure 1 would reinforce the impression that the wealth distributions of the Nordic economies are not exceptionally equal.

The historical evidence on the Nordic economies is limited, but it is consistent with the conclusions one might draw from the other data in Figure 1. Estimates of Gini coefficients based on tax and probate records of total privately held wealth (including debts and housing) from the beginning of the 19th century (Soltow (1979, 1981, 1985)) are 0.67 for Finland (1800) and 0.75 for both Norway (1789) and Sweden (1800). An estimate from Finland (tax-based) gives a Gini coefficient for material wealth (excluding land) of 0.49 in 1571.

From the available data it appears that the overall distribution of material wealth in the Nordic countries is not substantially more equal in today's technologically advanced capitalist economies under social democratic policies than it was two hundred or more years ago in farming economies under autocratic rule. But this is not the right counterfactual comparison for assessing the effects of the Nordic model: a more illuminating but wholly hypothetical counterfactual would be today's Nordic economies without the Nordic model. A hint of what such a comparison might show, were it possible is that there were significant reductions in the share of wealth held by the top wealth holders in Sweden in the post-World War II period (Ohlsson et al. (2006)), consistent with a strong Nordic model effect. Measures of the inequality of the wealth distribution as a whole are not available for these periods, however, so we are unable to determine if these losses in top shares of wealth represent a Nordic model induced trend towards reduced overall inequality of wealth, or instead were offset by disequalizing changes elsewhere in the distribution.

4. Schooling and human capital

At first glance, the case for Nordic exceptionalism appears much stronger if we turn from material to human capital. In contrast to material wealth, human capital in the Nordic nations quite equally distributed. The mean

Gini coefficient for years of schooling in the Nordic countries is one third of the mean for the non Nordic countries on which such measures are available. Moreover, comparing these schooling data with a heterogeneous set of somatic wealth inequality measures, the Nordic nations appear to be at least as equal in this respect as the most egalitarian economic systems in our data set: foragers and horticulturalists. But years of schooling is not a very good proxy for an individual's somatic and relational wealth, or even for education. If the average quality of schooling is greater for those who complete more years of schooling, for example, then the years of schooling Gini will understate the degree of inequality in education. (At a given level of schooling - that attained by 15 year olds - the Nordic countries are modestly more equal than other high income societies in the levels of cognitive performance measured by reading, science and mathematics scores, so comparisons based on inequality in school years may slightly understate the degree to which the Nordic countries are more equal. See Appendix B.1.)

In view of the shortcomings of years of schooling measures of inequality, we also consider a labor market measure of inequalities in individuals' non material wealth, namely the Gini coefficient for before tax wages and salaries. The centralized wage bargaining characteristic of the Nordic model surely reduces wage inequality (compared to some hypothetical Nordic economy without centralized bargaining) but whether this entails an understatement of inequalities in non material wealth is difficult to say. The reason is that some of the resulting wage compression is due to the elimination of idiosyncratic pay differences associated with place of employment and other individual differences that are not reflective of individuals' non material wealth.

In Figure 2 we present measures of inequality of somatic and relational wealth in the Nordic economies and small scale economies. Relational wealth is measured by an individual's degree in networks of gift exchange, food and labor sharing, and political allies. These data may overstate inequality, as they pertain to quite specific capacities. For example, among the Tsimane, a hunting and horticultural population in Amazonian Bolivia, both skill in hunting and gathering and relational wealth (the number of those who cooperate with the individual in work projects) are quite unequally distributed, but men good at hunting, for example, may not have the most network ties, so a plausible aggregate of these two kinds of wealth would be less unequally distributed than the components measures making it up.

Perhaps the most comparable measures concern the ability of an individual to make a living, that is, wage inequality in the Nordic economies and

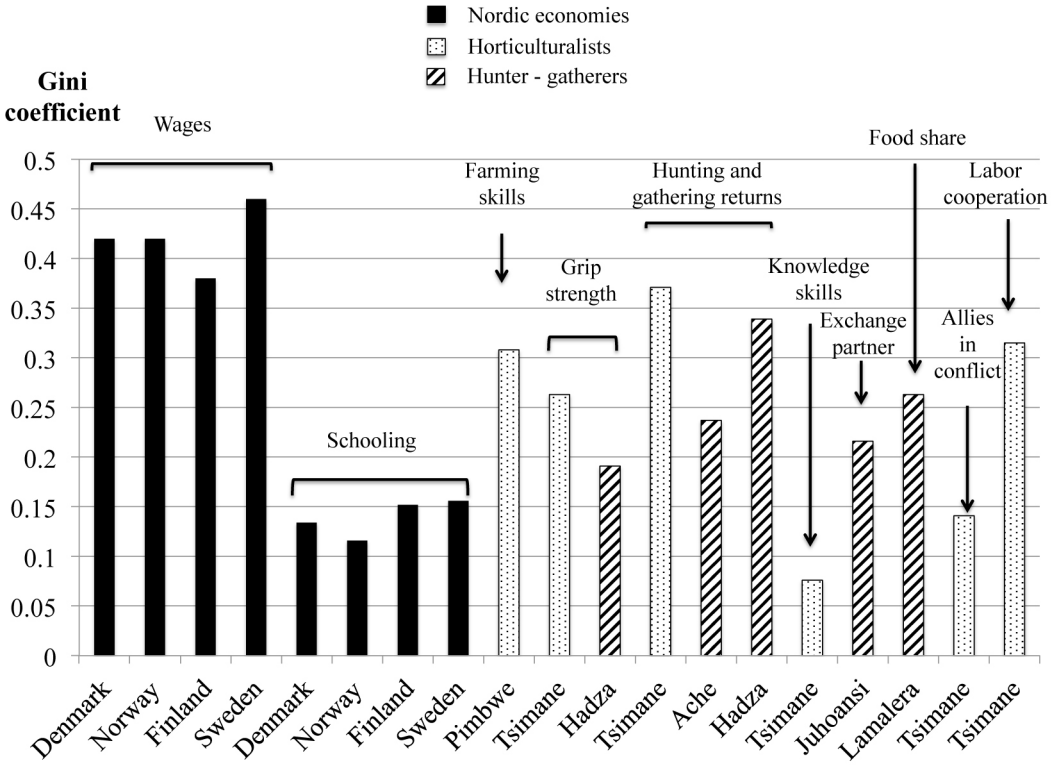

Figure 2: Non-material wealth inequality in Nordic countries and forager and horticultural small-scale societies. Sources: Borgerhoff-Mulder et al. (2009); Brandolini and Smeeding (2007) and Hertz et al. (2007).

inequality in hunting and gathering returns among foragers. By this comparison the Nordic nations are substantially more unequal than the foragers (mean Gini coefficients of 0.42 and 0.25 respectively, $p < 0.001$.)

Turning to a comparison of the Nordic nations with other modern national state scale economies, the Nordic model *per se* is not what accounts for the modest schooling Gini coefficients in Figure 2. Rather, they reflect the fact, common to the set of all nations, that where schooling levels are high years of schooling inequality is quite limited.

To test for Nordic exceptionalism in schooling, we regressed schooling Gini coefficients on the average years of schooling across 38 nations for which data are available (excluding the Nordic nations) and then compared the observed

levels of schooling inequality in the Nordic nations with the expected levels based on the pattern among the non-Nordic nations. We were also able to exploit the cohort structure of our schooling data to explore whether individuals who entered schooling in periods before the Nordic nations could be called social democratic were more differentiated in their eventual years of schooling than those who entered schooling under a social democratic regime. While one cannot give a particular date on which the Nordic model was launched, we let that first "Nordic model generation" in our data set be those born between 1941 and 1950. The results are in the left panel of Figure 3. (The regression details for both panels of Figure 3 are in Appendix B.3).

The regression line in the left panel of Figure 3 gives the expected Gini coefficient estimated from the 38 nation data set (the data from which the regression line is estimated are not shown in the figure), while the empty symbols are the pre-regime shift Nordic cohorts. The Nordic observations both before and following the advent of the social democratic model are no more egalitarian than expected given the average level of schooling for the cohort in question. The advent of social democracy *per se* seems to have had no effect on schooling inequality, conditional on the overall level of schooling (open and closed points alike are very close to the expected level of schooling inequality, given by the regression line.) In both cases, when estimated with the Nordic nations included, the coefficient of a dummy variable for cohorts that are Nordic nation under the Nordic model is of the unexpected sign (Nordic model cohorts less egalitarian), small, and insignificantly different from zero (see Appendix B.3.)

It is possible that the distinctive nature of the Nordic model in this respect was to expand schooling (with lower Gini coefficients then the expected consequence). To explore the possibility of this scenario of a Nordic pro-schooling bias with greater equality in human capital as a result, we regressed between cohort differences in years of schooling on the average level of schooling in the 38 nation data set, finding an inverse relationship shown by the regression line in the right panel of Figure 3. As in the left panel, the regression line gives the relationship based on the 38 nation data set between the level of schooling at time t_{-1} and its increase in the subsequent period. The open symbols above the regression line indicate that compared to other nations, the Nordic nations were markedly (and significantly) more pro-schooling expansion prior to the advent of the social democratic model (conditional on the observed level of schooling, the Nordic nations expanded schooling substantially more than would be expected based on the non Nordic nations'

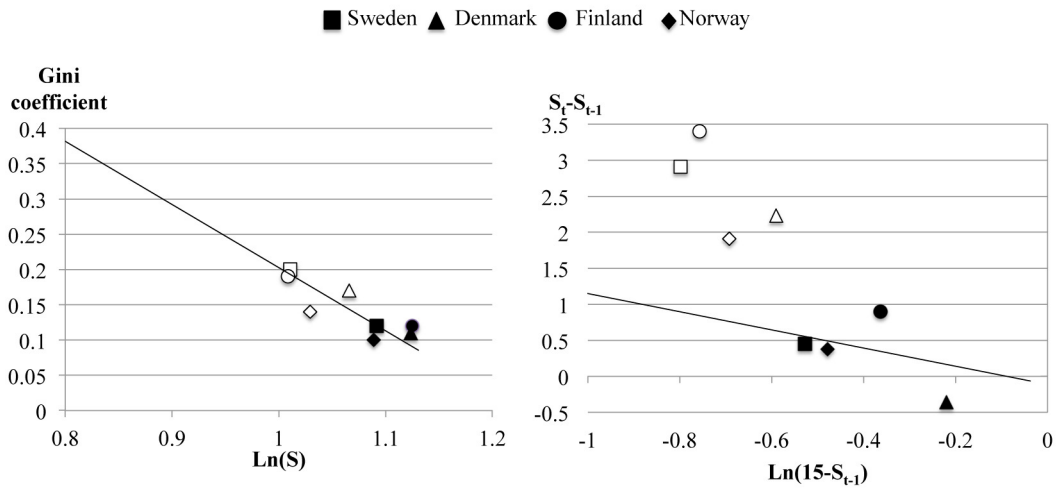

Figure 3: Schooling inequality and schooling expansion compared with expectations based on 38 other nations' data for pre (open symbols) and Nordic (bold symbols) model cohorts. The left panel gives the expected level of schooling inequality based on a regression of Gini for schooling attainment on the natural logarithm of on mean schooling for non-Nordic countries (the line) along with the observed schooling inequality for the Nordic country cohorts The right panel shows (the line) expected cohort difference in mean schooling levels from a regression of the inter-cohort differences in years of schooling ($S_t - S_{t-1}$) on a transformation of initial level of years of schooling (S_{t-1}) along with the values of these two variables for the Nordic nations for the pre Nordic model. Source and methods: see Appendix B.2 and Appendix B.3.

data.) But this is not the case after the adoption of the Nordic model.

5. Nordic exceptionalism: intergenerational mobility in earnings and wealth

The previous two sections show that the Nordic model cannot claim to be exceptionally egalitarian in either the size distribution of material wealth or years of schooling. But as we will see, by comparison to most other advanced economies on which we have comparable data, the Nordic economies are exceptionally egalitarian in that the economic and social status of one's parents matters less in these countries for the eventual success of their children.

Figure 4 presents estimates of the degree of intergenerational transmission of economic status as measured by the elasticity of the adult offspring's economic status with respect to the parents' status. The four estimates from ethnographic evidence in small scale societies are based on age-adjusted levels of somatic, relational and material wealth, using weights reflecting the importance of each wealth type in the economy under study (Borgerhoff-Mulder et al. (2009).) The modern economy data refer to earnings. The two sets of estimates are not directly comparable, of course, but the data are suggestive of the substantial differences in the heritability of economic status across economic systems and also among the advanced economies.

Even taking account of the many reasons for lack of direct comparability, it appears that the Nordic economies may be similar to the hunter gatherer and horticultural societies in the data set, and considerably more mobile than the herding and agricultural small scale societies as well as the U.S. and U.K economies. We selected the data set comparing the Nordic economies with other modern economies because the estimates are more nearly comparable across nations, and because data were available for women as well as men. Alternative estimates (Björklund and Jäntti (2009), Corak (2006)) confirm the contrast between the U.S and U.K on the one hand (joined by Italy and possibly France) and the Nordic nations (joined by Canada). (The transmission elasticities for the Nordic nations (and Canada) are estimated quite precisely, while this is not the case for other nations.)

A check on these estimates is provided by data on the degree to which biological siblings tend to have similar incomes. This is because siblings have in common their parents' wealth, schooling, genes, personalities and other possible direct or indirect influences on labor market success. The comparably estimated data appear in Figure 5, and are broadly consistent

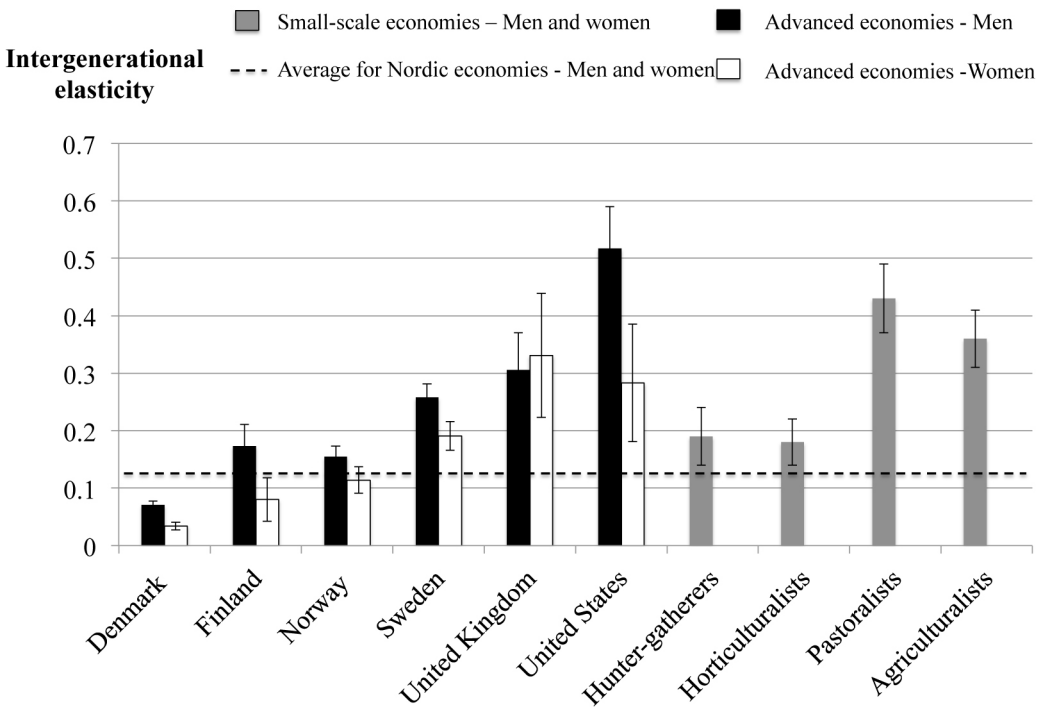

Figure 4: Intergenerational transmission of economic status: comparing small-scale society (total wealth) with contemporary advanced countries (wages). Source: Borgerhoff-Mulder et al. (2009), Jäntti et al. (2006).

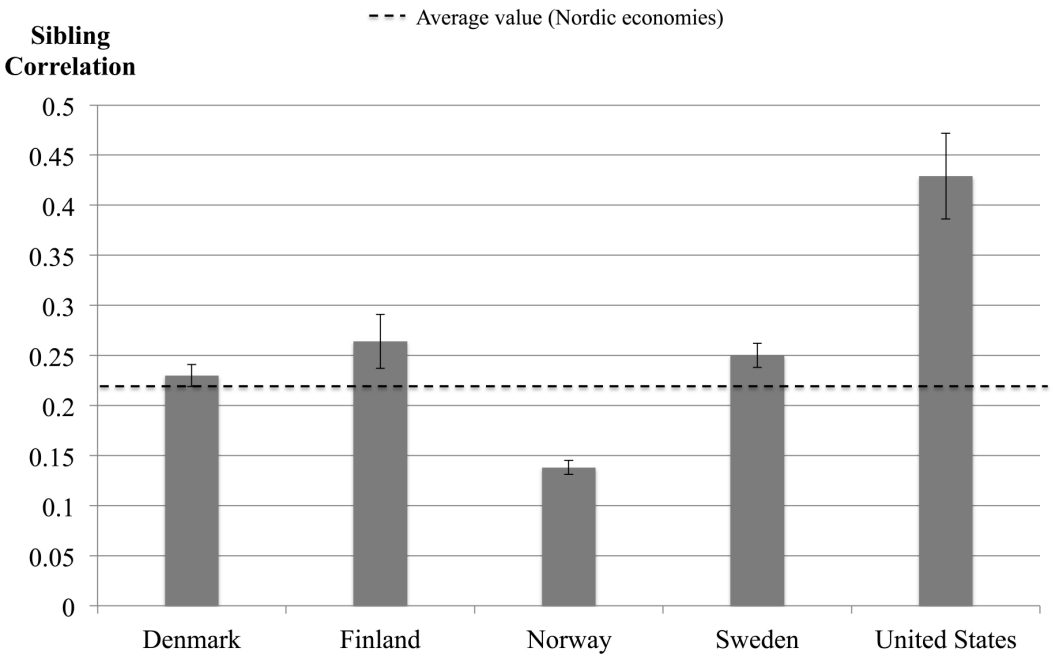

Figure 5: Sibling earnings correlations as an indicator of intergenerational transmission of economic status. Source: Björklund et al. (2002).

with the conclusion from Figure 4. In the case of Sweden, sibling correlations in income fell from 0.49 for the cohort born in 1932-1938 to 0.32 for the cohort born in 1947-1953 with a major contribution to the decline apparently the result of the expansion and associated equalization of years of schooling evident in Figure 3 (Björklund et al. (2009)).

Reliable estimates of the intergenerational transmission of material wealth are few, in part because data sets typically do not include the wealth of more than a single generation at the same age, and few have measures of second generation wealth after the death (and hence bequests) of the parents. Boserup et al. (2013), however, make use of three generations of Danish administrative wealth records to estimate the intergenerational transmission

elasticity, with 0.19 their preferred estimate (note that this is the same magnitude as the intergenerational transmission of aggregate wealth elasticity for foragers shown in Figure 4.) An estimate for the U.S. based on a smaller data set by Charles and Hurst (2003) yields an estimated intergenerational wealth elasticity of 0.365 (but those with zero or negative wealth are excluded and this is a data set in which both parents are still living). The Danish estimate closest in methods and data to this U.S. estimate is 0.268. Because the grandparental generation in this data set did not live as adults prior to the Nordic model's advent in Denmark, we cannot exploit the three generation structure of the data to make inferences about the effects of the model on intergenerational wealth transmission.

While the Nordic economies thus appear to be distinctive in the lesser degree to which earnings and (perhaps) material wealth are transmitted across generations, the result is far from an intergenerational level playing field. First, transmission elasticities for income are typically much greater than the elasticities for earnings shown for the Nordic countries in Figure 4 (in Sweden, for example 50 per cent greater or more depending on the sample Björklund et al. (2012)). Second, quite modest transmission elasticities estimated for an entire population (for example averaging about a quarter for men and women for earnings, as in Sweden) are consistent with the existence of extraordinarily long lived dynasties at the top with income transmission elasticities as high as 0.9 as in Sweden (Björklund et al. (2012)). And finally even a modest transmission elasticity of 0.25 implies (if the parental and offspring distributions of economic success are bivariate normal) that the likelihood that the offspring of parents in the top decile will in adulthood attain the top decile is five times the likelihood that a child from the bottom decile will be similarly successful.

6. Nordic exceptionalism: Intergenerational mobility in schooling

Intergenerational transmission of years of schooling (measured by an approximation of the elasticity of offspring years of schooling with respect to parental schooling) is marginally and insignificantly less in the Nordic nations (on average) by comparison to the average of other advanced economies in our data set (Italy, USA, Switzerland, Flemish Belgium, Netherlands, New Zealand, and Great Britain). But our data set allows us to estimate the degree of intergenerational transmission of years of schooling by cohort, so we can test if the cohorts schooled after the implementation of the Nordic model

exhibit a lesser intergenerational schooling elasticity than those schooled before (as we did in Figure 3 for the size distribution of years of schooling). Results are shown in Figure 6. As before, we define the Nordic model cohorts as those all of whose members would have begun schooling after World War II. Analyzing our cohort data on inter generational schooling elasticities for all of the advanced economies, we find that there is a small insignificant positive "Nordic country" effect large and a significant "Nordic model" effect ($t = -1.98$) indicating that in the hypothetical absence of the Nordic model the degree of intergenerational schooling elasticity would have been a third higher. (Statistical details of regression are shown in Appendix B.4. The pre Nordic-Nordic contrast is considerably greater if rather than elasticities approximated at the means of the two generations, we measure the estimated derivative of schooling of offspring with respect to schooling of parents. The negative Nordic model effect on the intergenerational transmission is about half the magnitude of the effect on the intergenerational elasticity and only marginally significant ($p < 0.157$). We consider the differences between these measures in Appendix B.5, and explain why the correlation coefficient is uninformative for the questions we have asked here.)

This "Nordic model effect" on intergenerational mobility appears also in a quite different data set on educational attainments over four generations in the Swedish city of Malmö. Lindahl et al. (2012) tracked changes in the persistence of social and economic status (measured by years of schooling) over multiple generations spanning a period during which Malmö and Sweden was transformed from the early stages of industrialization to a modern-service oriented economy and welfare state. In this data set the four generations' average birth years were 1898 for the great grandparents, 1928 for the grandparents, 1956 for the parents and 1985 for the current generation. Despite Malmö being in the forefront of the social democratic movement early in the century, it seems unlikely that the grandparents' generation felt the impact of the Nordic model during their formative years in school. The parents and current generation however were schooled in a society shaped by the SAP's long unbroken period in power in the four decades following the depth of the Great Depression.

Did the Swedish variant of the Nordic model significantly reduce the degree of intergenerational transmission of educational attainment? The intergenerational schooling elasticity for two generations (parents and offspring) fell to less than half of its pre-Nordic model values for the generation born in the 50s (compared to the generation born in the 20s). This is consistent with

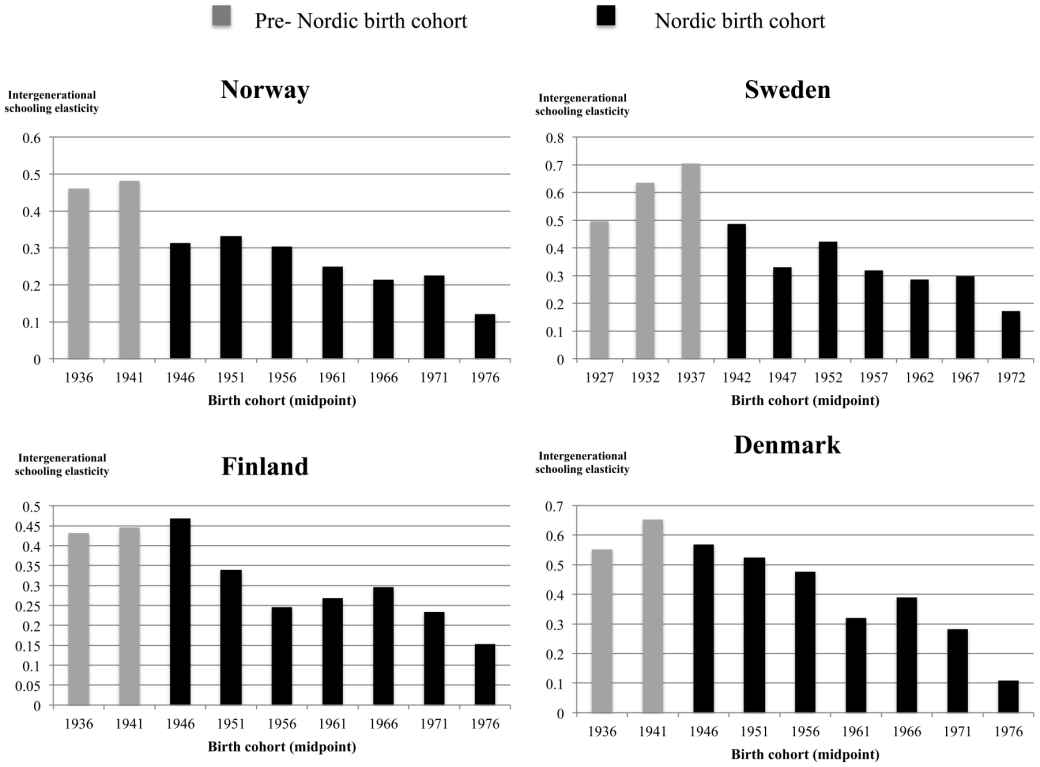

Figure 6: Birth cohort analysis of intergenerational schooling transmission. The bars indicate the intergenerational schooling elasticity estimated at the means of the two generations before (grey) and after (black) the implementation of the Nordic model. Source: Hertz et al. (2007).

the evidence concerning three-generation intergenerational schooling elasticities (estimated by the effect of variations in years of schooling two generations back on the level of schooling attained by the generation in question and the ratio of the mean schooling levels of grandparents and grandchildren.) This three-generation elasticity from the great grandparents born in the 1890s is twice the three-generation coefficient for the grandparents born in the 1920s.

In Figure 7 we present these estimates. Looking at the detailed pattern of transmission coefficients for all possible pairs of intergenerational transmission (from grandmother to father, or great grandfather to mother, and so on) confirms these patterns. The Malmö data are consistent with the conclusion that the Nordic model increased educational mobility (reduced the intergenerational schooling elasticity) over most of the distribution of years of schooling, while sustaining a considerable degree of persistence among the most highly educated. This is a conclusion also consistent with the evidence in Figure 6 combined with remarkable intergenerational persistence of occupational and educational success of those with noble names in Sweden documented by Clark (2013).

7. Nordic egalitarianism: a citizenship model

We conclude from the previous two sections that in terms of economic and social success it matters less who your parents are in the Nordic economies. In this section we will consider a second aspect of Nordic exceptionalism: one's own wealth (both material and human) also appears to matter less as a determinant of ones access to goods and services.

To explore this hypothesis we would like to compare the distribution of wealth (as measured by some aggregate of material and human wealth, for example) and the distribution of well being. The latter would require an adequate measure of an individual's or family's well being including not only purchased goods and services but also the elements of a family's livelihood that are acquired without purchase by dint of location or citizenship, such as non-priced educational, health and personal security services or environmental amenities. Internationally comparable measures that capture at least some of these dimensions are provided in Aaberge et al. (2010) and Verbist et al. (2012).

Stephen Durlauf (1999) distinguished between two inequality generating processes. In the standard process studied in economics one's income (or

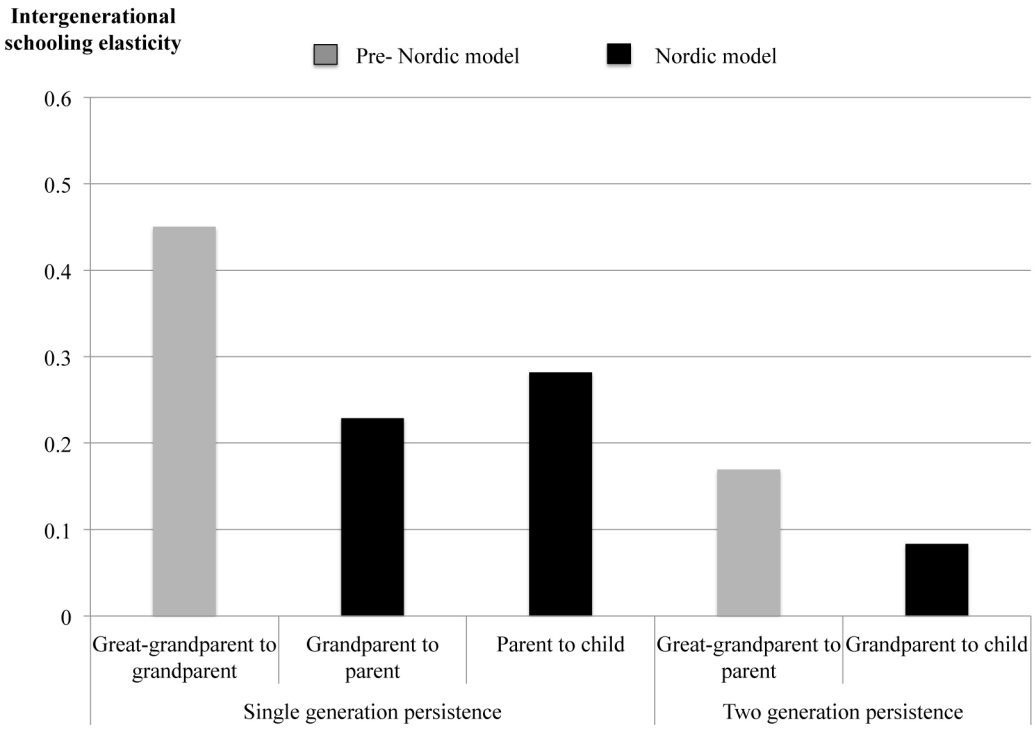

Figure 7: Intergenerational transmission of schooling in Malmö, Sweden. Shown are estimates of the intergenerational transmission elasticity calculated at the means of each generation. Source: Lindahl et al. (2012).

other measure of one's living standard) depends on one's wealth (both material and human). An example of this approach is the model in section 2, above. But in what Durlauf called the membership model what matters is the group or groups to which one belongs. We can use a variant of the membership model to understand the exceptional nature of Nordic egalitarianism, one in which the group to which one belongs is the entire nation, each member of which by dint of citizenship can lay claim to substantial resources.

Available data do not allow an entirely adequate estimate of the extent to which a citizenship model applies to the Nordic nations. The reason is that a substantial fraction of the goods and services that make up an individual's standard of living are not measured comparably across nations, or in many cases not adequately measured at all. Examples include such difficult to measure aspects of well being as personal security and environmental conditions.

The closest approximation of a measure of the extent to which citizens' living standards are independent of their wealth that is comparable across a significant number of economies is based on a comparison of the Gini coefficient for market income (as a proxy for the distribution of wealth, both human and material) and disposable income (as a proxy for living standards). This commonly used measure of tax and transfer redistribution is far from adequate, however. For the reason just mentioned disposable income is a poor proxy for living standards, especially in economies in which publicly provided services constitute a significant fraction of citizens' living standards. Moreover redistributive public policies have direct effects on the distribution of market incomes, as occur, for example when income tax rates affect labor supply through either incentive or Veblen effects (Oh et al. (2012), Prescott (2004)) or egalitarian educational policies affect the distribution of human capital.

The available evidence is in Figure 8, where numbers at the top of the bars are the redistribution ratio (ρ) introduced in Section 2 and measured here as one minus the ratio of the Gini coefficient for disposable income to the Gini coefficient for market income. The average redistribution ratio for the Nordic economies is 0.45 and for the others 0.29 (the two means are significantly different at $p < 0.001$). But the Nordic economies are not unique. Belgium has a greater redistribution ratio than any Nordic nation and the Netherlands is comparable to the Nordic nations as a whole. The two East Asian economies (mean $\rho = 0.06$) differ markedly from the rest by the virtual absence of tax and transfer redistribution. The Nordic nations

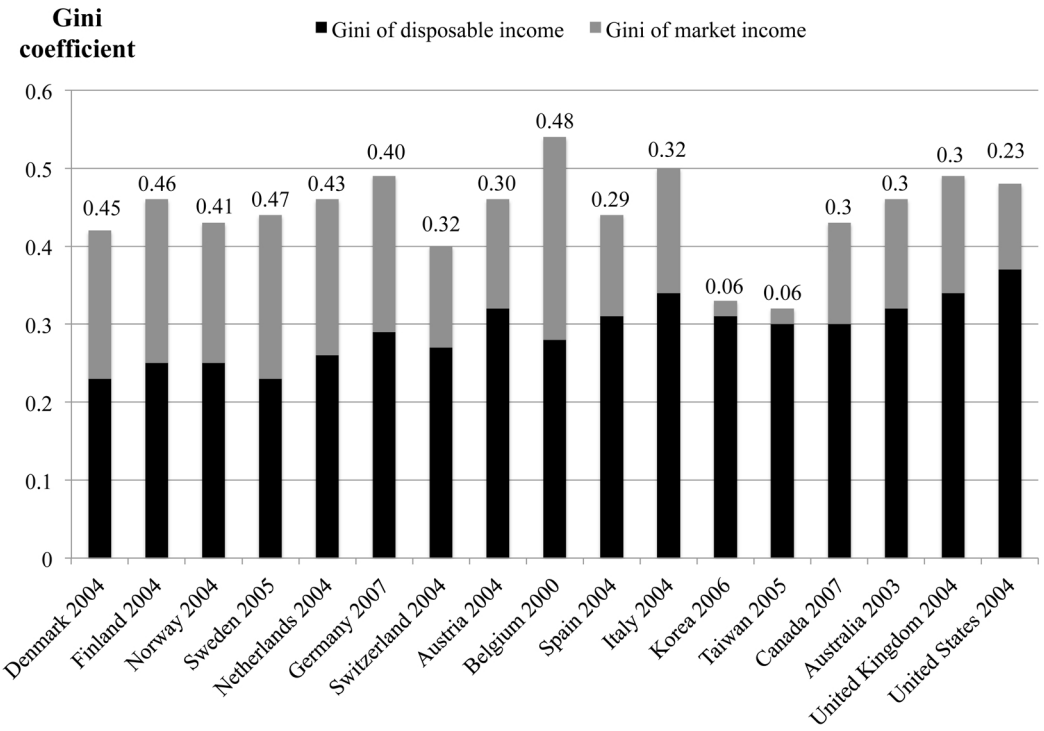

Figure 8: The Redistribution Ratio: Inequality in Disposable and Market Income in Nordic and other economies. (See text). The black segment of each bar gives the Gini coefficient for disposable income, the black plus the grey portion gives the Gini coefficient for market income, so the grey portion is a measure of the extent of redistribution. The redistribution ratio is the number at the top of the bar. Source: Wang and Caminada (2011).

appear to be also modestly more redistributive than the non Nordic nations in the effects of in kind transfers; but a comparison with the exact set of the non Nordic economies in Figure 8 is not possible. (See Appendix C.2 and Figure 10.)

Calculated in this manner the redistribution ratio fails to capture an important Nordic model mechanism that mitigated the effect of wealth differences on differences in well being, namely, the compression of market income inequality through solidaristic wage bargaining and active labor market policies (Moene and Wallerstein (1997)). Wage compression and the centralization of wage bargaining are both characteristic of the Nordic model with the four Nordic nations distinctively high on both measures compared to virtually all other OECD economies (Visser and Checchi (2011)). Were we able to measure these wage compression effects along with tax and transfer redistribution, the distinctiveness of the Nordic countries would almost certainly appear greater.

But the effect may be modest in magnitude. Inequality in earnings of full time fully employed individuals is substantially lower in the Nordic economies than in the countries without centralized wage bargaining (US, UK, Canada, Switzerland, Italy, Australia, Austria, France, Spain). But in calculating the redistribution ratio the measure of interest is market income inequality (not just wage inequality) and here, the Gini coefficient for the Nordic nations is just 0.019 less than in the comparison set of countries. Were we (somewhat speculatively) to have identified this difference as the Nordic wage compression effect, and included it in calculating the redistribution ratio the resulting Nordic average ρ would have risen from 0.45 to 0.47. (See Appendix C.3)

Is the substantial redistribution ratio characteristic of the Nordic economies exceptional in world historic perspective? For the vast majority of economic systems no such measurements are possible. But we do have data on the very considerable fraction of food acquired through one's hunting or gathering activities that is distributed to others (Kaplan and Gurven (2005)) as well as analogous data from horticultural economies in the Amazon. With a bit of exaggeration we can imagine that in these small scale societies, some fraction of all foods acquired is placed in a common pot from which all members consume equally, while the remainder is consumed by the immediate family of the individual who acquired the food (This "common pot" system of distribution is recognizable in public economics as a linear tax on the food that one has acquired followed by equal lump sum transfers.) We consider the right to food simply as a consequence of membership in the group to be

form of Durlauf's associational (or relational) wealth similar to one's position in a social network.

Using this simplification we can estimate the redistribution ratio. To exploit the available data - the average fraction of foods acquired that are allocated to consumption outside the immediate family - a linear version of the model in Section 2 is required, and, as a result, the coefficient of variation of living standards and wealth is the appropriate inequality measure rather than the variance of the logarithms of these quantities. In Appendix C.1 we show that using the coefficient of variation as the measure of inequality the redistribution ratio is simply the fraction of one's food that by dint of membership rights comes from the common pot.

In four forager and four horticultural communities ethnographers have provided detailed measurement of the flow of foods by caloric value from those who acquire them to those who consume them. Based on this evidence, Figure 9 presents estimates of the fraction of the food acquired by an individual that is retained for consumption for his or her family, that is b. The complement of this statistic is ρ itself; and as one can see from the figure the redistribution ratio is substantial, especially in the foraging populations

But like lump sum transfers in the public economics literature, the common pot is an abstraction; many transfers are bilateral, and a family can expect that those receiving transfers will reciprocate. To take account of this small-scale economy aspect of redistribution we define reciprocation as a return transfer expected *as a result* of the initial transfer (namely that would not have occurred in its absence) above and beyond the amount that would have resulted from family ties, genetic relatedness, propinquity and other influences on sharing. The few studies providing data for such an estimate suggest that reciprocation in this narrow causal sense does exist in both forager and horticultural societies, but that it is quite modest (see Appendix E).

If we apply the average reciprocation rate from these to these data we find the average redistribution ratio for the foragers is 0.640 and 0.260 for the horticulturalists. These estimates are used in Figure 10 to compare the redistribution ratio across economic systems, illustrating a distinctive aspect of Nordic egalitarianism (and its affinity to hunter gatherers). We do not have data sufficient to estimate b for farming and herding small scale economies, but ethnographic descriptions suggest that small scale farmers and herders retain a significantly greater portion of the returns to their wealth, and hence the redistribution ratio in these societies would be lower than the hunter

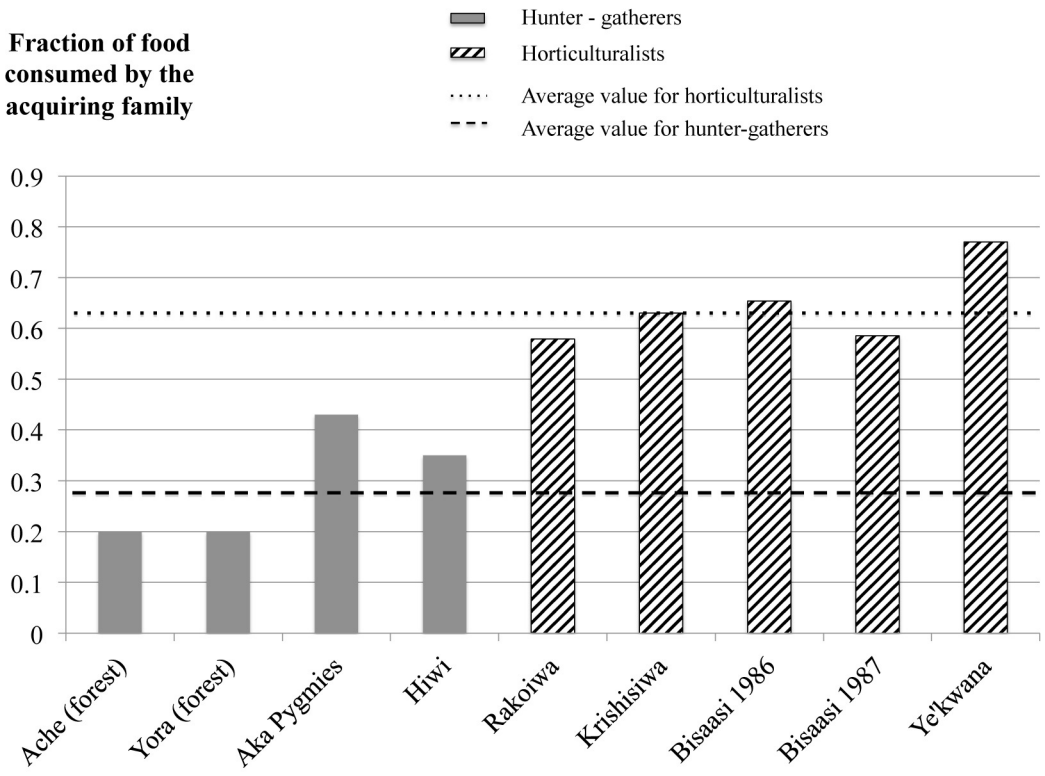

Figure 9: The fraction of food consumed by the acquiring family and the implied redistribution ratio in hunter gatherer and horticultural populations. The fraction of food acquired by a family that is retained and consumed by the acquiring family is an estimate of b in the text immediately above, so the complement of the height of the bars, namely $1 - b = \rho$, is the redistribution ratio. The mean (of these values) of the foragers is 0.295 and of the horticulturalists is 0.643. The difference in means is significant at $p < 0.001$. Source: Gurven et al. (2002); Yora: Hill and Kaplan (1989); Aka: Bahuchet (1990, 1991); Hiwi: Gurven et al. (2000); Rakoiwa, Krishisiwa and Bisaasi (1986 and 1987): Hames (2000); Ye'kwana: Hames and McCabe (2007).

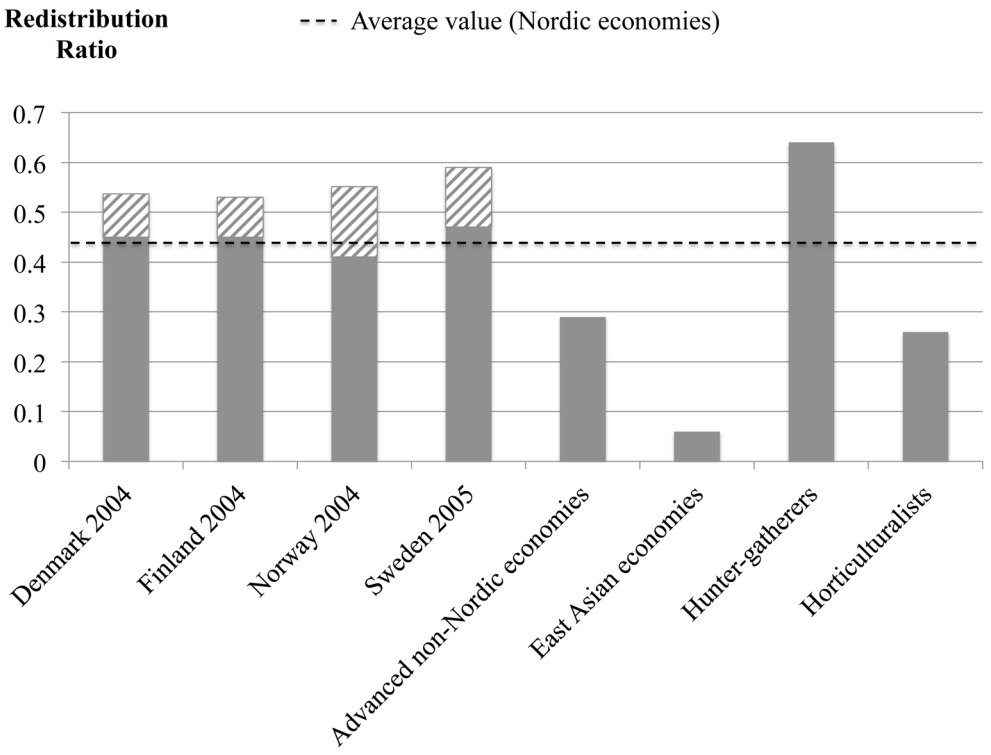

Figure 10: Nordic (almost) exceptionalism: the redistribution ratio across economies. Redistribution ratios for hunter-gatherers and horticulturalists are adjusted for reciprocation. If for greater comparability with hunter-gatherer and horticultural economies we include in the Nordic nations the redistribution accomplished through in kind transfers, the redistribution ratios are given by the dashed additions to the Nordic bars. Comparable adjustments to the non Nordic and East Asian economies in Figure 8 are not possible. See Appendix C.2. Source: Figures 8 and 9 and text.

gatherer populations, or in all likelihood the horticultural societies reported here, as well.

8. Conclusion

Given the heterogeneity of the set of economies and wealth types we have considered, the small and unrepresentative samples on which we have in some cases relied, and the lack of data sufficient to calibrate a complete model of the mechanisms that translate wealth inequalities into inequalities in living standards, we cannot claim precision for the quantitative assessments we have made.

But even with these caveats in mind we can suggest an answer to the question with which we began: in what respects are the Nordic countries exceptionally egalitarian? From the model in section 2 we know wealth inequalities may be limited either if i) the shocks to wealth in a given generation (σ_λ) are modest or ii) the transmission of wealth across generations (β) is limited. We also know that the contribution of inequalities in a particular type of wealth to inequality in living standards may be modest either because iii) the type of wealth is not very important in generating the flow of goods and services on which one's living standards depends (α is small), or because even if it is important in production, iv) its ownership is only weakly related to one's command of goods and services (τ is substantial relative to α).

The egalitarianism of the forager economies in our data set derives from reasons *ii*, *iii*, and *iv* and probably from reason *i* as well. Among foragers, wealth is not very unequal because it is not highly transmitted across generations, and probably because the vast number of wild species exploited by foragers provides a kind of portfolio diversification against shocks. Moreover among foragers the only form of wealth that is observed to be highly unequally held in some societies, that is material, is not very important in the production of goods and services. Moreover, the link between success in hunting and gathering (based on somatic and relational wealth) and one's subsequent consumption is weakened by substantial redistribution within the group.

Evidence on the transmission of material wealth across generations does not allow an adequate comparison of the Nordic and non Nordic nations. A single estimate indicates a lesser degree of transmission in a Nordic nation (Denmark) than in the U.S.. But we just do not have the data allowing a generalization about material wealth transmission across generations in the

Nordic economies. By contrast, the evidence suggests that the Nordic model significantly reduced the intergenerational transfer of years of schooling.

The lesser transmission of human and possibly material wealth across generations affects a kind of long term smoothing of wealth quite apart from the effect of reduced transmission on wealth inequality in each generation. This is because the variance of the multi generation average wealth is just the sum of the variances in each generation plus additional terms involving the covariances among the wealth levels in each generation, and greater intergenerational wealth mobility reduces these covariances. Thus considering a multi-generation consumption-smoothing family, the greater cross sectional equality in living standards in the Nordic nations is understated relative to economies with greater intergenerational transmission of wealth.

We have also presented evidence on the link between one's wealth (material and non material) as indicated by market incomes and one's standard of living (as measured by disposable income.) The connection, that is, mechanism *iv* above as measured by the inverse of the redistribution ratio, is markedly weaker in the Nordic economies than in other economies, with the exception of some forager and horticultural economies and a handful of democratic capitalist nations exemplified by Belgium.

Appendix A. Database composition

Appendix A.1. Description

The difference between this dataset and the pioneering compilation for the analysis income inequality in ancient societies used in Milanovic et al. (2011), is the object on which Gini coefficients are computed. While in Milanovic, Lindert and Williamson indexes are computed on national income aggregates distributed across a population through the construction of social tables, here Gini coefficients refer to distinct types of wealth held by households or individuals. We collected 63 coefficients computed on estimates of household wealth (such as cattle, livestock, housing, movables and immovable), 2 Gini coefficient computed on grave good values (averages of data from a total of 27 burial assemblages) and 24 coefficients computed on land. To make our data as comparable as possible, corrections have been implemented when raw data were reporting wealth owned by individuals rather than by households, when zero-wealth owners were omitted by original documents or when data referred to time intervals rather than single data point. Procedures for data correction are detailed in Fochesato and Bowles (2014).

Appendix A.2. Sweden

Contemporary wealth distribution in Sweden has been object of several empirical researches producing, in one case, what appears to be an outlier. Discrepancies in measurement might be attributed to diverse sources used to estimate inequality. In Davies and Shorrocks (2000), when coefficients are computed on a market-valued wealth survey (called HINK, described in Lindh and Ohlsson (1998)) the Gini coefficient for 1985 net worth in Sweden is equal to 0.59. The average of the 17 other available estimates is 0.84 (0.04). Limits of this dataset, as also observed in Klevmarken (2006), are the absence of adjustment for purchase price differences and the possibility that the tails of the distribution are excluded from the survey. Subsequent studies, such as Statistics Sweden (2000), Klevmarken (2006), Sierminska et al. (2006) (based on the Luxembourg Wealth Survey) and Davies et al. (2012), have computed coefficients based on tax registers. In some cases, as in Sierminska et al. (2006), some of the data have been adjusted for market values, while in Statistics Sweden (2000), Klevmarken (2006) and Davies et al. (2012) no adjustment has been made. In all these cases, Gini coefficients on net worth are never less than 0.78, as shown in Table A.1. Finally, in Flood and Klevmarken (2008), a complex procedure has been implemented to combine tax registers and wealth surveys and to obtain a complete wealth distribution in Sweden, adjusted for price fluctuations. The resulting Gini coefficients on net worth confirm the high estimates found by those authors using only tax registers. Table A.1 shows the Luxembourg Wealth Survey (LWS) based coefficient used in this study and the other estimates found in the above cited literature. The mean absolute difference between our estimate and the others is 0.07.

Appendix B. Schooling analysis

Appendix B.1. Schooling performance from PISA tests scores

Using PISA test scores of various dimensions of cognitive performance among 15 year olds (Ferreira and Gignoux (2011)), we are able to compare average coefficients of variation in Nordic countries to those of other advanced nations. Table B.1 shows statistical details of the Welch's t-test for the three subject matters for which data are available. Also, we merge results of the three tests and compare Nordic countries average score to the one of the other advanced economies (last row in Table B.1). The grand mean for the coefficients of variation being compared here is 0.193, so the

Table A.1: Gini coefficients for wealth distribution in contemporary Sweden. All the estimates are computed on net worth (real and financial assets minus liabilities). * Computed on net worth minus house assets and liabilities with a procedure explained in Fochesato and Bowles (2014). In bold is the estimate we included in our database. Sources: Davies and Shorrocks (2000), Statistics Sweden (2000), Klevmarken (2006), Sierminska et al. (2006), Davies et al. (2012), Flood and Klevmarken (2008), LWS (2012).

Year (1)	**Gini coefficient** (2)	**Source** (3)
1978	0.783	Statistics Sweden (2000)
1983	0.798	Statistics Sweden (2000)
1985	0.808	Statistics Sweden (2000)
	0.590	Davies and Shorrocks (2000)
1988	0.831	Statistics Sweden (2000)
1990	0.838	Statistics Sweden (2000)
1992	0.865	Statistics Sweden (2000)
1997	0.855	Statistics Sweden (2000)
1999	0.860	Klevmarken (2006)
	0.930	Flood and Klevmarken (2008)
2000	0.960	Flood and Klevmarken (2008)
2001	0.840	Klevmarken (2006)
2002	0.850	Klevmarken (2006)
	0.890	LWS (2012)(our computation) and Sierminska et al. (2006)
	0.970	LWS (2012)(our computation)*
2003	0.850	Klevmarken (2006)
2012	0.800	Davies et al. (2012)

Table B.1: Welch's t-test for average coefficient of variations of schooling performance in Nordic and other advanced countries. Nordic countries include Norway, Denmark Finland and Sweden. Non-Nordic countries include Japan, Australia, Canada, United States, Austria, Belgium, Switzerland, France, United Kingdom, Italy, Netherlands, Germany. Data refer to year 2006. Source: Ferreira and Gignoux (2011)

Test (1)	Difference tested (2)	Difference (3)	t (4)	p-value (5)
Reading	mean(non-Nordic) - mean(Nordic)	0.024	1.59	0.090
Math	mean(non-Nordic) - mean(Nordic)	0.019	1.94	0.051
Science	mean(non-Nordic) - mean(Nordic)	0.017	1.61	0.088
All subjects	mean(non-Nordic) - mean(Nordic)	0.020	2.91	0.004

differences between the Nordic and non Nordic nations shown here are quite modest (about ten percent). Only Finland appears to have appreciably and consistently more equal academic achievement than the non Nordic nations.

Appendix B.2. Data origin

Gini coefficients of schooling attainment in contemporary societies have been computed on the dataset provided in Hertz et al. (2007). For each country, average years of schooling have been grouped according to the following 10-year birth cohorts: 1921-30 through 1971-80. For the 1921-30 birth cohort, missing countries are: Sri Lanka, East Timor, Nepal, Malaysia, Northern Ireland, New Zealand, Slovenia, Ukraine, Belgium, Switzerland, United Kingdom, Peru, Estonia, Hungary, Slovakia, Norway, Czech Republic, Denmark, Finland, Indonesia and Italy. Malaysia and Peru are missing for the 1971-80 birth cohort. For the following countries, birth cohorts with a small number of observations have been excluded: Switzerland 1921-30, USA 1921-30, Ireland 1921-30, Nicaragua 1921-30 and Philippines 1921-30.

Appendix B.3. Expected schooling inequality and schooling expansion

Two normalization equations have been used to establish the expected degree of schooling inequality and expected inter-cohort difference in schooling for a given level of average schooling. Because the Gini of years of schooling is statistically associated with the extent of schooling (Gini coefficients are very high when schooling is so rare that most individuals have no schooling

at all), we study the deviation of a country's Gini from that expected on the basis of its average level of schooling. To assess the effect of average years of schooling on education inequality in different political regimes, the following form has been used

$$Gini = b_0 + b_1 ln(S) \tag{B.1}$$

where S is the average years of schooling during the analyzed period. Figure B.1 shows that the Gini is approximately linear in the natural logarithm of schooling. Results of the regression with standard errors of estimate in parentheses are:

$$\begin{gathered} Gini = 1.09 - 0.89 \ ln(S) \\ (0.03) \ \ (0.03) \end{gathered} \tag{B.2}$$

with coefficients estimated using OLS, both significant at 99%, number of observations equal to 38. Both the R^2 and the adjusted-R^2 are equal to 0.94.

An alternative equation, including Nordic countries within observations (pre and post implementation of the Nordic model) and a dummy for Nordic model observations, has been run

$$Gini = b_0 + b_1 ln(S) + b_2 Nordic \tag{B.3}$$

where S is the average years of schooling during the analyzed period and $Nordic$ is the dummy with value 1 if the observation refers to a Scandinavian country after the implementation of the Nordic model. Results of the regression are:

$$\begin{gathered} Gini = 1.097 - 0.894 \ ln(S) + 0.004 \ Nordic \\ (0.03) \ \ (0.03) \qquad\qquad (0.02) \end{gathered} \tag{B.4}$$

with coefficients estimated using OLS, b_0 and b_1 both significant at 99% while b_2 being not statistically significant. Number of observations is equal to 46 and standard errors are in parentheses. Both R^2 and the adjusted-R^2 are equal to 0.94.

To assess the effect of the initial average level of schooling on the variation of the level of schooling in the subsequent period, the following normalization regression has been used based on the natural logarithm of the difference

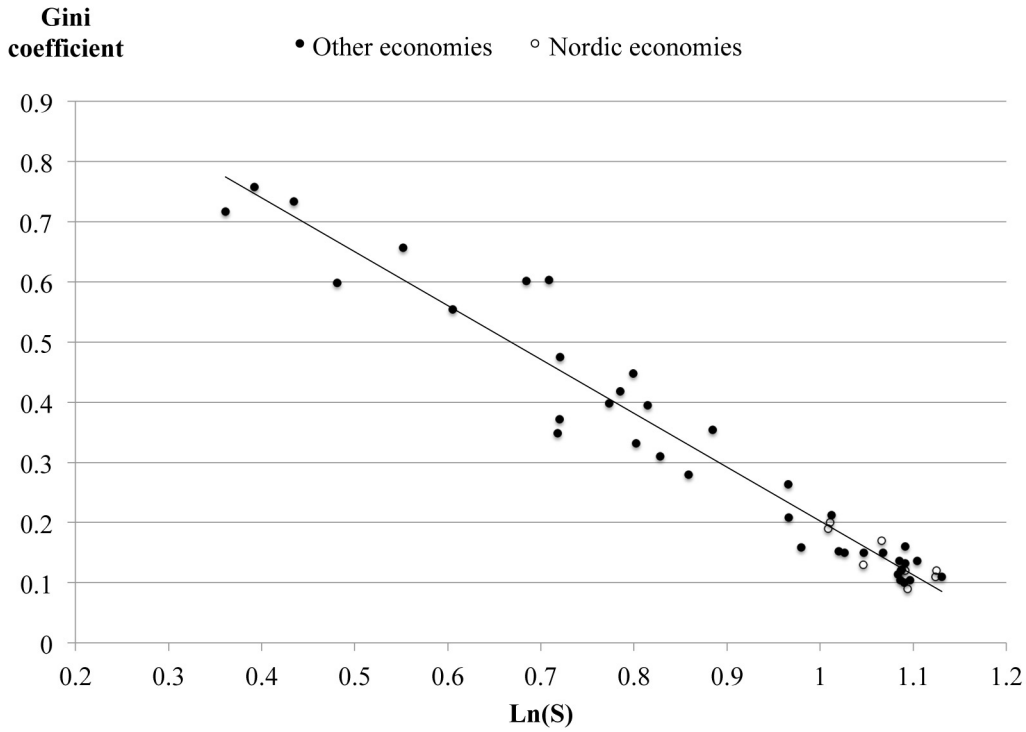

Figure B.1: Schooling inequality varies inversely with average schooling level. (Equation (B.2).) Note: open dots are the Nordic nations, prior to and after the Nordic model's implementation (not used in estimating the equation.)

between the country cohort's level of schooling and 15 (the normalization is selected to achieve an approximately linear relation between schooling level and cohort difference in the in level of schooling.)

$$(S_t - S_{t-1}) = b_0 + b_1 ln(15 - S_{t-1}) \tag{B.5}$$

Equation (B.6) shows details of data used for the regression. The level of schooling predicts the cohort difference schooling with much less precision than is the case for schooling inequality; but given our transformation of average schooling the relation appears approximately linear. Results of the regression are

$$\begin{array}{c}(S_t - S_{t-1}) = 0.11 - 1.26 \ ln(15 - S_{t-1}) \\ \qquad\qquad\quad (0.14) \ \ (0.17)\end{array} \tag{B.6}$$

with coefficients estimated using OLS, b_1 significant at 99%, number of observations equal to 156 and standard errors in parenthesis. The R^2 is equal to 0.29 and the adjusted-R^2 is equal to 0.27. Figure B.2 shows observed values and regression line.

Also in this case, we have run an alternative equation including Scandinavian countries among the observations and a dummy variable for the Nordic model.

$$(S_t - S_{t-1}) = b_0 + b_1 ln(15 - S_{t-1}) + b_2 Nordic \tag{B.7}$$

Results of the regression are

$$\begin{array}{c}(S_t - S_{t-1}) = -0.05 - 1.24 \ ln(15 - S_{t-1}) - 0.09 \ Nordic \\ \qquad\quad (0.15) \quad (0.18) \qquad\qquad\qquad (0.34)\end{array} \tag{B.8}$$

with coefficients estimated using OLS. Only b_1 is significant at 99%. Number of observations is equal to 164 and standard errors are in parenthesis. The R^2 is equal to 0.22 and the adjusted-R^2 is 0.21.

We did not use the Lee and Barro (1997) data set as it does not permit us to implement the cohort analysis on which our comparison of the Nordic model cohort with previous cohorts and our analysis of schooling expansion (Figure 3) is based. But we can check our estimated normalization equation using the Barro Lee data (and the Gini coefficient estimated by Castello and Domenech (2002)) and find that it is virtually identical to that estimated using the Hertz et al data (equation (B.3)). Using the Barro Lee data as in

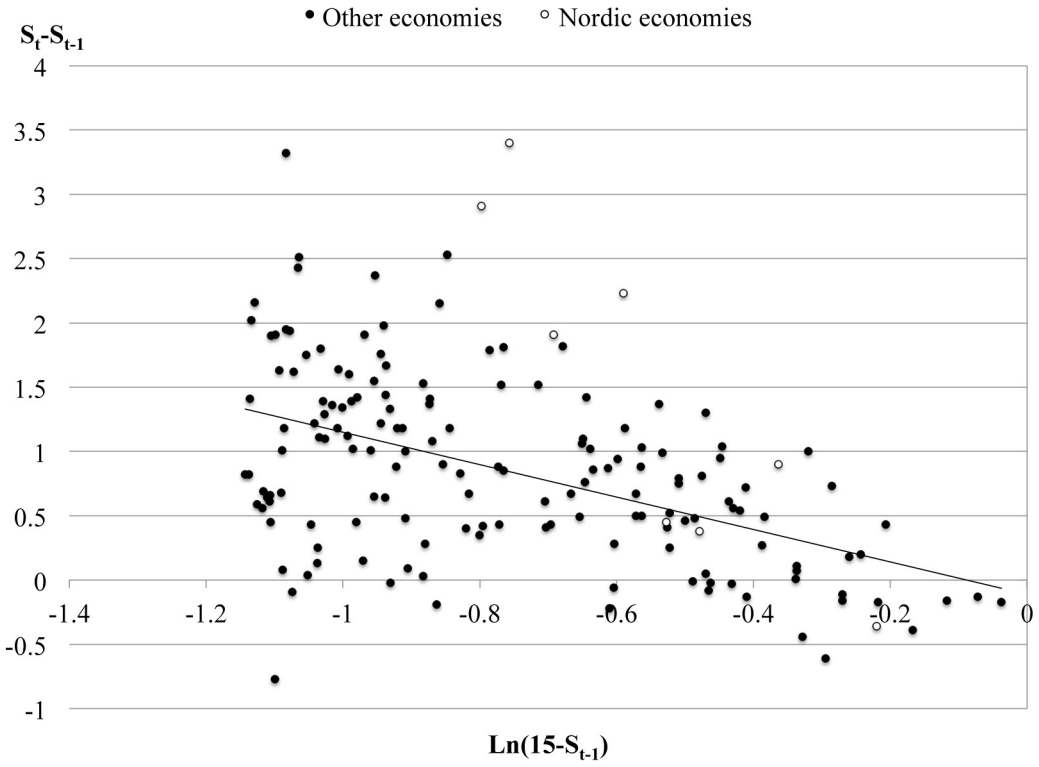

Figure B.2: Inter-cohort difference in schooling varies inversely with the mean level of schooling (Equation (B.6).) Note: open dots are the Nordic nations, prior to and after the Nordic model's implementation (not used in estimating the equation.)

our results reported here, the observed Gini coefficient for years of schooling for Denmark, Norway and Sweden is almost exactly what is expected for their levels of mean years of schooling. Finland, however, is somewhat (but not significantly) more egalitarian than predicted as a result of the seemingly anomalously much lower measured average years of schooling in Finland (by comparison to the other Nordics).

Appendix B.4. Birth cohort analysis of intergenerational schooling transmission

In order to check for Nordic model exceptionalism in intergenerational schooling transmission we have regressed the estimated intergenerational schooling elasticity (ISE) from 5-year birth cohorts for USA, Netherlands, Ireland, Belgium, UK, Italy, Switzerland, Norway, Sweden, Denmark and Finland (n=112) on time ($Year$) and on two dummies for Scandinavian countries, before and after the adoption of the Nordic model (respectively $Nordic_{country}$ and $Nordic_{model}$.) Based on our reading of the historical evidence, children exposed to the Nordic models are those who would have begun schooling after the end of World War II, so the first "Nordic cohort" were born in 1940-1944. Results of the regression with standard errors of estimates in parentheses are

$$\begin{array}{ccccc} ISE = & 0.485 - 0.005\ Year & + 0.025\ Nordic_{country} & - 0.106\ Nordic_{model} \\ & (0.01)\ \ (0.0009) & (0.04) & (0.054) \end{array} \tag{B.9}$$

with $Year$ having a value equal to the midpoint of the birth cohort of observation minus the midpoint of the first Nordic model birth cohort (1942). Coefficients are estimated with OLS. Estimates (not shown) using the 1945-1949 birth cohort as the first Nordic cohort, give very similar results. Were we to use the regression coefficient (derivative of offspring schooling with respect to parental schooling) rather than the elasticity, the Nordic model effect would be considerably larger (relative to the mean estimates).

Appendix B.5. Intergenerational derivatives, elasticities, correlations

What is the appropriate measure of intergenerational transmission of wealth in a model of the dynamics of wealth inequality? Our model in section 2 shows that the intergenerational elasticity allows a simple representation

of the stationary wealth distribution. But are there alternative measures? We would like a measure that captures "how much advantage is passed on from parent to offspring" and that allows a parsimonious representation of the dynamics of wealth inequality under the influence of intergenerational transmission.

Suppose that an individual's wealth (measured in its own untransformed units) is $W_i = A + BW_i^{'} + \Lambda_i$ where the prime ($'$) indicates the previous generation and Λ_i is the error term. If we de-trend the data so that $\underline{W} = \underline{W^{'}}$ then we can express the variance of the stationary distribution as

$$\sigma_W^2 = \sigma_\Lambda^2/(1 - B^2) \tag{B.10}$$

and using the coefficient of variation as our measure of inequality in the stationary distribution, we have

$$c_W = \sigma_W/\underline{W} \tag{B.11}$$

By contrast, the intergenerational correlation coefficient ($\phi_{W,W'}$) does not allow a representation of the stationary wealth distribution. This is because $\phi_{W,W'}$ is B normalized by the ratio of the standard deviations of the wealth measure in the two generations:

$$\phi_{W,W'} = B\sigma_{W'}/\sigma_W \tag{B.12}$$

Thus $\phi_{W,W'}$ measures intergenerational derivative (B) only for a population in which the degree of inequality is unchanging across generations (or more generally the derivative of the second generation wealth with respect to parental wealth when both measures have been normalized to have unit variance.)

If we would like to study changes in the intergenerational transmission of wealth as part of an investigation of changes wealth inequality then movements in the correlation coefficient are uninformative. The reason is that a decline in B is predicted to result in $\sigma_{W'}/\sigma_W > 1$ and this may also occur due to whatever policies reduced B. So if the trend towards greater equality in the cross section (represented by $\sigma_{W'}/\sigma_W > 1$) is sufficiently great, the intergenerational correlation coefficient could increase, despite a fall in B.

This is more than a hypothetical possibility. That this seemingly paradoxical result occurred in a large international comparative study is the major finding of the authors who produced our schooling data set, Hertz et al.

(2007): there is a significant downward trend in the regression coefficients (B) and a slight (and insignificant) upward trend in the correlations ($\phi_{W,W'}$, Figure 1). A similar pattern is evident in the correlations reported in Lindahl et al. (2012), namely a significant downward trend in B, and no trend or possibly upward trend in $\phi_{W,W'}$ (Table 3).

Consistent with our model in section 2 we have used intergenerational elasticities rather than simply the derivative B. Our approximation of the elasticity at the means is

$$\beta = B\underline{W}^{'}/\underline{W} \tag{B.13}$$

These "faux elasticities" are not the true elasticities that would be estimated from an equation using the natural logarithms of the wealth measures of the two generations, a procedure that is typically impossible with wealth measures (including years of schooling) due to the presence of individuals with zero wealth.

Comment. The extent of intergenerational transmission of wealth may be of interest in its own right (rather than as part of the explanation of stationary wealth inequality), for example in normative discussions of violations of equality of opportunity. For this purpose the measure one finds informative depends on the metric in which the advantage parents pass on to their children is to be measured. The educational advantages of those with well educated parents might be conceived of as the further learning associated with years of schooling, implying the use of B; or perhaps years of schooling relative to the general level of schooling in the population, in which case β would be appropriate. Only if the advantage is conceived entirely relatively, that is the passing on of ones position in a distribution, would $\phi_{W,W'}$ be appropriate.

Appendix C. The Redistribution ratio

Appendix C.1. A linear version of the redistribution ratio

We are interested in inequalities in individual well being measured by food consumption (Y_i) among n members of a group ($i = 1, \ldots, n$) in which food may be acquired as a result of one's own wealth measured by individual hunting and gathering returns (W_i) and, independently of W_i, as a right to an equal portion of food from "the common pot." We simplify by letting each member of the group derive the same level of well being, A, from membership, so that we have $Y_i = A + bW_i$ where b is the effect of variations in individual

i's wealth on her well being. We normalize the population mean well being, and set this equal to the mean wealth of the group so that $\underline{Y} = 1 = \underline{W}$. Using these normalizations, our data on the average and marginal tax rate $(1 - b)$ is an estimate of A, that is, $A = (1 - b)$.

To determine the redistribution ratio, ρ, from these data we use estimates of the coefficient of variation of wealth and living standards, c_W and c_Y respectively, with $\rho = 1 - (c_Y/c_W)$. Because $\underline{Y} = 1 = \underline{W}$ we have $c_Y = \sigma_Y/\underline{Y} = \sigma_Y$ and $c_W = \sigma_W/\underline{W} = \sigma_W$, and noting that $\sigma_Y^2 = b^2\sigma_W^2$ we have $c_Y = (b^2\sigma_W^2)^{1/2} = b\sigma_W$, so $c_Y = bc_W$ and as a results $\rho = 1 - b = A$. Thus the redistribution ratio is the fraction of food that any individual gets from the common pot by means of membership rights.

Appendix C.2. The redistribution ratios when disposable income includes in kind transfers

We take Gini coefficients on market income, $Gini_{market}$, from Wang and Caminada (2011) and Gini on disposable income plus in kind transfers, $Gini_{in-kind}$, from Verbist et al. (2012), and, for the contemporary countries for which both estimates are available (not identical to the set of nations in Figure 8), we compute the redistribution ratio as:

$$\rho = 1 - (Gini_{in-kind}/Gini_{market})$$

Results are shown in Table C.1. The average redistribution ratio for Nordic countries (0.55) is significantly higher than the mean redistribution ratio for non-Nordic nations (0.47) at at the 99% confidence level.

Appendix C.3. The effect of wage compression on redistribution ratio in Nordic countries

According to Visser and Checchi (2011), we distinguish two groups of countries with respect to the degree of bargaining centralization:

i Nordic countries, with high degree of bargaining centralization: Finland, Norway, Sweden, Denmark;

ii Non-Nordic countries, with low degree of bargaining centralization: US, UK, Canada, Switzerland, Italy, Australia, Austria, France, Spain.

Wage compression effect is estimated as the difference between average market income in group *ii*, 0.457, minus average market income in group *i*, 0.438, and it is equal to 0.019.[2] We add the wage compression effect to Gini on mar-

[2]Gini on market income are from Wang and Caminada (2011).

Table C.1: Redistribution ratios in advanced contemporary countries when disposable income includes in kind services

Country **(1)**	$Gini_{market}$ **(2)**	$Gini_{in-kind}$ **(3)**	**Redistribution ratio** **(4)**
Denmark	0.419	0.194	0.53
Finland	0.464	0.218	0.53
Norway	0.43	0.193	0.55
Sweden	0.442	0.181	0.59
Netherlands	0.46	0.22	0.52
Germany	0.49	0.249	0.49
Austria	0.46	0.219	0.52
Belgium	0.54	0.209	0.61
Spain	0.44	0.248	0.44
Italy	0.5	0.262	0.48
Canada	0.43	0.259	0.40
Australia	0.46	0.26	0.43
United States	0.48	0.303	0.37

ket income and compute new redistribution ratios for Nordic countries. Table C.2, column (2), shows redistribution ratios used in the text, while new values, obtained when market incomes are adjusted for wage compression effect, are in column (3). Average redistribution ratio increases from 0.44 to 0.47.

Appendix C.4. Statistical differences across groups of societies

The redistribution ratio for contemporary advanced countries has been defined as $\rho = 1 - (Gini_{disp}/Gini_{mark})$ where $Gini_{mark}$ is the Gini coefficient computed on market income and $Gini_{disp}$ is the Gini coefficient computed on

Table C.2: Wage compression and redistribution ratio in Nordic countries

Country **(1)**	**Redistribution ratio** **(2)**	**Redistribution ratio-adjusted market income** **(3)**
Finland	0.46	0.48
Norway	0.41	0.44
Sweden	0.47	0.50
Denmark	0.45	0.47

Table C.3: Welch's t-test for average redistribution ratios across different societies.

Test (1)	Difference tested (2)	Difference (3)	t (4)	p-value (5)
i	mean(non-Nordic) - mean(Nordic)	-0.156	-4.30	0.0003
ii	mean(small scale) - mean(Nordic)	-0.018	-0.31	0.3787
iii	mean(forager) - mean(Nordic)	0.146	2.85	0.0261
iv	mean(horticultural) - mean(Nordic)	-0.151	-4.62	0.0019

disposable income. Welch's t-test is used to check the difference of redistribution ratios among the following groups of societies:

i Four Nordic countries (Finland, Denmark, Norway and Sweden) and 11 contemporary advanced countries (Netherlands, Germany, Switzerland, Austria, Belgium, Spain, Italy, Canada, Australia, UK, US) in 2010;

ii The four Nordic countries and a group of 9 forager (Ache, Yora, Aka Pygmies, Hiwi) and horticultural (Rakoiwa, Krishisiwa, Bisaasi 1986, Bisaasi 1987 and Ye'Kwana) small-scale societies;

iii Nordic countries and the 4 forager small-scales societies in point (ii);

iv Nordic countries and the 5 horticultural small-scales societies in point (ii).

Table C.3 shows that the mean value of redistribution ratios in Nordic countries is statistically significantly higher (at the 99% confidence level) than the mean in non-Nordic contemporary countries and horticultural societies, rows (i) and (iv). Average ratios for Nordic countries are not statistically significantly higher than mean redistribution ratios for the whole set of small-scale societies or for the forager ones, rows (ii) and (iii).

Appendix C.5. Using a different concept of redistribution ratio

For 7 advanced countries, the redistribution ratio could also be defined as $\rho = 1 - (Gini_{disp}/Gini_{wealth})$, where the Gini on net worth ($Gini_{wealth}$) substitutes for the Gini on market income. New and old ratios are shown in Table C.4.

Table C.5 reports results of the Welch's t-test when the two different ratios are used:

Table C.4: Income and wealth based redistribution ratios

Country (1)	**Income based** (2)	**Wealth based** (3)
Finland	0.46	0.63
Sweden	0.47	0.74
Norway	0.41	0.67
Germany	0.40	0.62
Italy	0.32	0.45
Canada	0.30	0.60
USA	0.22	0.56
Average	**0.36**	**0.61**

Table C.5: Welch's t-test for income and wealth based redistribution ratios differences across contemporary countries.

Red. ratio (1)	**Difference tested** (2)	**Difference** (3)	**t** (4)	**p-value** (5)
Wealth based	mean(non-Nordic) - mean(Nordic)	-0.120	-2.39	0.0243
Income based	mean(non-Nordic) - mean(Nordic)	-0.135	-3.34	0.0102

The results show that for both wealth and income based redistribution ratios, the mean value for non–Nordic countries is significantly lower than the one of Nordic countries at 95% confidence interval.

Appendix D. Size effect on material wealth inequality comparisons

Because larger and more populous entities may be more heterogeneous with respect to both environmental (e.g. land quality) and individual differences (e.g. culture) affecting wealth, comparability across our estimates requires that possible size effects be accounted for. In Fochesato and Bowles (2014), we explore these size effects. Gini coefficients estimated from larger entities are larger in our data set, but this appears to be entirely the result of the fact that estimates from larger entities are from economic systems associated with substantial inequalities, not from size *per se*. In three cases for which we have estimates of Gini coefficients from both lower level entities and the aggregate for these entities as a whole - late medieval Finland and two sites in pre-historic North America - there seems to be little effect of size beyond populations of a thousand. For late medieval Finland, the Gini coefficients for lower level population groups (such as parishes) average about 95% of the level of Gini coefficients of the higher level entities that they make up (such as districts).

Appendix E. Estimated redistribution ratio for hunter gathers and horticulturalists

To take account of reciprocated food sharing among horticulturalists and hunter-gatherers, we define r, as the fraction of the quantity transferred from family A to family B that is reciprocated in transfers from B to A in the causal sense: the initial transfer from A to B *per se* is the cause of the return transfer rather than genetic relatedness, spatial proximity and other correlates of transfers. In this setup, the family now retains a fraction of its wealth equal to the part not contributed to others (b), plus the reciprocation by others of the family's transfers $r(1-b)$, and the amount consumed from the common pot is now the amount that families do not retain minus the amount that is reciprocated to other families (rather than going to the common pot) or $(1-b)(1-r)$, so the individual's well being can now be written

$$Y_i = A^* + b^* W_i = (1-b)(1-r) + [b + r(1-b)]W_i \tag{E.1}$$

Thus the redistribution ratio adjusted for reciprocation is

$$\rho = 1 - b^* = 1 - [b + r(1-b)] \tag{E.2}$$

The few studies providing data for an estimate of r suggest that reciprocation does exist but that it is quite modest. For Hiwi (Gurven et al. (2000), Table 7) and Ache forest foragers (Gurven et al. (2002) Table 4), Gurven and his co authors found reciprocation rates for all foods of 0.184 and zero respectively. For sedentary Ache horticulturalists (Gurven et al. (2002), Table 4) the reciprocation rate (also for all foods) was 0.27. These estimates are of course unlikely to be representative of the full range of foraging and horticultural populations. If we nonetheless applied the average of the two foraging reciprocation rates (0.092) to the foragers in the Figure 9 and the sedentary farming Ache rate (0.27) to the horticultural populations, the average effective tax rate $(1 - b)$ for the foraging populations would fall from 0.705 to 0.640 while that for horticulturalists would fall from 0.357 to 0.260. These are the numbers used in Figure 10.

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