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1156 15th St NW Suite 700
Washington DC 20005
202-545-6002

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Abstract: We compute rates of absolute upward income mobility for the 1960-1987 birth cohorts in eight countries in North America and Europe. Rates and trends in absolute mobility varied dramatically across countries during this period: the US and Canada saw upward mobility rates near 50% for recent cohorts, while countries like Norway and Finland saw sustained rates above 70%. Decomposition analysis suggests that differences in the marginal income distributions, especially the amount of between-cohort income inequality, were the primary driver of differing mobility rates across countries. We also demonstrate that absolute mobility rates can be accurately estimated without linked parent-child data.

The hope that standards of living rise from one generation to the next is widely shared across the world. In the United States, this goal is often considered part of the "American Dream." Yet the extent to which different countries realize this goal is not well known. Recent research has shown that in the United States, upward absolute income mobility—the likelihood that children grow up to have higher real incomes than their parents—has declined substantially over the last fifty years. Roughly 90% of US children born in 1940 grew up to earn more than their parents at age 30, compared to just 50% of the 1984 birth cohort (Chetty et al. 2017). But the United States is unusual among high-income countries along a number of dimensions that may impact absolute mobility, including its low levels of relative social mobility (Corak 2006), its high levels of inequality in market income (Piketty, Saez, and Zucman 2017), and its comparatively underdeveloped welfare state (Esping-Andersen 1990). This raises the question: have other countries also experienced declines in absolute income mobility, or is this an area in which the US is exceptional?

In this paper we present trends in absolute income mobility for a selection of North American and European countries: Canada, Denmark, Finland, the Netherlands, Norway, Sweden, the United Kingdom, and the United States. In doing so, we make three contributions to the literature on intergenerational income mobility. First, we show that both levels and trends in absolute mobility varied substantially across these countries for cohorts born in the late 20th century. The United States appears to have been unusual but not unique in both the magnitude of its mobility decline and the low upward mobility rate that currently pertains. Some countries, most notably Norway and Finland, have had both higher and more stable rates of upward mobility in recent generations, with Norway in particular maintaining a steady upward mobility rate of roughly 75% for the 1964-1983 birth cohorts. Other countries, such as the UK and the Netherlands, have had similarly high rates of mobility but with fluctuations, especially in recent years, that appear

to reflect variation in macroeconomic conditions. Alternative specifications highlight the importance of national economic institutions and demographic trends—most notably declining marriage and cohabitation rates—in shaping absolute income mobility.

Second, we provide direct validation of an increasingly common method to estimate absolute mobility rates by combining separate datasets on the marginal income distributions of parents and children and the parent-child income rank transition matrix, or copula. This "copula and marginals" approximation is emerging as the most widely used method of calculating absolute income mobility (Berman 2018; Bönke, Harnack, and Luthen 2019; e.g. Chetty et al. 2017). The approach does not require linked parent-child records, which makes it possible to calculate absolute mobility in the absence of high quality panel data. But it has not yet been directly tested through comparison to linked data. We conduct such a test here in five countries where both types of data exist, and show that the copula and marginals approach provides an accurate approximation of the true absolute mobility rate.

Third, we use decomposition analysis to show that differences in mobility between countries stem largely from differences in levels of income inequality and economic growth rates, as opposed to differences in the likelihood of children moving up or down in relative terms. While Scandinavian countries have had higher rates of relative mobility than the US, these largely net themselves out: anytime one child moves up the income ladder, other children necessarily move down. Patterns of absolute mobility are determined much more by marginal income distributions than by rank associations between children and parents (Berman 2018; Bukodi, Paskov, and Nolan 2019). In the case of the United States, low mobility rates exist not because the US economy has grown more slowly than the economies of other high-income countries, but because the US is less efficient at translating economic growth into higher standards of living for its populace.

Prior Research

Scholars of intergenerational mobility distinguish between absolute mobility, which compares the raw outcomes of children and parents—in this case their inflation-adjusted income—and relative mobility, which compares their rank or relative position in their respective distributions, adjusting for population-wide changes such as economic growth. Most previous research on intergenerational income mobility has focused on relative mobility: the association between the adult incomes of parents and children, often operationalized using the intergenerational elasticity of income or the correlation between the income rank of children and that of parents (Jäntti and Jenkins 2015; Torche 2015). A large literature has compared relative mobility rates across countries, generally finding that it is high in the Nordic countries and Canada, midrange in countries like Germany and Japan, and low in countries like Italy, the UK, and the US (Bratberg et al. 2017; Corak 2016; Smeeding, Erikson, and Jäntti 2011).

Very recently a number of researchers have turned to absolute income mobility, motivated by the high salience of absolute comparisons among laypeople (Amiel and Cowell 1999; Ravallion 2018) and its straightforward normative interpretation: while one person's upward mobility in relative terms necessarily comes at the expense of someone else's downward mobility, upward mobility in absolute terms does not. Individual studies have estimated absolute mobility rates for recent cohorts of roughly 50% in the US (Chetty et al. 2017), 53% in Canada (Ostrovsky 2017), 70% in Germany (Bönke et al. 2019; Stockhausen 2018), and 77% in Sweden (Liss, Korpi, and Wennberg 2019).

While no prior study has compared upward mobility rates across developed countries using comprehensive intergenerational administrative and survey data, Berman (2018) approximates mobility rates from countries' marginal income distributions alone. His findings suggest that upward mobility declined over the

second half of the 20th Century in 10 countries, and confirm that absolute mobility is determined largely by the marginal income distributions of parents and children, echoing findings for social class (Bukodi et al. 2019; Erikson and Goldthorpe 1992; Torche 2015). These are promising initial results that call for a fuller analysis using richer, inter-generationally linked administrative data.

There are reasons to expect that the countries in our sample might vary in their mobility trends. Although all have market economies, they differ substantially in their economic institutions and recent macroeconomic histories, in ways that might impact absolute mobility. One such potential driver is the extent to which countries exhibit cross-cohort inequalities. Esping-Anderson famously distinguished between English-speaking "liberal", Scandinavian "social democratic," and continental European "conservative" welfare states, which take very different approaches to managing the risks created by markets. Chauvel (2010; Chauvel and Schroder 2014) shows that conservative welfare states, which offer strong protections but tie many of them to employment, can have the effect of creating cross-cohort inequality, advantaging cohorts who come of age in a strong economy and are able to begin their careers in high-quality first jobs.

Liberal welfare states, most notably that of the US, have also seen cross-cohort inequalities increase. Guvenen et al. (2017) show declining median lifetime incomes for US men in the 1967-83 birth cohorts, which they attribute to income differences in the early years in the labor market. Concomitantly to these income pressures, marriage and family formation have been delayed (Ruggles 2015). Social democratic welfare states offer both a wider array of public goods and protections against adverse life events that are not tied to employment status (DiPrete 2002). In such countries younger cohorts could be expected to see similar income growth relative to prior generations.

Macroeconomic trends also differ across our sample countries. Sweden, for instance, suffered a major recession in the early 1990s, but was less impacted by

the Global Financial Crisis which began in 2007 (Domeij and Flodén 2010). Other countries in our sample—notably the US, the UK, Denmark, and the Netherlands—were more impacted by the Financial Crisis, while Norway, Finland, and Canada have had somewhat calmer recent macroeconomic histories (Eurostat 2020). The US saw a much larger increase in income inequality than any other country in our sample over the last four decades, which was a major driver of its declining absolute income mobility (Alvaredo et al. 2017; Chetty et al. 2017).

The remainder of this paper makes three contributions to the literature described here. First, we present a comparative analysis of trends in absolute income mobility across eight high-income countries using high quality administrative and survey data that require minimal assumptions for the computation of income mobility rates. We use a range of specifications to isolate the role of the various demographic, economic, and institutional differences across these eight countries. Second, we provide the first direct validation of the "copula and marginals" approximation that is rapidly becoming a standard approach for estimating absolute mobility in the presence of data limitations (Berman 2018; Bönke et al. 2019; Chetty et al. 2017). Third, we identify drivers of variation in mobility rates across countries, specifically noting the importance of cross-national differences in income inequality, especially the share of total national income going to young adults.

Data and Methods

Because the type, time period, format, and quality of data differ across the countries in our sample, the data and methods that we use vary somewhat from country to country. An overview comparison of the specifications used across all countries is provided in Appendix 1, and detailed descriptions of the exact data, methods, and specifications used in each country are provided in Appendix 2. The

approaches that we use fall into two main categories. For countries where register data that link children to parents and track incomes over time are available—Canada, Denmark, Finland, the Netherlands, Norway, and Sweden—we calculate absolute mobility directly. We measure the household incomes of children and their parents when each is age 30. We then adjust for inflation using each country's consumer price index,[1] and compute the fraction of children whose incomes exceed their parents'.

For the US and the UK, where linked register data are not available, we use the "copula and marginals" approach introduced by Chetty et al. (2017). This involves constructing a copula, or parent-child income rank transition matrix, for the subset of the data where linked income information is available for parents and children. The marginal income distributions for parents and children for a range of birth cohorts can then be combined with this copula to compute the overall absolute income mobility rate. This approach does not determine whether any individual child out-earned his or her parents, but it does provide an accurate estimation of the upward mobility rate in total, as we show below using data from countries where both linked data and copulas and marginals are available.

With both approaches, we compute an initial specification that compares the family incomes of children (self plus spouse or cohabiting partner) at age 30 with those of their parents at the same age, and a second specification at age 40. We measure parent age using the father in Norway; the father if available and the mother if no father is present in Denmark, Finland, the Netherlands, and Sweden; and the parent earning the higher income in Canada, the UK, and the US. We limit

[1] The proper way to measure inflation has long been debated (Abraham, Greenlees, and Moulton 1998; Boskin et al. 1997). Challenges include how to account for consumers' substitution of goods due to changes in price, how to quantify the benefits of technological advances, and how to create one summary index that is valid for people with a range of income levels and purchasing habits (Jaravel 2019). While a perfect price index is impossible, governments must construct some measure of changes in the price level for the purposes of macroeconomic policymaking. Those are the measures that we use here. It is possible that our results may be sensitive to the use of alternative price indexes, and scholars working in specific countries where multiple price indexes exist may wish to replicate our analysis using alternative price indexes. Such an analysis for all eight countries is beyond the scope of this paper.

our sample to children born in the country everywhere except Canada, where children are included if they lived in Canada between ages 16-19; Finland, where they are included if they lived in the country in the year their parents turned 30; and the UK, where children are included if they were present in the country at age 30.[2] Because all of the children in a given cohort were by definition born in the same year, their incomes are measured in the same year as one another, 30 (40) years later. But since parents vary in the age at which they have children, parent incomes for a given cohort are not always measured in the same year as one another.

The measurement of incomes in one year only means that there will be noise in our results, but because absolute mobility is evaluated by comparing income levels rather than calculating a correlation this should not introduce a systematic bias. Additionally, by age 30 income ranks have largely stabilized (Chetty, Hendren, Kline, and Saez 2014), but earnings have not typically peaked (Murphy and Welch 1990). We measure income at age 30 in our initial specification as it is the age where family formation and (early) child-rearing is likely to make inter-generational reproduction the most salient. Moreover, the age 30 results allow for comparability with Chetty et al. (2017) and maximize the length of our time trends. However, we also include an alternative specification where income is measured at age 40 rather than age 30, providing a second year of income measurement closer to typical peak earnings and to more settled family and child-rearing patterns.

We do not normalize by family size in the main specification, but do so in an alternative specification shown in the online Appendix. We also include a specification that compares the individual incomes of fathers and sons. Because many countries do not have disposable (post-tax) income data available for the full

[2] The countries in our sample are notable for relatively high levels of immigration in recent years. Among our sample countries in 2019, foreign-born residents made up 21.3% of the population in Canada, 12.5% in Denmark, 6.9% in Finland, 13.4% in the Netherlands, 18.2% in Norway, 20.0% in Sweden, 14.1% in the UK, and 15.4% in the United States (United Nations Department of Economic and Social Affairs 2019). We do not believe that the inclusion or exclusion of immigrants systematically affects our results.

period under study, our primary specification uses pre-tax income from wages, self-employment, and social insurance programs such as unemployment and social security.[3] For countries where post-tax disposable income is available, we present trends in upward mobility rates using that measure in the online Appendix.

To our knowledge, our sample contains almost all of the countries in which high quality data on both historical income distributions and relative income mobility currently exist for a substantial number of birth cohorts. Similar data exist for Germany, and have been used to estimate trends in absolute income mobility there (Bönke et al. 2019; Stockhausen 2018). Historical income data are available that would allow computation of mobility rates for Japan for the 1970 birth cohort, but there is not linked data to create a copula, and the marginal income distributions for parents and children in that cohort are sufficiently overlapping that knowing the copula is necessary for precise estimation. Similarly, historical data on income distributions by age exist for France (Garbinti, Goupille-Lebret, and Piketty 2018), but linked parent-child records do not. Many other countries are currently creating datasets, through longitudinal surveys or linked administrative records, that will allow this sort of analysis in the future. These include Australia (Deutscher 2018), New Zealand (Laws, Gemmell, and Creedy 2014), and Singapore (Yip 2012). However, the great length of time necessary for a direct comparison—roughly 30 years between children and parents to directly calculate absolute mobility for one cohort, and longer to establish any sort of trend across cohorts—means that such datasets are not yet usable for the analysis we conduct here.

[3] Data constraints require us to deviate from this exact income definition in certain countries. As described in Appendices 1 and 2, in Finland and the United States we include capital income as well as labor and transfer income, while we include income from social transfer programs beyond unemployment and social security in Canada, the Netherlands, the UK, and the US.

Results

Trends in Absolute Income Mobility

Figure 1 presents trends in absolute mobility in pre-tax, post-transfer income by birth cohort for the countries included in this study. Because of data limitations, not all countries have estimates for all cohorts. The US series goes back to the 1940 birth cohort, while most European countries begin in the 1960s. Data for Canada only exist for the 1976-85 birth cohorts, and for the Netherlands we focus on the 1973-84 cohorts. For ease of comparison, we show results starting in 1960, the first year for which non-US data are available.

[Insert Figure 1 Here]

A few takeaways stand out in Figure 1. First, there is substantial variation across the eight countries in the rates of upward mobility experienced by recent cohorts. At the top end, recent cohorts of Norwegians have experienced upward mobility rates of roughly 75%, while cohorts born before 1980 in the Netherlands saw upward mobility rates approaching 80%. Finland, Sweden, and the UK all have recent values over 65%, well above recent US levels. Only Canada and Denmark have recent upward mobility rates comparable to those in the United States.

A second pattern in Figure 1 is the different mobility trends that countries have seen over time. The United States is not alone in seeing mobility declines for recent cohorts: Denmark, the Netherlands, and the UK have all seen drops of 10 percentage points or more from their peak upward mobility rates. However, the bulk of the mobility decline in these countries dates roughly to the onset of the Great Recession (the 1977 cohort turned 30 and had their adult incomes measured in 2007), while the US decline began much earlier. In very recent years upward

mobility in the US has increased slightly, perhaps capturing the start of recovery after the Recession.

As discussed above, one potential concern with our analysis is that we measure incomes at age 30. If recent cohorts are reaching their peak earning years later than earlier cohorts did, this may create an appearance of lower upward mobility that is driven by changes in the age-income profile rather than lower lifetime or peak earnings among children. To address this possibility, Figure 2 presents results with income measured at age 40. Note that because of the later age of income measurement, the cohorts for which we have age-40 data are shifted roughly 10 years earlier than those where we observe income at age 30.

[Insert Figure 2 here]

For countries and cohorts where mobility data at both age 30 and 40 are available, trends in upward absolute income mobility measured at age 40 were broadly similar to those measured at age 30, with a few notable differences. In Sweden and Norway, upward mobility rates measured at age 40 were 5-10 percentage points higher than mobility rates for the same cohorts at age 30, while in the US, the UK, and the Netherlands mobility rates were 5-15 points lower when measured at age 40. In Denmark and Finland mobility rates were similar at both ages.

Some of the difference between mobility rates at age 30 and age 40, particularly in Sweden and the UK, appears to be due to different cohorts being impacted by the same macroeconomic shocks at different ages. In Sweden, for instance, there is a drop in age-40 mobility rates for the 1953-56 cohorts that parallels that in age-30 mobility rates for the 1963-1966 cohorts. In both cases, the adult incomes of children were measured in the early 1990s, during a major recession. This suggests that the business cycle, and period effects in general, may have a large impact on rates of absolute mobility. Such an impact is consistent with the importance of

marginal income distributions for absolute mobility, but differs markedly from the impact on relative mobility rates, which have been found to be fairly stable from year to year (Chetty, Hendren, Kline, Saez, et al. 2014; Lee and Solon 2009; but see Harding and Munk 2020).

In Figure 1, and to a lesser extent Figure 2, the case of Denmark is particularly striking in contrast to the other Nordic countries: after a very sharp decline over the previous five cohorts, upward mobility at age 30 for the 1982 birth cohort was below 50%, the lowest of any country in our sample. Upward mobility at age 40 for the 1972 cohort was 64%, seven percentage points lower than Finland and more than 10 percentage points below Sweden and Norway. This difference appears to be in part a consequence of the Global Financial Crisis, which hit Denmark substantially harder than other Scandinavian countries. The overall unemployment rate for Danes aged 25-54 more than doubled from 3.2% of the active population in 2006 to 6.7% in 2010, compared to changes for the same population from 6.1% to 6.8% in Finland, 2.9% to 3.0% in Norway, and 5.3% to 6.7% in Sweden (Eurostat 2020). This unemployment shock was felt most strongly by young adults (Pihl and Breck 2012), as is the case in many recessions (Hoynes, Miller, and Schaller 2012). The disproportionate effect on young adults may be one reason why the impact of the Financial Crisis appears larger in the age-30 than age-40 results.

The Danish trends also reflect our use of pre-tax income in our primary specification. If we look instead at results using post-tax disposable income (Appendix Figure A3.1), which is generally agreed to offer a better measure of true living standards, we see a decline in age-30 upward mobility of just 5 percentage points following the Financial Crisis, from 72% for the 1977 cohort to 67% for the 1982 cohort. Measured using disposable income, then, absolute mobility in Denmark for recent cohorts is much higher than in the US or Canada, and substantially closer to Sweden, the other Scandinavian country where disposable income is available. This substantial difference between market and disposable

income is consistent with findings from Landersø and Heckman (2017), who show that pre-tax relative mobility is similar in Denmark and the US, but post-tax relative mobility is much greater in Denmark. Among the other countries where disposable income is available, upward mobility in post-tax income is roughly 10 percentage points higher than in pre-tax income in Sweden, 5 percentage points higher in the UK and the US, and 2 percentage points higher in Canada. Trends over time in these four countries are similar for both pre- and post-tax measures.

On the whole, then, it appears that pre-tax absolute mobility in Denmark suffered a large decline due to the particularly large impact of the Global Financial Crisis on Danish young adults, but the impact was lessened somewhat by the structure of the Danish tax and welfare state. These patterns are consistent with the Danish policy of labor market "flexicurity," which combines low barriers to employment separations with educational and social insurance programs (Andersen 2019; Bredgaard, Larsen, and Madsen 2005).

Beyond the measurement of income at age 40 and the inclusion of taxes, we conduct two alternative specifications to explore the impact of changing family composition and labor force participation by gender on our results. These are shown in Appendix 3. First, we analyze mobility after normalizing income by the number of adults in each family. In practice this means dividing total income by two for couples, while leaving income for singles unchanged. This specification accounts for the possibility that changing total incomes may be due to changing family structures, rather than changes in the earnings patterns of individuals. There has been a secular decline in marriage among countries in our sample over the past several decades (Lesthaeghe 2010; Ruggles 2015). If members of younger cohorts are remaining single at higher rates than older cohorts, their total family incomes may be lower simply because there are fewer adults in the household (c.f. Bloome 2014; Western, Bloome, and Percheski 2008). As shown in Figure A3.2, in all countries and cohorts where this normalization is possible upward mobility using

the normalized income measure is 8-17 percentage points higher than baseline. This suggests that changes in family structure have resulted in lower family incomes for recent cohorts than would pertain if family structures had remained as they were for these cohorts' parents.

Second, we conduct an analysis comparing the individual incomes of fathers and sons rather than total family income. This comparison isolates the mobility patterns that are due to earnings trends among men alone from those that are due to changes in labor force participation or earnings among women. Results are shown in Figure A3.3. In Canada, Denmark, Norway, Sweden, and the UK, upward mobility rates for sons compared to fathers are similar to those using total family income, although the dips in mobility associated with the early 1990s recession in Sweden and the global financial crisis in the UK are steeper when looking at father-son mobility. In the Netherlands and the US, upward mobility rates for sons alone are consistently 10-20 percentage points lower than those using total family income. In the Netherlands, this likely reflects the massive increase in female labor force participation since the 1970s, by far the largest in the OECD (Olivetti and Petrongolo 2017). In the US it may reflect the faster than average decline in male labor force participation over this same period (Krause and Sawhill 2017) or the partial closing of the gender earnings gap (Blau and Kahn 2017).

Taken together, our various alternate specifications broadly conform to the baseline results in terms of the relative position of the different countries and trends over time. But the variation across specifications highlights important differences between countries in terms of political economy, age, and gender. The results using incomes at age 40 suggest that changes from parents to children in the age-earnings profile may be largest in Norway and Sweden, while results using post-tax disposable income highlight the importance of the tax code as a means of increasing mobility in Denmark and Sweden, but not Canada, the US, or the UK. Results using normalized family income highlight the role of changing family structure—in

particular the growing share of young adults who are not married or cohabiting—in reducing family incomes across our sample countries. Results using the individual incomes of fathers and sons suggest that different labor force participation and earnings trends by gender may be especially impactful on mobility patterns in the Netherlands and the United States.

In online Appendix 4 we present a detailed comparison of our results with those of Berman (2018). The upward mobility rates we calculate for recent cohorts roughly align with Berman's estimates in most countries, but differ in the UK and Denmark by as much as 10 to 15 percentage points. Additionally, we find stability in absolute mobility rates over time in several countries where Berman reports downward trends. Where differences exist, they appear to be due to differences in the data used rather than differences in methods—specifically, the fact that we measure incomes for 30-year-old parents and children directly, while Berman uses income data for the entire population. Because younger workers tend to be more affected by changes to the macroeconomic climate than older workers (Hoynes et al. 2012), and because incomes of parents may differ systematically from incomes of non-parents of similar age, trends in the full income distribution are in some cases not an accurate proxy for trends in the earnings of young adults.

Validation of the Copula and Marginals Approach

Chetty et al. (2017) proposed that overall rates of absolute mobility can be accurately calculated without linked panel data, by combining data on the marginal income distributions of children and parents with the copula, or parent-child rank transition matrix. This approach draws on Sklar's Theorem (Sklar 1959), which showed that any multivariate distribution can be expressed in terms of marginal distributions and a copula. Because of its much lower data requirements and its ability to incorporate data from multiple sources, the "copula and marginals"

approach is becoming widely used in studies of absolute income mobility (e.g. Berman 2018; Bönke et al. 2019).

While the logic behind this approach is compelling, it has never been validated through a direct comparison of absolute mobility rates calculated using the copula and marginals approach and those using the true, linked records approach on the same data. We conduct such a comparison here. For five of the countries in our sample—Canada, Denmark, Finland, Norway, and Sweden—we can both calculate the upward mobility rate directly from linked data and produce copulas and marginal distributions. By comparing estimates constructed using the copula and marginals to those constructed from linked data we are able to determine whether the former is a reasonable approximation of the latter.

For each country, we produce a copula for the most recent birth cohort in the data. In Norway and Sweden we combine multiple birth cohorts to increase the observation counts within each percentile cell. This parallels the methodology of Chetty et al. (2017), who used a copula constructed from the 1980-82 birth cohorts for the entire analysis. Following the procedure described by Chetty et al., when using the copula and marginals approach we calculate the upward mobility rate for a given cohort by first comparing the mean incomes in every pair of child and parent percentile cells and determining whether the children in that child cell had higher incomes than the parents in that parent cell. We then take the average of upward mobility across all parent and child cell pairs, weighting by the probability from the copula that children with parents in that parent cell grew up to have incomes placing them in that child cell.

[Insert Figure 3 Here]

Figure 3 compares upward mobility rates calculated using the copula and marginals and linked records approaches in each country. The results largely

confirm that the copula and marginals approach is an effective approximation of the true, linked record method of estimating absolute income mobility. Across all cohorts in all five countries, the copula and marginals estimates are always within 1.4 percentage points of the true value, even though upward mobility rates varied by approximately 18 percentage points in Denmark, 14 percentage points in Sweden, 6 percentage points in Norway, and 4 percentage points in Finland over our sample period. The largest deviations from the true value, especially in Finland, Norway, and to a lesser extent Denmark, occur for the cohorts most removed from those in the copula, but across all cohorts the differences between the two methods are always small relative to the overall trends. This exercise suggests that the copula and marginals approach is an effective way to estimate rates of absolute mobility when linked panel data are unavailable.

What Explains Variation in Upward Mobility?

Why have countries like Norway and Finland maintained high levels of upward absolute mobility for generations, while countries as diverse as Denmark (in pre-tax income), Canada, and the United States have seen much lower rates? To answer this question, we conduct a series of counterfactual exercises to decompose the differences between high- and low-mobility countries for cohorts born in the early 1980s. Here we present results comparing the low mobility countries of Canada, Denmark, and the US to Norway, which had the highest rate of upward mobility in our sample.

Using the copula and marginals approach, the absolute mobility rate of a given cohort in a given country can be fully accounted for by four components: the copula, the ratio of mean income in the child generation to mean income in the parent generation, and the shape of the income distribution (that is, the level of

inequality) in a) the parent and b) the child generations (Liss et al. 2019; Van Kerm 2004).

To determine the source of differences in mobility rates between high- and low-mobility countries, we run simulations for the 1983 birth cohort in which we substitute each of these components from our low mobility countries with the equivalent component from Norway. For greater interpretability, we further decompose the ratio of mean child to mean parent income into two subcomponents: the overall growth rate of real Gross Domestic Product (GDP) per capita from 1983-2013 and the ratio of growth in mean income from parents to children in our sample to growth in GDP—that is, the extent to which incomes for 30-year-olds kept up with GDP growth during this period. We use GDP per capita values in constant local currency units sourced from the World Bank national accounts data (World Bank 2019). In Appendix 5, we show that the cumulative substitution of all five of these components—the copula, GDP growth rate, sample income growth to GDP growth ratio, inequality among parents, and inequality among children—perfectly accounts for the difference between mobility rates in any two countries.

We first consider differences in the rate of relative mobility, as captured by the copula. It is well known that rates of relative income mobility are much higher in Scandinavia than in the United States (Bratberg et al. 2017; Corak 2006; Smeeding et al. 2011). In our sample, 25.4% of US children born in the early 1980s ended up within 10 percentile ranks of their parents, compared to 20.1% of Norwegian children. US children were thus 26% more likely than their Norwegian counterparts to grow up to occupy a position in the income distribution similar to that of their parents.

To determine whether rates of relative mobility are an important driver of differences in absolute mobility across countries, we run simulations replacing the US, Canadian, and Danish copulas with that from Norway. As shown in the first column of Figure 4, doing this hardly alters rates of absolute mobility at all. This is

perhaps unsurprising in the cases of Canada and Denmark, which have relative mobility rates comparable to Norway's, but even in the United States there is no difference—in fact, the higher relative mobility of the Norwegian copula actually lowers the absolute mobility rate slightly, conforming to the result that absolute and relative mobility are inversely correlated when other variables are held constant (Berman 2018).

[Insert Figure 4 Here]

If differences in relative mobility do not account for national variation in upward absolute mobility, the variation must be due to features of the marginal distributions. The remaining columns of Figure 4 explore three aspects of the child marginal income distribution. The second column for each country considers a scenario where that country experienced the Norwegian GDP growth rate from 1983-2013. Real GDP per capita grew by 1.86% a year during this period in Norway, compared to growth of 1.80% annually in the US, 1.50% in Canada, and 1.49% in Denmark. This scenario is implemented by multiplying the income for every percentile of the child distribution in each low mobility country by the ratio of total Norwegian GDP growth from 1983-2013 to total country GDP growth over that same period. It thus simulates a scenario where GDP grew more quickly during the children's lives but was distributed exactly as in reality. As shown in the figure, faster GDP growth would not make much difference for the United States, but would close about a quarter of the gap for Canada and Denmark.

The third column considers a scenario where the total size of the economy stays the same but the income distribution among 30 year old children in Norway is applied to the country of interest. This "within-cohort inequality" scenario is constructed by taking the ratio of income at each child percentile to overall mean child income in Norway and multiplying that by the mean child income in the

country of interest. As with GDP, the importance of within-cohort inequality varies substantially across the three countries considered. In the US, this scenario closes almost half of the mobility gap with Norway, while in Denmark it closes just 1% of the gap.

The final column considers a "between-cohort inequality" scenario, where the ratio of growth in mean income from parents to children in our sample to GDP growth in Norway is applied to observed GDP growth in each of the low-mobility countries. We interpret this primarily as a measure of changing inequality between age groups, capturing the extent to which mean incomes for 30-year-olds kept up with GDP. It could also reflect measurement error if the total fraction of GDP captured by our data sources changed over time. Such a change could be due to increasing non-response rates in survey data (for a discussion of this issue in the US context, see Bollinger et al. 2019), or due to changes in the composition of income that affect the percentage of GDP subject to taxation and thus inclusion in register data.[4]

For all three countries, the between-cohort inequality scenario accounts for the single largest proportion of the gap with Norway, and for Denmark it accounts for roughly 75%. Thus the biggest source of difference has to do with increasing inequality across cohorts: mean incomes for 30-year-olds did a much better job of keeping pace with overall economic growth in high-mobility countries than in low-mobility ones. For example, for the 1983 cohort in the US, the growth rate from mean parent income to mean child income in our sample was only 71% of the GDP growth rate over the same period, while in Norway the sample income grew 95%

[4] Note that to the extent that results for the "between-cohort inequality" scenario are driven by increases in nonresponse bias rather than truly growing inequality across cohorts, the child income distribution used in the "within-cohort inequality" scenario will likely understate the true level of within-cohort inequality, since nonresponse tends to be concentrated at the extremes (Bollinger et al. 2019). Thus the amount of the mobility gap attributable to within- and between-cohort inequality combined is likely to be similar to what we report, although the allocation between the two scenarios might be affected by measurement error.

as fast as GDP. In the United States, the remainder of the gap is accounted for by within-cohort inequality: the richest 30-year-olds take home a much larger share of their cohort's total income than in Norway. For Denmark, low GDP growth accounts for the remainder. For Canada it is some of each. Results comparing the low mobility countries to Sweden and Finland are presented in online Appendix 6 and are similar to those for Norway.

Discussion

In this paper we have directly calculated absolute income mobility rates for a selection of countries in North America and Europe. We have shown that there is a substantial amount of variation in upward mobility across countries, both in current levels and in trends over time. The US pattern of sharply declining upward mobility in recent decades is by no means a universal trend. Some countries, most notably Finland and Norway, have had high and steady rates of upward mobility for cohorts born as far back as the mid-1960s. Other countries, notably Denmark (in pre-tax income only), the Netherlands, and the UK, maintained high mobility rates longer than the US, but have seen declining mobility for cohorts that experienced the brunt of the Great Recession. The exact magnitude of differences across countries varies across our different specifications in ways that reflect cross-national variation in demographic trends, economic institutions, and macroeconomic environment.

For all of the countries except the US and the UK, we calculated mobility rates by directly comparing linked parent and child income data. Our estimates thus represent a ground truth against which other methods of inferring absolute mobility can be evaluated. For five of the countries in our sample—Canada, Denmark, Finland, Norway, and Sweden—we have shown that mobility rates calculated with the "copula and marginals" approach introduced by Chetty et al. (2017) very closely track those calculated directly from linked records, suggesting that the copula and

marginals approach is in fact an accurate approximation of true absolute income mobility. This is promising for a range of popular applications that frequently cannot be validated directly, such as microsimulations and synthetic panels (Bourguignon and Spadaro 2006; Deaton 1985).

Through decomposition analyses, we have shown that the higher relative mobility of Scandinavian countries contributes very little to their high absolute mobility rates. Compared to the United States, their success in upward mobility is due not to faster economic growth, but to their more egalitarian income distributions, both across and within cohorts. US GDP grew almost as fast as Norway's, and faster than Sweden's, during the lifetimes of our most recent cohorts. But Norway, Sweden, and Finland were much more efficient in translating that growth in total production into increased standards of living for their residents. Low pre-tax mobility in Denmark, on the other hand, is due to slower GDP growth than its neighbors and especially to the divergence between overall GDP growth and growth in the incomes being earned by 30-year-olds. Canada falls somewhere in the middle.

The idea that living standards should rise from one generation to the next is a core implicit promise of the market economy. When countries fall short of that promise, they are often beset with frustration and instability (Friedman 2005). In this paper we have shown that developed nations vary dramatically in the extent to which they live up to that promise, and have explored some of the drivers of that variation. Our findings highlight the contingent nature of absolute income mobility. To achieve and sustain high rates of upward mobility, countries need economic institutions capable of both encouraging strong economic growth and distributing that growth to all of their citizens. Encouragingly, there exist several examples of countries that have managed exactly that.

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Figures

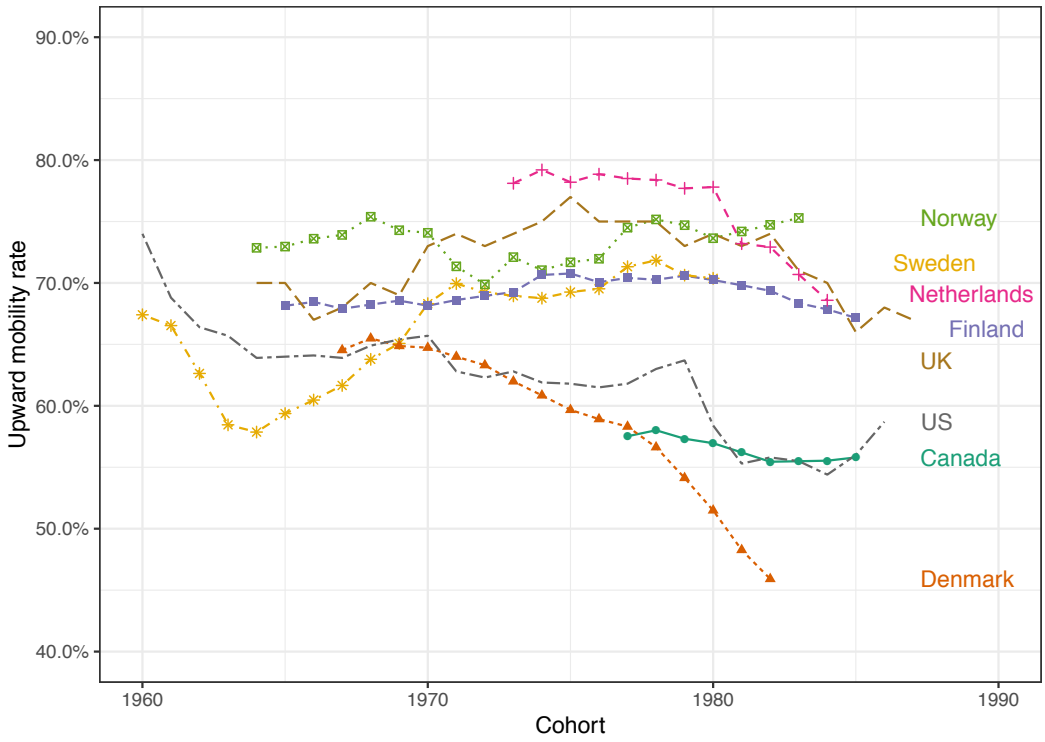

FIGURE 1. ESTIMATES OF UPWARD ABSOLUTE INCOME MOBILITY BY COUNTRY AND BIRTH COHORT

Notes: The upward mobility rate is calculated as the percentage of children in each birth cohort whose pre-tax, post-transfer family income at age 30, adjusted for inflation, was higher than their parents' family income at age 30. Incomes are measured using a combination of register and survey data in each country, as described in Appendix 2.

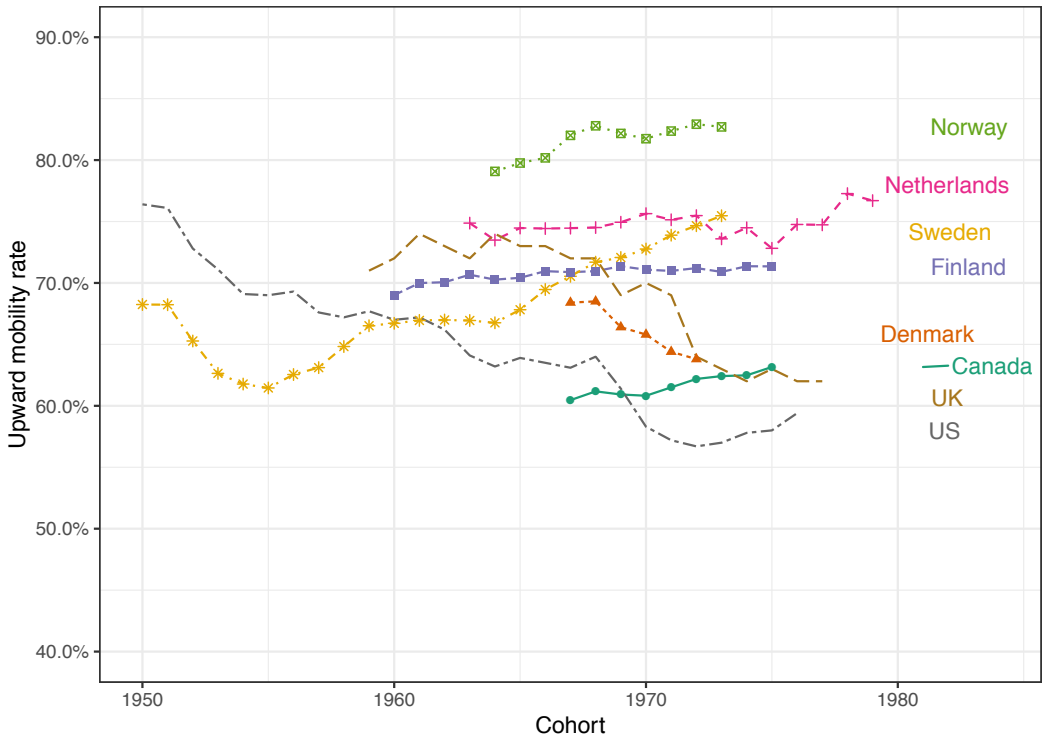

FIGURE 2. ESTIMATES OF UPWARD ABSOLUTE INCOME MOBILITY BY COUNTRY AND BIRTH COHORT, INCOME MEASURED AT AGE 40

Notes: The upward mobility rate is calculated as the percentage of children in each birth cohort whose pre-tax, post-transfer family income at age 40, adjusted for inflation, was higher than their parents' family income at age 40. Incomes are measured using a combination of register and survey data in each country, as described in Appendix 2.

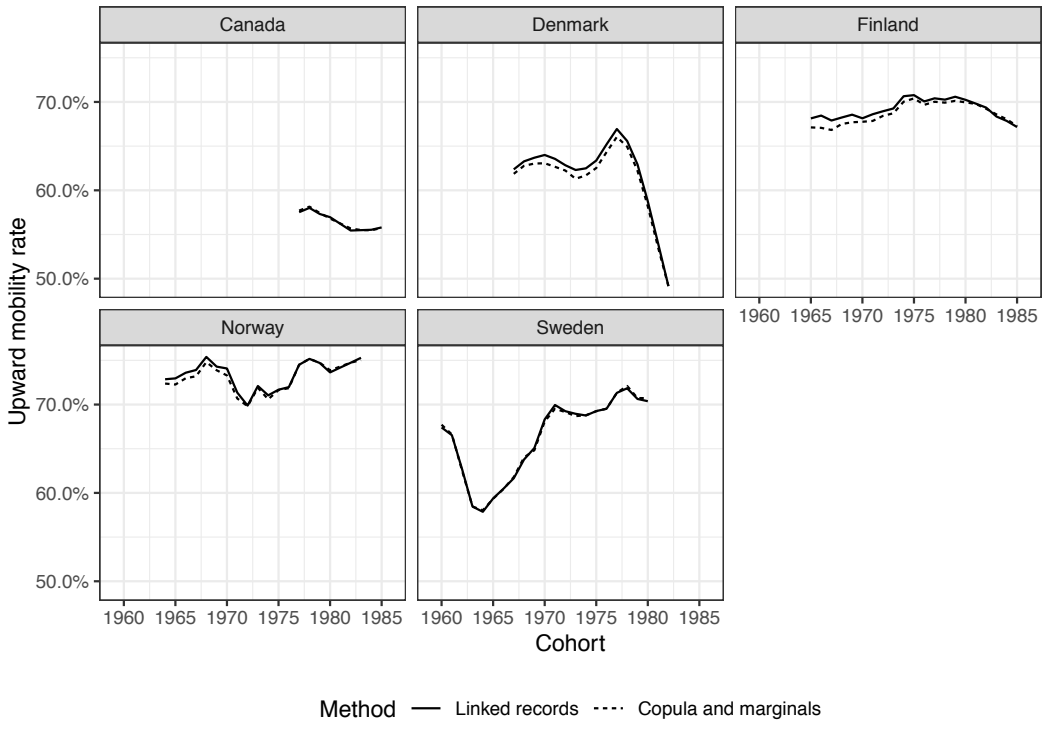

FIGURE 3. VALIDATION OF THE "COPULA AND MARGINALS" APPROACH FOR ESTIMATING ABSOLUTE INCOME MOBILITY

Notes: This figure compares estimates of absolute income mobility using linked records with those using the "copula and marginals" approach introduced by Chetty et al. (2017) for the five countries in our sample where both methods are possible. Copula and marginals estimates are constructed by computing child and parent marginal income distributions at age 30 for each birth cohort in each country, and combining them with the parent-child income rank transition matrix constructed based on linked parent-child records for the most recent available cohort in each country. Linked records estimates are computed as in the baseline results except for Denmark, where non-age matched records are used (see Appendix 3.2), resulting in a mobility trend for Denmark that differs somewhat from that shown in Figure 1. Across all countries and birth cohorts, estimates with the two methods match within 1.4 percentage points.

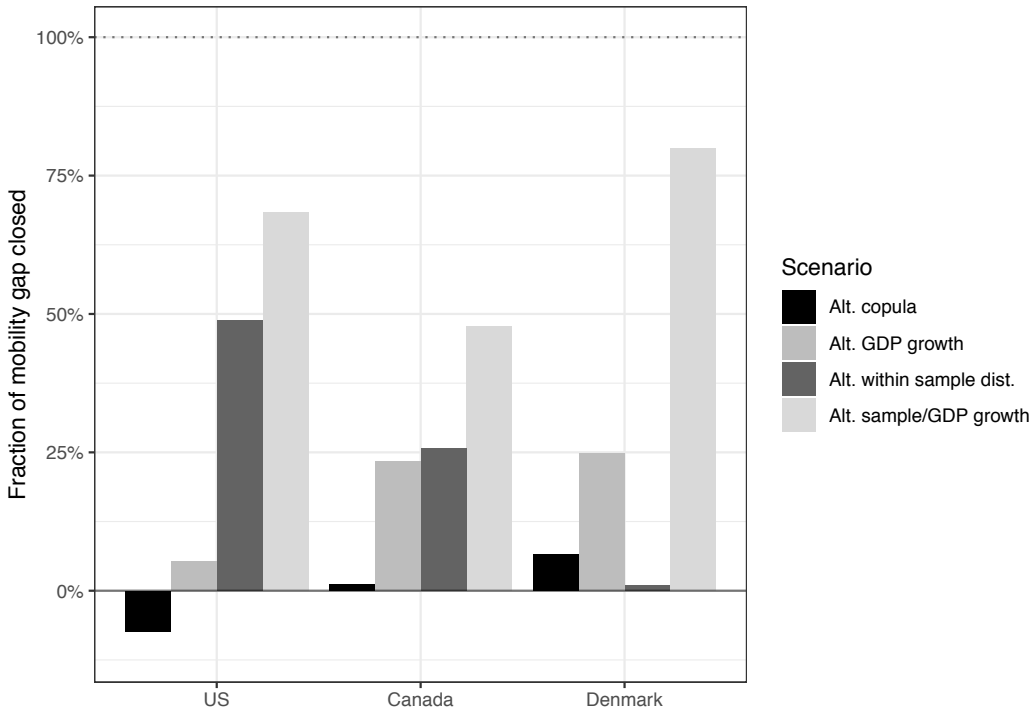

FIGURE 4. DECOMPOSITION OF CROSS-COUNTRY DIFFERENCES IN ABSOLUTE MOBILITY

Notes: This figure shows results from counterfactual simulations decomposing the difference in upward mobility rates between three low-mobility countries and Norway for the 1983 birth cohort (1982 in Denmark). As shown in Figure 1, upward mobility in Norway for the 1983 birth cohort was roughly 20 percentage points higher than for the same cohort in the US and Canada, or for the 1982 cohort in Denmark (the most recent available). To determine the source of this difference, upward mobility is calculated using the "copula and marginals" decomposition approach. Simulations are run replacing the copula, GDP growth rate, within-sample income distribution, and ratio of mean sample income growth from parents to children to GDP growth of each low-mobility country with those of Norway. Bars indicate the fraction of the total gap with Norway that is closed in each simulation.