# Intergenerational Educational Mobility in Europe*

Orhan Torul†
*Boğaziçi University*

Oğuz Öztunali‡
*Istanbul Bilgi University*

**First Version:** May 15th, 2017

**This Version:** August 23rd, 2019

**Abstract**

In this paper, we investigate the empirical evolution of intergenerational educational mobility in Europe at country and country group scales. We first show that intergenerational educational persistence, i.e. educational *immobility* probability across generations, displays considerable heterogeneity, both in level and in trend, across countries and country groups: Mediterranean, Post-Socialist, Nordic and the Rest of Europe. We next report that intergenerational educational mobility dynamics display further heterogeneity over educational composition of parental couples, gender of descendants and their parental financial status. We also document the evolution of educational inequality patterns in Europe, and investigate how educational inequality and intergenerational mobility figures interact with each other. We report that intergenerational educational elasticity correlates positively with educational inequality, thus the "Educational Great Gatsby" hypothesis holds true in Europe. We further show that the link between relative high education prospect, a set of measures that capture how *de facto* high education prospects of descendants vary over their parental education, and educational inequality is present, too. We finally document both intergenerational elasticity and relative high education prospect measures correlate significantly with returns to education, and indicate that lower intergenerational educational mobility coincides with higher college premium in Europe.

‡For the latest version, please visit: http://web.boun.edu.tr/torul/ieme.pdf
‡For the online appendix, please visit: http://web.boun.edu.tr/torul/iemeoa.pdf

**Keywords:** Education Inequality, The Great Gatsby Curve, POUM

**JEL Classification:** I20, I24, J62, N30, E24

*We would like to thank Kjetil Storesletten, Ethan Kaplan, M. Daniele Paserman, Miles Corak, Mehmet Ali Soytaş, Alpay Filiztekin, İnsan Tunalı, Tolga Umut Kuzubaş, Gökhan Özertan, Murat Kırdar, Malik Çürük, Murat Koyuncu, Kıvanç Karaman and other faculty at the Department of Economics, Boğaziçi University for their helpful comments and suggestions. We also thank the participants at the First WID.world Conference in Paris, 2017 and 2018 CEE Annual Conferences in Istanbul, 3rd ESS Conference in Lausanne, and 17th IWH-CIREQ-GW Macroeconometric Workshop in Halle-Saale. We are also grateful for the feedback by the seminar participants at Özyegin University, Istanbul Bilgi University, University of Oslo, Boğaziçi University, Galatasaray University, TOBB University of Economics and Technology and TCMB Istanbul School of Central Banking. Torul acknowledges financial support by European Economic Association (EEA) European Research Council (ERC) Seed Grant and Boğaziçi University Research Fund, grant number BAP 9081 and 13920. All remaining errors are ours.

†Address: Boğaziçi University, Department of Economics, 34342 Bebek, Istanbul, Turkey. E-Mail: orhan.torul@boun.edu.tr

‡Address: Istanbul Bilgi University, Department of Economics, 34060 Eyüp, Istanbul, Turkey. E-Mail: oguz.oztunali@bilgi.edu.tr

# 1 Introduction

The focus of modern economics has expanded beyond the dynamics of economic aggregates into the evolution of *distribution* of economic variables over the recent decades.[1] Concerns over distribution of key economic variables of households, such as labor earnings, income and wealth have motivated a growing body of literature to explore cross-sectional and time-series behaviors of economic inequalities, along with their determinants and consequences. Of the underlying sources of economic inequalities, while intergenerational persistence of earnings, income and wealth have been studied quite extensively, rigorous attempts in investigating intergenerational *educational* mobility across countries have been limited both in number and in content.[2] Further, these attempts have hardly surpassed documenting and comparing simple measures of country-level average intergenerational educational correlates, thereby ignoring several critical dimensions of heterogeneities, as well as their time-varying evolutions.[3]

Understanding dynamics and determinants of educational attainment is critical for a number of reasons, but particularly so because i) education is arguably the most pivotal determinant in accumulating human capital and as such, especially in its later stages, education is decisive in affecting labor income,[4] ii) educational attainment correlates highly with income and wealth, thereby preserving indirect intergenerational welfare implications,[5] iii) educational attainment has important implications on electorate decisions, and as such, education has critical political and accordingly policy-making consequences, beyond its implications on income.[6] Therefore, in order to understand *de facto* prospects of social mobility and unveil the sources and implications of economic inequalities, it is essential to understand salient patterns in educational attainment across generations.

In this paper, we investigate the evolution of intergenerational educational mobility in Europe both at the country and country-group scales via individual-level data from the European Social

[1] See Krueger et al. (2010), Heathcote et al. (2009) and Güvenen (2011) for discussions on the advances in the distributional macroeconomics literature.

[2] In one of the attempts to review empirical results on intergenerational correlations, Krueger (2012) coins the term the "Great Gatsby Curve" to refer to the positive cross-country relationship between income inequality and intergenerational earnings elasticity to proxy for the inverse of social mobility, and highlights the importance of acknowledging this phenomenon in policy making.

[3] See Hertz et al. (2007), van Doorn et al. (2011) and Schneebaum et al. (2015), among others for studies addressing intergenerational educational mobility.

[4] Among others, see Mankiw et al. (1992) for an extensive discussion on the importance of higher educational attainment in human capital formation.

[5] See Díaz-Giménez et al. (2011) for a recent discussion on the distribution of education, earnings, income, and wealth for the United States.

[6] For instance, Silver (2016) documents that education was a better predictor than income for electorate choices in the 2016 U.S. National Elections. Similarly, on the *Brexit* decision of the United Kingdom from the European Union, Darvas (2016) shows that education was a significant determinant of voter behavior, whereas income was not. Additionally, Öztunalı et al. (2019) shows that upward mobility prospects during the upbringing affect preferences for redistribution later in life.

Survey (ESS) for 34 countries and 46 cohorts, born between 1940 and 1985.[7] We first show that intergenerational educational persistence, i.e. the probability of descendants to mimic the educational attainment of their better-educated parents displays considerable heterogeneity both in level and in time-trend across countries and country groups: Mediterranean, Post-Socialist, Nordic and the Rest of Europe. In particular, we document that starting from different initial levels, intergenerational educational persistence exhibits a downward trend in the Mediterranean country group, an upward trend in the Post-Socialist group, a U-shaped pattern in the Nordic group and a moderate downward trend, accompanied by constancy in the Rest of Europe group.

We also explore heterogeneities in intergenerational educational mobility dynamics by estimating how descendants' educational prospects depend on different levels of parental education over time. In doing so, we aim to unveil the driving forces behind aggregate mobility figures and detect whether observed variations occur due to changes in conditional intergenerational educational transition *probabilities* or due to changes in educational *distributions* of parents. Our dissection exercises reveal that intergenerational educational persistence in the Mediterranean country group demonstrates a downward time-trend because of both a dramatic fall in the share of parents with below-high-school levels of education, and an increase in the probability of achieving higher levels of education for descendants born to families with below-high-school-educated parents. On the contrary, overall persistence in the Post-Socialist group increases over time due to an increase in the share of families with high school or above-educated parents, in which descendants are more likely to mimic the educational attainment of their parents. As for the Nordic country group, the share of families with university-graduate parents, in which descendants are also likely to obtain university degrees, increases over time and surpasses the share of families with below-high-school-educated parents, in which descendants have historically been more likely to attain higher levels of education than their parents. As a result, educational persistence in the Nordic country group displays a reversion in its sub-components over time: once mainly driven by the persistence in families with below-high-school-educated-parents, recent Nordic persistence results mainly from persistence in families with university-graduate parents. The moderate downward time-trend in the Rest of Europe country group is due to a similar fall in persistence in families with below-high-school-educated parents. The accompanied constancy in overall persistence arises due to the fact that the rise in persistence in families with parents with high school or above educational backgrounds are just strong enough to offset the fall in persistence in families with below-high-school educated parents.

Next, we turn to exploring heterogeneous impacts of parental educational couple compositions and gender of descendants, and report that intergenerational educational mobility prospects of de-

[7] We restrict our analysis to cohorts born between 1940 and 1985 because of the limited number of observations for individuals born prior to 1940, and that individuals born after 1985 may have not completed their educational attainment by the time of surveys. For robustness purposes, we also redo our analyses employing European Values Survey (EVS), OECD's Survey of Adult Skills (PIAAC) and EuroStat's Adult Education Survey (AES) datasets for countries with available data. These findings deliver both qualitatively and quantitatively similar results, and are available upon requests.

scendants display considerable variation over both of these factors, as well. Specifically, our results demonstrate that keeping the educational level of the better-educated parent constant, educational attainment of the less-educated parent also positively yet heterogeneously predicts descendants' better-education prospects, particularly starkly in the case of the Mediterranean country group. In addition, we report that descendants' gender is also one of the primary determinants of intergenerational educational mobility. Our results suggest that while female descendants of the earlier cohorts were more disadvantaged in educational attainment prospects than their male counterparts at different degrees across countries, the disadvantages of female descendants gradually disappear over time and recently-born female descendants' better education prospects either catch-up to or surpass those of males descendants. Further, our findings show that the historic reversal of the gender gap applies to descendants born to both symmetric (i.e. assortatively matched in terms of educational backgrounds) and asymmetric parental couples, although more intensely in magnitude for descendants born to asymmetric couples than symmetric ones.

We further investigate whether financial well-being of parents matter *in addition to* their educational backgrounds, *when* descendants receive their education. We document that conditional on being born to fathers with equal educational attainment, descendants' subjective assessment of their parental financial status at the age of 14 significantly predicts the educational prospects of descendants, albeit heterogeneously over country groups and gender over time.

Finally, we document the evolution of educational inequality patterns in Europe, and investigate how educational inequality and intergenerational mobility figures interact with each other. We show that intergenerational educational elasticity correlates positively with educational inequality, i.e. the "Educational Great Gatsby" hypothesis holds true in Europe. We also show that the link between *relative high education prospect*, a set of measures capturing how better educational attainment prospects depend on parental education, and educational inequality is strongly present, as well. We further report that both mobility measures correlate significantly with returns to education, indicating that lower intergenerational educational mobility coincides with higher college premium in Europe.

We believe that this paper contributes to the literature in two main aspects. First, by documenting both country and country-group level measures with a reliable and standardized methodology, we provide evidence on countries's and country groups's absolute and relative intergenerational educational performances, along with their evolution over time. In doing so, we detect and report several dimensions of heterogeneities, which can be used in exploring interactions of different economic policies and economic variables with mobility dynamics, as well as for materializing parameters and calibration targets in economic models featuring education and human capital.

Second, by documenting relative high education prospect measures and educational inequality predictions, along with reporting time-varying Markov chain transition probabilities, our findings can contribute to the understanding on *de facto* educational prospects of current generations, as well as to the improvements in forecasts on future educational distributions. We believe these re-

sults could further serve to contribute to the understanding on the direction a country or a country group is heading towards in terms of its mobility patterns and equality of educational opportunities, along with other distributional concerns. We further believe that our findings could contribute to the ongoing debates on the cross-country link between economic inequalities and intergenerational transmissions by reporting on the "Educational Great Gatsby" curve for a wide group of European economies. Overall, the fact that our results also suggest the presence of a robust correlation between educational inequalities, returns to education and the strength of intergenerational educational transmission is supportive of the original "Great Gatsby" hypothesis on income, thereby indicating the importance of understanding intergenerational transmission channels when addressing economic inequalities in an era of increasing concerns.

The rest of the paper is organized as follows: In section 2, we review the literature on intergenerational mobility and on education, in section 3, we describe the details of the data we use and we describe our empirical methodology, in section 4 we report and discuss our findings, and in section 5 we conclude.

## 2 Related Literature

The study of economic inequalities and their intergenerational transmission has been receiving increasing attention both in policy-making and academic research over the recent years. The most well-established theoretical strand of this literature focuses on intergenerational *income* mobility and has built upon the framework proposed by Becker and Tomes (1979) and Loury (1981). Among recent theoretical advances in this literature, Hassler et al. (2007) explore the effects of exogenous changes, such as subsidization of public education or increasing quality of education on the relationship between wage inequality and intergenerational mobility. In a theoretical environment similar to Becker and Tomes (1979), Solon (2004) shows that the intergenerational income elasticity depends negatively on the progressivity of the public investment in children's human capital. Piketty (2000) also explores the effects of several relevant variables and dynamics on relationship between inequality and intergenerational mobility.

In addition to developments on the theoretical side of the literature, as a result of the advances in the availability of datasets that keep track of both parents' and their descendants' earnings, income and wealth during various phases of adulthood, a plethora of empirical studies flourished over the last two decades. Recent studies by Chetty et al. (2017, 2014b,a); Chetty and Hendren (2015) are examples of the current state-of-the-art methodology used for the measurement of this intergenerational link for the U.S. economy.[8] However, due to the limited availability of reliable datasets for

[8]For further empirical studies addressing the intergenerational transmission of earnings, income, and wealth in the United States, see Chamberlain (2016), Kourtellos et al. (2016), Durlauf and Seshadri (2016), Durlauf and Shaorshadze (2015), Mazumder (2014, 2005), Kopczuk et al. (2010), Björklund and Jäntti (1997), Haider and Solon (2006), Solon (1992), Peters (1992) and Behrman and Taubman (1985), among others.

other countries, analyses on intergenerational transmission of the aforementioned variables have yet been limited to only a small set of mainly developed countries.[9]

Advances in the empirical findings on the intergenerational transmission of earnings and income have given birth to another strand of literature focusing on the potential link between intergenerational mobility and other economic variables.[10] In particular, the relationship between *intergenerational income mobility* and *income inequality* has been scrutinized in recent years. Corak (2013) and Krueger (2012) provide empirical evidence suggesting the existence of a positive cross-country relationship between *intergenerational income elasticity* and *income inequality*, coined as the "Great Gatsby Curve" hypothesis. This hypothesis has attracted considerable attention, as it raises concerns on the well-being of both current and future generations: it conjectures that rising income inequality will curb intergenerational upward mobility, which will in turn potentially further increase income inequality and reduce upward mobility, possibly generating an ever-increasing inequality spiral. Rauh (2017) studies this phenomenon theoretically by focusing on the potential role of demographic differences and voter turnout across the U.S. and Scandinavian countries. Jerrim and Macmillan (2015) study this relationship empirically and provide results that support the existence of a cross-country relationship between intergenerational elasticity of income and income inequality. However, Chetty et al. (2014b) show that this hypothesis does not hold true for the U.S.: while the intergenerational elasticity of income exhibits a relatively constant trend, income inequality continuously increases over time. The authors argue that the evolution of the two variables are driven by different parts of the society: (i) intergenerational mobility is driven essentially by the poorest 99% of the U.S. population (ii) whereas the most influential force determining the income inequality is the richest 1% of the population for whom intergenerational mobility figures in the country is not directly relevant.

Despite the plethora of recent studies on intergenerational income and wealth mobility, rigorous attempts addressing intergenerational *educational* mobility have been limited both in number and in content. The role of education on several economic inequalities and intergenerational mobility dynamics, through its pivotal importance in the accumulation of human capital and therefore earnings,[11] is well-acknowledged and difficult to contest.[12] Additionally, the reliability of measuring educational attainment of adults, due to its *stock* variable nature for adults, as opposed to the *flow* variable nature of earnings and income, and the increase in the number of both country-specific and cross-country datasets that contain information on both and parents' and their descendants' level of education render the study of educational mobility dynamics and inequalities in a cross-country setting and over time suitable. However, earlier studies that address the evolution of intergenerational

[9]See Braun and Stuhler (2016) for Germany, Clark and Cummins (2015) for England, Boserup et al. (2013) for Denmark, Björklund et al. (2012) for Sweden, Jäntti et al. (2007) for the Nordic countries, the U.K. and the U.S., Österberg (2000), Corak and Heisz (1999) for Canada and Gong et al. (2012) for China.

[10]See Mayer and Lopoo (2008), Sakellaris and Spilimbergo (2000) and Dellas and Sakellaris (2003), among others.

[11]See Díaz-Giménez et al. (2011) for instance on the interaction between education income and wealth for the United States.

[12]See Stiglitz (1973) and Machin (2009), among others.

educational mobility in cross-country settings, such as Hertz et al. (2007), van Doorn et al. (2011) and Schneebaum et al. (2015), either rely on overly simplistic econometric methods or use datasets with insufficiently low number of observations, thereby produce empirical results with limited statistical and conceptual reliability.[13] Further, country-specific studies do not adhere to a common methodology, thereby reducing the comparability of country-specific findings and lacking to come up with a general picture which is free of country-specific idiosyncratic factors.[14]

In this study we aim to contribute to filling this gap in the literature by documenting empirical patterns of intergenerational educational mobility in Europe, along with their interaction with other factors thoroughly with a reliable empirical methodology. In doing so, we keep both a cross-sectional and time-series perspective, which allows us to provide evidence both on countries's and country groups's absolute and relative intergenerational educational performances, as well as their evolution over time. Throughout our analyses, we follow a standardized methodology with room for detecting heterogeneities in several dimensions, which we document are present and crucial empirically. We further aim to contribute to the literature addressing the link between economic inequalities and intergenerational transmission channels by reporting on the "Educational Great Gatsby" curve for Europe, along with providing evidence on its relevance to the equality of *de facto* educational opportunities for the first time.

[13]In terms of the potential problems in the econometric specifications of the earlier educational mobility literature, which is adopted directly from the *income* mobility literature, we refer mainly to the modeling assumptions, such as linearity, symmetry, cardinality and monotonicity on the form of relationship between descendants' and parents' educational attainment, calculated by the years of schooling as the main measure of educational attainment and both the dependent and the independent variable in regressions. In other words, earlier literature, which reports simply on country-wide average correlations between parents' and descendants' years of schooling via standard ordinary least squares (OLS) methodology implicitly assumes, for instance, that a year in doctoral studies, a year in the 1$^{st}$ grade or a year towards non-graduation has identical same marginal effect as any other year of schooling, which we show in Table A.3 is incompatible with data: Table A.3 demonstrates that parental education asymmetrically governs the correlation between the educational attainment of parents and descendants, and previously reported correlation coefficients in the literature are mere averages of immensely heterogeneous intergenerational correlation coefficients over parents with different educational backgrounds. Moreover, standard years of schooling methodology ignores *threshold* effects of graduation, for which the required number of years of schooling varies over country and time due to changes in country-specific education policies. Further, Ashenfelter and Krueger (1994), among others criticize the use "years of schooling" methodology, as it is susceptible to generating sizable measurement errors in the case of estimating returns to education. Black and Devereux (2011) also highlight a list of potential methodological issues, such as the effects of heterogeneity in the relative variance of years of schooling across generations and their impacts in creating biases on regression coefficients, when education is treated as a *cardinal* variable. In order to address these methodological concerns, Black and Devereux (2011) suggest the use of educational attainment as an *ordinal* categorical variable, which is the methodology we adopt in this study. Moreover, earlier studies in the do not factor in the evolution of gender-fixed effects and parental educational couple structures's implications in their analyses, which we document in this paper that are of critical importance.

[14]For country-specific studies, see Aydemir et al. (2013) for Canada, Blanden and Macmillan (2014) for the United Kingdom, Bloome and Western (2011), Huang (2013) and Martin (2012) for the United States, Checchi et al. (2013) for Italy, Daouli et al. (2010) for Greece, Emran and Shilpi (2015) for India, and Öztunali and Torul (2017) and Tansel (2016) for Turkey.

# 3 Data and Methodology

## 3.1 Data Description

The main data source we use in our analyses is from the European Social Survey (ESS) waves 1-7.[15] We focus on individuals who are born between 1940-1985 and were at least 25 years old at the time of surveys, thereby qualifying as having completed their educational attainment.[16] These criteria yield a total number of 196,362 respondents from 34 European countries.[17,18] Table 1 reports the descriptive statistics of the main demographic variables in our dataset.[19] According to Table 1, the average age of respondents for the whole sample is 47 years, ranging from 41.46 (Turkey) to 51.56 (Lithuania) in country sub-samples. The average years of schooling for the whole sample is 12.70, with the lowest country-specific values ranging from 6.41 (Turkey) to 14.62 (Iceland).

We group educational attainment levels of both descendants and parents into three ordinal categories: i) **low**-education (individuals with less than or equal to secondary education: ISCED 0,1 and 2), ii) **medium**-education (individuals with upper secondary education and post-secondary education: ISCED 3 and 4), and iii) **high**-education (individuals with tertiary education and above: ISCED 5 and 6). We adopt a three-level education categorization mainly for three reasons: First, we aim that cross-categoric educational transitions have statistically meaningful economic and educational outcomes, and we believe minor transitions across finer ordinal categories (e.g. one level upward ISCED movement from lower secondary education (ISCED 2) to upper secondary education (ISCED 3)) could fail to deliver such results. Second, we aim that our categorization preserves compatibility and comparability across datasets, while also delivering statistically significant and efficient estimations. Having too many categories limits the comparability of results across various data sources and reduces their statistical precision due to limited number of observations falling into a larger number of categories.[20] Third, we aim to investigate and report on cross-categoric ordinal transitions thoroughly, therefore working with larger number of categories reduces the ease of comprehensibility and tractability of our findings.[21]

[15] As briefly discussed, we also redo our analyses employing European Values Survey (EVS), OECD's Survey of Adult Skills (PIAAC) and EuroStat's Adult Education Survey (AES) micro datasets for countries with feasible data. These findings are available upon requests.

[16] We follow the standard adult education definition by the OECD Education at a Glance, which measures education by "the highest level of education completed by the 25-64 year-old population". We exclude individuals born before 1940 because of their limited number of observations, and we omit individuals born after 1985 because a sizable fraction of these respondents were still continuing their education at the time of surveys.

[17] In order to abstain from the impacts of immigration, we limit our analysis to individuals who were born in *and* were residents of countries at the time of the survey.

[18] We exclude Luxembourg due to her limited number of observations.

[19] See Figure A.1 for the geographic illustration of average years of schooling by country.

[20] In fact, the first four waves of the ESS allows educational attainment to be categorized in 6 main ISCED categories, and last three waves permit even a more detailed categorization through subcategorizing within the main ISCED classification. However, for instance OECD's Survey of Adult Skills PIAAC, which we employ for robustness purposes measures parental education only under three ordinal categories.

[21] We also replicate our analyses adopting finer education classifications, data permitting. These findings are available upon request.

**Table 1:** Descriptive Statistics by Country

| Country | No of Obs. | Years of Schooling | | Age | |
|---|---|---|---|---|---|
| | | Mean | Std. Dev. | Mean | Std. Dev. |
| Albania | 790 | 10.62 | 3.61 | 49.33 | 12.79 |
| Austria | 5411 | 12.67 | 3.09 | 46.47 | 11.61 |
| Belgium | 7010 | 13.20 | 3.66 | 46.80 | 12.04 |
| Bulgaria | 6026 | 11.72 | 3.34 | 50.58 | 12.68 |
| Croatia | 1914 | 12.05 | 3.41 | 47.72 | 13.15 |
| Cyprus | 2937 | 12.02 | 3.97 | 47.12 | 12.99 |
| Czech Republic | 8786 | 12.83 | 2.36 | 47.83 | 12.65 |
| Denmark | 7170 | 13.91 | 4.52 | 48.50 | 12.21 |
| Estonia | 5536 | 13.52 | 3.18 | 47.10 | 12.75 |
| Finland | 9423 | 13.77 | 3.99 | 48.17 | 12.53 |
| France | 7796 | 13.06 | 3.85 | 47.27 | 12.32 |
| Germany | 12483 | 14.13 | 3.24 | 48.36 | 11.92 |
| Greece | 5887 | 11.42 | 4.22 | 45.62 | 12.18 |
| Hungary | 6587 | 12.50 | 3.57 | 46.40 | 12.32 |
| Iceland | 804 | 14.62 | 4.15 | 46.61 | 12.15 |
| Ireland | 9025 | 13.59 | 3.55 | 47.87 | 12.75 |
| Italy | 2378 | 11.94 | 4.77 | 45.98 | 11.82 |
| Kosovo | 732 | 9.93 | 3.70 | 47.20 | 11.92 |
| Latvia | 1958 | 12.91 | 3.29 | 45.72 | 12.40 |
| Lithuania | 3804 | 13.09 | 3.00 | 51.56 | 12.85 |
| The Netherlands | 8665 | 13.84 | 4.01 | 47.64 | 12.13 |
| Norway | 7542 | 13.96 | 3.67 | 46.70 | 11.88 |
| Poland | 8011 | 12.59 | 3.32 | 45.71 | 12.25 |
| Portugal | 8008 | 8.17 | 4.82 | 48.82 | 12.95 |
| Romania | 2752 | 11.74 | 3.64 | 45.70 | 12.16 |
| Russia | 6142 | 13.03 | 2.69 | 46.35 | 12.54 |
| Slovakia | 6029 | 12.93 | 2.96 | 47.12 | 12.51 |
| Slovenia | 5740 | 12.32 | 3.51 | 46.27 | 12.47 |
| Spain | 7998 | 12.44 | 5.40 | 45.98 | 12.34 |
| Sweden | 5223 | 13.51 | 3.34 | 48.97 | 13.03 |
| Switzerland | 6524 | 11.71 | 3.56 | 47.05 | 12.10 |
| Turkey | 3002 | 6.41 | 4.17 | 41.46 | 11.85 |
| Ukraine | 5800 | 12.53 | 3.01 | 47.26 | 12.72 |
| United Kingdom | 8469 | 13.59 | 3.57 | 47.80 | 12.59 |
| All | 196362 | 12.70 | 3.97 | 47.35 | 12.47 |

In addition to the described educational classification, we also cluster individuals according to their i) **country** and ii) **country-group** of residence.[22] While for the former category, we rely on standard official country definitions, for the latter category we group countries based on their geographical proximities, political histories *and* observed empirical commonalities. Accordingly, we form the following four country groups: i) Mediterranean, ii) Post-Socialist, iii) Nordic and iv) Rest of Europe country groups.[23]

In Table 2 and Table 3, we report the distribution of descendants and parents over the three ordinal education categories for the countries of interest.[24] Table 2 reports that the average fraction of descendants with low education is one-fourth of descendants in Europe for the whole sample. Country-specific values of this variable range from 8% (Russia) to 76% (Turkey). The cross-country average of the share of descendants with medium education is 44%, while the country-specific values range from 16% (Turkey and Portugal) to 80% (the Czech Republic). The cross-country average of the share of descendants with high education is 33%, ranging from 8% (Turkey) to 64% (Russia). Finally, female descendants are slightly more disadvantaged on average in terms of educational attainment, as the share of descendants with low education is slightly higher for females, i.e. 26%, compared to that of male descendants, i.e. 23%.[25]

In Table 3, we report the distribution of parents over the three educational categories.[26] Table 3 reports that the average share of fathers with low educational attainment is slightly over half of their respective country figures, which is substantially higher than the 24% share of descendants, thereby indicating the upward trend in educational attainment throughout Europe. The fraction of low-educated fathers range from 92% (Turkey) to 15% (the Czech Republic). As for mothers, we report a similar cross-country pattern, albeit with some gender disadvantage for females: the average share of low-educated mothers is 61%, varying considerably between 97% (Turkey) and 28% (the Czech Republic). Finally, our main measure of parental education, i.e. the educational attainment level of the *better-educated parent* of descendants, which we discuss in the next section, is low for approximately half of parents, medium for one-third of parents and high for one-sixth of parents on average, again with displaying considerable heterogeneity across countries.

[22] While we do the former categorization in order to study within-country intergenerational mobility dynamics, we do the latter categorization in order to detect similarities and differences across European countries in terms of their mobility patterns over time.

[23] While constructing the country groups, we do not strictly adhere to geographical proximities: for instance, the observed intergenerational educational mobility patterns in France parallel with Germany and Austria significantly more than Italy or Spain, therefore we place France in the "Rest of Europe" group, despite her Mediterranean coast. See Table A.1 for the descriptive statistics of the country groups.

[24] See Online Appendix for geographical illustration of the shares of descendants with low, medium and high education.

[25] The presence of educational disadvantages for female descendants does not hold true for all countries of interest, and there is a gradual improvement in favor of female descendants' educational prospects over time, the details of which we discuss in detail in the results section.

[26] See Online Appendix for the geographic illustration of the shares of families where better-parental-education is low, medium and high, respectively.

**Table 2:** Distribution of Descendants over Education Categories

| | | All descendants | | | Male descendants | | | Female descendants | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Country | Country Group | Low | Medium | High | Low | Medium | High | Low | Medium | High |
| Albania | Mediterranean | 0.45 | 0.43 | 0.12 | 0.43 | 0.46 | 0.11 | 0.48 | 0.40 | 0.12 |
| Cyprus | Mediterranean | 0.27 | 0.42 | 0.31 | 0.22 | 0.46 | 0.33 | 0.32 | 0.38 | 0.30 |
| Greece | Mediterranean | 0.40 | 0.36 | 0.24 | 0.37 | 0.35 | 0.28 | 0.42 | 0.37 | 0.21 |
| Italy | Mediterranean | 0.44 | 0.40 | 0.15 | 0.44 | 0.41 | 0.16 | 0.45 | 0.40 | 0.15 |
| Portugal | Mediterranean | 0.71 | 0.16 | 0.13 | 0.69 | 0.18 | 0.13 | 0.73 | 0.14 | 0.14 |
| Spain | Mediterranean | 0.52 | 0.23 | 0.25 | 0.52 | 0.24 | 0.24 | 0.52 | 0.21 | 0.26 |
| Turkey | Mediterranean | 0.76 | 0.16 | 0.08 | 0.71 | 0.19 | 0.11 | 0.80 | 0.14 | 0.06 |
| Mediterranean | | 0.54 | 0.26 | 0.20 | 0.51 | 0.28 | 0.21 | 0.56 | 0.25 | 0.19 |
| Denmark | Nordic | 0.15 | 0.37 | 0.47 | 0.15 | 0.43 | 0.42 | 0.16 | 0.31 | 0.53 |
| Finland | Nordic | 0.20 | 0.39 | 0.41 | 0.23 | 0.42 | 0.35 | 0.18 | 0.36 | 0.46 |
| Iceland | Nordic | 0.25 | 0.33 | 0.42 | 0.25 | 0.44 | 0.31 | 0.26 | 0.23 | 0.51 |
| Norway | Nordic | 0.12 | 0.45 | 0.43 | 0.12 | 0.48 | 0.41 | 0.13 | 0.41 | 0.46 |
| Sweden | Nordic | 0.16 | 0.46 | 0.38 | 0.17 | 0.51 | 0.32 | 0.15 | 0.42 | 0.44 |
| Nordic | | 0.17 | 0.41 | 0.42 | 0.17 | 0.45 | 0.38 | 0.16 | 0.37 | 0.47 |
| Bulgaria | Post-Socialist | 0.23 | 0.53 | 0.24 | 0.22 | 0.59 | 0.20 | 0.24 | 0.48 | 0.28 |
| Croatia | Post-Socialist | 0.19 | 0.58 | 0.24 | 0.15 | 0.62 | 0.23 | 0.22 | 0.54 | 0.24 |
| Czech Republic | Post-Socialist | 0.07 | 0.80 | 0.14 | 0.05 | 0.81 | 0.14 | 0.08 | 0.78 | 0.14 |
| Estonia | Post-Socialist | 0.11 | 0.50 | 0.39 | 0.13 | 0.56 | 0.30 | 0.10 | 0.46 | 0.45 |
| Hungary | Post-Socialist | 0.21 | 0.59 | 0.20 | 0.17 | 0.66 | 0.16 | 0.25 | 0.53 | 0.22 |
| Kosovo | Post-Socialist | 0.48 | 0.44 | 0.07 | 0.28 | 0.62 | 0.10 | 0.66 | 0.29 | 0.05 |
| Latvia | Post-Socialist | 0.16 | 0.55 | 0.29 | 0.21 | 0.56 | 0.23 | 0.12 | 0.55 | 0.33 |
| Lithuania | Post-Socialist | 0.16 | 0.46 | 0.38 | 0.19 | 0.50 | 0.31 | 0.14 | 0.43 | 0.43 |
| Poland | Post-Socialist | 0.27 | 0.53 | 0.20 | 0.28 | 0.53 | 0.18 | 0.25 | 0.53 | 0.22 |
| Romania | Post-Socialist | 0.27 | 0.58 | 0.16 | 0.24 | 0.60 | 0.16 | 0.29 | 0.56 | 0.16 |
| Russia | Post-Socialist | 0.08 | 0.28 | 0.64 | 0.09 | 0.31 | 0.60 | 0.07 | 0.27 | 0.66 |
| Slovakia | Post-Socialist | 0.10 | 0.73 | 0.16 | 0.07 | 0.77 | 0.17 | 0.13 | 0.71 | 0.16 |
| Slovenia | Post-Socialist | 0.17 | 0.58 | 0.26 | 0.13 | 0.64 | 0.23 | 0.20 | 0.52 | 0.28 |
| Ukraine | Post-Socialist | 0.08 | 0.33 | 0.59 | 0.08 | 0.37 | 0.55 | 0.08 | 0.31 | 0.61 |
| Post-Socialist | | 0.16 | 0.55 | 0.29 | 0.15 | 0.60 | 0.25 | 0.16 | 0.51 | 0.32 |
| Austria | Rest of Europe | 0.18 | 0.70 | 0.12 | 0.15 | 0.71 | 0.14 | 0.20 | 0.69 | 0.11 |
| Belgium | Rest of Europe | 0.24 | 0.38 | 0.38 | 0.24 | 0.41 | 0.35 | 0.24 | 0.35 | 0.40 |
| France | Rest of Europe | 0.21 | 0.45 | 0.34 | 0.18 | 0.49 | 0.33 | 0.23 | 0.42 | 0.35 |
| Germany | Rest of Europe | 0.06 | 0.61 | 0.34 | 0.04 | 0.55 | 0.41 | 0.08 | 0.66 | 0.26 |
| Ireland | Rest of Europe | 0.37 | 0.29 | 0.34 | 0.42 | 0.28 | 0.31 | 0.34 | 0.30 | 0.36 |
| The Netherlands | Rest of Europe | 0.35 | 0.32 | 0.33 | 0.32 | 0.32 | 0.36 | 0.38 | 0.32 | 0.30 |
| Switzerland | Rest of Europe | 0.12 | 0.55 | 0.33 | 0.07 | 0.50 | 0.43 | 0.17 | 0.59 | 0.24 |
| United Kingdom | Rest of Europe | 0.41 | 0.19 | 0.41 | 0.37 | 0.20 | 0.43 | 0.43 | 0.18 | 0.39 |
| Rest of Europe | | 0.24 | 0.43 | 0.33 | 0.22 | 0.43 | 0.36 | 0.26 | 0.43 | 0.31 |
| All | | 0.25 | 0.44 | 0.31 | 0.23 | 0.47 | 0.30 | 0.26 | 0.42 | 0.32 |

**Table 3:** Distribution of Parents over Education Categories

| | | Father | | | Mother | | | Better-Educated Parent | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Country | Country Group | Low | Medium | High | Low | Medium | High | Low | Medium | High |
| Albania | Mediterranean | 0.73 | 0.23 | 0.04 | 0.85 | 0.14 | 0.02 | 0.70 | 0.26 | 0.04 |
| Cyprus | Mediterranean | 0.77 | 0.17 | 0.06 | 0.84 | 0.13 | 0.03 | 0.75 | 0.18 | 0.07 |
| Greece | Mediterranean | 0.84 | 0.10 | 0.06 | 0.89 | 0.08 | 0.03 | 0.81 | 0.11 | 0.07 |
| Italy | Mediterranean | 0.82 | 0.13 | 0.05 | 0.87 | 0.10 | 0.02 | 0.79 | 0.15 | 0.06 |
| Portugal | Mediterranean | 0.93 | 0.03 | 0.03 | 0.95 | 0.03 | 0.03 | 0.92 | 0.04 | 0.04 |
| Spain | Mediterranean | 0.85 | 0.06 | 0.09 | 0.92 | 0.04 | 0.04 | 0.83 | 0.07 | 0.10 |
| Turkey | Mediterranean | 0.93 | 0.05 | 0.02 | 0.98 | 0.02 | 0.00 | 0.93 | 0.05 | 0.02 |
| Mediterranean | | 0.86 | 0.08 | 0.06 | 0.91 | 0.06 | 0.03 | 0.85 | 0.09 | 0.06 |
| Denmark | Nordic | 0.37 | 0.41 | 0.22 | 0.56 | 0.25 | 0.19 | 0.31 | 0.39 | 0.29 |
| Finland | Nordic | 0.64 | 0.20 | 0.16 | 0.66 | 0.22 | 0.12 | 0.55 | 0.25 | 0.20 |
| Iceland | Nordic | 0.43 | 0.44 | 0.13 | 0.74 | 0.15 | 0.11 | 0.38 | 0.44 | 0.19 |
| Norway | Nordic | 0.45 | 0.34 | 0.21 | 0.56 | 0.29 | 0.15 | 0.37 | 0.37 | 0.26 |
| Sweden | Nordic | 0.62 | 0.19 | 0.19 | 0.63 | 0.21 | 0.16 | 0.53 | 0.23 | 0.24 |
| Nordic | | 0.52 | 0.29 | 0.19 | 0.61 | 0.24 | 0.15 | 0.44 | 0.32 | 0.24 |
| Bulgaria | Post-Socialist | 0.59 | 0.32 | 0.10 | 0.62 | 0.29 | 0.09 | 0.56 | 0.32 | 0.13 |
| Croatia | Post-Socialist | 0.54 | 0.37 | 0.09 | 0.67 | 0.27 | 0.06 | 0.51 | 0.38 | 0.11 |
| Czech Republic | Post-Socialist | 0.16 | 0.75 | 0.09 | 0.28 | 0.67 | 0.05 | 0.12 | 0.77 | 0.11 |
| Estonia | Post-Socialist | 0.47 | 0.37 | 0.16 | 0.43 | 0.43 | 0.14 | 0.36 | 0.44 | 0.21 |
| Hungary | Post-Socialist | 0.44 | 0.47 | 0.09 | 0.63 | 0.32 | 0.06 | 0.41 | 0.48 | 0.11 |
| Kosovo | Post-Socialist | 0.75 | 0.22 | 0.04 | 0.93 | 0.06 | 0.01 | 0.75 | 0.21 | 0.04 |
| Latvia | Post-Socialist | 0.52 | 0.36 | 0.12 | 0.43 | 0.44 | 0.13 | 0.38 | 0.45 | 0.18 |
| Lithuania | Post-Socialist | 0.63 | 0.25 | 0.12 | 0.56 | 0.29 | 0.15 | 0.53 | 0.29 | 0.18 |
| Poland | Post-Socialist | 0.62 | 0.32 | 0.06 | 0.66 | 0.29 | 0.04 | 0.57 | 0.35 | 0.08 |
| Romania | Post-Socialist | 0.62 | 0.32 | 0.06 | 0.71 | 0.23 | 0.05 | 0.60 | 0.33 | 0.08 |
| Russia | Post-Socialist | 0.47 | 0.17 | 0.36 | 0.43 | 0.18 | 0.39 | 0.37 | 0.16 | 0.47 |
| Slovakia | Post-Socialist | 0.40 | 0.53 | 0.07 | 0.51 | 0.45 | 0.04 | 0.37 | 0.55 | 0.08 |
| Slovenia | Post-Socialist | 0.40 | 0.50 | 0.10 | 0.60 | 0.32 | 0.07 | 0.38 | 0.49 | 0.13 |
| Ukraine | Post-Socialist | 0.48 | 0.26 | 0.26 | 0.48 | 0.26 | 0.27 | 0.40 | 0.25 | 0.35 |
| Post-Socialist | | 0.46 | 0.41 | 0.13 | 0.53 | 0.36 | 0.12 | 0.41 | 0.42 | 0.17 |
| Austria | Rest of Europe | 0.41 | 0.52 | 0.07 | 0.60 | 0.38 | 0.02 | 0.39 | 0.55 | 0.07 |
| Belgium | Rest of Europe | 0.57 | 0.26 | 0.17 | 0.66 | 0.23 | 0.12 | 0.51 | 0.28 | 0.21 |
| France | Rest of Europe | 0.62 | 0.27 | 0.11 | 0.72 | 0.21 | 0.07 | 0.57 | 0.30 | 0.13 |
| Germany | Rest of Europe | 0.10 | 0.64 | 0.26 | 0.33 | 0.59 | 0.08 | 0.09 | 0.64 | 0.27 |
| Ireland | Rest of Europe | 0.79 | 0.13 | 0.08 | 0.75 | 0.17 | 0.08 | 0.69 | 0.19 | 0.12 |
| Netherlands | Rest of Europe | 0.68 | 0.16 | 0.16 | 0.83 | 0.10 | 0.07 | 0.66 | 0.17 | 0.17 |
| Switzerland | Rest of Europe | 0.29 | 0.52 | 0.20 | 0.53 | 0.42 | 0.05 | 0.26 | 0.54 | 0.20 |
| United Kingdom | Rest of Europe | 0.70 | 0.11 | 0.20 | 0.77 | 0.07 | 0.16 | 0.65 | 0.11 | 0.24 |
| Rest of Europe | | 0.51 | 0.33 | 0.16 | 0.64 | 0.28 | 0.08 | 0.46 | 0.35 | 0.19 |
| All | | 0.55 | 0.31 | 0.14 | 0.64 | 0.27 | 0.10 | 0.50 | 0.33 | 0.17 |

### 3.2 Estimation Methodology

The main methodology we use throughout our analyses involves the use of *ordered logistic regressions*, in which the dependent variable is a descendent's ordinal educational attainment (1 for low, 2 for medium, and 3 for high) and the main explanatory variable is the *maximum* educational attainment level of the descendant's parents (1, 2 or 3).[27,28,29]

Using the described ordinal education definitions, we rely on two econometric specifications, in which educational attainment $E_{it}$ of the individual $i$ born in year $t$ depends on a latent variable $E^*_{it}$, which is a function of the *maximum* parental education of descendent $i$, $P_{it}$, as well as other control variables.[30]

In our first specification, we estimate the relationship between descendants' and parents' education for each of the **country groups**, while controlling for the country-fixed, cohort-fixed, gender-fixed and parental couple-fixed effects, along with their time interactions. In this specification, the latent variable takes the form:

$$E^*_{it} = (\beta_1 + \beta_2 t)P_{it} + (\gamma_1 + \gamma_2 t)F_{it} + \sum_{j=1}^{6}(\alpha_{1j} + \alpha_{2j}t)D_{ijt} + \sum_{K=1940}^{1985} \eta_k Y_{ik} + \sum_{l=1}^{34} \theta_l C_{lit} + u_{it} \qquad (1)$$

where $D_{ijt}$ refers to dummy variables that summarize the educational attainment composition of the parental couple (e.g. low maternal and medium paternal education permutation showing up as one

[27]Note that contrary to the methodology adopted in the earlier educational mobility literature relying on years of schooling OLS regressions, e.g. as in Hertz et al. (2007) and Schneebaum et al. (2015), our estimation strategy does *not* rely on the assumption that the relationship between parental education and children's education needs to be linear/log-linear, symmetric or cardinal. Further, we believe our estimation strategy is more robust to estimation errors due to measurement problems of years of schooling, as highlighted in Ashenfelter and Krueger (1994). In fact, when we compare reported educational measures in two comparable datasets: the ESS and the EVS, we calculate that while years of schooling of descendants vary radically and significantly over the two datasets (e.g. for the Nordic country group, the discrepancy is 30.90% due to 13.82 average years in the ESS dataset versus 18.09 years in the EVS dataset), the variation over the ordinal categoric distributions are insignificant, and an order of magnitude lower (e.g. for the Nordic country group, the discrepancy in average ordinal categoric attainment is 1.78% for parents and 3.89% for descendants, with the highest *within-category* variation being 20%.

[28]The use of the *maximum* of the education levels of parents as an explanatory variable is not a critical feature of our estimation strategy, but merely a matter of normalization and mapping of a two-state variable into a single-state variable, since we also keep track of the marginal impact of the less-educated parent by the use of couple-specific categorical dummy variables, along with their time interaction. Results by the use of alternative specifications as done in the earlier literature, such as the use of *average* education of the parents, *only* mother's education and *only* father's education as the main independent variable are available upon request.

[29]For robustness purposes, we also replicate our analyses using ordered *probit* regressions, which generate quantitatively similar results as the ordered *logistic* regressions.

[30]Throughout our econometric analyses, we refrain from using *flow* variables (e.g. income, city of residence) in our estimations. We believe making use of flow variables could contribute to potential misspecification problems: educational choices of descendants are likely to depend not just on family's contemporaneous income, but also on their *expected* life-time earnings; and geographical locations of residence during the years when descendants study may not necessarily coincide with the place of residence at the time of survey. Therefore, we rely only on *stock* variables, e.g. educational attainment of the parents (along with their gender) in our calculations when estimating intergenerational mobility figures. The only exception to this specification strategy is when we study the marginal impact of parental finances at descendants' age of 14, as described in detail in the results section.

dummy variable) for the cohort born at $t$, $Y_{kit}$ refers to dummy variables controlling for the cohort-fixed effects for the cohort born at $t$, $C_{lit}$ refers to dummy variables controlling for the country-fixed effects for the cohort born at $t$ and $F_{it}$ refers to dummy variables on descendants' gender.[31][32]

Additionally, we also estimate the relationship between descendants' and parents' educational attainment separately for each **country** of interest, as in (2):[33,34]

$$E^*_{it} = (\beta_1 + \beta_2 t)P_{it} + (\gamma_1 + \gamma_2 t)F_{it} + \sum_{j=1}^{6} \alpha_j D_{ijt} + \sum_{k=1940}^{1985} \eta_k Y_{ik} + u_{it} \tag{2}$$

Depending on the value of $E^*_{it}$, educational attainment of descendant $i$ born at time $t$ takes the value 1 for low, 2 for medium or 3 for high education. Therefore, the educational outcome of individual $i$ is described by the step function, as in (3):

$$E_{it} = \begin{cases} 1 & \text{if } \; E^*_{it} \leq \theta_1 \\ 2 & \text{if } \; \theta_1 < E^*_{it} \leq \theta_2 \\ 3 & \text{if } \; \theta_2 < E^*_{it} \leq \theta_3 \end{cases} \tag{3}$$

Accordingly, the probability of a descendant to attain education $z$ follows:

$$\Pr(E_{it} = z | P_{it}) = \Pr(\theta_{(z-1)} < E^*_{it} \leq \theta_z) = \Pr(\theta_{(z-1)} - \beta P_{it} < u_{it} \leq \theta_z - \beta P_{it}) \tag{4}$$

We estimate the $\beta$ vector by using ordered logistic regressions. Accordingly, for members of the cohort born in the year $t$, we calculate the intergenerational educational persistence $\mathcal{P}_t$ (5), upward mobility $\mathcal{U}_t$ (6) and downward mobility $\mathcal{D}_t$ (7) probabilities using the following definitions:[35]

[31] We also repeat estimations with alternative specifications (e.g. consisting only of parental education as the independent variable, involving parental couple effects while omitting gender-cohort effects, among others) for each of the countries of interest and country-groups. The details of these findings are available upon request.

[32] We conduct our estimations by using microdata obtained via combining the first seven waves of ESS. However this practice comes with a cost as well since there is no straightforward way of harmonizing the design and post-stratification weights across observations coming from different waves of the survey. Since our primary aim is to enhance the precision of our estimation results via using the maximum number of observations available, we do not use any weights throughout the estimation procedure.

[33] The specification (2) allows us to detect cross-country similarities and heterogeneities over time without having to impose within-group similarities econometrically.

[34] We also cluster descendants according to their birth cohorts, and run ordered logistic regressions regressions separately for *each birth cohort* without introducing fixed effects. Regression results and the predicted transition probabilities calculated by this approach are quantitatively similar, yet are more erratic due to limited sample sizes for some birth cohorts. These findings are available upon request.

[35] Alternatively, we also estimate the intergenerational educational persistence $\mathcal{P}_t$, upward mobility $\mathcal{U}_t$ and downward mobility $\mathcal{D}_t$ probabilities by using probit and logit regressions indicator functions, which take the value of 1 if the descendant has experienced intergenerational educational persistence (or upward/downward mobility), and zero otherwise. We verify that this approach delivers quantitatively similar results, as well.

$$\mathcal{P}_t = \frac{\sum_{j=1}^{3} \Pr_t(E = j|P = j) \times N_t(P = j)}{\sum_{j=1}^{3} N_t(P = j)} \tag{5}$$

$$\mathcal{U}_t = \frac{\sum_{j=1}^{2} \Pr_t(E > j|P = j) \times N_t(P = j)}{\sum_{j=1}^{2} N_t(P = j)} \tag{6}$$

$$\mathcal{D}_t = \frac{\sum_{j=2}^{3} \Pr_t(E < j|P = j) \times N_t(P = j)}{\sum_{j=2}^{3} N_t(P = j)} \tag{7}$$

where $N_t(P = j)$ refers to the number of descendants born in the year $t$ whose parental education is equal to $j$. These estimated transition probabilities allow us to construct *time-varying educational Markov-chain transition probability matrices* for the countries and country groups of interest.[36]

A typical intergenerational transition matrix resulting from our analyses is portrayed in Table 4. Our measure for the degree of intergenerational educational persistence, $\mathcal{P}_t$, as it is defined in (5) corresponds to descendants born in a specific birth-cohort at a specific country/country group that are located the on *diagonal* of the transition matrix, i.e. the orange-colored area. Similarly, upward mobility, $\mathcal{U}_t$, as in (6) corresponds to green-colored *upper triangular* part; and downward mobility, $\mathcal{D}_t$, as in (7) corresponds to the red-colored *lower-triangular* part of the Markov-chain transition matrix.[37]

**Table 4:** Intergenerational Educational Mobility Transition Matrix

| Parent \ Descendant | **Low** | **Medium** | **High** |
|---|---|---|---|
| **Low** | Low-type persistence | Low-type upward mobility | |
| **Medium** | Medium-type downward mobility | Medium-type persistence | Medium-type upward mobility |
| **High** | High-type downward mobility | | High-type persistence |

Equation (8) summarizes the procedure we use to calculate our three intergenerational educational mobility measures: we first estimate intergenerational educational transition probabilities and construct time-varying Markov-chain transition probability matrices for each birth-cohort and

[36]Note that Markov chain transition matrices can be used to predict educational distributions of future generations, as well as to calculate the steady-state educational distributions, as it is common particularly in the heterogeneous-agent macroeconomics literature.

[37]Note that not all sub-components of the same-colored three intergenerational educational transitions are homogeneous and equally preferable: while intergenerational educational persistence of descendants born to high-educated parents may not be an undesirable outcome *per se*, persistence of descendants born to low-educated parents could be alarming in terms of *de facto* relative high education prospect concerns. To address this issue, we study the nature of the intergenerational mobility dynamics in complete detail by identifying the underlying sources of persistence (i.e. low-type vs. medium-type vs. high-type persistence), upward mobility (i.e. low-type vs. medium-type upward mobility) and downward mobility (i.e. medium type vs. high-type downward mobility), which we discuss thoroughly in the results section.

country/country group. Next, using actual parental educational distributions and the estimated transition probabilities, we calculate the three intergenerational mobility measures, $\mathcal{P}_t$, $\mathcal{U}_t$ and $\mathcal{D}_t$ as in (5), (6) and (7), respectively.[38]

$$\underbrace{\begin{bmatrix} N_t(P=1) & N_t(P=2) & N_t(P=3) \end{bmatrix}}_{\substack{\text{Distribution of parental education} \\ \text{for birth-cohort } t}} \underbrace{\begin{bmatrix} \Pr(1|1) & \Pr(2|1) & \Pr(3|1) \\ \Pr(1|2) & \Pr(2|2) & \Pr(3|2) \\ \Pr(1|3) & \Pr(2|3) & \Pr(3|3) \end{bmatrix}}_{\substack{\text{Estimated intergenerational transition} \\ \text{matrix for birth-cohort } t}} = \underbrace{\begin{bmatrix} N_t(E=1) & N_t(E=2) & N_t(E=3) \end{bmatrix}}_{\substack{\text{Predicted educational} \\ \text{distribution of birth-cohort } t}} \tag{8}$$

In order to explore the relationship between educational inequality and intergenerational educational elasticity and so as to test for the validity of the"Educational Great Gatsby Curve" hypothesis for Europe, we first measure educational inequality in country and country groups by calculating the educational Gini coefficients for each birth-cohorts, as in Thomas et al. (2002).[39] In order to calculate the intergenerational educational elasticity figures, we estimate a standard intergenerational elasticity equation, as in (9):

$$\log(E_{ict}) = \alpha_{ct} + \beta_{ct} \log(P_{ict}) + \epsilon_{ict} \tag{9}$$

where $\log(\cdot)$ refers to the natural logarithm function, $E_{ict}$ refers to the educational attainment (in terms of the described ordinal units) of individual $i$ in country $c$ and born in the year $t$, and $P_{ict}$ refers to the better-educated parent's ordinal education level for descendant $i$; thereby $\beta_{ct}$ coefficient corresponding to the intergenerational educational elasticity measure.

Additionally, we also define a new set of variables, **relative high education prospect** ($\mathcal{RHEP}$), which measure the relative high education prospects of descendants born to parents with different levels of education. Our first relative high education prospect variable, ($\mathcal{RHEP}_{\text{L\&M/H}}$) measures the high education probability of descendants born to below-high-educated parents relative to descendants born to high-educated parents, as formally defined in (10):

$$\mathcal{RHEP}_{\text{L\&M/H}} = \frac{\Pr(E=3|P<3)}{\Pr(E=3|P=3)} = \frac{\Pr(E=3|P=1 \vee P=2)}{\Pr(E=3|P=3)} \tag{10}$$

This *de facto* educational opportunity measure describes how *disadvantaged* descendants born to below-high-educated parents are: a value close to zero indicates that a descendant born to below-high-educated parents have almost no chance to attain tertiary education, and the high-educated

[38]Note that as described in (8), intergenerational educational mobility figures $\mathcal{P}_t$, $\mathcal{U}_t$ and $\mathcal{D}_t$ are affected by both changes in parental educational distributions *and* changes in intergenerational transition probabilities over time.

[39]In order to accomplish this goal, we first determine the unique values of years of education received by the members of birth-cohorts. Next, we sort individuals over years of education and calculate their educational distribution, which we use to construct the "educational Lorenz curve" and calculate the educational Gini coefficient. Alternatively, we calculate educational inequality by making use of *ordinal* educational attainment levels, and we verify that Gini coefficients by this approach generates qualitatively similar results. The details of and findings from our ordinal educational inequality calculations are available upon request.

descendants come almost exclusive from parents with high-education backgrounds; whereas a value close to one suggests that *all* descendants, regardless of their parental educational background have equal *de facto* chances of attaining high education. Therefore, in an educationally-mobile society, one would expect the relative high education prospect measure in (10) to take a high and intergenerational educational elasticity measure in in (9) to take a low value.

We further dissect the relative high education prospect in (10) into two parts: (i) relative high education prospect of descendants born to low-educated parents relative to descendants born to high-educated parents:

$$\mathcal{RHEP}_{\mathrm{L/H}} = \frac{\Pr(E=3|P=1)}{\Pr(E=3|P=3)} \tag{11}$$

and (ii) relative high education prospect of descendants born to medium-educated parents relative to descendants born to high-educated parents:

$$\mathcal{RHEP}_{\mathrm{M/H}} = \frac{\Pr(E=3|P=2)}{\Pr(E=3|P=3)} \tag{12}$$

Finally, we define the equality of high education prospects of descendants born to low-educated parents relative to descendants born to medium-educated parents:

$$\mathcal{RHEP}_{\mathrm{L/M}} = \frac{\Pr(E=3|P=1)}{\Pr(E=3|P=2)} \tag{13}$$

These latter three relative high education prospect measures, as they are defined *only* over estimated conditional transition probabilities, do not depend on actual educational distribution of parents, and accordingly offer a standardized measure of better-educational prospects of disadvantaged descendants relative to their advantaged counterparts.[40,41]

# 4 Results

In this section we report and discuss our findings. In doing so, we first present mobility figures at broadest scales so as to provide a general picture. Next, we concentrate on several dimensions of heterogeneities in our exposition so as to highlight marginal effects of factors of interest. Finally, we report and discuss on the links between educational inequalities and intergenerational mobility patterns.

[40] To exemplify, suppose that conditional educational transition probabilities of descendants are time-invariant, and that high-education prospects of descendants born to medium-educated parents are better than those of low-educated parents. If the share of parents with low-educated parents decreases and the share of medium-educated parents increases over time, as in the case of the Post-Socialist group, then the relative high education prospect measure in (10) would increase as a result of the distributional change of parents, despite that descendants born to low-educated parents are equally disadvantaged. relative high education prospect measures in (11), (12) and (13), however, are immune to such distributional changes.

[41] In order to detect gender-specific gaps in better-education prospects, we also calculate relative high education prospect figures for male and female descendants, as well. Our results are available in the Online Appendix.

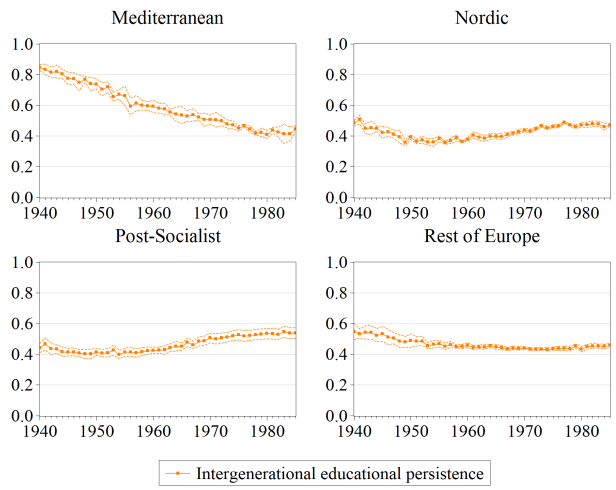
## 4.1 Intergenerational Educational Mobility Dynamics

We start our exposition by reporting on the evolution of intergenerational educational mobility figures for cohorts born between 1940-1985. In doing so, we first report our results at the *country-group* scale, then we report and discuss our *country*-specific findings.

### 4.1.1 Intergenerational Educational Mobility Dynamics by Country Groups

In this section, we start by reporting on country groups's intergenerational persistence estimates, i.e the probability of a randomly-chosen descendent born in a country group to mimic the educational attainment of her better-educated parent for cohorts born between 1940 and 1985.[42] Figure 1 depicts the evolution of intergenerational educational persistence estimates across the four country groups. Figure 1 reveals that both intergenerational educational persistence probabilities and their evolution vary considerably across the four country groups.

**Figure 1:** Intergenerational Educational Persistence by Country Group




† Dates on the horizontal axis correspond to the ***birth-cohort*** of interest. Dashed lines correspond to country-clustered 95% confidence interval standard error bands.

*A priori*, one could expect to see a downward time-trend in the likelihood of descendants to mimic their parental education, due to the increase educational attainment in Europe over the second half

[42]Our main goal in reporting mobility dynamics at the *country-group scale* is twofolds: first we aim to illustrate our findings in a compact and easy-to-follow manner. Second, we aim to cluster countries in their observed *time-series* similarities in order to emphasize group-specific distinct and unique patterns. For this purpose, Figure A.2, Figure A.3 and Figure A.4, in which we display intergenerational educational persistence for descendants born between 1940 and 1944, descendants born between 1981 and 1985, and the *change* in the observed persistence probabilities respectively, could be particularly useful: first, one could notice that intergenerational educational persistence figures vary considerably across European countries for both the 1940-1944 and the 1981-1985 cohorts, as depicted in Figure A.2, Figure A.3. Second, albeit at different magnitudes, the *change* in intergenerational persistence probabilities, as depicted in Figure A.4 suggest notable empirical similarities for particular country clusters. In the next sections, we discuss further that members of the country groups display not only similarities in their evolution of *average* persistence and mobility dynamics, but also in their underlying sources.

of the last century. Our findings for the Mediterranean country group are indeed in accordance with these predictions: while the probability of descendants to mimic the educational attainment of their better-educated parents is as high as 85% for cohorts born in the early 1940s, this probability descends rather monotonically to slightly over 40% for cohorts born in the early 1980s.

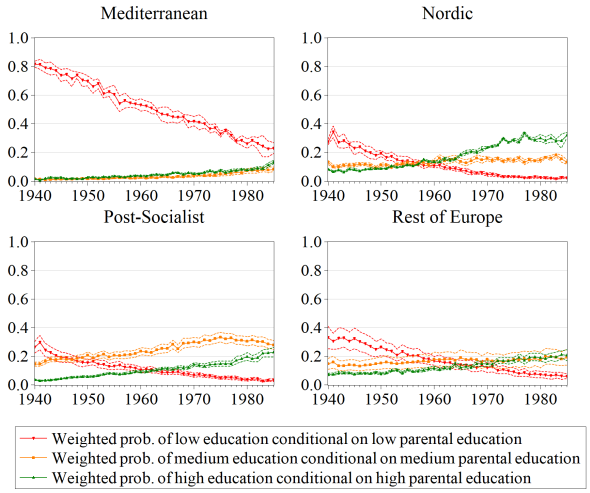
The time-series patterns in intergenerational persistence for the three other country groups, however, display a different pattern than the Mediterranean country group. Intergenerational educational persistence in the Nordic country group starts from 50% for cohorts borns in the early 1940s, diminishes to below 40% for cohorts born in 1960, and increases back to its 1940 levels for the 1980s-born cohorts, thereby generating a U-shaped pattern over time. Persistence in the Post-Socialist country group decreases moderately for cohorts born in early 1940s, and then monotonically increases up to 55% for the most recent cohorts, thereby exceeding its initial level despite the increase in overall educational attainment over time. The Rest of Europe country group also displays an initial drop in persistence, from 55% for cohorts born in the 1940s down to slightly over 40% for the 1960-born cohort. However, cohorts born between 1960 and 1985 face almost identical intergenerational educational persistence probabilities. Overall, our findings suggest that that European country groups differ not only in their average intergenerational persistence probabilities, but also in their *evolution* over time.[43]

As we briefly discussed, the intergenerational educational persistence figures depicted in Figure 1 display the probability of a *randomly-chosen* descendant in a country group to mimic the educational attainment of her better-educated parent. Evidently, this probability depends *both* on the educational distribution of parents, *and* the conditional educational transition probabilities of descendants. In other words, intergenerational educational persistence estimates for the country groups of interest in Figure 1 do not translate into *identical* measures of intergenerational educational persistence, since the observed persistence figures could stem from (i) low-type persistence (i.e. low-educated descendants and parents), (ii) medium-type persistence (i.e. medium-educated descendants and parents), or (iii) high-type persistence (i.e. high-educated descendants and parents). In order to explore the driving forces generating the observed *overall* persistence patterns, we next distinguish between the types of intergenerational educational persistence, and in Figure 2 we illustrate the empirical evolution of the three persistence types, as portrayed in the form of the diagonal cells of the transition matrix in Table 4.

Figure 2 reveals that the country groups have different determinants behind the particular evolution of their intergenerational educational persistence figures. For the Mediterranean country group,

[43]We depict intergenerational educational *upward mobility* figures of the four country groups in Figure A.5. As intergenerational educational *downward mobility* has not been historically frequent for any of the country groups of interest, upward mobility figures over time tend to be the *mirror images* of the persistence figures depicted in Figure 1: intergenerational educational upward mobility prospects monotonically increase over time for the Mediterranean country group, display an inverted U-shape for the Nordic country group, moderately increase and then almost monotonically decrease for the Post-Socialist group, and moderately increase and remain relatively stable for the Rest of Europe country group. Because of its limited frequency and erratic nature, we report our downward intergenerational educational mobility estimates only in the Online Appendix, for the sake of brevity.

**Figure 2:** Intergenerational Educational Persistence Type by Country Group

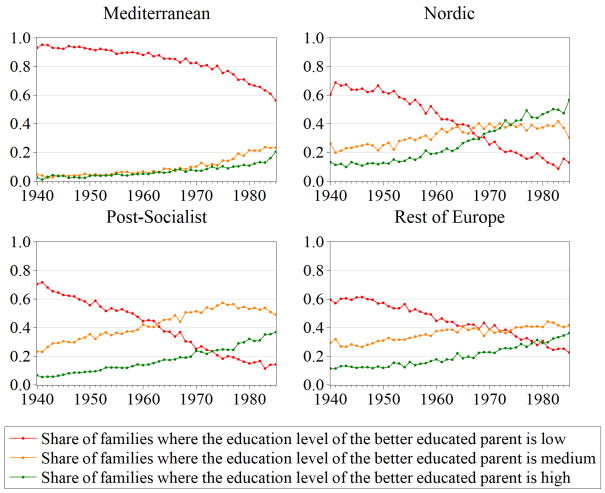



† Dates on the horizontal axis correspond to the ***birth-cohort*** of interest. Red, orange and green lines correspond to low-type, medium-type and high-type intergenerational educational persistence, respectively. Dashed lines correspond to country-clustered 95% confidence interval standard error bands.

the main force behind the monotonic decrease in overall persistence is the radical decline in the low-type persistence of later-born cohorts. The upward time-trend in overall persistence for the Post-Socialist country group is driven by the increase in the medium-type, and especially the high-type persistence over time, as the competing force, i.e. decrease in the low-type persistence is not nearly strong enough to revert the overall upward trend in persistence. The Nordic U-shaped pattern in intergenerational educational persistence is mainly a result of an initial decline in the frequency of low-type persistence, accompanied by a rather sharp ascent in the high-type persistence for later-born cohorts. The reason behind the initial moderate drop in overall persistence for the Rest of Europe country groups is the same as the three other ones: the decrease in low-type persistence over newborn cohorts. Further, the constancy of the overall intergenerational persistence for the post-1960-born cohorts does not stem from the stabilization of the three persistence types, but from the fact that the increase in the medium and particularly high-type persistence are just strong enough offset the decrease in the low-type persistence.

The graphs in Figure 2 result from *conditional persistence* estimations. For instance, the displayed low-type persistence figures in Figure 2 illustrate the probability of a descendant to attain low education *conditional* on being born to low-educated parents. In generating the overall persistence dynamics reported in Figure 1 and Figure 2, the *distribution* of parental education is apparently crucial, as well. In other words, what parental educational background a *randomly-chosen* descendant has depends on the *population share* of parents with low, medium and high education; therefore the overall persistence figures stem not just from conditional transition probabilities but also from the educational distribution of parents, as described in (8). Accordingly, in order to explore further on overall persistence dynamics in Figure 1, we report the evolution of parental education shares in

**Figure 3:** Share of *Better-Educated* Parents by Country Group



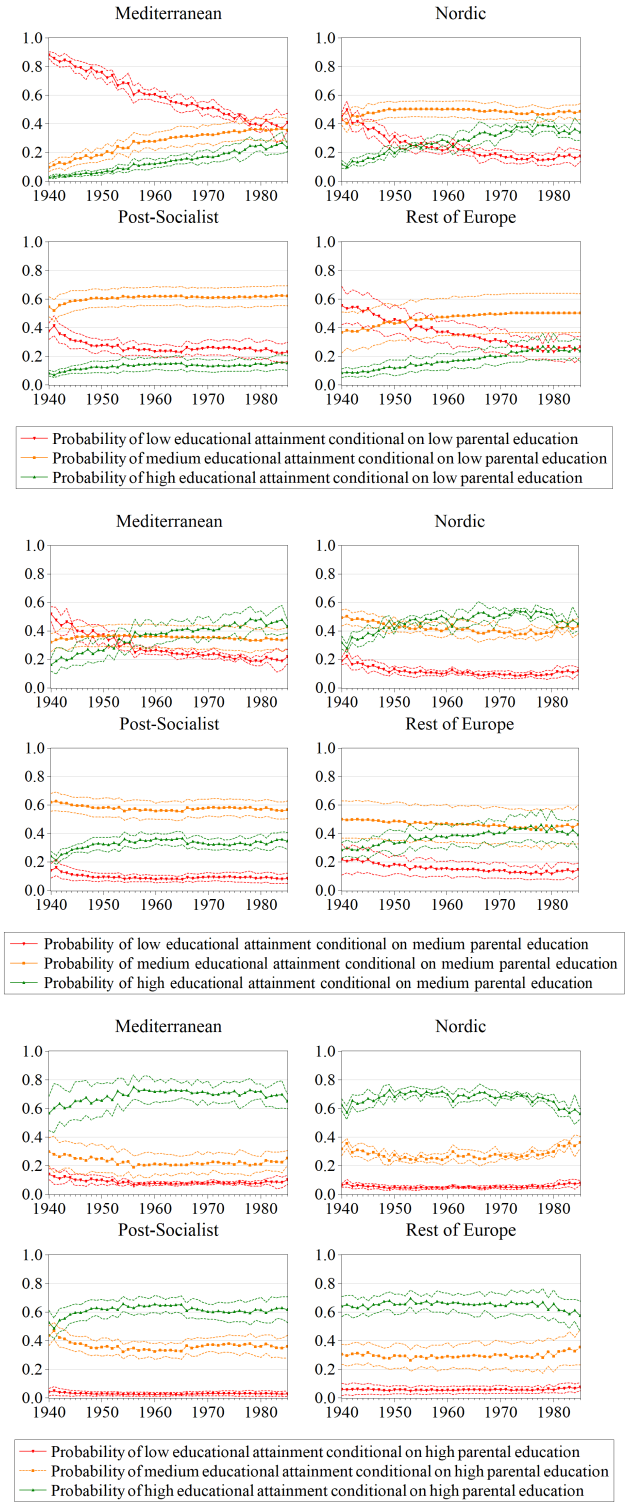

† Dates on the horizontal axis correspond to the ***birth-cohort*** of interest. Red, orange and green lines correspond to the shares of families where parental *better-education* is low, medium and high, respectively.

Figure 3.

Figure 3 shows that among the four country groups, early descendants in the Mediterranean country group have *by far* the highest share of low-educated parents: no less than 90% of descendants born between 1940 and 1960 have low-educated parents in the Mediterranean country group. This share, however, decreases monotonically over time, with the speed of decrease increasing over time; and reaches a level slightly below 60% for the most recently-born cohorts in the country group. Figure 3 further displays that the monotonic decrease in the share of low-educated parents is not unique to the Mediterranean country group, yet the share of low-educated parents in the Mediterranean country group compare sharply above those of the three other groups, whose share of low-educated parents lie slightly above 60% for the cohorts born in the early 1940s and slightly below 20% for the most recent cohorts. Figure 3 further displays that while the share of medium-educated parents rises continuously over time in the Mediterranean country group, it does not increase for the three other country groups for cohorts born after 1970s. As a result, the share of medium-educated parents differ considerably for the recently-born cohorts, varying from 20% in the Mediterranean country group to 50% in the Post-Socialist group. Finally, all four country groups display monotonic increases in the share of high-educated parents over newborn cohorts. However, this fraction reaches only 20% in the Mediterranean country group, and almost 60% in the Nordic country group for the most recent cohorts. Accordingly, Figure 3 summarizes that the persistence measure for the Mediterranean country group, by the definition of the intergenerational educational persistence variable, is the ones most sensitive to improvements in the educational attainment of descendants born to low-educated parents.

Figure 4 completes the picture behind the particular evolution of the different persistence types

**Figure 4:** Conditional Intergenerational Educational Transition Probability by Country Group




† Dates on the horizontal axis correspond to the ***birth-cohort*** of interest. Red, orange and green lines correspond to conditional education probabilities of low, medium and high education, respectively. Dashed lines correspond to country-clustered 95% confidence interval standard error bands.

by reporting on country groups's conditional intergenerational educational transition probabilities. Figure 4 displays first that descendants born to low-educated parents in the Mediterranean country group are the ones most likely to attain low education among the four country groups during any period of interest. Although recent Mediterranean cohorts born to low-educated parents have considerably better educational prospects than older ones, their likelihood of surpassing the educational attainment of their parents are noticeably smaller than any of their Nordic, Post-Socialist or Rest of European counterparts born after the late 1950s. In addition, while medium-education prospects of Mediterranean descendants born to low-educated parents are ever increasing, they remain rather stable for all their Nordic and Post-Socialist counterparts, and their Rest of European counterparts born after the mid-1950s. Third, while high-education prospects of the Mediterranean and Rest of European descendants born to low-educated parents are monotonically increasing over time, such prospects of Nordic descendants born after the mid-1970s stop increasing and even moderately decrease for cohorts born after the 1980s, albeit reaching a level considerably above the levels in the Mediterranean or the Rest of Europe groups. High-education prospects of descendants born to low-educated parents in the Post-Socialist countries, on the contrary, remain rather stable for cohorts born after the 1950s.

Further, in terms of educational prospects of descendants born to medium-educated parents, we report in Figure 4 that descendants' probability of attaining low levels of education diminish over time for all four country groups, with the highest improvement showing up for the Mediterranean country group. However, despite such improvements, the respective figure in the Mediterranean country group remains still the highest among the four country groups. descendants' probability of attaining medium education conditional on being born to medium better-educated parents remain rather stable, albeit with a moderate downward time-trend for all cohorts in the four country groups, except only for the most recent Nordic cohorts. Moreover, while high-education prospects of descendants born to medium-educated parents in the Mediterranean, the Nordic and the Rest of Europe groups increase monotonically for cohorts born before 1980s, they tend not to increase for the very recent cohorts, and even decrease moderately in the latter two country groups. For the Post-Socialist counterparts of these descendants, prospects of attaining high education increase over time for cohorts born before mid 1960s, and remain rather stable after a minor drop for cohorts born after.

Finally, Figure 4 also displays that descendants born to high-educated parents have relatively stable conditional education probabilities over time. Further, these descendants have significantly better educational prospects than those who are born to low or medium-educated parents. Specifically, in all four country groups, descendants born to high-educated parents practically have a probability of no less than 90% to exceed secondary education, and at least 60% probability of obtaining a tertiary degree or above. The probability of these descendants to mimic the better-educational attainment level of their parents moderately increases for the early cohorts in the Mediterranean, Nordic and Post-Socialist countries, and mildly decreases for the recent Nordic and the Rest of European co-

horts.[44]

Figure 3 and Figure 4 together unveil the factors behind the particular observed intergenerational educational mobility dynamics: for the Mediterranean country group, both the monotonic decline in the share of low-educated parents, and the decline in the probability of low educational attainment conditional on low parental education contribute to the decline in low-type persistence, which thereby generates a monotonic decrease in the overall intergenerational educational persistence and ascent in the intergenerational upward mobility over time.[45]

For the Post-Socialist country group, the increase in the medium and high-type persistence, and accordingly the increase in overall persistence, is driven mainly by the evolution of the *distribution* of parental education over cohorts: while descendants' conditional probability of mimicking the education level of their better-educated parents with medium or high education is stable over time (approximately at 60% for both), the share of families with either medium or high parental education increases drastically from 25% in 1940 to 80% in 1985. Accordingly, the increasing concentration of parents with above-secondary education, accompanied by stable conditional transition probabilities over time boosts intergenerational educational persistence in the Post-Socialist country group over newborn cohorts.

A relatively more intricate mechanism generates the U-shaped persistence pattern observed in the Nordic country group. As Figure 2 displays, the most frequent persistence type in this country group is the low-type persistence for descendants born between 1940 and 1960. However, Nordic descendants' high education prospects conditional on being born to either low or medium-educated parents improve drastically over time. This empirical phenomenon, accompanied by rapid decrease in the share of low-educated parents forces the low-type and accordingly the overall persistence to fall gradually. At the same time, the share of parents with high educational attainment increases continuously, and constitutes a noticeably larger fraction in the population. Further, high education prospects of descendants born to high-educated parents remain close to 70% for all but the most recent cohorts. These two forces contribute to the rapid increase in high-type and accordingly overall persistence over time. As a result, the dominant intergenerational educational persistence pattern for the Nordic country group can be summarized as the replacement of one persistence type (low-type persistence) by another (high-type persistence).

The direction of change in the intergenerational educational mobility dynamics in the Rest of Europe country group is the same as in the Nordic group: high-education prospects of descendants born to low or medium-educated parents increase and the share of low-educated parents decreases

[44] Note that while estimating descendants' education prospects, *not conditioning* on parental educational backgrounds, as done in the earlier intergenerational educational mobility literature would be misleading: education prospects of descendants born to low-educated versus high-educated parents evolve asymmetrically, and a single statistic to summarize intergenerational mobility would not suffice to capture this asymmetry.

[45] Our exercise of dissecting the components of different types of intergenerational educational persistences should *not* be interpreted as that conditional educational transitional probabilities and educational distribution of parents are *dynamically* independent from each other.

over time. As a result, low-type and overall persistence decreases for descendants born before the 1960s, albeit not as drastically as in the Nordic group's case. While the downward time-series pattern in low-type persistence continues even for cohorts born after the 1960s, the decreasing share of low-educated parents reduces the weight of low-type persistence on overall persistence, and the simultaneous increase in high-type persistence as a result of greater share of high-educated parents suffices to offset the decrease in low-type persistence. Accordingly, while the *composition* of intergenerational educational persistence continues to change, *overall* persistence for cohorts born after the 1960s remain stable over time.

#### 4.1.2 Intergenerational Educational Mobility Dynamics by Country

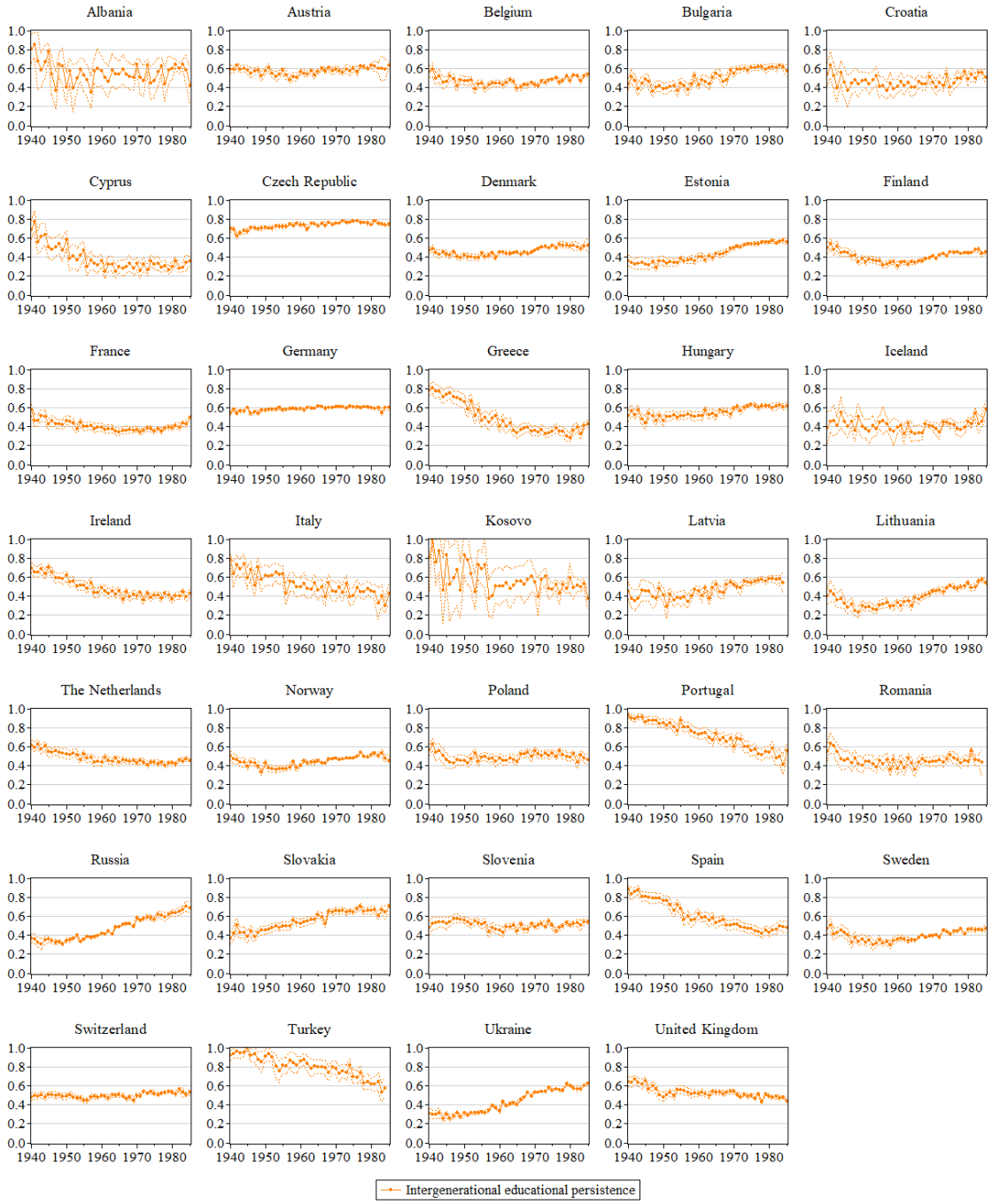
After describing the evolution of overall mobility variables across the country groups and scrutinizing the mechanisms behind patterns characterizing each country group in detail, we next explore within-country-group mobility patterns by the use of country-level regressions, and focus on country-specific peculiarities in this section.

Figure 5 displays the evolution of intergenerational educational persistence over time for the countries of interest.[46] We start our discussion by focusing on the Mediterranean country group and compare Mediterranean countries according to their persistence levels during the two 5-year end-point averages of our sample: the 5-year average of our mobility estimates for cohorts born in 1940-1944, and in 1981-1985.[47] Our results from country-level regressions suggest that (i) the degree of intergenerational educational persistence declines sharply over time in each Mediterranean country and (ii) the ranking of Mediterranean countries with respect to their persistence levels remains relatively stable over time. Specifically, Turkey and Portugal are the countries with the highest levels of intergenerational persistence, whereas Cyprus is the country with the lowest one in both end-points of our sample. For the cohorts born within the 1940-1944 period, the likelihood of a randomly selected child to attain the same education level as her better-educated parent is 94% in Turkey, 91% in Portugal and 65% in Cyprus. For the cohorts born within the 1981-1985 period, this probability is 50% in Turkey, 51% in Portugal and 32% in Cyprus. When we focus on the mechanism that generates the overall decline in intergenerational educational persistence within the Mediterranean country group, we observe that both the share of families with low educated parents (as depicted in Figure A.8) and the probability of low educational attainment conditional on low parental education (as depicted in Figure A.9) declines sharply over time in each Mediterranean country. While the share of families with low-educated parents are as high as 97% in Turkey, 96% in Portugal and 95% in Cyprus for cohorts born within the 1940-1944 period, this figure decreases gradually over time down to 85% in Turkey, 82% in Portugal and 37% in Cyprus. As for descendants' probability of low educational attainment conditional on low parental education, our findings suggest

[46] For upward educational mobility by country, see Figure A.6.

[47] The reason behind our use of *5-year* averages and not *annual* ones is to reduce the noise and smoothen the erratic time-series patterns for the countries of interest, thus to improve precision of our country-specific measures.

**Figure 5:** Intergenerational Educational Persistence by Country




† Dates on the horizontal axis correspond to the ***birth-cohort*** of interest. Dashed lines correspond to 95% confidence interval standard error bands.

a decline from 96% to 62% in Turkey, from 92% to 62% in Portugal and from 66% to 11% in Cyprus for cohorts born within 1940-1944 and 1980-1985.

The Nordic country group differs from the Mediterranean one in terms of its evolution of within-group country mobility dynamics, as the ranking of Nordic countries with respect to their persistence levels reverses over newborn cohorts. For cohorts born in the early 1940s, Finland is the most immobile country with an intergenerational persistence measure of 49%, and Iceland is the most mobile one with a measure of 45%. For cohorts born by the early 1980s, however, Finland becomes the most mobile one, with a persistence measure of 45%, whereas Denmark becomes the most immobile one, with a persistence measure of 51%. The reversal of Finland's rank with respect to its degree of persistence within the Nordic country group is mainly due to the faster decline in the frequency descendants that experience low-type persistence, and slower increase in high-type persistence in Finland: the likelihood of observing low-type persistence in Finland declines from 39% for cohorts born in the early 1940s to 3% in the early 1980s, which is due to both the decline in the share of families with low educated parents (from 79% to 13%) and the decline in the probability of low educational attainment conditional on low parental education (from 49% to 20%) between the end points in time.[48]

The evolution of within-group mobility dynamics in the Post-Socialist group displays elements that are similar to both the Mediterranean, and the Nordic groups: it parallels the Mediterranean group in the sense that the ranking of the most immobile country, the Czech Republic, does not change over time. In particular, the Czech Republic displays an intergenerational educational persistence measure of 67% for cohorts born in 1940-1944 and 75% for cohorts born in 1981-1985.[49] The Post-Socialist country group also parallels the Nordic group, as the Post-Socialist countries other than the Czech Republic display radical variations both in their persistence levels and in their within-group persistence rankings: Ukraine and Russia, which rank among the most mobile Post-Socialist countries for cohorts born in 1940-1944 become increasingly immobile over time, whereas Romania and Poland, ranking among the least mobile countries for cohorts born in 1940-1944 evolve to be among the more mobile countries for cohorts born in the 1980s. Specifically, for the 1940-1944-born cohorts, the likelihood of intergenerational educational persistence is 29% in Ukraine (i.e. the most mobile Post-Socialist country of the period), 34% in Russia, (i.e. the second most mobile country of this period), and 56% in both Romania and Poland. By the 1980s, however, Romania and

[48]Note that while intergenerational educational persistence in Finland measures similarly at the two-end points of our sample, persistence in Finland has *not* remained steady over time: in fact, intergenerational persistence in Finland declines down to 34% for the cohort born in 1961, and climbs back up to 45% for cohorts born in the early 1980s. The period of increasing overall persistence in Finland coincides with increasing frequency of high-type persistence, from 10% for the cohort born in 1961 to 27% in 1985. As we discussed in the previous section, the evolution of Finland's overall persistence is driven by the replacement of the low-type persistence by the high-type persistence. The same U-shape pattern in persistence due to the time-series switch in persistence types holds true for the other Nordic countries, as well.

[49]As Figure A.7,Figure A.8 and Figure A.10 reveal, this pattern in the Czech Republic stems from consistently high fraction of families with medium-educated parents (67% in 1940-1944 and 77% in 1981-1985) and high probability of medium educational attainment conditional on medium parental education (85% in 1940-1944 and 83% in 1981-1985)

Poland rank as the most mobile countries with their relative persistence measures of 47% and 48%, respectively. Russia, and Ukraine, with their persistence levels of 66% and 59% rank among the most immobile Post-Socialist countries, right after the Czech Republic. The increasing mobility in Romania and Poland stems from both the decline in the share of families with low educated parents (from 83% to 38% in Romania and from 82% to 33% in Poland) and the fall in the probability of low educational attainment conditional on low parental education (from 57% to 27% in Romania and from 55% to 27% in Poland). On the contrary, the downward mobility trends in Russia and Ukraine stem mainly from the increase in the share of families with high-educated parents (from 18% to 78% in Russia and from 12% to 56% in Ukraine), along with consistently high conditional probabilities of high educational attainment (71% for the 1940-1944-born cohorts and 78% for the 1981-1985-born cohorts in Russia, and 68% and 76% for Ukraine, respectively).

The evolution of within-country mobility dynamics in the Rest of Europe country group displays noticeable heterogeneities, as well. Among its members, the least mobile country for cohorts born in 1940-1944 is Ireland, with its persistence measure of 67%. Mainly through the fall in the share of low-educated parents, Ireland's mobility improves considerably over time, and reaches 42% for the 1980s-born cohorts. France, as one of the more mobile countries of this group also displays improvement in its mobility: persistence of 50% for 1940s-born cohorts equates with Ireland levels for the most recent cohorts. On the contrary, intergenerational persistence in Central Europe increases moderately over new cohorts. Switzerland, with its persistence measure of 49%, is the least persistent country in this group for the cohorts born in 1940-1944. Germany and Austria, by their respective measures of 56% and 60% rank among the more mobile countries. As a result of moderate increases in their persistence measures, Switzerland, Germany and Austria rank as the three least mobile members of the Rest of Europe country group for cohorts born in 1980-1985, with their respective figures of 53%, 59% and 61%.[50]

#### 4.1.3 An Alternative Intergenerational Educational Mobility Measure

As we discussed briefly, previous literature on intergenerational educational mobility (e.g. Hertz et al. 2007) relies on *years of schooling* OLS regressions to infer about mobility. Specifically, earlier studies regress years of schooling of descendants on years of schooling of their parents, and report on correlation coefficients. They conclude that the lower the magnitude of the correlation of interest, the higher the intergenerational mobility.

For the sake of comparability of our findings, and complementing our results, we redo the same

[50]Persistence in Switzerland and Austria increase over time due to the increase in the medium-persistence. In Germany, the rising persistence stems mainly from the increase in high-type persistence as a result of the increase in the share of families with high-educated parents, from 22% or the cohorts born in 1940-1944 to 41% in 1980-1985.

analysis by the use of an imputation algorithm, the details of which we discuss in detail in Appendix.[51]

Let educational distribution of parents and descendants, proxied by years of schooling, be normally distributed with $N \sim (\mu_t, \sigma_t^2)$. Further, let the true nature of the evolution of education over generations take an autoregressive form as follows:

$$E_{it} = \alpha_t + \beta_t P_{it} + u_{it} \tag{14}$$

where $E_{it}$ denotes years of schooling of descendant $i$ born in year $t$, $P_{it}$ denotes descendant $i$'s parents' *average* years of schooling, $\alpha_t$ denotes birth-cohort specific constant, and $\beta_t$ governs the degree of intergenerational educational mobility: i.e. if $\beta_t = 0$, parental education has no impact at all, hence there is perfect mobility.

Since the ESS dataset contains information *only* on descendants' years of schooling, we first impute each parent's *average* years of schooling, and second, regress descendants' observable years of schooling on their parents' imputed average years of schooling $\overline{P}_{it}$, and estimate the regression coefficients of interest:[52]

$$E_{it} = \hat{\alpha}_t + \hat{\beta}_t \overline{P}_{it} \tag{15}$$

Next, as there is no consensus in the earlier literature on which mobility measure to derive conclusions from, we also calculate and report intergenerational correlation estimates by incorporating the effects of the standard deviation of descendants' and parents' years of schooling:

$$\hat{\rho}_t = \hat{\beta}_t \frac{\hat{\sigma}_{P_t}}{\hat{\sigma}_{E_t}} \tag{16}$$

where $\hat{\rho}_t$ denotes the correlation coefficient between education of descendants and parents, and $\hat{\sigma}_{P_t}$ and $\hat{\sigma}_{E_t}$ denote standard deviation of years of schooling for parents and descendants, respectively.[53]

We report our findings for country groups in Figure 6.[54] The left panel in Figure 6 displays the evolution of intergenerational educational mobility coefficient $\hat{\beta}$, and its comparison to our persis-

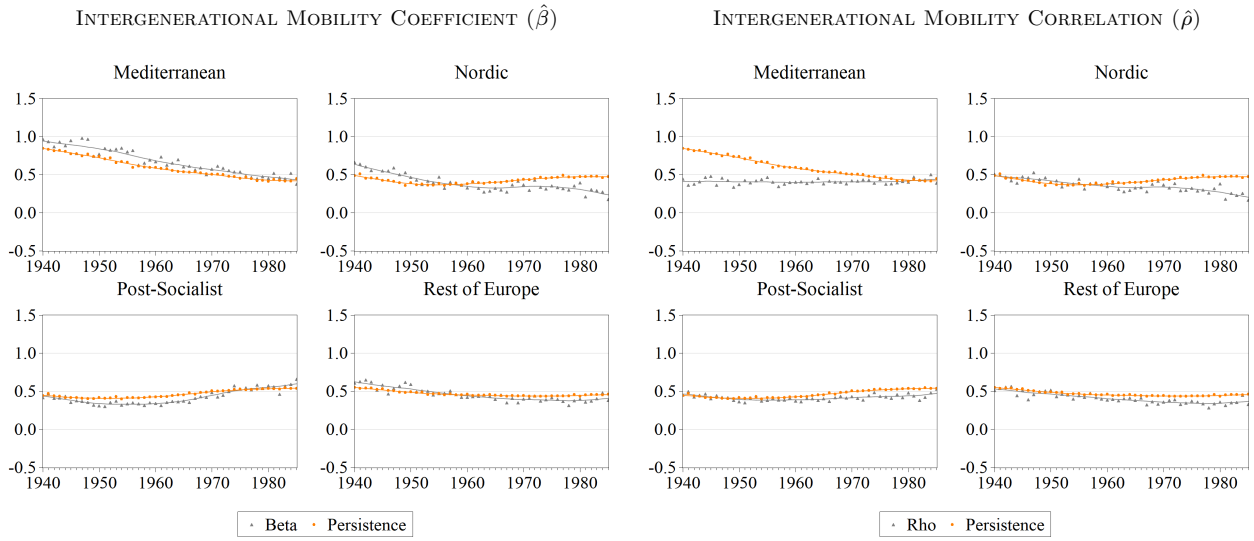
[51] As in the earlier literature, the need for imputation arises due to data limitations on parental education. Our imputation approach differs from the earlier literature, as we rely on distributional assumptions, whereas earlier literature assumes that mode of the distribution is representative of population mean in education subcategories. We refrain from reporting regression results by such assumptions, since despite working with a considerably larger sample, we document that frequently hazardously few number of observations fall into education subcategories, and due to limited number of observations, modes (and averages) evolve severely erratically over time. However, results with alternative imputation strategies are available upon request.

[52] Note that if distributional assumptions we impose are true, $\hat{\alpha}_t, \hat{\beta}_t$ are *unbiased* estimators of $\alpha_t$ and $\beta_t$, i.e. $\mathbb{E}(\hat{\alpha}_t) = \alpha_t$ and $\mathbb{E}(\hat{\beta}_t) = \beta_t$.

[53] Note that, as discussed, this specification assumes there is absence of any level or threshold effect of parental education, as well as that there is symmetry, monotonicity and cardinality between parents' and descendants' educational attainment. Further, as long as average years of schooling of two parents are identical, this specification assumes within-couple variation in educational attainment of parents has no implications. While we believe that these all are valid concerns, we report these findings mainly for the sake of completeness and comparability of our findings with the earlier literature.

[54] For our country-specific results, see Figure A.12 and Figure A.13.

**Figure 6:** Alternative Intergenerational Educational Mobility Measures by Country Groups




† Dates on the horizontal axis correspond to the ***birth-cohort*** of interest. Orange circles correspond to annual intergenerational persistence estimates, and orange lines refer to Hodrick-Prescott time trends. $\hat{\beta}$ refers to the estimated intergenerational mobility coefficient in (15), and $\hat{\rho}$ refers to the estimated intergenerational mobility correlation in (16). Gray triangles and lines refer to the corresponding annual values and Hodrick-Prescott time trends of the respective estimates.

tence measure, as depicted in Figure 1. We document that despite methodological differences, our overall intergenerational persistence measure constructed by ordinal education categories and intergenerational mobility coefficients generated by years of schooling regressions yield similar findings for all country groups, but the Nordic one. In other words, the likelihood of a randomly selected descendant in the Mediterranean, Post-Socialist or the Rest of European country groups to mimic the categorical educational attainment of her better-educated parent align well with the marginal increase in her years of schooling due to her parents' additional year of schooling. In the case of Nordic descendants, however, while overall persistence displays a U-shaped pattern historically, the marginal effect of parents' years of schooling decreases monotonically over time. The Nordic discrepancy arises due to the definition of our intergenerational persistence variable: as we discussed in detail in the previous subsection, the constancy in Nordic overall persistence does *not* stem from stable conditional transition probabilities, but from increasing concentration of Nordic parents and descendants in the high end of educational distributions.[55]

The right panel in Figure 6 displays the evolution of intergenerational educational mobility correlation $\hat{\rho}$, and its comparison to our persistence measure. We report that overall persistence and intergenerational education correlation in the Nordic, Post-Socialist and the Rest of Europe country groups co-move almost identically for the earlier cohorts, but not so much for the recent ones.

[55] In other words, while, for instance, a recent male descendant born to university-graduate parents is *less* likely to attain a university degree compared to his older counterparts, the probability of a randomly-chosen Nordic descendant to mimic the educational attainment of his university-graduate parents does not diminish over time because of the ever-increasing share of university-graduate parents in the region.

While the discrepancy in the Nordic country group stems mainly from the distributional evolution we discussed, the discrepancies in the Post-Socialist and the Rest of Europe country groups emerge from mild differences in time trends of parents' and descendants' years of schooling standard deviations.[56] Evidently, the most pronounced discrepancy between intergenerational education correlation and overall persistence (and thereby intergenerational mobility coefficient) shows up in the case of the Mediterranean country group, where descendants' mean and standard deviation in years of schooling compare sharply above those of their parents. Accordingly, our results suggest that in the case of earlier cohorts of Mediterranean descendants who were born predominantly to low-educated parents with similar years of schooling backgrounds, an additional year of schooling in parental education had considerable implications on descendants' education prospects. As educational attainment of Mediterranean parents and descendants improve over time, our estimation results imply that the marginal impact of the same absolute increase in years of schooling of parents weaken, complementing our earlier findings from ordinal intergenerational education estimations on the monotonic decrease in overall persistence and ever-increasing time-trend in upward mobility in the Mediterranean country group.

## 4.2 Intergenerational Educational Mobility and Other Factors

In this subsection, we report and discuss our findings on the marginal effects of *gender*, *parental couple composition*, and *parental financial well-being* of descendants on intergenerational educational mobility dynamics in Europe.

### 4.2.1 Intergenerational Educational Mobility and Gender

We start our analyses by concentrating on the marginal impact of descendants' gender. In doing so, we report our estimation results by (1) and (2) for country-group and country-specific estimations, respectively.[57,58]

Figure 7 displays the evolution of overall intergenerational educational persistence for male and female descendants by country group.[59] Historically, intergenerational persistence (*upward mobility*)

[56] Note that intergenerational educational mobility coefficient $\hat{\beta}$ and correlation $\hat{\rho}$ differ from one another by as much as the standard deviation of parents' years of schooling diverges from that of descendants, i.e. by how much $\frac{\hat{\sigma}_{P_t}}{\hat{\sigma}_{E_t}}$ diverges from unity.

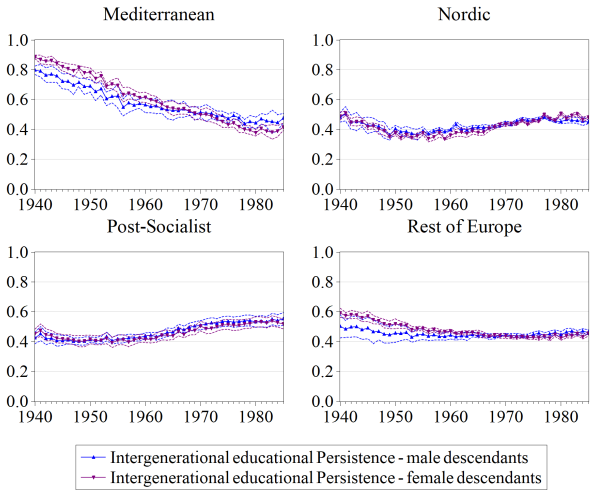
[57] Note that our econometric specifications capture both gender-fixed and gender-time-interaction effects so as not to ignore the potentially time-varying effects of gender on educational attainment, and thereby intergenerational educational mobility.

[58] For the sake of brevity, we discuss only our findings from the *country-group* level estimations in the main text. For our resultant country-specific findings on the marginal impact of gender, parental couple compositions and parental finances, see Appendix and Online Appendix.

[59] For the evolution of educational upward mobility by gender and country/country group, see Figure A.14 and Figure A.15. Note that, as briefly discussed, due to the limited occurrence of downward educational mobility in Europe historically, upward mobility figures evolve as the mirror images of persistence figures, i.e. an empirical increase in intergenerational persistence coincides with a decrease in upward mobility.

falls (*rises*) for both male and female descendants in the Mediterranean country group. However, the absolute value of the decrease (*increase*) in slope is higher for female descendants than their male counterparts. Consequently, while early-born Mediterranean female descendants are more (*less*) likely to display intergenerational educational persistence (*upward mobility*) than male descendants, female descendants born after the 1970s are less likely to mimic the educational attainment of their better-educated parent than their male counterparts. The gender gap in persistence is statistically significant for the early cohorts in the Rest of Europe group, as well. However, as the intergenerational persistence of female descendants decreases faster than male descendants, female and male persistences converge to same levels for the cohorts born after the mid-1960s. For the two other country groups, gender gap in persistence has been historically insignificant for almost all cohorts, and whenever significant, it has often showed up in the form of *lower* intergenerational persistence in female descendants than male ones, albeit not nearly as sizable in magnitude as in the Mediterranean and the Rest of Europe country groups.

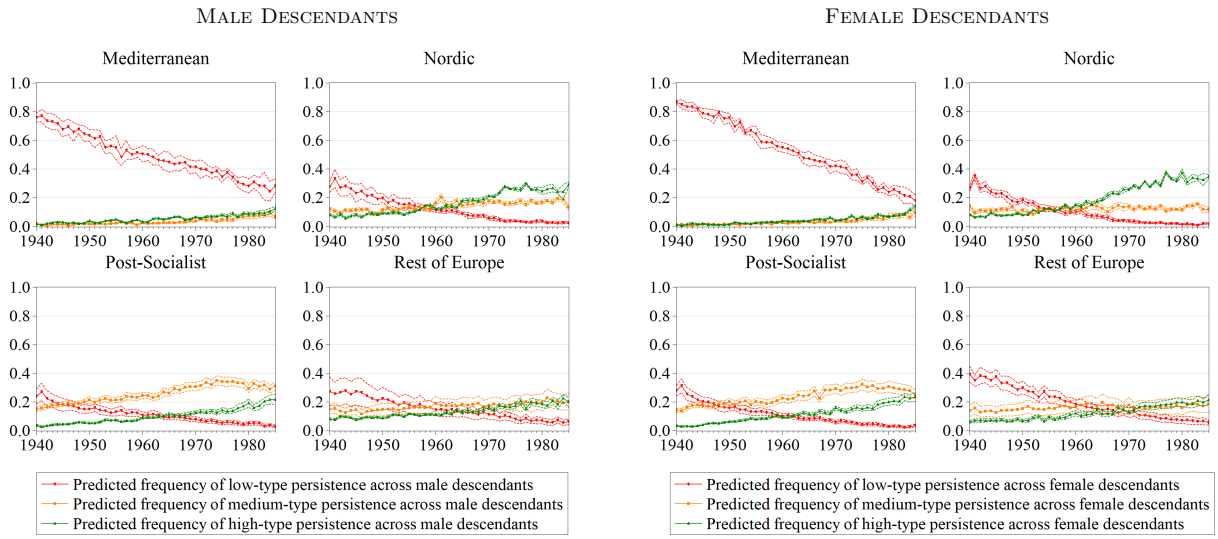
**Figure 7:** Intergenerational Educational Persistence by Gender




† Dates on the horizontal axis correspond to the ***birth-cohort*** of interest. Purple and blue lines correspond to female and male intergenerational educational persistence, respectively. Dashed lines correspond to country-clustered 95% confidence interval standard error bands.

In Figure 8, we display the evolution of the three types of intergenerational educational persistence by gender and country group. Figure 8 illustrates that gender gap in overall intergenerational educational persistence emerges not due to contrary time-series patterns of male and female descendants, but due to different *magnitudes* in male and female persistence types. For instance, while the historical decrease in persistence for both genders in the Mediterranean country group is driven by the monotonic decrease in low-type persistence, the fall is more pronounced for female descendants (84% for the cohort born in 1940 to 22% in 1985) than for males (74% for the cohort born in 1940 to 28% in 1985). Similarly, for the Rest of Europe country group, low-type persistence in female descendants is significantly more frequent than in male descendants only for the earlier cohorts, and

**Figure 8:** Intergenerational Educational Persistence Type by Gender



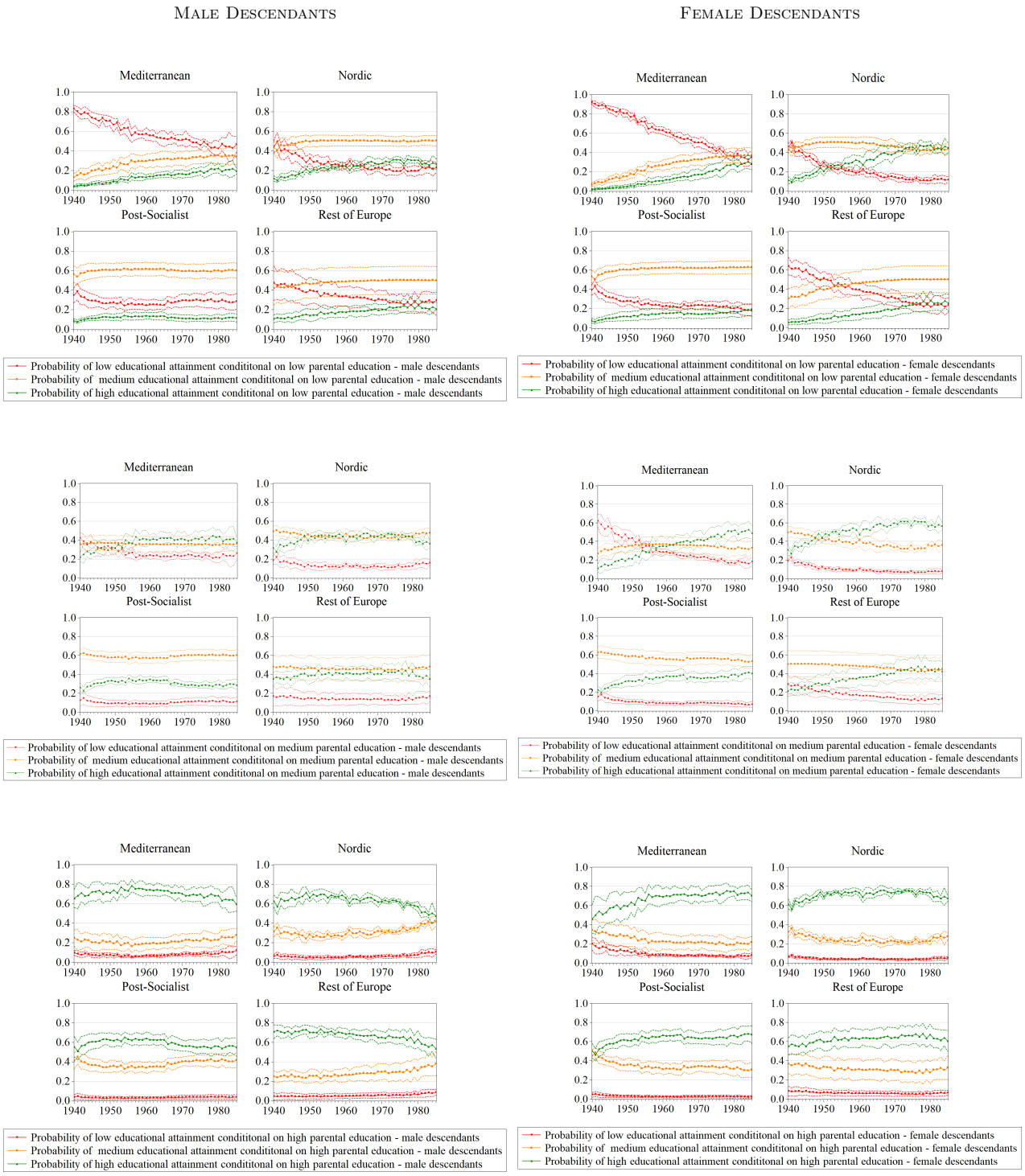

† Dates on the horizontal axis correspond to the ***birth-cohort*** of interest. Red, orange and green lines correspond to low-type, medium-type and high-type intergenerational educational persistence, respectively. Dashed lines correspond to country-clustered 95% confidence interval standard error bands.

the gender gap in types of intergenerational educational persistence disappears over time.

In order to explore further on the gender gap in intergenerational educational mobility, in Figure 9 we report the conditional intergenerational educational transition probabilities by gender and country group.[60] Figure 9 displays that while female descendants born in earlier cohorts are more disadvantaged relative to their male counterparts, historical evolution of transition probabilities favors female descendants better. Accordingly, recently-born female descendants are at least as likely as their male counterparts, if not more likely, in their better educational prospects. For instance, while early female descendants born to low-educated parents in the Mediterranean countries have lower high-education and lower high-education conditional probabilities, this picture reverses as recent female descendants in the same country group have higher high-education and lower low-education prospects than their male counterparts. Similarly, although early female Mediterranean descendants born to medium or high-educated parents face worse educational prospects than their male counterparts, lately female descendants have significantly greater high-education prospects than male descendants of the same country group. Further, regardless of their parental educational backgrounds, while earlier female descendants born in the Rest of European countries have worse educational prospects than male descendants, this is not the case for the recently-born cohorts. The time-series pattern favoring female descendants' better educational prospects is strongly evident for the Nordic and Post-Socialist country groups, as well: regardless of their educational backgrounds,

[60] In Figure A.16, we show that parental educational distribution of male and female descendants do not differ significantly. Thus, historical variations in persistence types by gender stem *only* from the differences in conditional in transition probabilities of male and female descendants.

**Figure 9:** Conditional Intergenerational Educational Transition Probability by Gender




† Dates on the horizontal axis correspond to the ***birth-cohort*** of interest. Red, orange and green lines correspond to conditional education probabilities of low, medium and high education, respectively. Dashed lines correspond to country-clustered 95% confidence interval standard error bands.

female descendants born after the 1980s surpass their male counterparts in their better educational prospects. Overall, our findings suggest that gender gap in education has not only disappeared throughout Europe but also *reversed* for majority of the instances.[61]

Overall, our results suggest that it is crucial to factor in the time-varying implications of gender, and ignoring the direction in which gender contributes to educational attainment for descendants with different parental education levels, as in e.g. Schneebaum et al. (2015), limits the understanding of the role of gender in intergenerational educational mobility.

#### 4.2.2 Intergenerational Educational Mobility and Parental Couple Composition

The empirical findings we report so far address the relationship between the education level of descendants and their *better-educated* parents. We next turn to exploring the marginal impact of the education level of the *less-educated* parent.[62] In doing so, we report heterogeneities in educational prospects of descendants whose better-educated parents have the same, but less-educated parents have different levels of educational backgrounds. In other words, we unveil, for instance, whether education prospects of descendants born to parents with i) medium-educated father and medium-educated mother ii) medium-educated father and low-educated mother and iii) low-educated father and medium-educated mother differ from one another.[63] In Figure 11, we display the predicted conditional education probabilities of descendants born to medium-educated parents for the country groups of interest.[64]

First, Figure 10 shows that when better-educated parent's education is held constant at the medium level, descendants' probability of low educational attainment do not vary considerably over their less-educated parents' education, with the notable exception of the Mediterranean country group.[65] In other words, if at least one parent, regardless of the gender, of a descendant has medium educational background, the descendant faces comparable low education prospects within the Post-Socialist, Nordic and Rest of European country groups, especially when born after the 1960s. However, in the case of the Mediterranean country group, descendants face a significantly lower probability of low educational attainment if both of their parents have medium education, compared to the cases when they are born to one medium-educated and one low-educated parent.

Second, Figure 10 displays that while medium-education prospects of descendants born to medium-

[61] Due to similar *de facto* dynamics, we observe the same empirical gender gap reversion in majority of country-specific estimations, as depicted in Figure A.15 and Online Appendix.

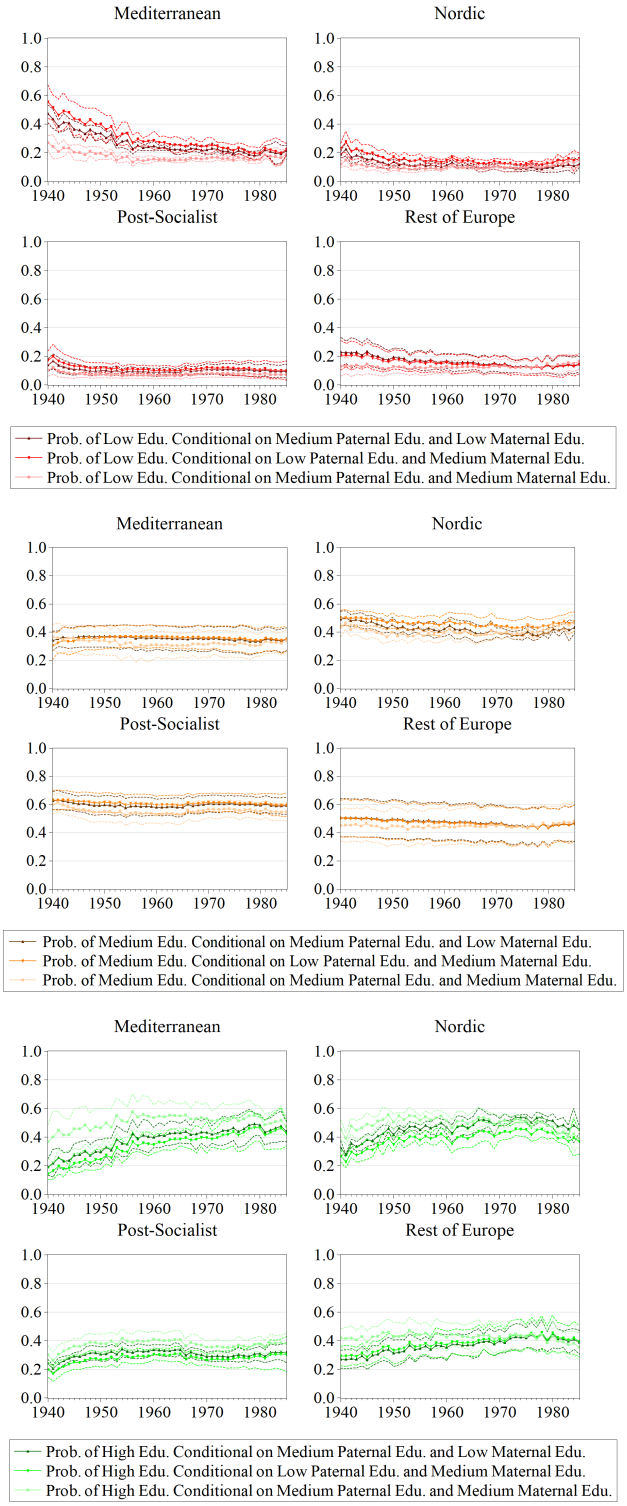
[62] In order to capture the marginal effect of the educational attainment of descendants' *less-educated* parent, we incorporate "parental educational couple composition" categorical dummy variables, along with their time interactions into our estimations (1) and (2), the details of which can be seen in Table A.2.

[63] Note that in all three parental couple combinations, the better-educated parent has the same level of education, hence the three listed parental couple scenarios are treated identically in our former results.

[64] For the distribution of parents over particular educational couples by country group, see Figure A.17, and by country, see Online Appendix.

[65] For country-specific conditional probabilities for descendants born to medium-educated parents with different parental educational couple structures, see Figure A.18, Figure A.19 and Figure A.20.

**Figure 10:** Education Probability of Descendants Conditional on *Medium* Parental Education




† Dates on the horizontal axis correspond to the ***birth-cohort*** of interest. Red, orange and green lines (at different depth levels) correspond to low, medium and high educational attainment probabilities, respectively. Dashed lines correspond to country-clustered 95% confidence interval standard error bands.

educated parents do not vary considerably over the less-educated parent's educational attainment, descendants whose parents are both medium-educated are the least likely ones to attain medium education when born in the Mediterranean or the Post-Socialist countries. Further, while this phenomenon also holds true for descendants born in the Nordic and the Rest of European country groups before the 1960s, it does not apply to the recent cohorts of the latter two country groups.

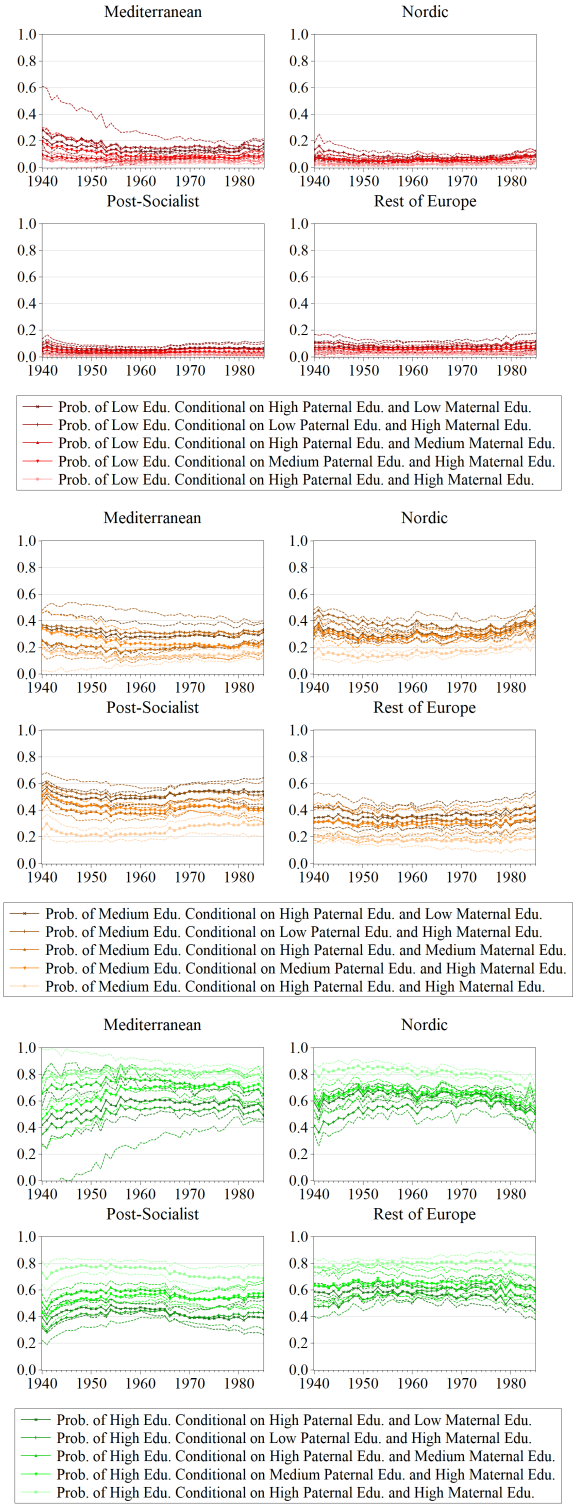
Third, Figure 10 illustrates that whether *only one* or *both* parents of descendants have medium education has sizable and significant implications on high education prospects of descendants: in all four country groups, descendants whose parents are both medium-educated have the best prospects of attaining high education, and the marginal increase in high-education probability of descendants when the less-educated parent's education level increases from low to medium reaches as much as 25% for some cohorts of interest, with the highest heterogeneity emerging within the Mediterranean country group. This gap is most pronounced for the earlier cohorts, and it diminishes over time for all country groups but the Post-Socialist one. Further, when comparing cases in which one of the parents has low educational background, paternal increase in education contributes more to high education prospects of descendants than the maternal one, albeit statistically insignificantly for majority of the cohorts.

Next, we turn to exploring the parental educational couple composition effect when at least one of the parents has high education background. We present our findings in Figure 11.[66] First, despite the higher number of possible educational parental couple scenarios in which our parental education variable qualifies *high*, Figure 11 illustrates that heterogeneity in descendants' predicted low education probabilities over their less-educated parent's education is minuscule in all country groups but the Mediterranean one. Descendants in the Nordic, Post-Socialist and the Rest of European countries born after 1960s to at least one high-educated parent have a low education attainment probability of no more than 10%, regardless of the education level of the other parent. In addition, this probability does not vary significantly over the education level of the less-educated parent. As for the Mediterranean country group, however, the probability of low educational attainment depends significantly on the education level of the less-educated parent, and there is sizable heterogeneity over the educational attainment of the less-educated parent: compared to descendants whose both parents are high-educated, Mediterranean descendants born to one parent with low and the other with high educational backgrounds have an additional 10% more probability of not surpassing low education. In all four groups, descendants born to parents both of who have high education backgrounds face the smallest likelihood of attaining low education, although the marginal difference being statistically significant only for the Mediterranean descendants.

Second, Figure 11 shows that medium education prospects of descendants when born to at least one parent with high educational attainment vary considerably over the educational attainment of the less-educated parent in all four country groups. Further, among these descendants, medium

[66] For country-specific conditional probabilities of descendants born to high-educated parents with different parental educational couple structures, see Figure A.21, Figure A.22, and Figure A.23.

**Figure 11:** Education Probability of Descendants Conditional on *High* Parental Education




† Dates on the horizontal axis correspond to the ***birth-cohort*** of interest. Red, orange and green lines (at different depth levels) correspond to low, medium and high educational attainment probabilities, respectively. Dashed lines correspond to country-clustered 95% confidence interval standard error bands.

education probability is lowest when both of their parents attained high education. Lower marginal probability due to high education background of the other parent is statistically significant for all country groups, but the Mediterranean one. Further, medium education probability of descendants are highest when either of the parent has low educational attainment, with the gender of the low-educated parent not having a significant universal effect.

Third, we present in Figure 11 that high education probabilities of descendants differ significantly over the educational attainment of the less-educated parent, when at least one parent has high educational attainment. Among these descendants, high education attainment prospects are universally highest when both parents received tertiary education or above. Further, the marginal difference in probability of descendants' high education prospects is significant for all country groups but the Mediterranean one. When both parents received high education, descendants' high education probability remains steady over time at 80% in the Mediterranean and Rest of Europe country groups. As for the Nordic group, the same probability stays above 80% for all cohorts but the ones born after 1980s, and as for the Post-Socialist group, it drops steadily from 80% to 70% over time. When either paternal or maternal education is low, the probability of descendants to attain high education almost never exceeds 60% for any of the cohorts in any of the country groups, and remains as low as 40% for the earlier cohorts in the Mediterranean, Nordic and Post-Socialist country groups, and 50% for the Rest of Europe group. Finally, among descendants whose at least one parent received high education, the additional difference in the probability of attaining high education due to the education level of less-educated parent does not diminish over time in any of the country groups, but the Nordic one.

Overall, our findings highlight the presence of significant heterogeneities, and distinct and asymmetric time-series patterns of conditional educational attainment probabilities over the educational backgrounds of parents, which thereby casts doubt on the completeness of the earlier literature on intergenerational educational mobility.[67]

#### 4.2.3 Intergenerational Educational Mobility, Descendant Gender and Parental Educational Couple Composition

We next investigate whether educational composition of parents have gender-specific implications on descendants' educational prospects. In other words, we explore if the educational attainment of the less-educated parent has different implications on conditional educational probabilities of male and female descendants. We illustrate our resultant findings in Figure 12 and Figure 13.

Figure 12 displays the conditional educational probabilities of male and female descendants born to medium-educated parents. First, Figure 12 shows that in all country groups but the Rest of Eu-

[67] Earlier studies in the literature, e.g. Schneebaum et al. (2015), Hertz et al. (2007), specifies parental education as the *average* years of schooling of the two parents, and does not condition on parental education level in measuring its impact, thereby disregards the heterogeneous implications of parental couples for descendants born to parents with asymmetric educational backgrounds.

**Figure 12:** Education Probability of Descendants Conditional on *Medium* Parental Edu. & Gender


† Dates on the horizontal axis correspond to the ***birth-cohort*** of interest. Red, orange and green lines (at different depth levels) correspond to low, medium and high educational attainment probabilities, respectively. Dashed lines correspond to country-clustered 95% confidence interval standard error bands.

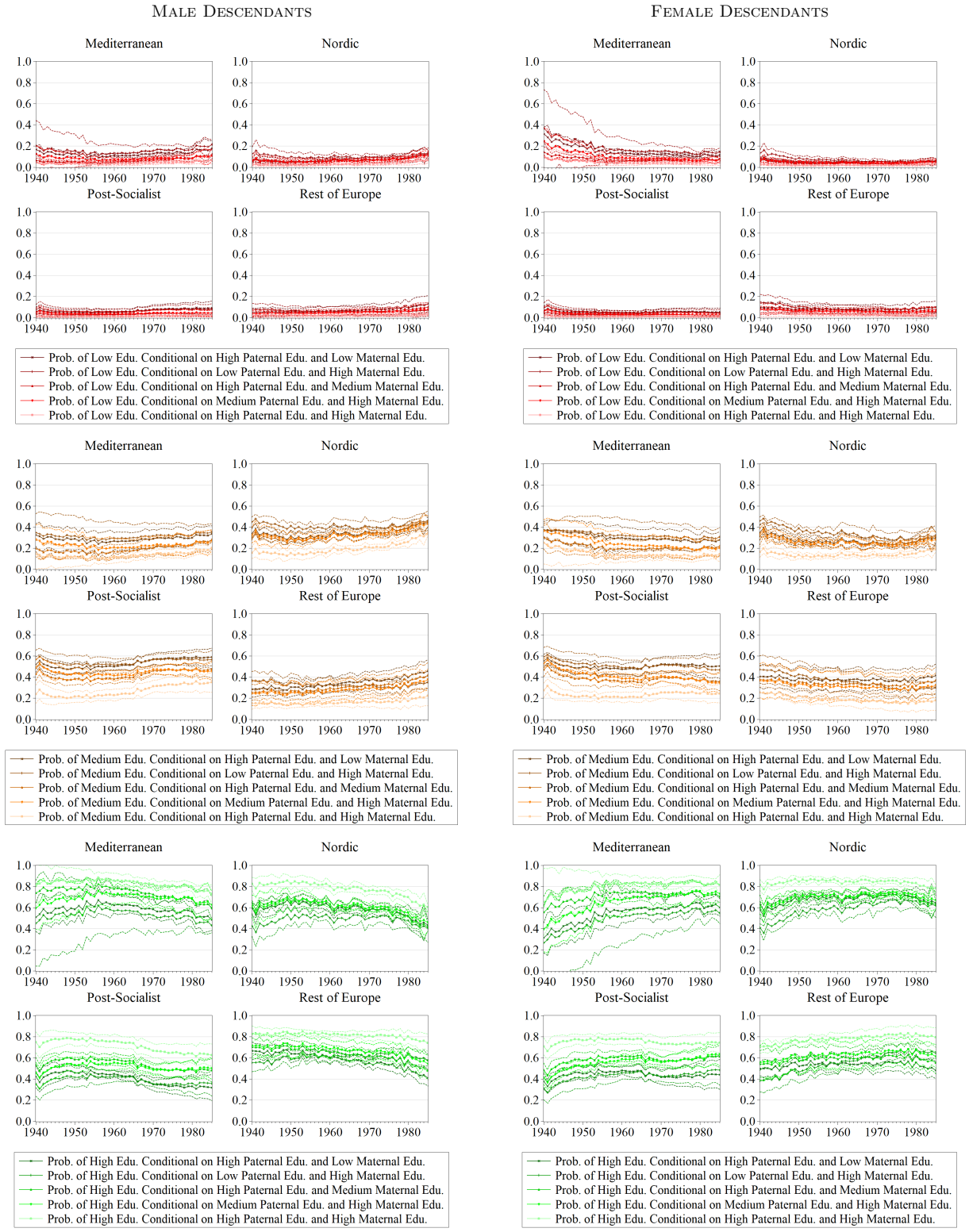
rope, low education probability of descendants are highest for both genders when paternal education is low; and the same probability is lowest when both parents attained medium education. Differences in low education prospects of both genders due to the educational attainment of the less-educated parent is highest in the Mediterranean group. Further, the same group displays considerable heterogeneity in low education prospects of female and male descendants: female descendants of earlier cohorts face radically higher probabilities (as much as 20% more) in getting only low education than their male counterparts, yet this gender gap diminishes over time and reverses for cohorts born by 1980s, albeit insignificantly. The same gender gap is present in the Rest of Europe group, as well. Early female descendants in this country group face higher likelihoods of getting only low education than their male counterparts, however this probability converges to the same 20% by for both gender-cohorts born by 1980s. On the contrary, female descendants of Nordic and Post-Socialist face lower probabilities of getting only low education than their male counterparts, albeit not drastically in magnitude.

Second, Figure 12 reveals that medium education prospects of both male and female descendants born to medium-educated parents remain fairly stable over time. The biggest exception to this phenomenon shows up in the case of female Nordic descendants, whose medium education prospects decrease by 10% in probability over 45 years. In all four country groups, descendants of both genders whose less-educated parent also has medium education background face the lowest likelihood of medium educational attainment, compared to the case when one parent received low and the other received medium education. However, the marginal decrease in medium education prospects of both genders due to the better educational attainment of the less-educated parent is small in magnitude, and often statistically insignificant.

Third, Figure 12 shows that high education prospects of descendants depend both on their gender and the educational composition of their parents. In the Mediterranean, Post-Socialist and Rest of Europe country groups, both male and female descendants' chances of getting a tertiary degree is highest when both of their parents received medium education. The same observation holds true for the earlier cohorts in the Nordic group, but not the recent ones: both male and female Nordic descendants born after the 1970s have the best chance of getting a tertiary degree when their paternal education is medium and maternal education is low. In all four country groups, descendants of the two genders face different *levels* and *time-trends* in their high education prospects: when born to both medium-educated parents, Mediterranean male descendants born after the 1950s face stagnant high education conditional probabilities, whereas their female counterparts face ever increasing prospects of attaining high education. Due similar time-trends favoring female descendants, male descendants born in the Nordic, Post-Socialist and the Rest of Europe country groups after the mid-1960s fall behind in their high education prospects compared to their female counterparts, as well.

Next, in Figure 13, we present the conditional educational probabilities of male and female descendants born to at least one high-educated parent. First, Figure 13 reveals that low education prospects of both male and female descendants are relatively low historically in all four country

**Figure 13:** Education Probability of Descendants Conditional on *High* Parental Edu. & Gender




† Dates on the horizontal axis correspond to the ***birth-cohort*** of interest. Red, orange and green lines (at different depth levels) correspond to low, medium and high educational attainment probabilities, respectively. Dashed lines correspond to country-clustered 95% confidence interval standard error bands.

groups but the Mediterranean one: while low education probabilities of male and female descendants of any cohort do not exceed 15% in the Nordic, Post-Socialist and Rest of Europe country groups, early female cohorts born in the Mediterranean country group face as high as 30% probability of attaining only below-secondary education. Further, the evolution of low education probabilities of descendants born to high-educated parents differ over gender in all four country groups, albeit most radically in the Mediterranean one: while conditional low education probability of female descendants decreases considerably over time in the Mediterranean country group, the same probability moderately increases in the case of male Mediterranean descendants. The converse evolution of low education probabilities of male and female descendants are also present in the other three groups, albeit much more moderately in magnitude and less heterogeneously over parental educational couple compositions.

Second, Figure 13 displays that conditional on one parent having received high education, educational attainment of the other parent has sizable implications on medium education prospects of both male and female descendants in all four country groups. Medium education probabilities of both male and female descendants are consistently and significantly lowest when both paternal and maternal education is high, due to better high education prospects of these descendants. Further, among descendants whose at least one parent received high education, we report the highest probability of medium educational attainment for descendants whose other parent received low education, albeit not significantly in all cohorts and country groups. Similar to the case in the conditional low education probabilities, medium education prospects of male and female descendants born to high-educated parents evolve conversely over time: while medium education prospects of male descendants gradually increase, especially for the Mediterranean, the Nordic and the Rest of Europe cohorts born after the 1960s, the same probability monotonically decreases over time for their female counterparts. In the case of the Post-Socialist country group, while male descendants' medium education prospects also increase over time, we report a fairly steady time-trend in medium education prospects of female descendants, especially for cohorts born after the 1960s.

Third, Figure 13 shows that high education prospects of both male and female descendants depend significantly on the education level of their less-educated parent. As in our earlier findings, heterogeneity in descendants' high education prospects over the educational attainment of their less-educated parent is most pronounced in the case of Mediterranean descendants. In all four country groups, both male and female descendants born to a high-educated parent have significantly higher chances of attaining high education when the other parent received high education, as well. Although varying over country groups and cohorts, descendants whose both parents received a tertiary degree have as much as an 30% additional probability of attaining tertiary education, compared to descendants whose other parent does not have a degree above secondary education. In terms of the evolution of their high education prospects, while male descendants' chances moderately decrease in all four country groups over time, female descendants of later cohorts have at least the same (as in the Nordic, Post-Socialist and Rest of European country groups) or even higher chances (as in the

Mediterranean country group) than their earlier-cohort counterparts.

Overall, we document that as we dissect descendants' educational prospects over their gender and their parental educational couple compositions, both factors have heterogeneous time-varying implications, which persist over time. Accordingly, we conclude that these two factors matter both qualitatively and quantitatively in understanding intergenerational mobility dynamics of descendants born to medium and high-educated parents.

#### 4.2.4 Intergenerational Educational Mobility and Parental Financial Status

We next turn to investigating whether financial well-being of parents matter *in addition to* their educational backgrounds, at the time when descendants their receive education. Specifically, we examine if conditional on being born to parents with equal educational attainment, descendants born to parents with better (*worse*) financial status when they are 14 years old have significantly different educational prospects. As the ESS dataset does not contain information on parental finances, we make use of a different dataset: European Values Survey (EVS). In addition to keeping track of descendants' and their *paternal* ordinal categoric educational attainment (via ISCED categorization as in the ESS dataset), EVS contains information on descendants' subjective (ordinal) evaluation of their parental financial status when they are 14 years old (coded `V363`) for 43,363 descendants born between 1940-1985 from all 34 European countries of our interest, thereby rendering the conduct of our previous analyses by the incorporation of parental finances feasible.[68,69]

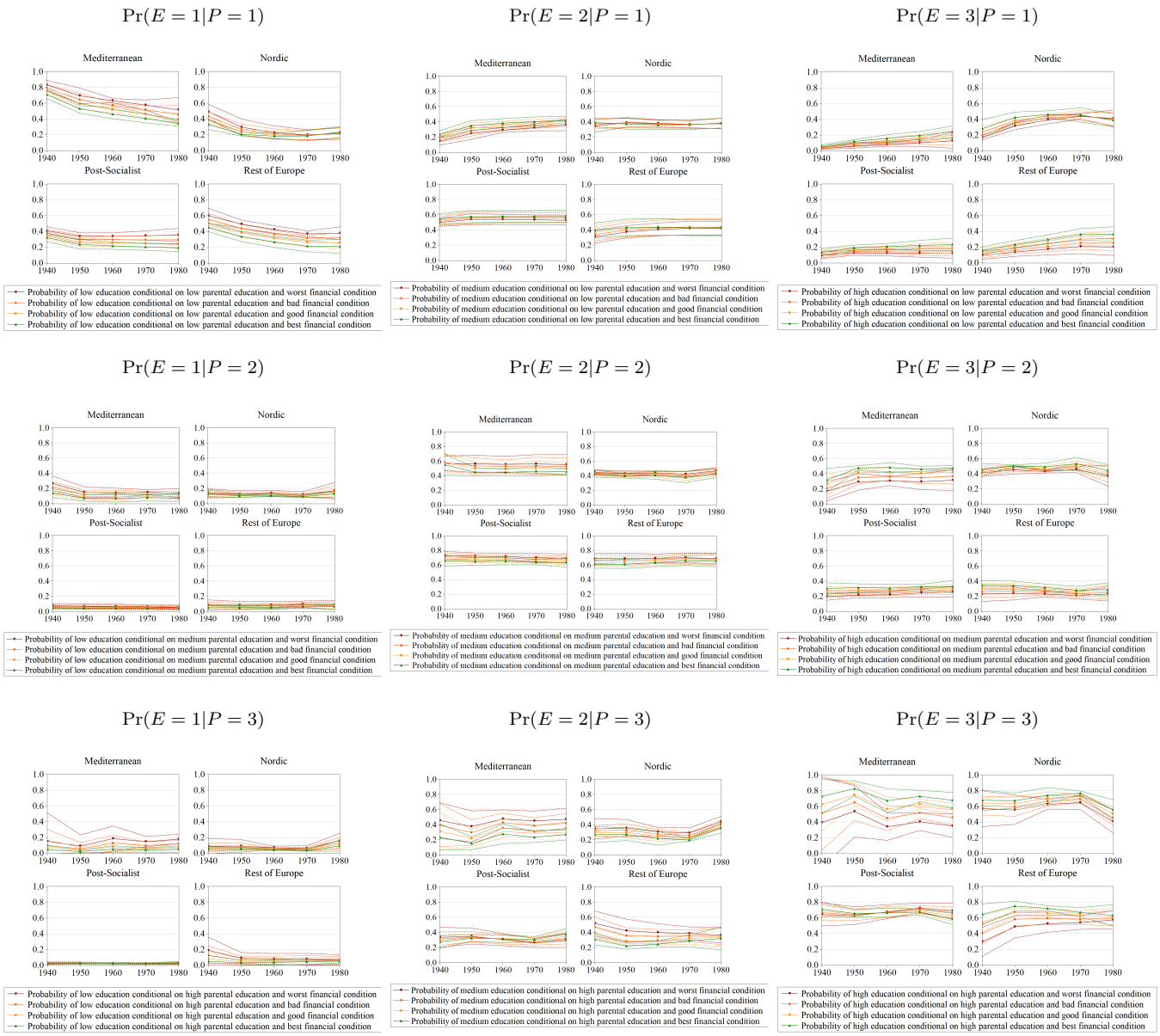
We cluster descendants based on their paternal education, and estimate their conditional educational probabilities for each country and country group of interest, while also controlling for descendants' decade of birth.[70] We report our findings in Figure 14, in which we illustrate how descendants' conditional educational attainment probabilities vary over their parental finances at the age of 14. Figure 14 reveals that although descendants' evaluation of their parental finances are *subjective*, almost all estimated conditional probabilities are sorted over descendants' parental financial status: conditional on being born to fathers with equal educational backgrounds, descendants with better financial status at the age of 14 have monotonically better education prospects in

[68] While the EVS gathers information on descendants' evaluation on their parental subjective well-being when they are 14 years old, it contains parental education information about *fathers only* if descendants' parents were living together, and *mothers only* if descendants were living with their single mothers at the age of 14. Further, the EVS dataset contains significantly lower number of observations than the ESS, hence motivating us to use the ESS dataset for our main analyses. We exclude descendants living with their single mothers at the age of 14 for robustness purposes, which accounts for 4,162 observations, thereby leaving us with 39,201 observations. Note that in the ESS dataset, categoric (ordinal) maternal education strictly exceeds paternal education (i.e. becomes decisive in the valuation of the *better-educated* parent) in only 10% of instances, hence we expect ESS's data limitations on the lack of information on maternal education not to induce severe distortions to our results.

[69] Note that for a majority of the European countries, age 14 is a critical threshold with regards to descendants' surpassing *low* education; and when it is not, we believe it is highly improbable for parental financial status of descendants to vary drastically a few years before and after this age.

[70] We control for decade and not year of birth due to fewer number of observations in the EVS dataset. Findings by alternative time-fixed effect specifications are available upon request.

**Figure 14:** Intergenerational Educational Mobility & Parental Finances by Country Group




† Dates on the horizontal axis correspond to the ***birth-cohort*** of interest. $\Pr(E = i|P = j)$ reads as descendants' probability of attaining education level $i$ conditional on being born to a father with an education level of $j$. Dashed lines correspond to country-clustered 95% confidence interval standard error bands.

all four country groups, with the exception being Nordic descendants born to low-educated fathers after the 1970s and Post-Socialist descendants born to high-educated fathers after the 1950s. We report the highest variation in conditional educational probabilities over parental finances for the Mediterranean descendants, followed by the Rest of European descendants. Further, while probability dispersion over parental finances persist over time in the Mediterranean country group, it diminishes and disappears in the Rest of European country group for descendants born to fathers with medium or high education. Finally, historically parental finances matter the least for the Nordic descendants when born to low-educated fathers, and the Post-Socialist (and recently-born Rest of European descendants) when born to medium or high-educated parents.[71]

Our findings suggest that descendants' parental finances at their age of 14 *do* have significant implications on educational prospects of descendants, in addition to their paternal educational backgrounds, albeit heterogeneously over country groups and over time.[72,73]

### 4.3 Educational Inequality, Intergenerational Educational Mobility and Relative High Education Prospect

After investigating the evolution of intergenerational educational mobility estimates along with their interactions thoroughly, we next turn to exploring the relationship between intergenerational educational mobility and educational inequality. For this goal, we first calculate within-cohort educational inequalities for countries and country groups of interest. Second, in order for our analyses to relate to the discussion on the Great Gatsby hypothesis, we estimate intergenerational educational elasticities over time, and investigate the cross-country relationship between intergenerational educational elasticities and educational inequality. Third, we report on the evolution of the relative high education prospect measures we propose, as well as their interaction with intergenerational educational elasticities and educational inequality.

[71] We also redo our analysis by clustering descendants' four evaluation categories into two: i) descendants who experienced no financial difficulties at all when they are 14 years old, versus ii) others (who experienced financial distress at different degrees). These findings are available in Online Appendix.

[72] In Figure A.25, Figure A.26, and Figure A.27 we report how parental finances affect male and female descendants' educational prospects separately. Our findings reveal that parental finances have heterogeneous implications on male and female descendants' education prospects, especially when born to fathers with medium or high educational backgrounds, albeit again heterogeneously over country groups and over time.

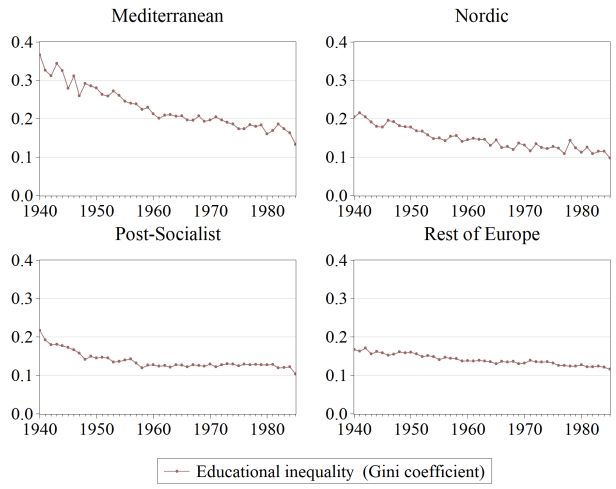
[73] Another plausible explanation one could suspect behind the positive relationship between parental finances and better education prospects of descendants could be due to "assortative matching": high-educated fathers with better finances could have partnered with mothers with better educational backgrounds, and the isolated effects of parental finances could actually stem from the unobservable maternal education, which could thereby correlate positively with family finances. However, for this explanation to hold true, one would expect the cross-sectional and time-series variations in the frequency of assortative matching, as depicted in Figure A.17 and marginal differences in educational prospects of descendants born to assorted parents, as depicted in Figure 9 and Figure 11 to align well with the variations in the isolated effects of parental finances, which is not the actual case.

### 4.3.1 Educational Inequality

In order to test for the "Educational Great Gatsby Hypothesis", we first measure educational inequality for each birth cohort in each country and country group by calculating their respective educational Gini coefficients.[74]

In Figure 15, we report the evolution of educational Gini coefficients by country group.[75] Figure 15 displays that all four country groups experience monotonic decreases in their within-cohort educational inequalities over time, albeit at different magnitudes across country groups. Mediterranean educational Gini coefficients of any cohort exceed those of the three other groups, and the Mediterranean Gini coefficient decreases from slightly above 0.35 to slightly below 0.15 over 46 years. The Nordic and the Post-Socialist educational Gini coefficients also approximately halve in magnitude, both from 0.20 to 0.10 over the period of interest. The educational Gini coefficient in the Rest of Europe country group decreases only moderately over time, from slightly above to below 0.15.

**Figure 15:** Educational Inequality by Country Group




† Dates on the horizontal axis correspond to the ***birth-cohort*** of interest.

### 4.3.2 Educational Inequality and Mobility

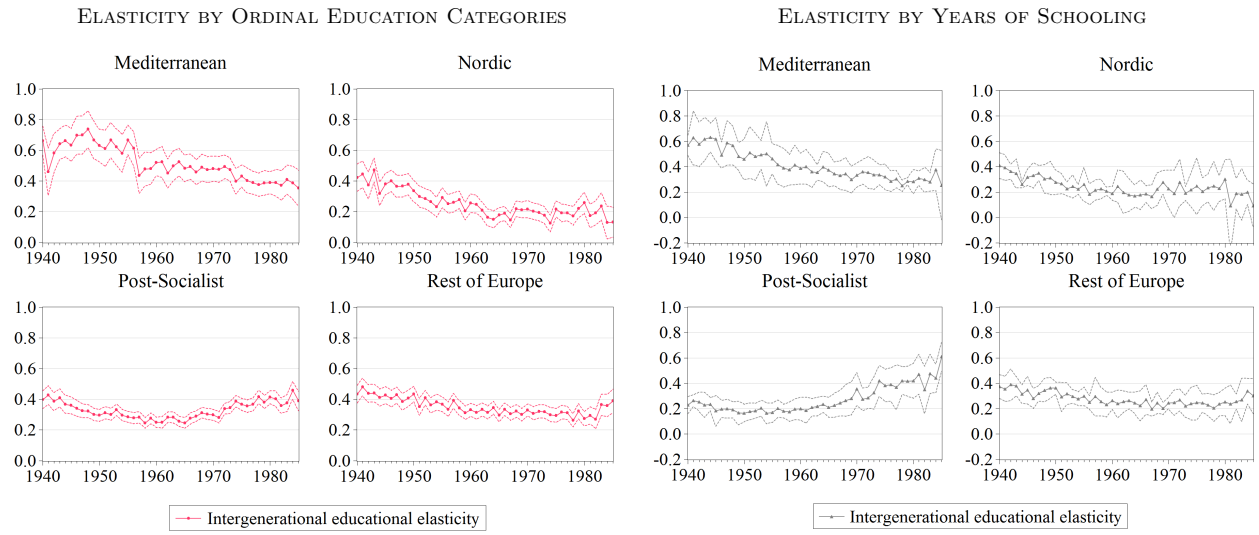
Next, using (9) and the natural logarithmic variant of (15), we calculate ordinal and cardinal intergenerational educational elasticities, as it is standard in the literature on the Great Gatsby Curve

[74] As we briefly discussed, while calculating the within-cohort Gini coefficients, we use years of schooling, as it is standard in the literature. In addition, we also calculate the Gini coefficients by the use of our ordinal educational attainment definitions, which generate qualitatively similar results. For the Gini coefficients by the use of years of schooling, we adopt the methodology by Thomas et al. (2002), and for the Gini coefficients by the use of our ordinal education categories, we follow Peñaloza (2016). Findings by alternative ordinal Gini measurement methods, e.g. as in Van Doorslaer and Jones (2003) and Madden (2010) are available upon request.

[75] For educational Gini coefficients by country, see Figure A.28.

hypothesis.[76]

**Figure 16:** Intergenerational Educational Elasticity by Country Group




† Dates on the horizontal axis correspond to the ***birth-cohort*** of interest. Dashed lines correspond to country-clustered 95% confidence interval standard error bands.

In Figure 16, we display the evolution of intergenerational educational elasticity over time by the use of our ordinal education categories and by years of schooling calculations for the four country groups.[77] Noticeably, our findings reveal that time trends of intergenerational educational elasticities by ordinal education categories, as shown on the left panel in Figure 16, and intergenerational educational persistence, as shown in Figure 1 do not overlap, which is to be expected since our persistence measure is constructed upon population-weighted *conditional probabilities*, whereas the elasticity measure quantifies *percentage change* in descendants' educational attainment in response to one percentage increase in parental educational attainment.[78] Intergenerational elasticities by ordinal education categories in the Mediterranean, Nordic and Rest of Europe groups gradually decrease in level over newborn cohorts, whereas the Post-Socialist elasticity displays a monotonic increase for cohorts born after the 1960s, and reaches its 1940-level for cohorts born by the early 1980s. As depicted on the right panel in Figure 16, intergenerational elasticity measure calculated by years of schooling displays similar time-series patterns as the elasticity measure by ordinal educational

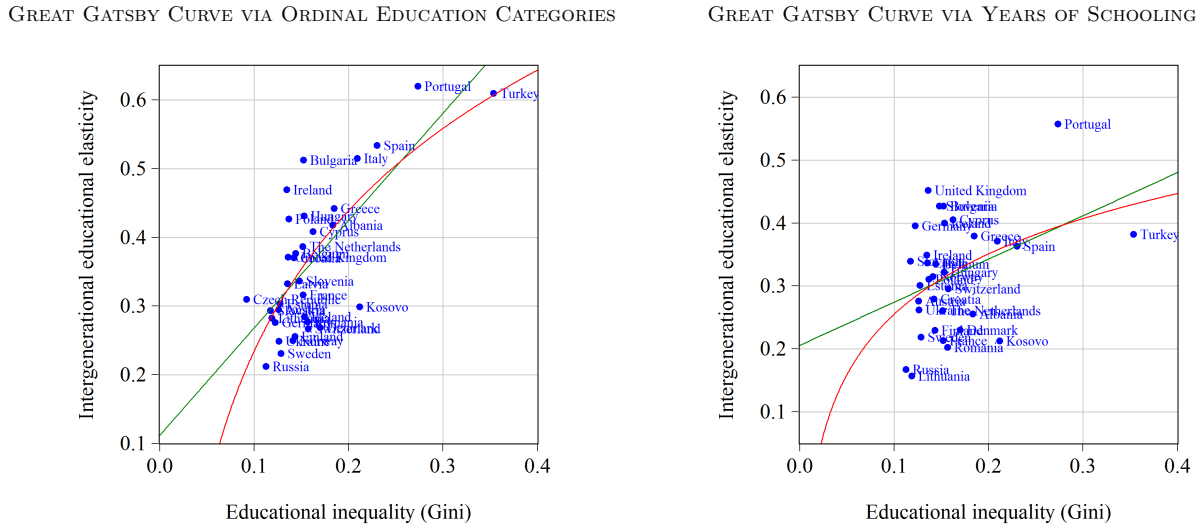
[76]For an elaborate discussion on the Great Gatsby curve, see Corak (2013). The natural logarithmic variant of (15) is of the form $\log(E_{it}) = \hat{\delta}_t + \hat{\gamma}_t \log(\overline{P}_{it})$, where $\log(E_{it})$ denotes the natural logarithm of years of schooling of descendants, and $\log(\overline{P}_{it})$ denotes the natural logarithm of average years of schooling of parents.

[77]For intergenerational educational elasticities by country, see Figure A.29 and Figure A.30.

[78]In particular, the left panel in Figure 16 displays that while the direction of historical change in elasticity estimates *more or less* parallels with persistence in the Mediterranean, Post-Socialist and Rest of European groups, the monotonic decrease in the elasticity of the Nordic group contradicts with the U-shaped pattern in the Nordic persistence, yet aligns well with the mobility coefficients and correlations by years of schooling estimates, as depicted in Figure 6.

categories.[79]

**Figure 17:** Educational Great Gatsby Curves




† The red line refers to the non-linear (logarithmic-linear), and the green line refers to the linear fit between the two variables. A cross-sectional linear OLS regression of intergenerational educational elasticity (via ordinal education categories) on educational inequality yields a positive regression coefficient estimate (and *standard error*) of 1.56(*0.26*) with a corresponding $p$ value of 0.000. OLS regression of the same elasticity on the natural logarithm of educational inequality yields regression coefficient estimate (and *standard error*) of 0.30(*0.05*) with a corresponding $p$ value of 0.000. The same OLS regression of intergenerational educational elasticity (via years of schooling) on educational inequality yields a positive regression coefficient estimate (and *standard error*) of 0.68(*0.30*) with a corresponding $p$ value of 0.031. The logarithmic fit in the latter case is significant with a positive regression coefficient estimate (and *standard error*) of 0.14*(0.06)* with a corresponding $p$ value of 0.027. On the right panel, we omit the single outlier, i.e. the Czech Republic, whose intergenerational elasticity measure of 0.76 is 3.67 standard deviations distant from the sample mean 0.43. Findings with the inclusion of the Czech Republic are available upon request.

We next report the cross-country relationship between educational inequality and our two intergenerational educational elasticity measures in Figure 17.[80] As the educational equivalents of the Great Gatsby Curve, both panels in Figure 17 indicate a significant *positive* correlation between intergenerational educational elasticity and educational inequality, i.e. countries in which descendants' educational attainment mimics their parental educational attainment more, within-cohort educational inequality tends to be higher. In other words, countries with lesser degrees of intergenerational mobility display higher levels of educational dispersion, as well.[81]

[79] We acknowledge that our intergenerational elasticity measures can be taken with caution: our first intergenerational educational elasticity measure is constructed by the use of our *ordinal* education definitions, and the second by the use of our *imputed* years of schooling values, whereas the main Great Gatsby Curve literature relies on *actual cardinal* income variations. In the next subsection, we address this issue by introducing our relative high education prospect measures, and argue that findings by these variables are also in accordance with the Great Gatsby hypothesis.

[80] Each observation in Figure 17 corresponds to a single country's *average* educational Gini coefficient and *average* intergenerational elasticity pair. In Online Appendix, we report on the *evolution* of the Educational Great Gatsby Curves (via both ordinal education categories and years of schooling) over decades.

[81] A cross-sectional linear OLS regression of intergenerational educational elasticity (via ordinal education categories) on educational inequality yields a positive regression coefficient estimate of 1.53 (with a standard error of 0.26), which is statistically significant at 99% confidence interval. The same OLS regression of intergenerational educational elasticity (via years of schooling) on educational inequality yields a positive regression coefficient estimate of 0.68 (with a standard error of 0.30), which is statistically significant at 95% confidence interval.

### 4.3.3 Educational Inequality and Relative High Education Prospect

Our discussion in the previous subsection highlights the drawbacks of our intergenerational elasticity measures. In order to address issues arising from the ordinality of our education definitions and possible concerns due to the use of imputation in our years of schooling calculations, we introduce a set of mobility measures, i.e. relative high education prospect variables, which can be interpreted as the ordinal analogues of intergenerational educational elasticities. As discussed in detail in the methodology section, our relative high education prospect measures are devised to unveil how high education prospects of descendants vary over their parental education in the countries and country groups of interest. The four relative high education prospect variables we propose measure high education prospects of I) descendants born to below-high-educated parents relative to descendants born to high-educated parents; II) descendants born to low-educated parents relative to descendants born to high-educated parents; III) descendants born to medium-educated parents relative to descendants born to high-educated parents; and IV) descendants born to low-educated parents relative to descendants born to medium-educated parents.[82]

In Figure 18, we report the evolution of the four relative high education prospect measures by country group.[83] The first quadrant in Figure 18 displays that in all four country groups, descendants born to below-high-educated parents have lesser high education prospects than those descendants born to high-educated parents. Further, among descendants born to below-high-educated parents, we report that Nordic descendants are the least and Mediterranean descendants are the most disadvantaged ones in terms of their relative high education prospects. In all four country groups, relative high education prospects of descendants who are not born to high-educated parents improve over time, albeit due to different reasons, as the three other quadrants reveal.

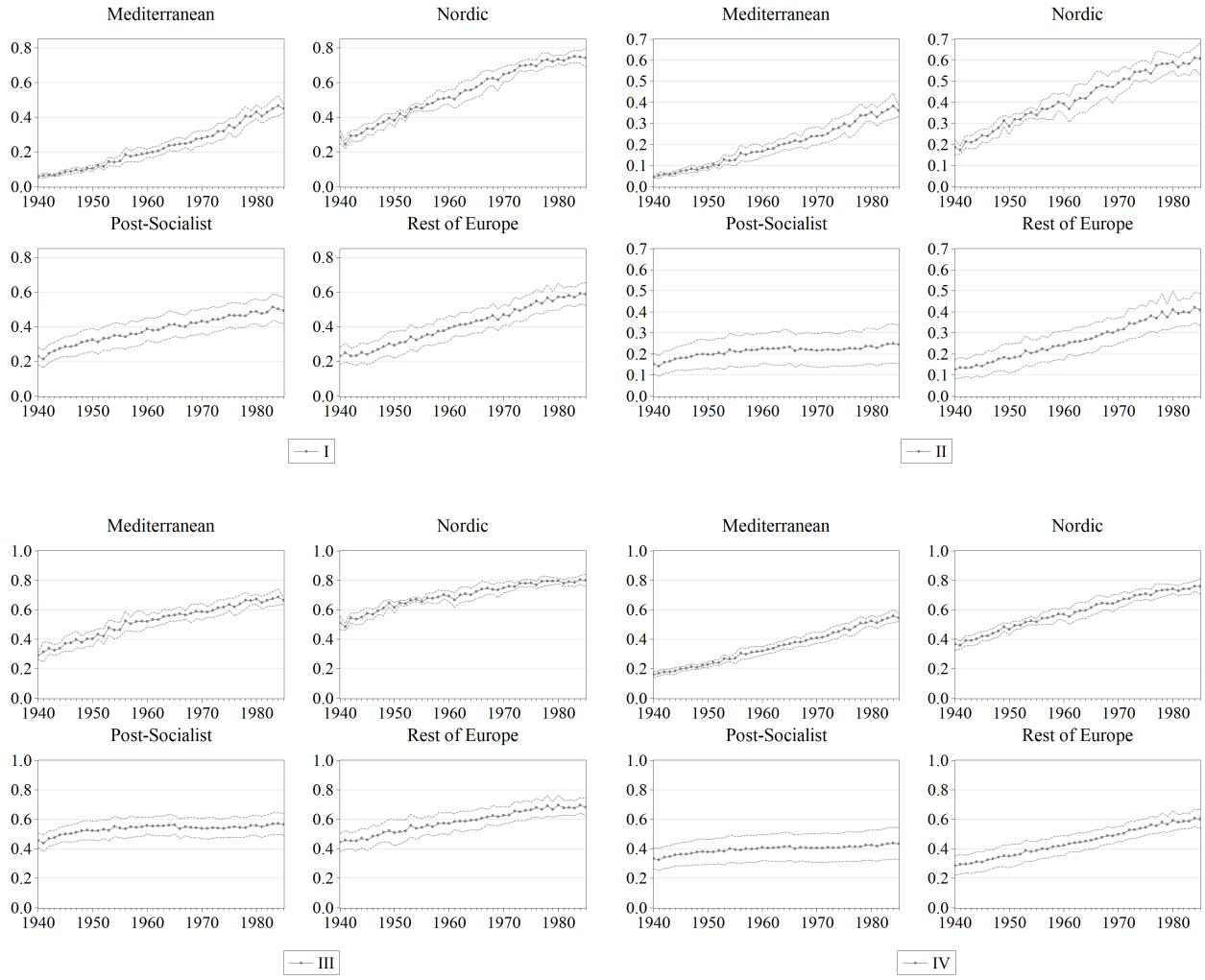
The second quadrant in Figure 18 displays that while relative high education prospects of descendants born to low-educated parents in the Mediterranean, Nordic and Rest of Europe country groups improve over time, they remain rather stagnant in the Post-Socialist group. Consequently, across the four country groups while Mediterranean descendants face the lowest relative high education prospects when born in the 1940s, Post-Socialist descendants face the lowest relative prospects when born in the 1980s. Further, among descendants born to low-educated parents, Nordic descendants are again the least disadvantaged ones in terms of their relative high education prospects historically.[84]

[82] Note that, as discussed in the Estimation Methodology section, the latter three relative high education prospect measures (II, III, IV) are defined *only* over estimated conditional transition probabilities, hence they are orthogonal to variations in distributions of parents over education categories, similar to the notion behind elasticity calculations. The first measure (I) depends on parental educational distribution of descendants only to the extend that the relative share of medium-educated parents to low-educated parents varies. For the cross-gender variants of the relative high education prospect measures, see Online Appendix.

[83] For the cross-country relationship between the four equality of education opportunity measures and intergenerational educational elasticities, see Figure A.31 and Figure A.32; and for the evolution of the four relative high education prospect measures by country, see Figure A.33, Figure A.34, Figure A.35, and Figure A.36.

[84] Our findings for the Nordic countries are in accordance with Mazumder (2015), in which Nordic intergenerational mobility is documented to be the most rapid in terms of socioeconomic standing over generations.

**Figure 18:** Relative High Education Prospect by Country Group




† Dates on the horizontal axis correspond to the ***birth-cohort*** of interest. Dashed lines correspond to country-clustered 95% confidence interval standard error bands. The measures in the four quadrants refer to high-education probability of descendants born to I) below-high-educated parents relative to high-educated parents II) low-educated parents relative to high-educated parents III) medium-educated parents relative to high-educated parents, and IV) low-educated parents relative to medium-educated parents.

I: $\mathcal{RHEP}_{\text{L\&M/H}} = \frac{\Pr(E=3|P=1\vee 2)}{\Pr(E=3|P=3)} = \frac{\Pr(E=3|P\neq 3)}{\Pr(E=3|P=3)}$

II: $\mathcal{RHEP}_{\text{L/H}} = \frac{\Pr(E=3|P=1)}{\Pr(E=3|P=3)}$

III: $\mathcal{RHEP}_{\text{M/H}} = \frac{\Pr(E=3|P=2)}{\Pr(E=3|P=3)}$

IV: $\mathcal{RHEP}_{\text{L/M}} = \frac{\Pr(E=3|P=1)}{\Pr(E=3|P=2)}$

The third quadrant in Figure 18 reveals a similar pattern as does the the second quadrant: high education prospects of descendants born to medium-educated parents relative to those born to high-educated parents improve noticeably in all country groups, but the Post-Socialist one. Accordingly, once ranking similar to the Nordic and the Rest of European group in terms of its relative high education prospect performance (III), the Post-Socialist group ranks the last for recent-born cohorts.

Finally, the fourth quadrant in Figure 18 shows that high education prospects of descendants born to low-educated parents relative to those born to medium-educated ones improve over time in all four groups but the Post-Socialist one, rendering it as the country group with the lowest relative high education prospect (IV) for cohorts born after the 1970s.[85]

We next report our variants of the Educational Great Gatsby Curve in Figure 19, where we plot country averages of educational Gini coefficients against our four relative high education prospect estimates.[86] Figure 19 documents a *negative* cross-sectional correlation between educational inequality and our relative high education prospect variables, albeit significantly only for the first, second and the fourth relative high education prospect measures (except for the first quadrant, the statistical significance of these correlations disappears once Portugal and Turkey are removed).[87] These findings suggest that countries in which high educational prospects of descendant vary more over their parental educational backgrounds tend to display higher within-cohort educational inequalities, or equivalently countries in which descendants from different parental educational backgrounds have similar tertiary education prospects are associated with lower levels of educational dispersions. Therefore, we conclude that our analyses by the use of our relative high education prospect measures also support the Educational Great Gatsby Curve hypothesis in Europe.

#### 4.3.4 Intergenerational Educational Mobility and Returns to Education

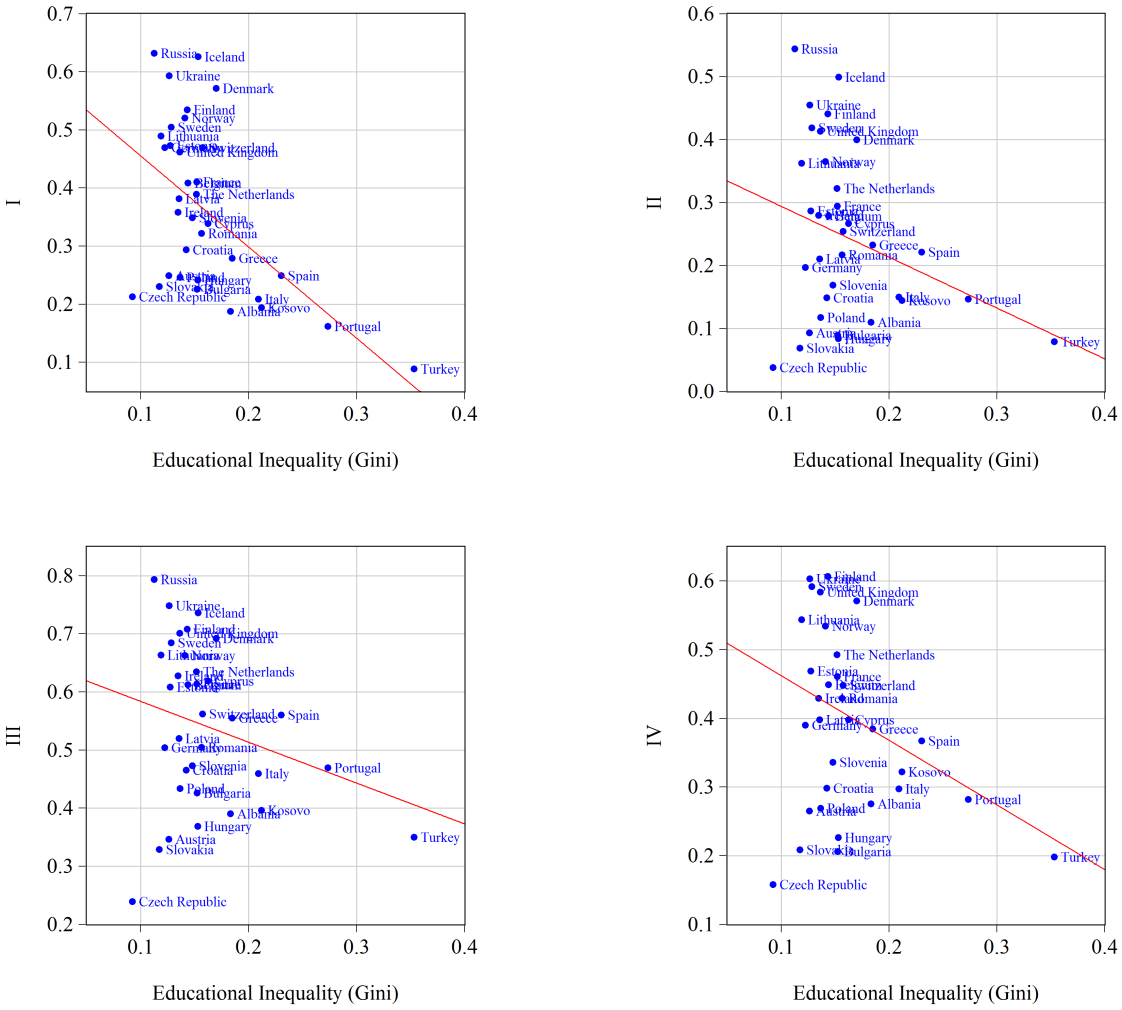
Finally, we test if low intergenerational mobility coincides with high return on human capital investment, as conjectured theoretically by Solon (2004). Specifically, we examine the cross-sectional relationship between intergenerational educational mobility and *college premium*: how average of earnings of those with tertiary education background compare to those with upper secondary or post-secondary and non-tertiary education. To this end, we retrieve college premium (in 2010 earnings) of i) 1946-1955 and ii) 1976-1985 birth-cohorts from OECD's *Education at a Glance Reports*,

[85] The latter three quadrants in Figure 18 thereby reveal that the monotonic increase in the first relative high education prospect measure for the Post-Socialist group does *not* stem from higher conditional education prospects of descendants born to low and medium-educated parents *per se*, but from a higher share of medium-educated parents relative to low-educated ones.

[86] We report how the Educational Great Gatsby Curves (by both intergenerational elasticities and by the set of relative high education prospect measures) evolve over decades in Online Appendix. Briefly, we document that Educational Great Gatsby Curves by both measures offer higher statistical significance and better fit for the earlier cohorts.

[87] The cross-sectional negative correlation between the educational inequality and first, second and fourth relative high education prospect variables are significant at 99%, 90% and 90% confidence intervals, respectively. Cross-sectional linear OLS regressions of the four relative high education prospect variables on educational inequality yield coefficient estimates (and *standard errors*) of $-1.57(\mathit{0.44})$ $-0.81(\mathit{0.47})$, $-0.70(\mathit{0.48})$, $-0.94(\mathit{0.49})$ with corresponding $p$ values of 0.001, 0.092, 0.153, 0.064, respectively.

**Figure 19:** Educational Inequality & Relative High Education Prospect by Country




† The red line refers to the linear fit between the two variables.The measures in the four quadrants refer to high-education probability of descendants born to I) below-high-educated parents relative to high-educated parents II) low-educated parents relative to high-educated parents III) medium-educated parents relative to high-educated parents, and IV) low-educated parents relative to medium-educated parents.

I: $\mathcal{RHEP}_{\text{L\&M/H}} = \frac{\Pr(E=3|P=1\vee 2)}{\Pr(E=3|P=3)} = \frac{\Pr(E=3|P\neq 3)}{\Pr(E=3|P=3)}$ II: $\mathcal{RHEP}_{\text{L/H}} = \frac{\Pr(E=3|P=1)}{\Pr(E=3|P=3)}$

III: $\mathcal{RHEP}_{\text{M/H}} = \frac{\Pr(E=3|P=2)}{\Pr(E=3|P=3)}$ IV: $\mathcal{RHEP}_{\text{L/M}} = \frac{\Pr(E=3|P=1)}{\Pr(E=3|P=2)}$

Cross-sectional OLS linear regressions of the four relative high education prospect variables on educational inequality yield coefficient estimates (and *standard errors*) of $-1.57(\mathit{0.44})$ $-0.81(\mathit{0.47})$, $-0.70(\mathit{0.48})$, $-0.94(\mathit{0.49})$ with corresponding $p$ values of 0.001, 0.092, 0.153, 0.064, respectively.

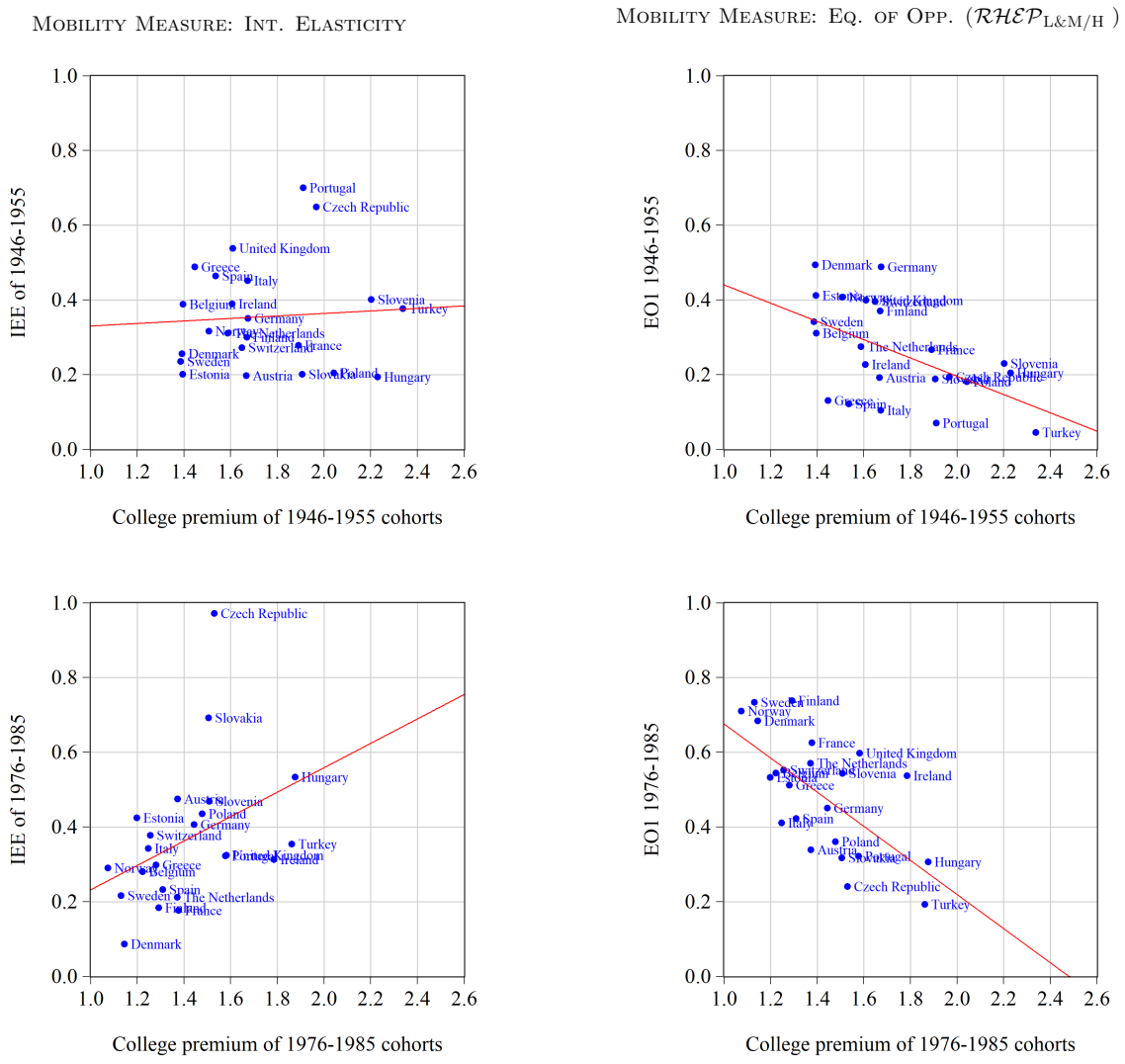
and we plot intergenerational educational elasticity (or the relative high education prospect measure) jointly with college premium for the birth-cohorts in Figure 20.[88,89] The left panels on Figure 20 reveal that both the strength and the significance of the relationship between intergenerational educational elasticity and returns to education varies over time: while the relationship is barely positive and insignificant for the early birth cohort, it is notably positive and significant for the late one. The right panels on Figure 20 display similarly that the strength of the relationship between college premium and our educational relative high education prospect variable increases over birth-cohorts. However, the two right panels reveal also that the relationship between intergenerational educational mobility and returns to education is considerably more robust when our relative high education prospect measures are employed: for both the early *and* the late birth-cohorts, the negative and significant relationship between the variables of interest prevails at higher significance levels, and these findings are robust to the use of our other relative high education prospect definitions.[90] These findings suggest that countries where tertiary education prospects of descendants depend sizeably on their parental backgrounds, earning differences due to tertiary education are higher, and low intergenerational mobility in Europe indeed coincides with high returns to education.

[88] In order to construct college earning premium series, we utilize OECD's Education at a Glance 2012, 2013 and 2014 reports. For the following 19 countries were able to retrieve college earning premium information for 2010: Austria, Belgium, Czech Republic, Denmark, Estonia, France, Germany, Hungary, Ireland, Italy, the Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom. Due to data limitations, for Turkey (Finland and Greece) we use earnings data from 2012 (2009), as 2010 data is not available.

[89] In OECD's Education at a Glance reports published between 2007 and 2017, college premium due to tertiary education is calculated for the adult population between ages i) 25-64 ii) 25-34 and iii) 55-64 in each year. Therefore, in 2010 this data set allows us to obtain college earning premium data for those born in 1946-1955 and 1976-1985, separately. For robustness purposes, we repeat this exercise via 2006 earnings, and we reach similar qualitative conclusions. See Online Appendix for further details.

[90] See Online Appendix for results by our other relative high education prospect definitions.

**Figure 20:** Intergenerational Educational Mobility and Returns to Education by Country




† The red line refers to the linear fit between the two variables. Cross-sectional OLS linear regressions of the intergenerational educational elasticity on 2010 college earning premium yield coefficient estimates (and *standard errors*) of 0.03(*0.31*) and 0.33(*0.17*) with corresponding $p$ values of 0.761, 0.066 for the cohorts of 1946-1955 and 1976-1985, respectively. Cross-sectional OLS linear regressions of the educational relative high education prospect on 2010 college earning premium yield coefficient estimates (and *standard errors*) of $-0.24$(*0.08*) and $-0.46$(*0.12*) with corresponding $p$ values of 0.010, 0.001 for the cohorts of 1946-1955 and 1976-1985, respectively.

# 5 Conclusions

In this paper, we study the relationship between parental education and educational prospects of their descendants born between 1940-1985 in 34 European countries and 4 country groups. Our findings reveal that intergenerational educational persistence, i.e. the probability of descendants to mimic the educational attainment of their better-educated parents displays sizable heterogeneity in both level and in trend across countries and country groups. Specifically, we report that starting from different levels for the earliest cohorts, intergenerational educational persistence exhibits a downward time-trend in the Mediterranean country group, an upward time-trend in the Post-Socialist group, a U-shaped time-trend in the Nordic group and a moderate downward time-trend, accompanied by constancy for the Rest of Europe group.

We next investigate the role of gender of descendants, and asymmetries in paternal and maternal education. Our results show that gender of descendants matters in a time-varying way: while female descendants of the earlier cohorts were more disadvantaged in educational attainment prospects than their male counterparts at different degrees across countries, the disadvantages of female descendants gradually disappear over time and recently-born female descendants' better education prospects either catch-up to or surpass those of males descendants. Further, our results reveal that keeping the educational level of the better-educated parent constant, educational attainment of the less-educated parent also positively predicts descendants' better educational attainment prospects, particularly pronounced in the case of the Mediterranean country group. We also investigate whether financial well-being of parents matter *in addition to* their educational backgrounds, at the time descendants receive their education. We document that conditional on being born to fathers with equal educational attainment, descendants' subjective evaluation of their parental financial status at the age of 14 has significant implications on educational prospects of descendants, albeit heterogeneously over country groups and gender over time.

We further document the evolution of educational inequalities in Europe, and show that intergenerational educational elasticity correlates positively with educational inequality, i.e. the "Educational Great Gatsby" hypothesis holds true in Europe. We also show that the link between *relative high education prospect*, a set of measures capturing how better educational attainment prospects of descendants vary over their parental education, and educational inequality is present, as well. We finally document that both mobility measures correlate significantly with returns to education, indicating low intergenerational mobility coincides with higher college premium in Europe.

This paper does not intend to contradict earlier studies on intergenerational educational mobility, but to provide a more complete picture with a reliable, standardized empirical approach, thereby improving both cross-sectional and time-series comparability. The findings we report in this paper show that European intergenerational educational mobility patterns are *not* linear, symmetric, gender-neutral and time-invariant, as specified in the earlier literature, and overlooking several dimensions of heterogeneities would be misleading in understanding educational transmission across

generations.

This paper does not intend to challenge earlier studies addressing intergenerational transmission of earnings or income, either, but intends to complement them. Education, as an undetestable factor in contributing to human capital, and accordingly labor earnings, is a major determinant of income, and we believe that in order to unveil income mobility, a natural first step is to explore on educational transmission across generations. We also believe that further research on the intersection of parental income and educational transmission across generations would be particularly enlightening in unveiling descendants' *de facto* relative high education prospect. While our analyses on the link between parental finances and intergenerational educational transmission are suggestive, we believe further work on quantifying the marginal effects of parental finances when descendants their receive education would be especially illuminating.

Finally, while this paper aims to answer questions on "what" has happened to intergenerational educational mobility in Europe, and "how" these patterns have materialized, it does not address "why" we observe such patterns. Investigating the roots of causal mechanisms are critical in understanding intergenerational mobility dynamics, and as a result taking necessary precautionary measures, yet exploring the causalities are beyond the scope of this paper, which we leave to future research.

## References


Ashenfelter, O. and Krueger, A. B. (1994). Estimates of the Economic Returns to Schooling from a New Sample of Twins. *American Economic Review*, 84(5):1157–1173.

Aydemir, A., Chen, W.-H., and Corak, M. (2013). Intergenerational education mobility among the children of canadian immigrants. *Canadian Public Policy*, 39(Supplement 1):S107–S122.

Becker, G. S. and Tomes, N. (1979). An equilibrium theory of the distribution of income and intergenerational mobility. *The Journal of Political Economy*, pages 1153–1189.

Behrman, J. and Taubman, P. (1985). Intergenerational earnings mobility in the united states: Some estimates and a test of becker's intergenerational endowments model. *The Review of Economics and Statistics*, 67(1):144–151.

Björklund, A. and Jäntti, M. (1997). Intergenerational income mobility in sweden compared to the united states. *The American Economic Review*, 87(5):1009–1018.

Björklund, A., Roine, J., and Waldenström, D. (2012). Intergenerational top income mobility in sweden: Capitalist dynasties in the land of equal opportunity? *Journal of Public Economics*, 96(5–6):474 – 484.

Black, S. E. and Devereux, P. J. (2011). *Recent Developments in Intergenerational Mobility*, volume 4 of *Handbook of Labor Economics*, chapter 16, pages 1487–1541. Elsevier.

Blanden, J. and Macmillan, L. (2014). Education and intergenerational mobility: Help or hindrance?

Bloome, D. and Western, B. (2011). Cohort change and racial differences in educational and income mobility. *Social Forces*, 90(2):375–395.

Boserup, S. H., Kopczuk, W., and Kreiner, C. T. (2013). Intergenerational wealth mobility: Evidence from danish wealth records of three generations. *University of Copenhagen Mimeo*.

Braun, S. T. and Stuhler, J. (2016). The transmission of inequality across multiple generations: Testing recent theories with evidence from germany. *The Economic Journal*, Forthcoming.

Chamberlain, G. (2016). Fixed effects, invariance, and spatial variation in intergenerational mobility. *American Economic Review*, 106(5):400–404.

Checchi, D., Fiorio, C. V., and Leonardi, M. (2013). Intergenerational persistence of educational attainment in italy. *Economics Letters*, 118(1):229 – 232.

Chetty, R., Grusky, D., Hell, M., Hendren, N., Manduca, R., and Narang, J. (2017). The fading american dream: Trends in absolute income mobility since 1940. *Science*.

Chetty, R. and Hendren, N. (2015). The impacts of neighborhoods on intergenerational mobility: Childhood exposure effects and county-level estimates. *Harvard University and NBER*.

Chetty, R., Hendren, N., Kline, P., and Saez, E. (2014a). Where is the land of opportunity? the geography of intergenerational mobility in the united states. *The Quarterly Journal of Economics*, 129(4):1553–1623.

Chetty, R., Hendren, N., Kline, P., Saez, E., and Turner, N. (2014b). Is the united states still a land of opportunity? recent trends in intergenerational mobility. *The American Economic Review*, 104(5):141–147.

Clark, G. and Cummins, N. (2015). Intergenerational wealth mobility in england, 1858–2012: Surnames and social mobility. *The Economic Journal*, 125(582):61–85.

Corak, M. (2013). Income inequality, equality of opportunity, and intergenerational mobility. *The Journal of Economic Perspectives*, 27(3):79–102.

Corak, M. and Heisz, A. (1999). The intergenerational earnings and income mobility of canadian men: Evidence from longitudinal income tax data. *Journal of Human Resources*, pages 504–533.

Daouli, J., Demoussis, M., and Giannakopoulos, N. (2010). Mothers, fathers and daughters: Intergenerational transmission of education in greece. *Economics of Education Review*, 29(1):83 – 93.

Darvas, Z. (2016). High inequality and poverty helped trigger the brexit protest vote.

Dellas, H. and Sakellaris, P. (2003). On the cyclicality of schooling: theory and evidence. *oxford Economic papers*, 55(1):148–172.

Díaz-Giménez, J., Glover, A., Ríos-Rull, J.-V., et al. (2011). Facts on the distributions of earnings, income, and wealth in the united states: 2007 update. *Quarterly Review*.

Durlauf, S. N. and Seshadri, A. (2016). Some microfoundations for the great gatsby curve. Mimeo.

Durlauf, S. N. and Shaorshadze, I. (2015). *Intergenerational Mobility*, chapter Intergenerational Mobility. Wiley Online Library.

Emran, M. S. and Shilpi, F. (2015). Gender, geography, and generations: Intergenerational educational mobility in post-reform india. *World Development*, 72:362 – 380.

Gong, H., Leigh, A., and Meng, X. (2012). Intergenerational income mobility in urban china. *Review of Income and Wealth*, 58(3):481–503.

Güvenen, F. (2011). Macroeconomics with Heterogeneity: A Practical Guide. *National Bureau of Economic Research*, page 69.

Haider, S. and Solon, G. (2006). Life-cycle variation in the association between current and lifetime earnings. *The American Economic Review*, 96(4):1308–1320.

Hassler, J., Mora, J. V. R., and Zeira, J. (2007). Inequality and mobility. *Journal of Economic Growth*, 12(3):235–259.

Heathcote, J., Storesletten, K., and Violante, G. L. (2009). Quantitative Macroeconomics with Heterogeneous Households. *Annual Review of Economics*, 1(1):319–354.

Hertz, T., Jayasundera, T., Piraino, P., Selcuk, S., Smith, N., and Verashchagina, A. (2007). The inheritance of educational inequality: International comparisons and fifty-year trends. *The BE Journal of Economic Analysis & Policy*, 7(2).

Huang, J. (2013). Intergenerational transmission of educational attainment: The role of household assets. *Economics of Education Review*, 33:112 – 123. Assets and Educational Attainment: Theory and Evidence.

Jäntti, M., Bratsberg, B., Røed, K., Raaum, O., Naylor, R., Österbacka, E., Björklund, A., and Eriksson, T. (2007). American exceptionalism in a new light : a comparison of intergenerational earnings mobility in the Nordic countries, the United Kingdom and the United States. The Warwick Economics Research Paper Series (TWERPS) 781, University of Warwick, Department of Economics.

Jerrim, J. and Macmillan, L. (2015). Income inequality, intergenerational mobility, and the great gatsby curve: Is education the key? *Social Forces*, 94(2):505.

Kopczuk, W., Saez, E., and Song, J. (2010). Earnings inequality and mobility in the united states: evidence from social security data since 1937. *The Quarterly Journal of Economics*, 125(1):91–128.

Kourtellos, A., Marr, C., and Tan, C. M. (2016). Robust determinants of intergenerational mobility in the land of opportunity. *European Economic Review*, 81:132–147.

Krueger, A. (2012). The rise and consequences of inequality. *Presentation made to the Center for American Progress, January 12th. Available at http://www. americanprogress. org/events/2012/01/12/17181/the-rise-and-consequences-of-inequality.*

Krueger, D., Perri, F., Pistaferri, L., and Violante, G. L. (2010). Cross-Sectional Facts for Macroeconomists. *Review of Economic Dynamics*, 13(1):1–14.

Loury, G. C. (1981). Intergenerational transfers and the distribution of earnings. *Econometrica: Journal of the Econometric Society*, pages 843–867.

Machin, S. (2009). *The Oxford Handbook of Economic Inequality*, chapter Education and Inequality. Oxford University Press.

Madden, D. (2010). Ordinal and cardinal measures of health inequality: an empirical comparison. *Health Economics*, 19(2):243–250.

Mankiw, N. G., Romer, D., and Weil, D. N. (1992). A contribution to the empirics of economic growth. *The Quarterly Journal of Economics*, 107(2):407–437.

Martin, M. A. (2012). Family structure and the intergenerational transmission of educational advantage. *Social Science Research*, 41(1):33 – 47.

Mayer, S. E. and Lopoo, L. M. (2008). Government spending and intergenerational mobility. *Journal of Public Economics*, 92(1):139–158.

Mazumder, B. (2005). Fortunate sons: New estimates of intergenerational mobility in the united states using social security earnings data. *Review of Economics and Statistics*, 87(2):235–255.

Mazumder, B. (2014). Black–White Differences in Intergenerational Economic Mobility in the U.S. *Economic Perspectives*, 38(1):1–18.

Mazumder, B. (2015). *Intergenerational Mobility: A Cross-National Comparison*, chapter Intergenerational Mobility: A Cross-National Comparison. Wiley Online Library.

Österberg, T. (2000). Intergenerational income mobility in sweden: What do tax-data show? *Review of Income and Wealth*, 46(4):421–436.

Öztunali, O. and Torul, O. (2017). Intergenerational educational mobility in turkey. Mimeo.

Öztunalı, O., Torul, O., and Yıldırım, U. S. (2019). Intergenerational educational mobility and preferences for redistribution in europe. Mimeo.

Peñaloza, R. (2016). Gini coefficient for ordinal categorical data. Working Paper.

Peters, H. E. (1992). Patterns of intergenerational mobility in income and earnings. *The Review of Economics and Statistics*, 74(3):456–466.

Piketty, T. (2000). Theories of persistent inequality and intergenerational mobility. *Handbook of income distribution*, 1:429–476.

Rauh, C. (2017). Voting, education, and the great gatsby curve. *Journal of Public Economics*, 146:1 – 14.

Sakellaris, P. and Spilimbergo, A. (2000). Business cycles and investment in human capital: international evidence on higher education. In *Carnegie-Rochester Conference Series on Public Policy*, volume 52, pages 221–256. Elsevier.

Schneebaum, A., Rumplmaier, B., and Altzinger, W. (2015). Gender in intergenerational educational persistence across time and place. *Empirica*, 42(2):413–445.

Silver, N. (2016). Education, not income, predicted who would vote for trump.

Solon, G. (1992). Intergenerational income mobility in the united states. *The American Economic Review*, pages 393–408.

Solon, G. (2004). A model of intergenerational mobility variation over time and place. In Corak, M., editor, *Generational Income Mobility in North America and Europe:*, pages 38–47. Cambridge University Press, Cambridge.

Stiglitz, J. E. (1973). Education and inequality. *The Annals of the American Academy of Political and Social Science*, 409(1):135–145.

Tansel, A. (2016). Intergenerational educational mobility in turkey. *IZA Discussion Paper No. 9590*.

Thomas, V., Wang, Y., and Fan, X. (2002). A new dataset on inequality in education: Gini and theil indices of schooling for 140 countries, 1960-2000. *World Bank*.

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

Van Doorslaer, E. and Jones, A. M. (2003). Inequalities in self-reported health: validation of a new approach to measurement. *Journal of health economics*, 22(1):61–87.

# Appendix

## A Appendix Figures and Tables

### Figures

**Figure A.1:** Average Years of Schooling of Descendants by Country

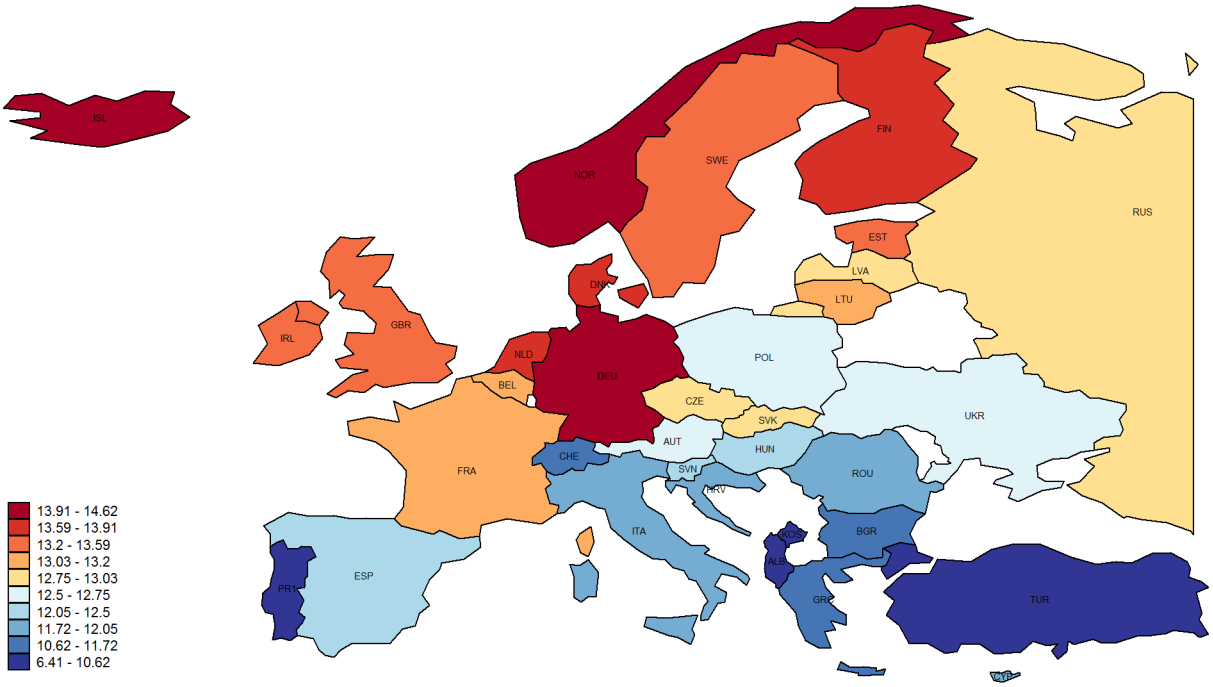


**Figure A.2:** Intergenerational Educational Persistence of the Birth-Cohorts 1940-1944

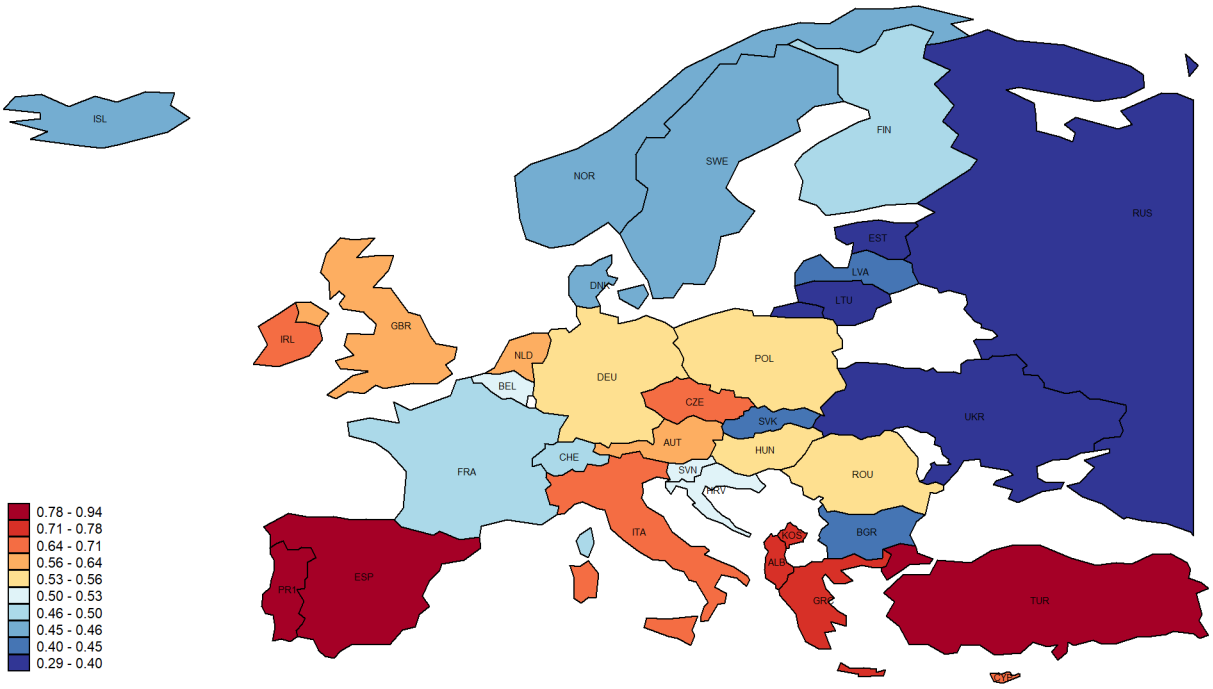



**Figure A.3:** Intergenerational Educational Persistence of the Birth-Cohorts 1981-1985

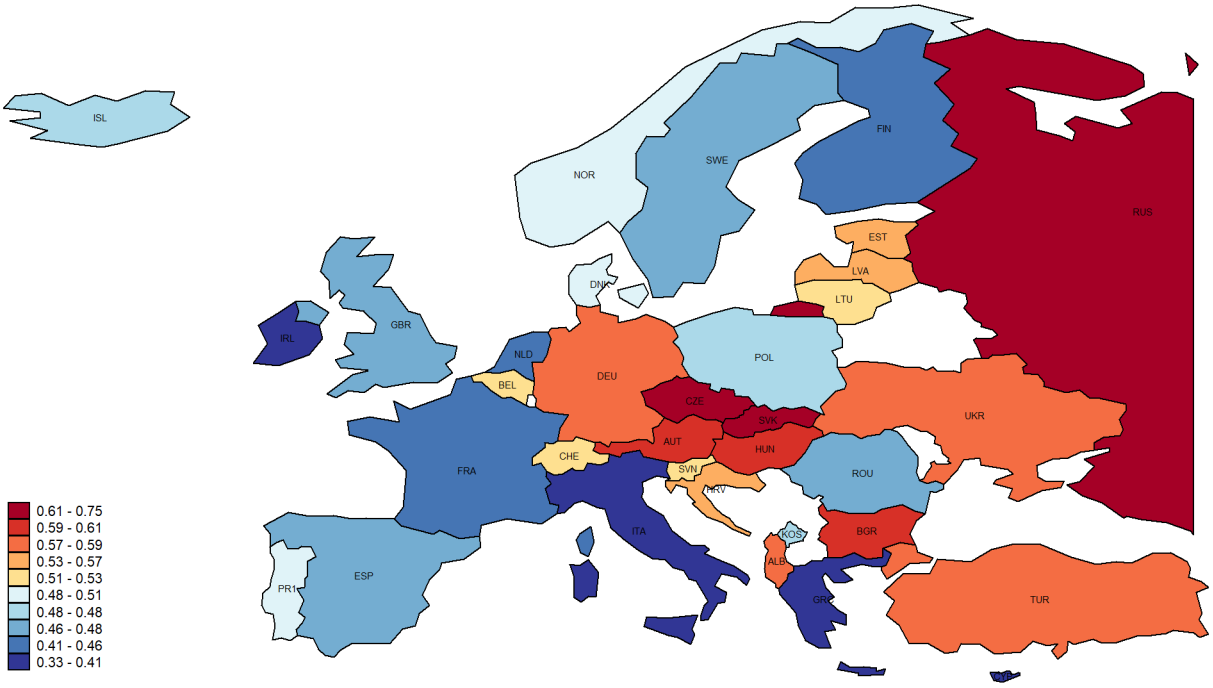


**Figure A.4:** *Change* in Intergenerational Educational Persistence Between 1940-1944 and 1981-1985

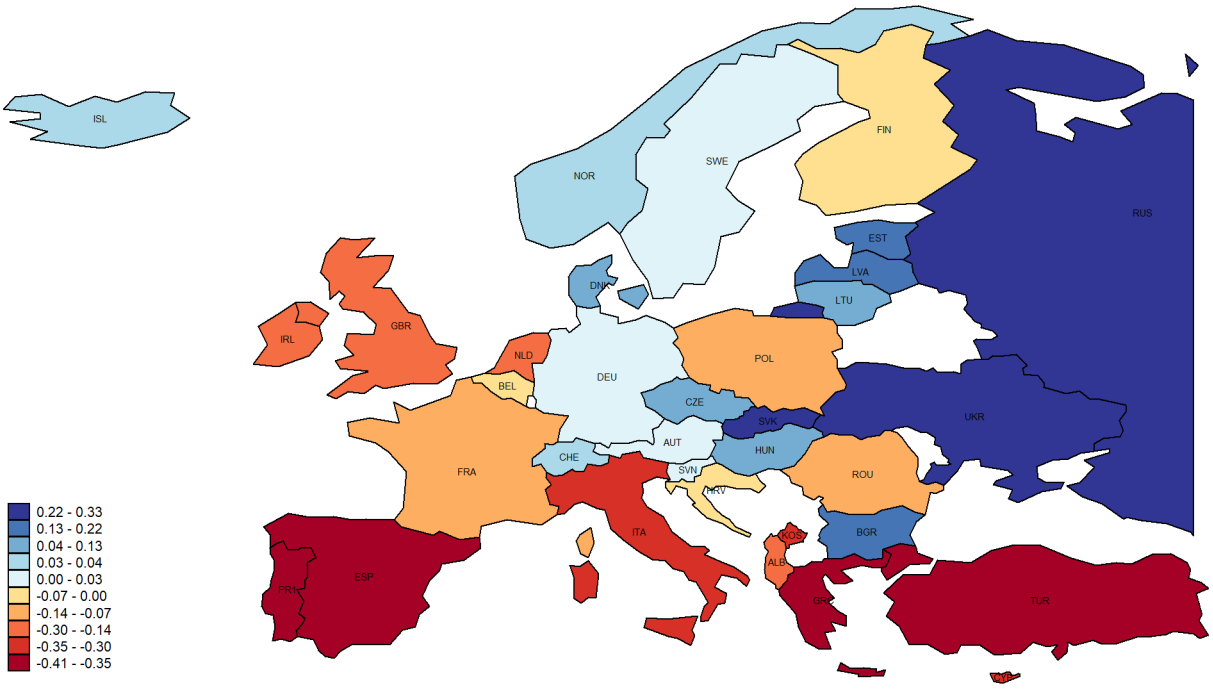
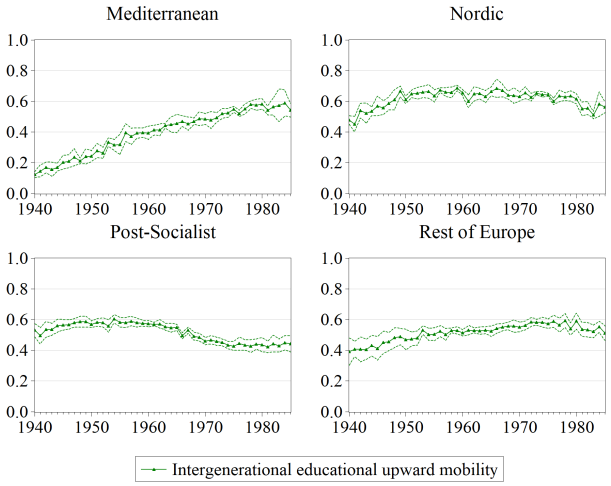
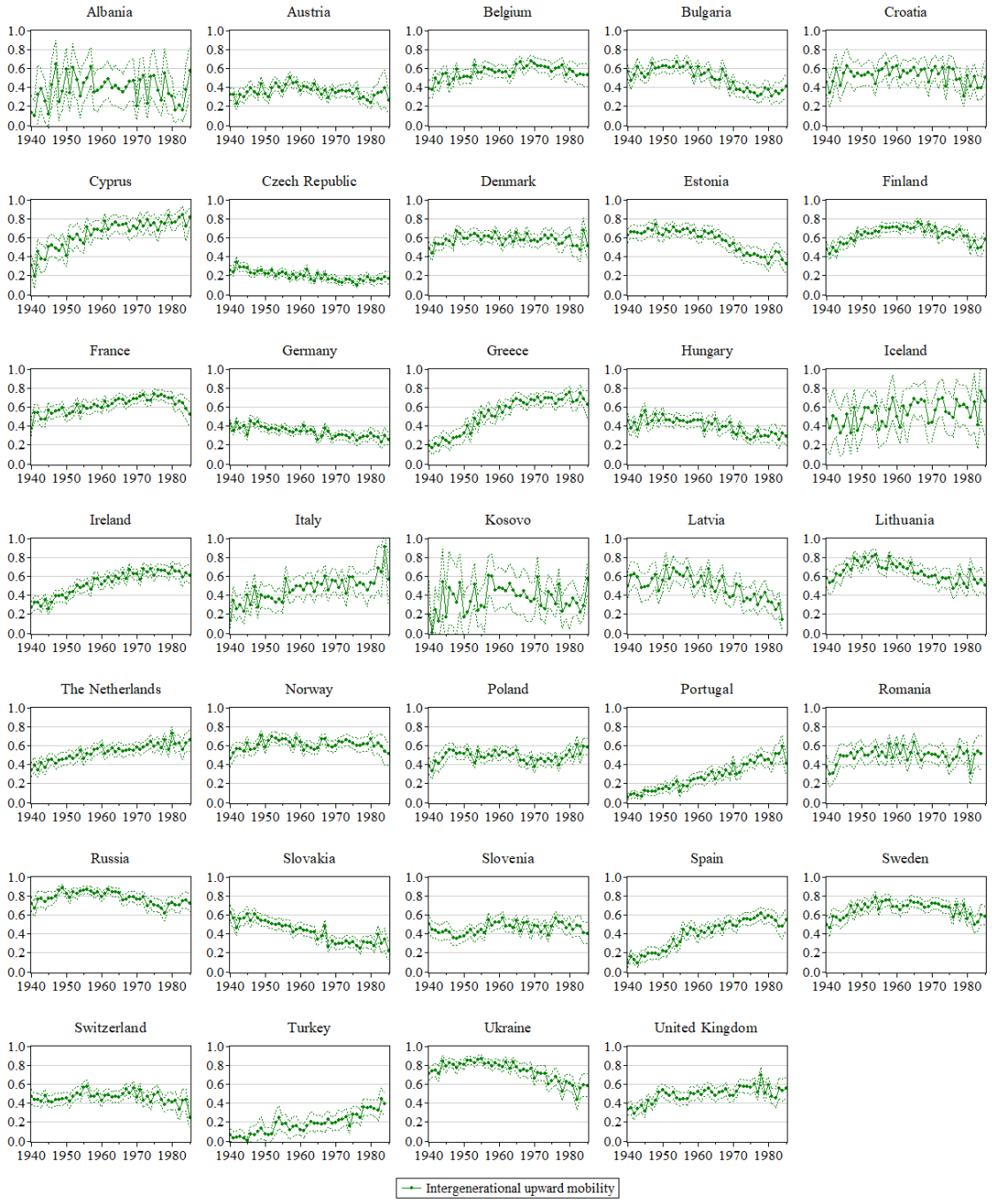



**Figure A.5:** Intergenerational Educational Upward Mobility by Country Group



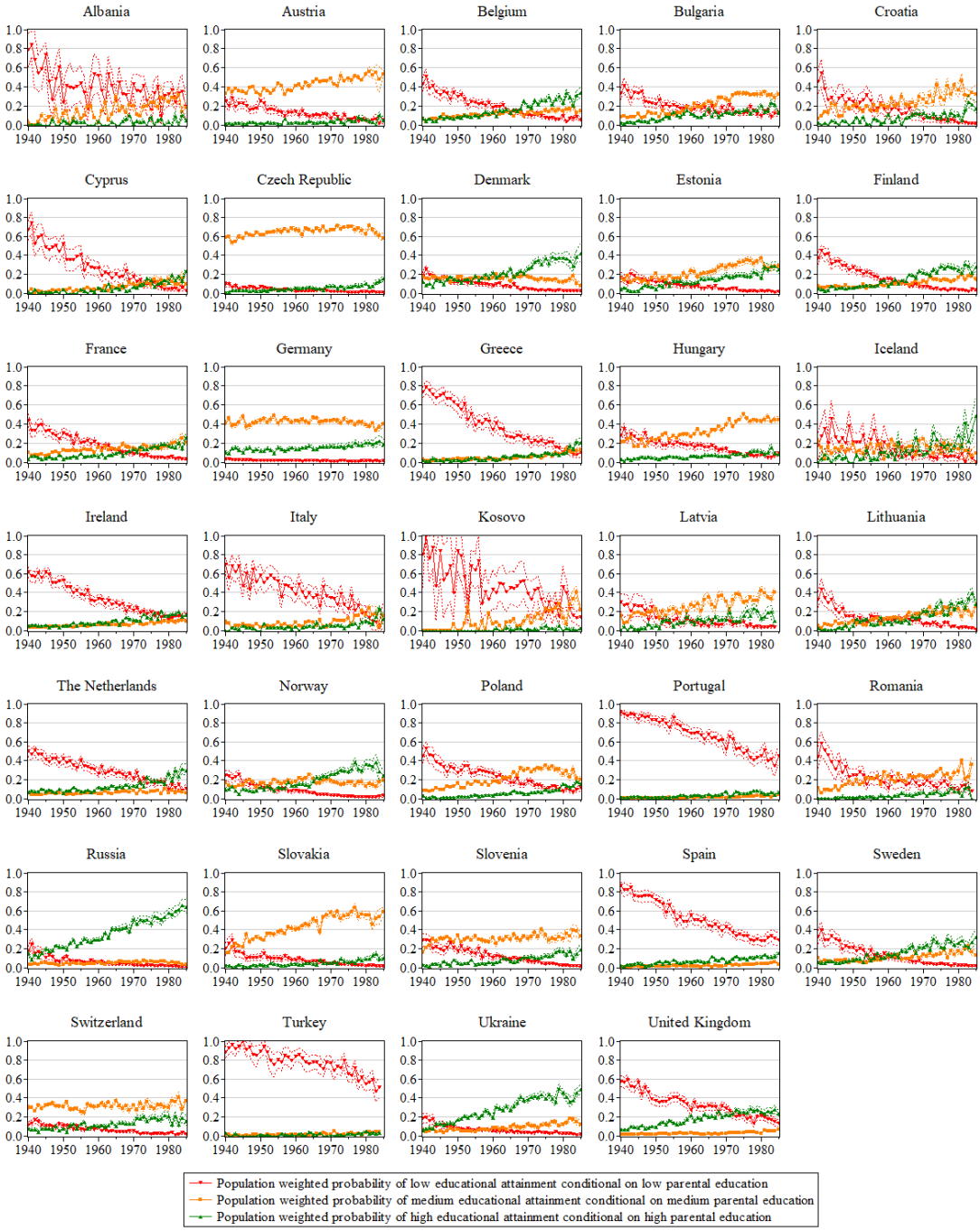

† Dates on the horizontal axis correspond to the ***birth-cohort*** of interest. Dashed lines correspond to country-clustered 95% confidence interval standard error bands.

**Figure A.6:** Intergenerational Educational Upward Mobility by Country



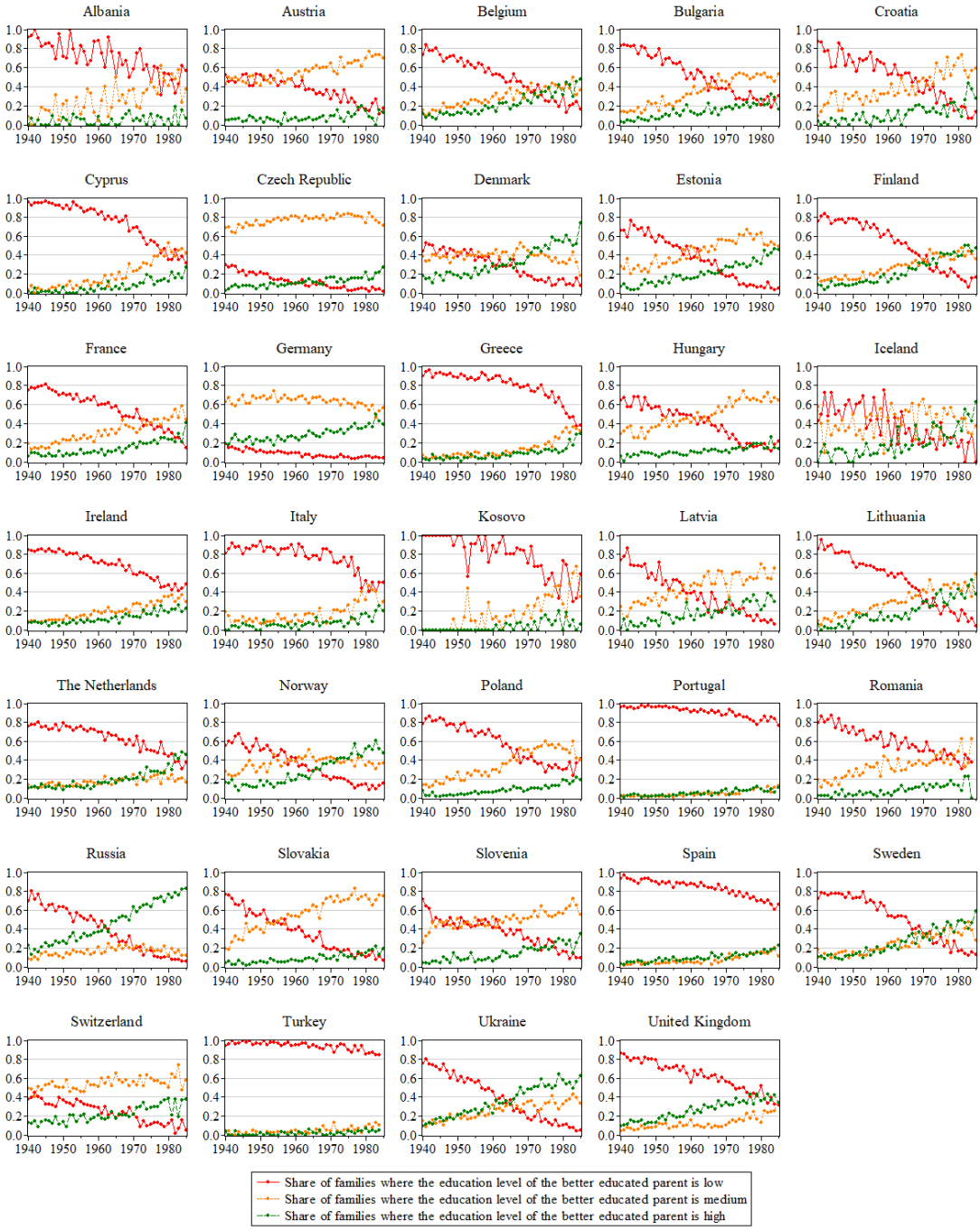

† Dates on the horizontal axis correspond to the ***birth-cohort*** of interest. Dashed lines correspond to 95% confidence interval standard error bands.

**Figure A.7:** Intergenerational Educational Persistence Type by Country




† Dates on the horizontal axis correspond to the ***birth-cohort*** of interest. Red, orange and green lines correspond to low-type, medium-type, and high-type intergenerational educational persistence, respectively. Dashed lines correspond to 95% confidence interval standard error bands.

**Figure A.8:** Share of *Better-Educated* Parents by Country

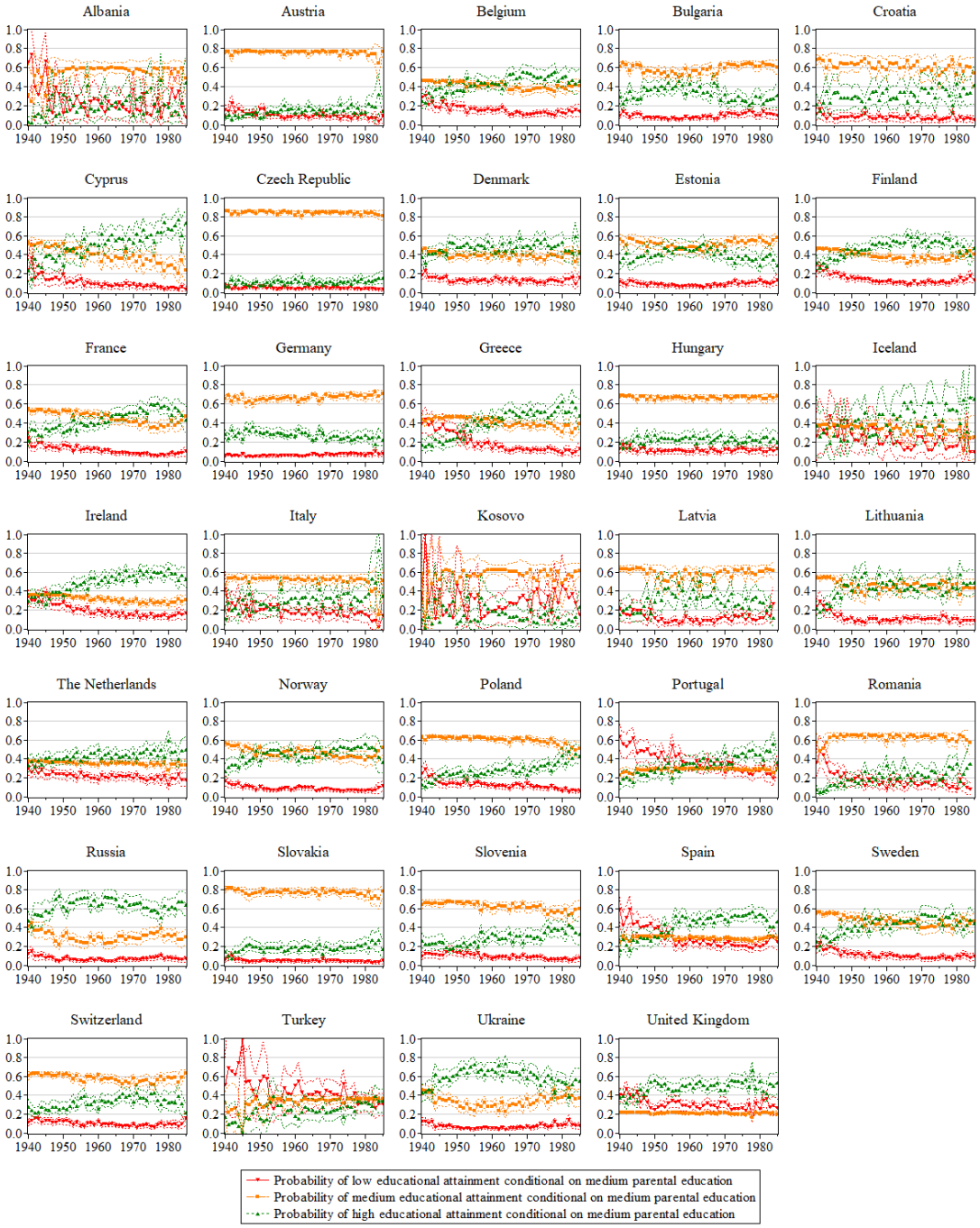



† Dates on the horizontal axis correspond to the ***birth-cohort*** of interest. Red, orange, and green lines correspond to the shares of descendants whose parental *better-education* is low, medium, and high, respectively.

**Figure A.9:** Intergenerational Transition Prob. Conditional on *Low* Parental Edu. by Country

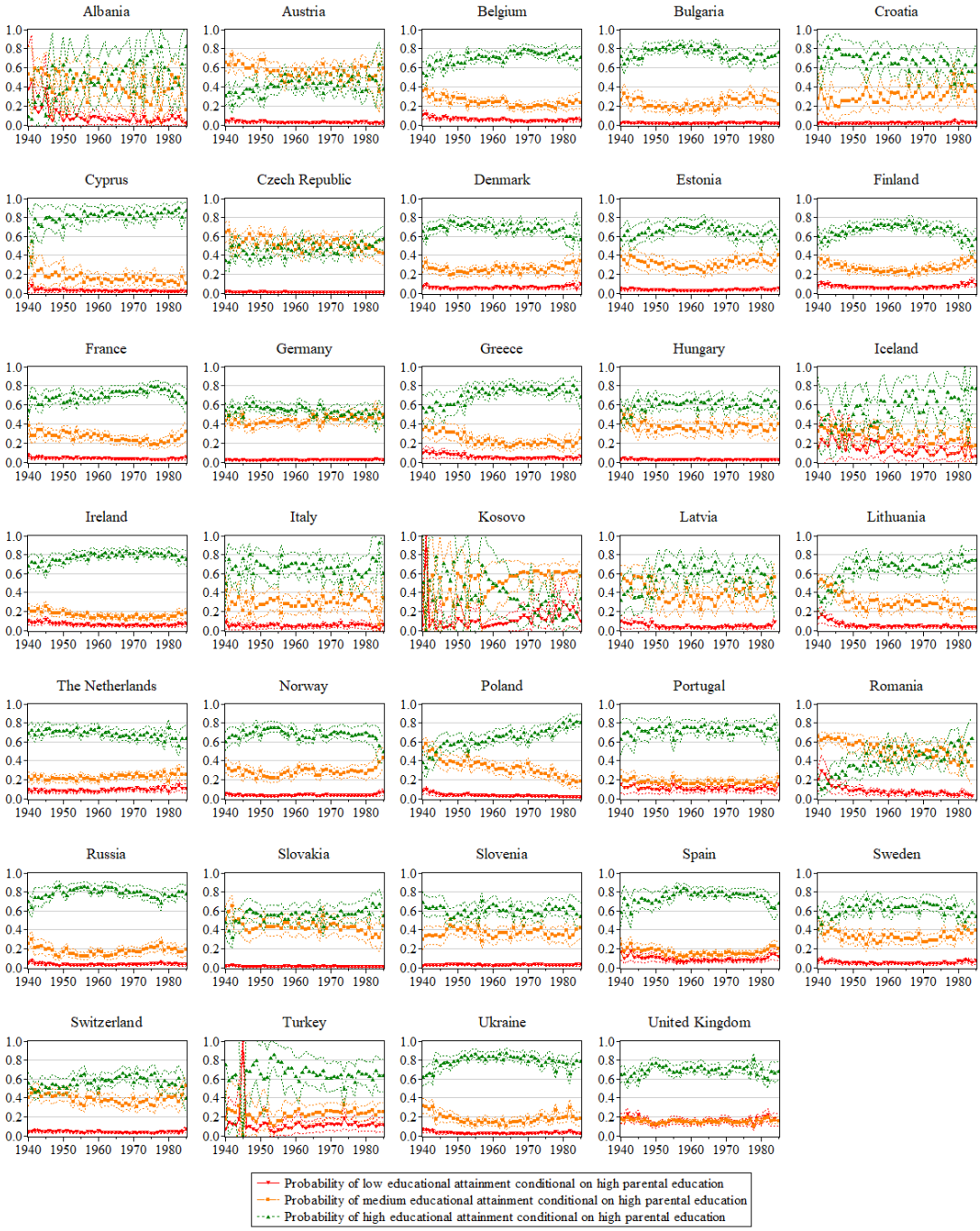

† Dates on the horizontal axis correspond to the ***birth-cohort*** of interest. Red, orange, and green lines correspond to conditional education probabilities of low, medium, and high education, respectively. Dashed lines correspond to 95% confidence interval standard error bands.

**Figure A.10:** Intergenerational Transition Prob. Conditional on *Medium* Parental Edu. by Country




† Dates on the horizontal axis correspond to the ***birth-cohort*** of interest. Red, orange, and green lines correspond to conditional education probabilities of low, medium, and high education, respectively. Dashed lines correspond to 95% confidence interval standard error bands.

**Figure A.11:** Intergenerational Transition Prob. Conditional on *High* Parental Edu. by Country




† Dates on the horizontal axis correspond to the ***birth-cohort*** of interest. Red, orange, and green lines correspond to conditional education probabilities of low, medium, and high education, respectively. Dashed lines correspond to 95% confidence interval standard error bands.

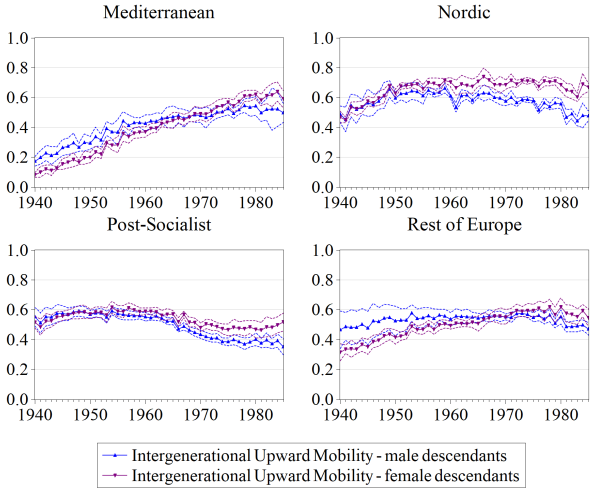
**Figure A.12:** Intergenerational Mobility Coefficient ($\hat{\beta}$) via Years of Schooling by Country


† Dates on the horizontal axis correspond to the ***birth-cohort*** of interest. Orange circles correspond to annual intergenerational persistence estimates, and orange lines refer to Hodrick-Prescott time trends. $\hat{\beta}$ refers to the estimated intergenerational mobility coefficient in (15).Gray triangles and lines refer to annual values and Hodrick-Prescott time trends, respectively.

**Figure A.13:** Intergenerational Mobility Correlation ($\hat{\rho}$) via Years of Schooling by Country

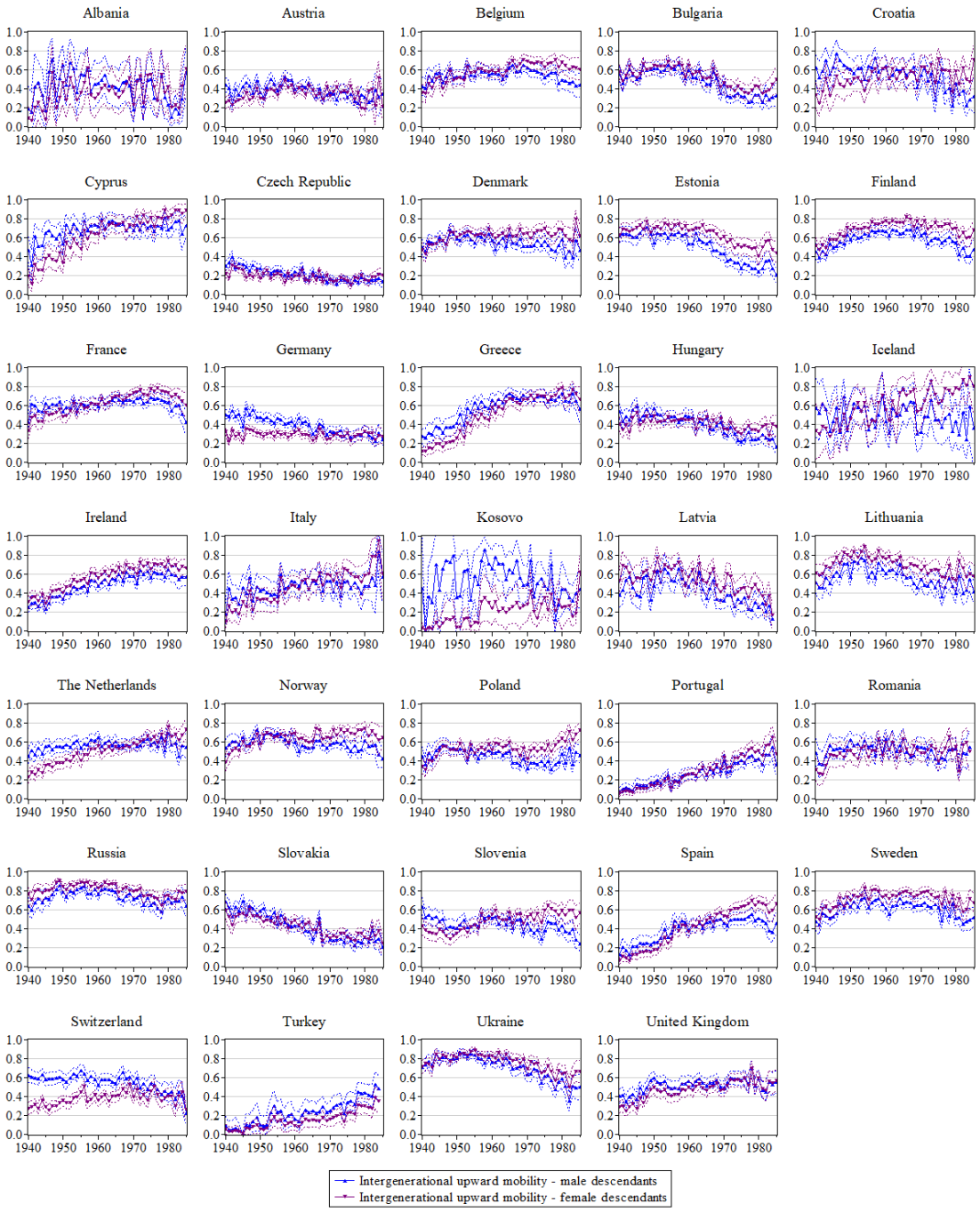

† Dates on the horizontal axis correspond to the ***birth-cohort*** of interest. Orange circles correspond to annual intergenerational persistence estimates, and orange lines refer to Hodrick-Prescott time trends. $\hat{\rho}$ refers to the estimated intergenerational mobility correlation in (16).Gray triangles and lines refer to annual values and Hodrick-Prescott time trends, respectively.

**Figure A.14:** Intergenerational Educational Upward Mobility by Gender and Country Group



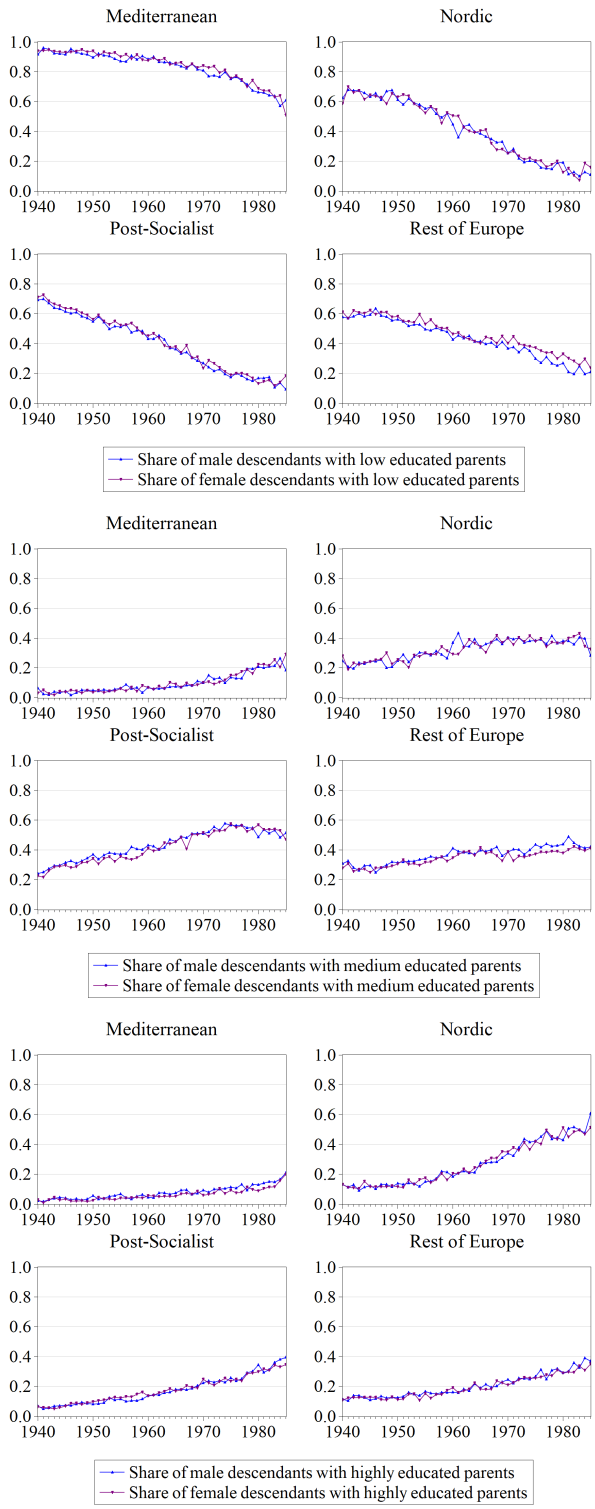

† Dates on the horizontal axis correspond to the ***birth-cohort*** of interest. Purple and blue lines correspond to female and male intergenerational educational upward mobility, respectively. Dashed lines correspond to country-clustered 95% confidence interval standard error bands.

**Figure A.15:** Intergenerational Educational Upward Mobility by Gender and Country



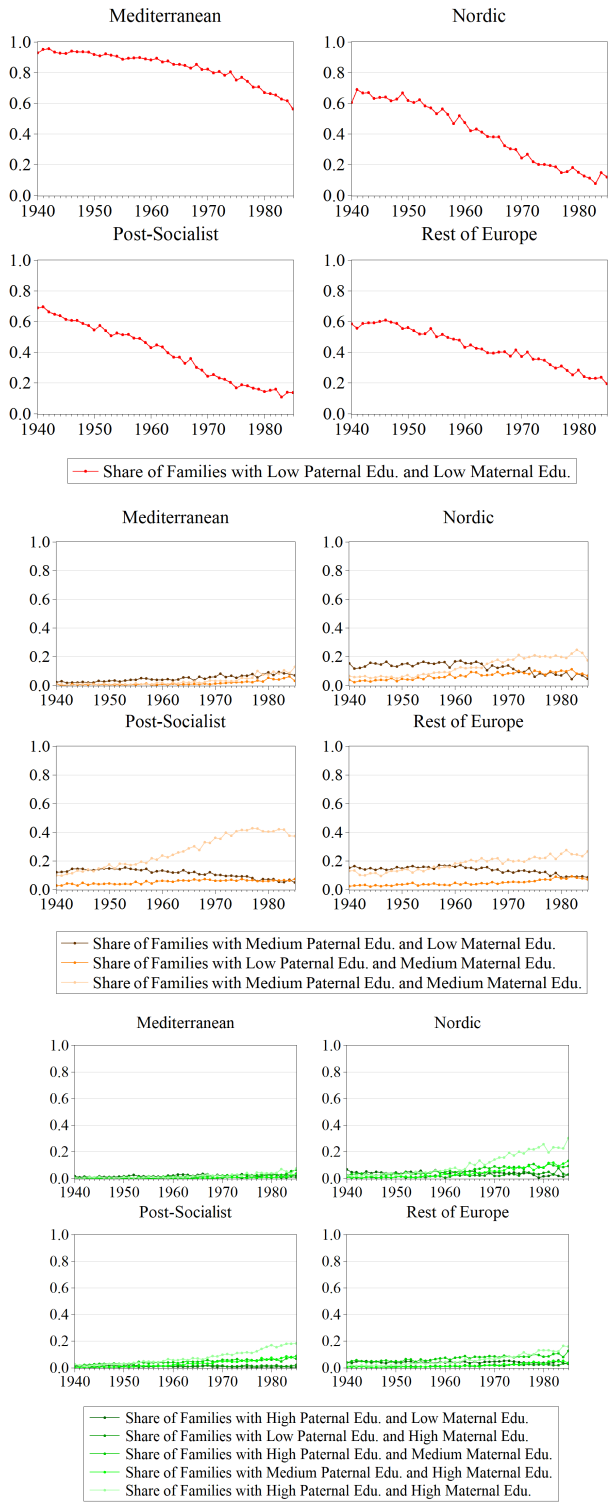

† Dates on the horizontal axis correspond to the ***birth-cohort*** of interest. Purple and blue lines correspond to female and male intergenerational educational upward mobility, respectively. Dashed lines correspond to 95% confidence interval standard error bands.

**Figure A.16:** Share of *Better-Educated* Parents by Gender and Country Group



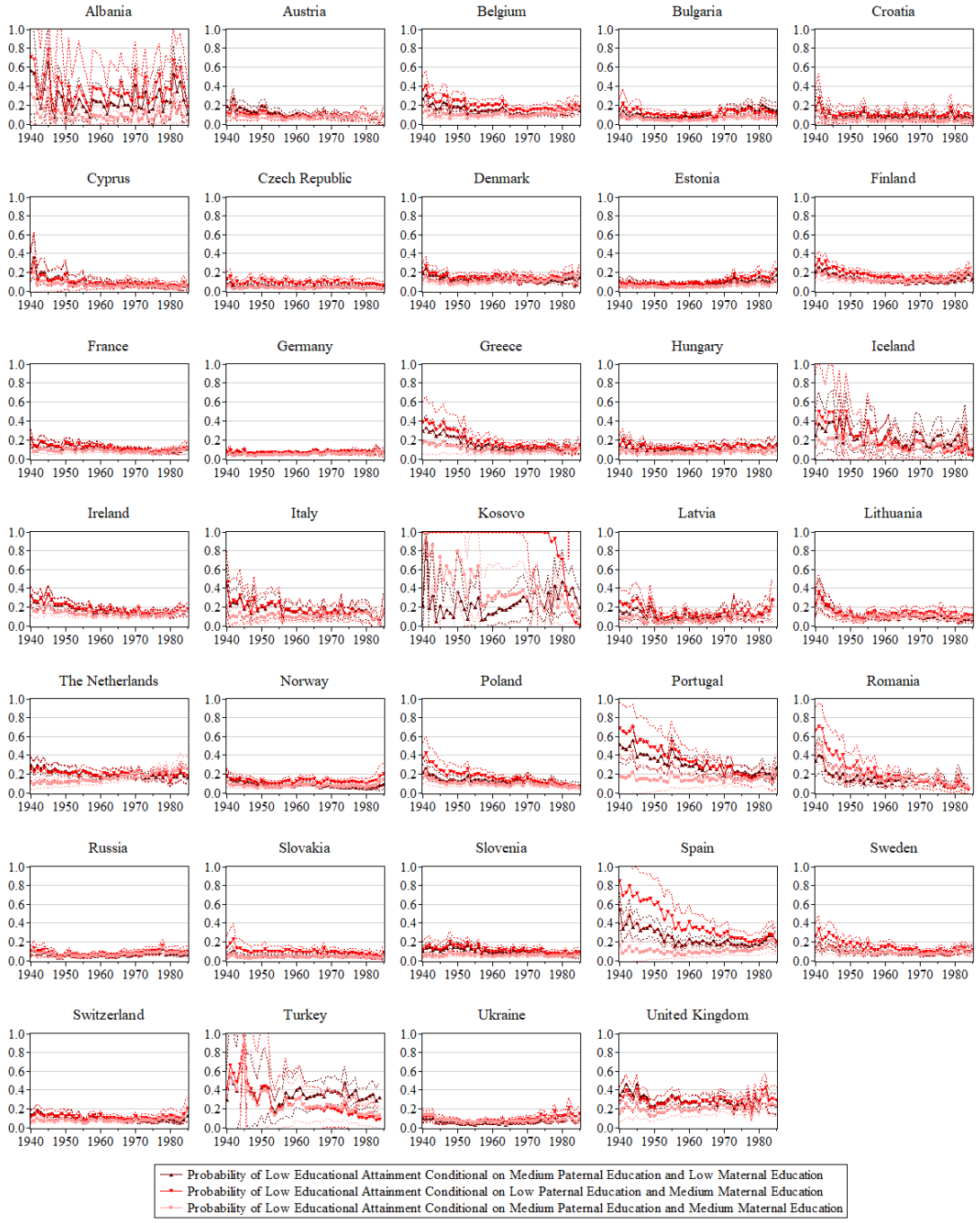

† Dates on the horizontal axis correspond to the ***birth-cohort*** of interest. Purple and blue lines correspond to female and male descendants' parental education shares, respectively.

**Figure A.17:** Share of *Better-Educated* Parents by Parental Composition and Country Group



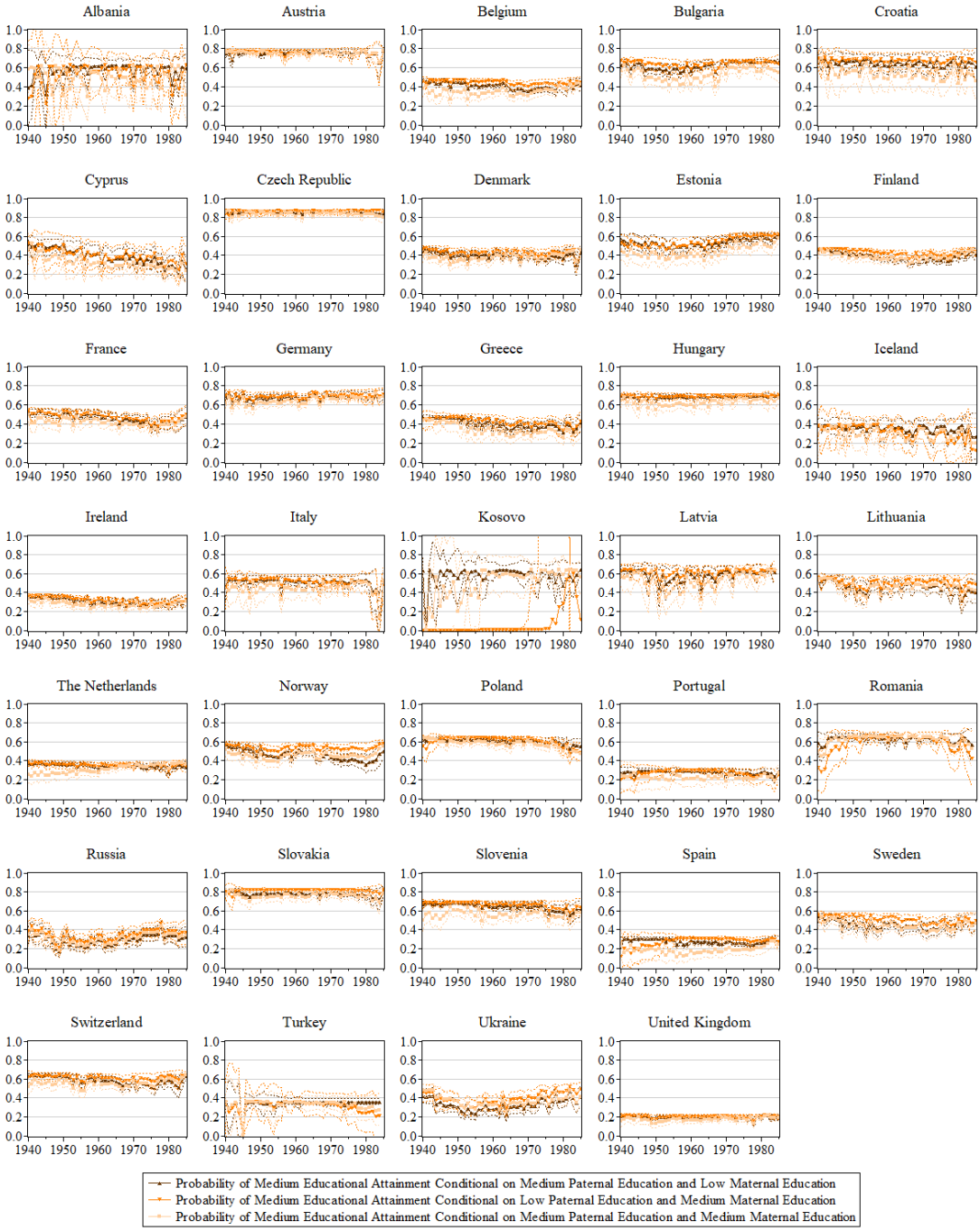

† Dates on the horizontal axis correspond to the ***birth-cohort*** of interest. Red, orange, and green lines (at different depth levels) correspond to low, medium, and high parental education shares, respectively.

**Figure A.18:** *Low* Education Prob. Conditional on *Medium* Parental Education by Country



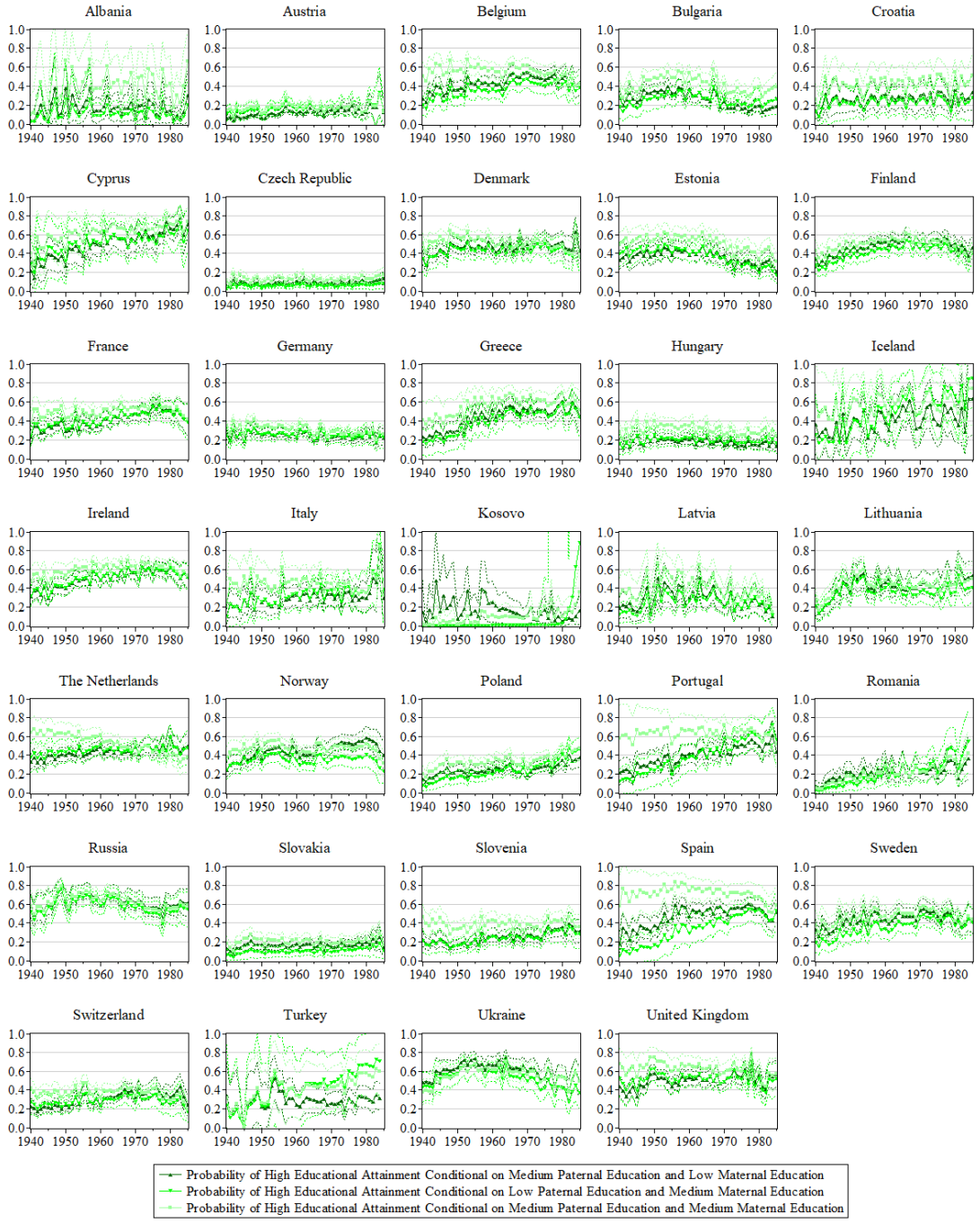

† Dates on the horizontal axis correspond to the ***birth-cohort*** of interest. Red lines (at different depth levels) correspond to low educational attainment probabilities, respectively. Dashed lines correspond to 95% confidence interval standard error bands.

**Figure A.19:** *Medium* Education Prob. Conditional on *Medium* Parental Education by Country



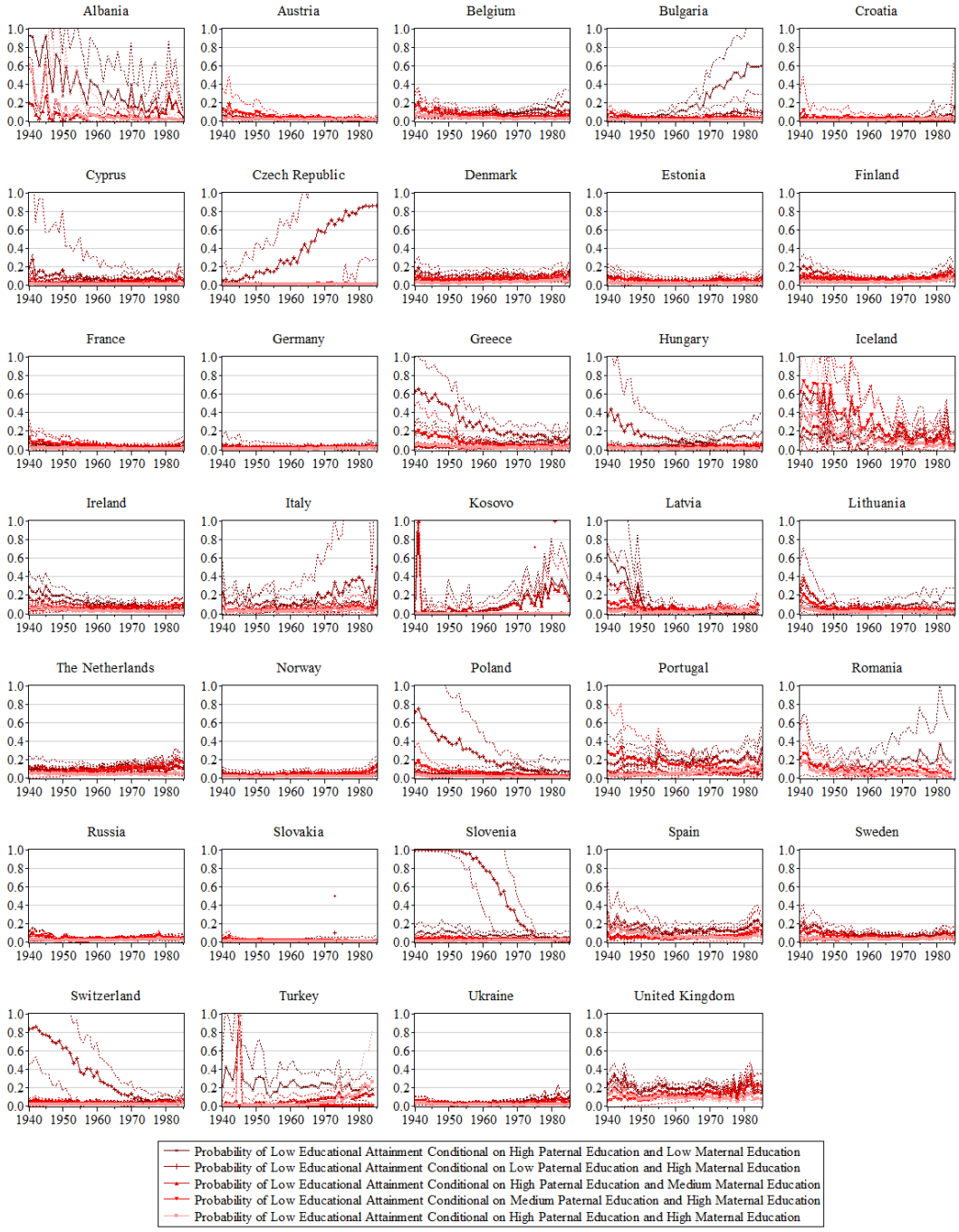

† Dates on the horizontal axis correspond to the ***birth-cohort*** of interest. Orange lines (at different depth levels) correspond to medium educational attainment probabilities, respectively. Dashed lines correspond to 95% confidence interval standard error bands.

**Figure A.20:** *High* Education Prob. Conditional on *Medium* Parental Education by Country



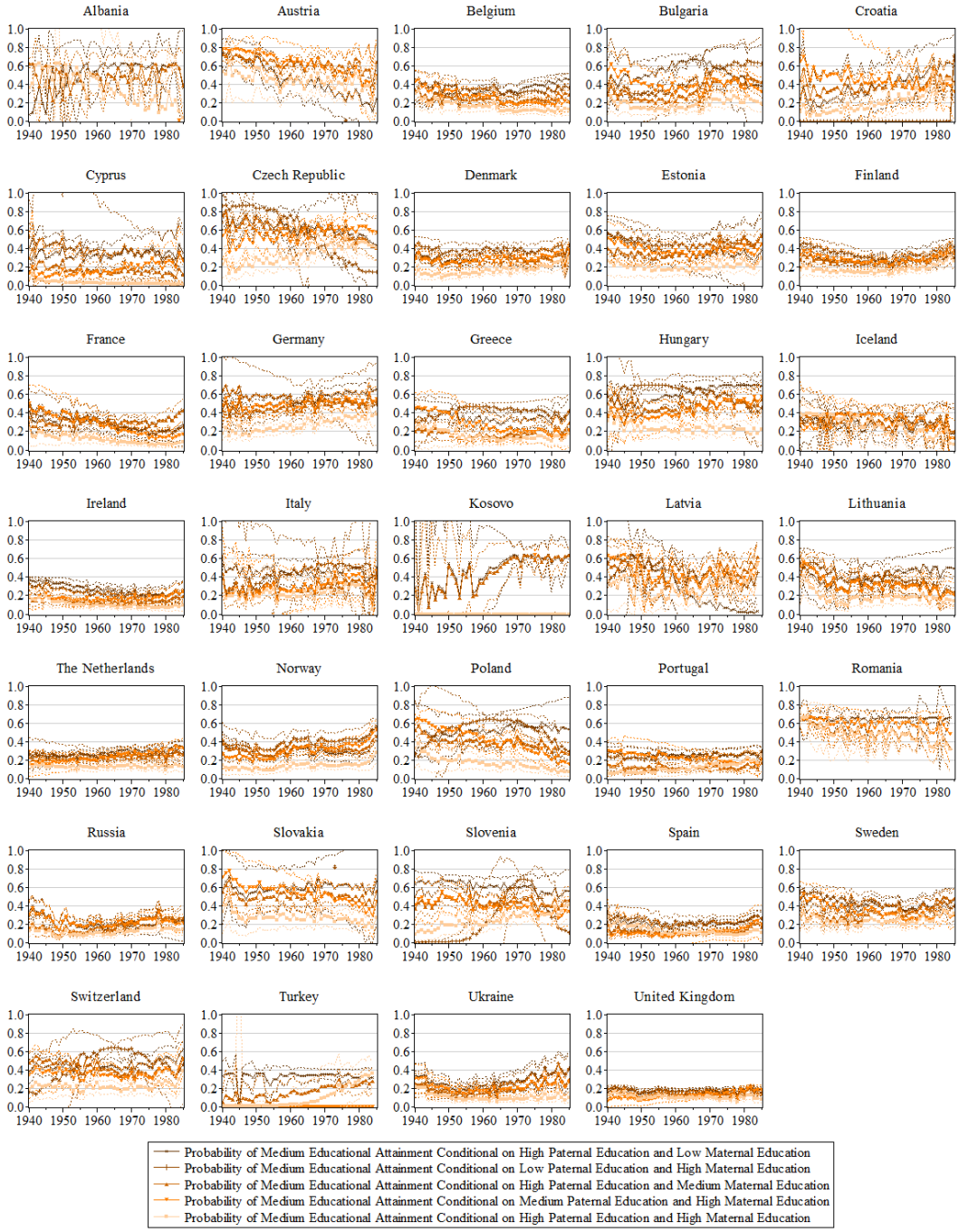

† Dates on the horizontal axis correspond to the ***birth-cohort*** of interest. Green lines (at different depth levels) correspond to high educational attainment probabilities, respectively. Dashed lines correspond to 95% confidence interval standard error bands.

**Figure A.21:** *Low* Education Prob. Conditional on *High* Parental Education by Country



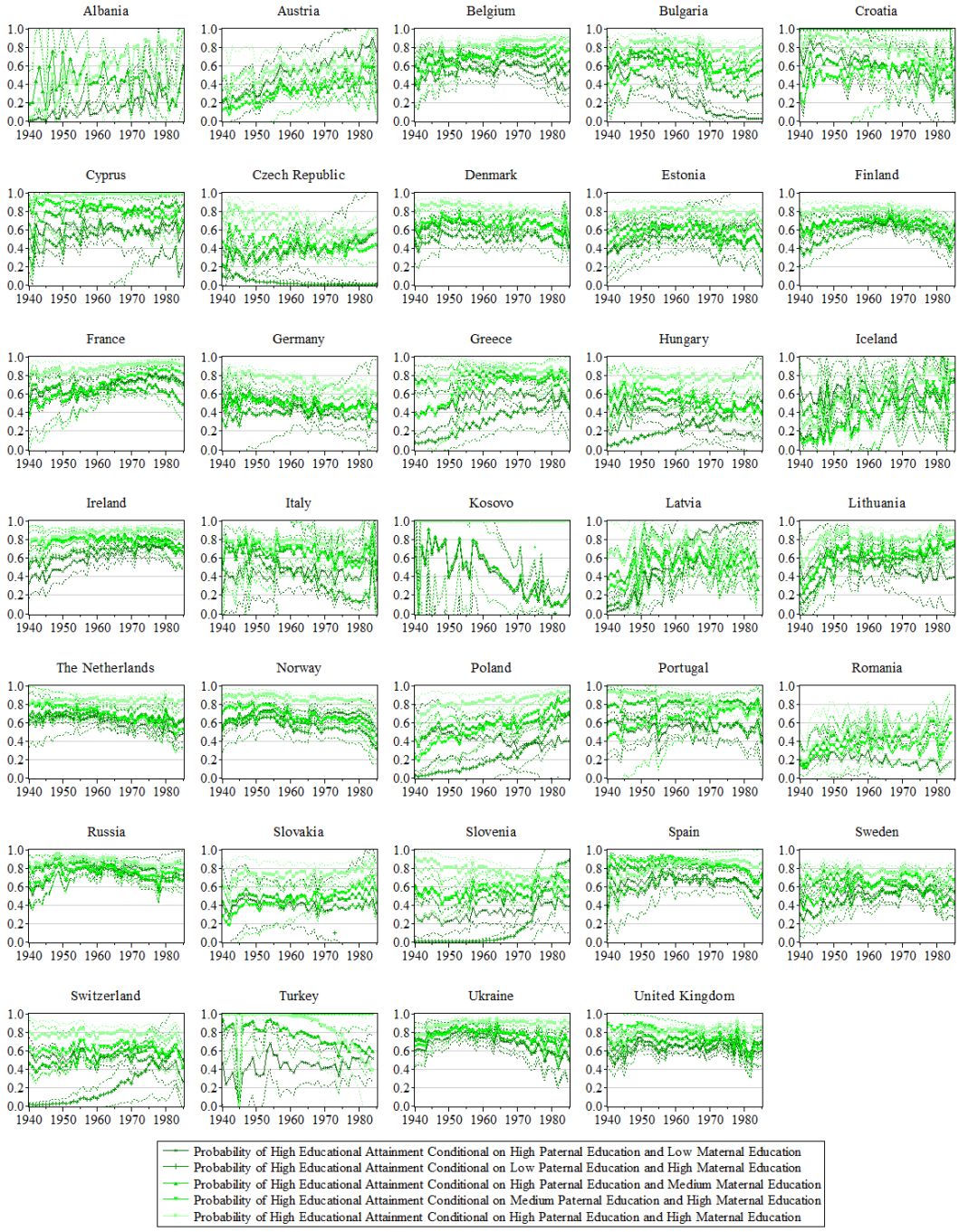

† Dates on the horizontal axis correspond to the ***birth-cohort*** of interest. Red lines (at different depth levels) correspond to low educational attainment probabilities, respectively. Dashed lines correspond to 95% confidence interval standard error bands.

**Figure A.22:** *Medium* Education Prob. Conditional on *High* Parental Education by Country



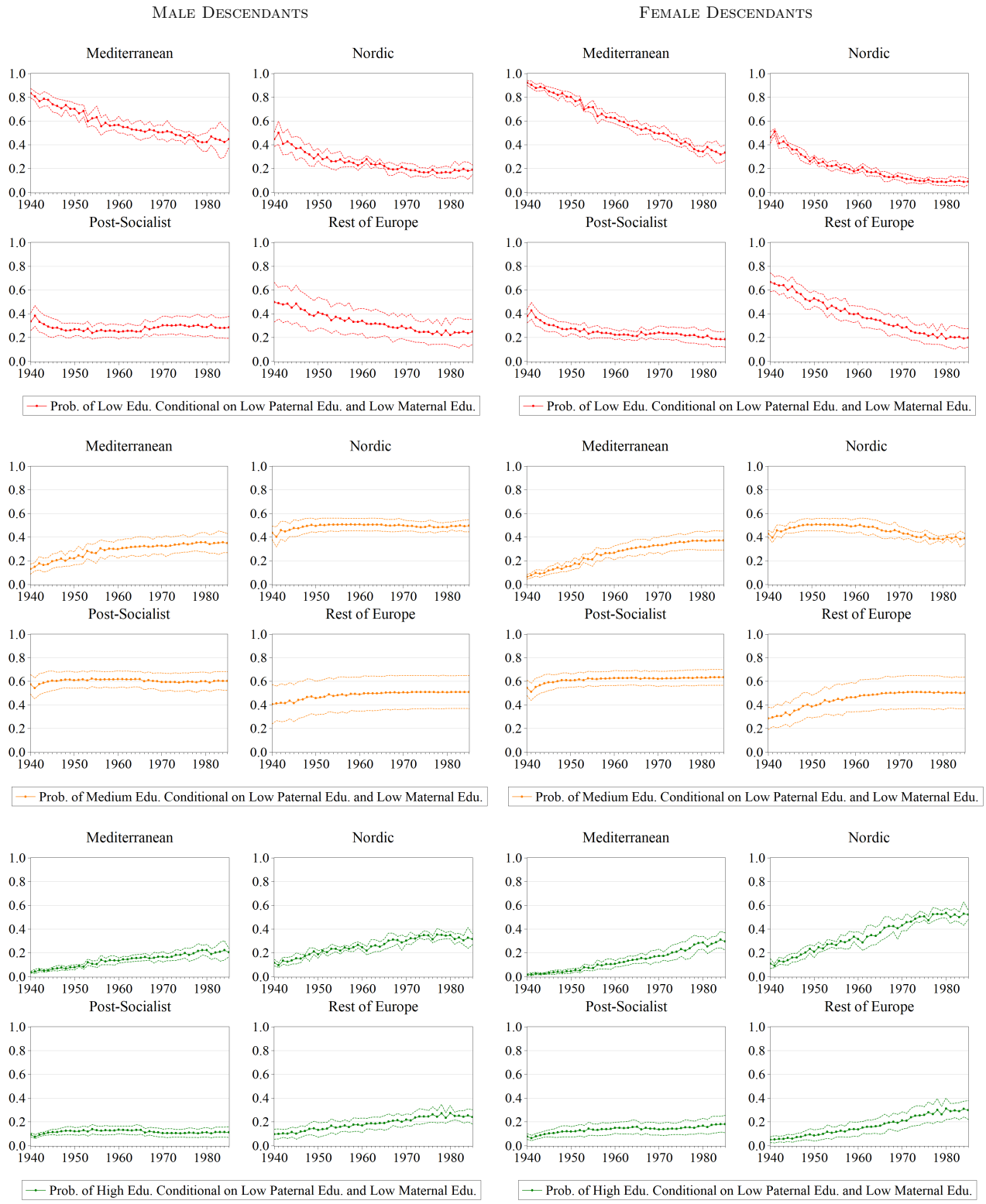

† Dates on the horizontal axis correspond to the ***birth-cohort*** of interest. Orange lines (at different depth levels) correspond to medium educational attainment probabilities, respectively. Dashed lines correspond to 95% confidence interval standard error bands.

**Figure A.23:** *High* Education Prob. Conditional on *High* Parental Education by Country




† Dates on the horizontal axis correspond to the ***birth-cohort*** of interest. Green lines (at different depth levels) correspond to high educational attainment probabilities, respectively. Dashed lines correspond to 95% confidence interval standard error bands.

**Figure A.24:** Education Probability of Descendants Conditional on *Low* Parental Edu. & Gender




† Dates on the horizontal axis correspond to the ***birth-cohort*** of interest. Red, orange and green lines (at different depth levels) correspond to low, medium and high educational attainment probabilities, respectively. Dashed lines correspond to country-clustered 95% confidence interval standard error bands.

**Figure A.25:** Edu. Prob. Conditional on *Low* Paternal Edu. by Gender & Parental Finances

Male Descendants | Female Descendants


† Dates on the horizontal axis correspond to the ***birth-cohort*** of interest. Dashed lines correspond to country-clustered 95% confidence interval standard error bands.

**Figure A.26:** Edu. Prob. Conditional on *Medium* Paternal Edu. by Gender & Parental Finances

Male Descendants | Female Descendants

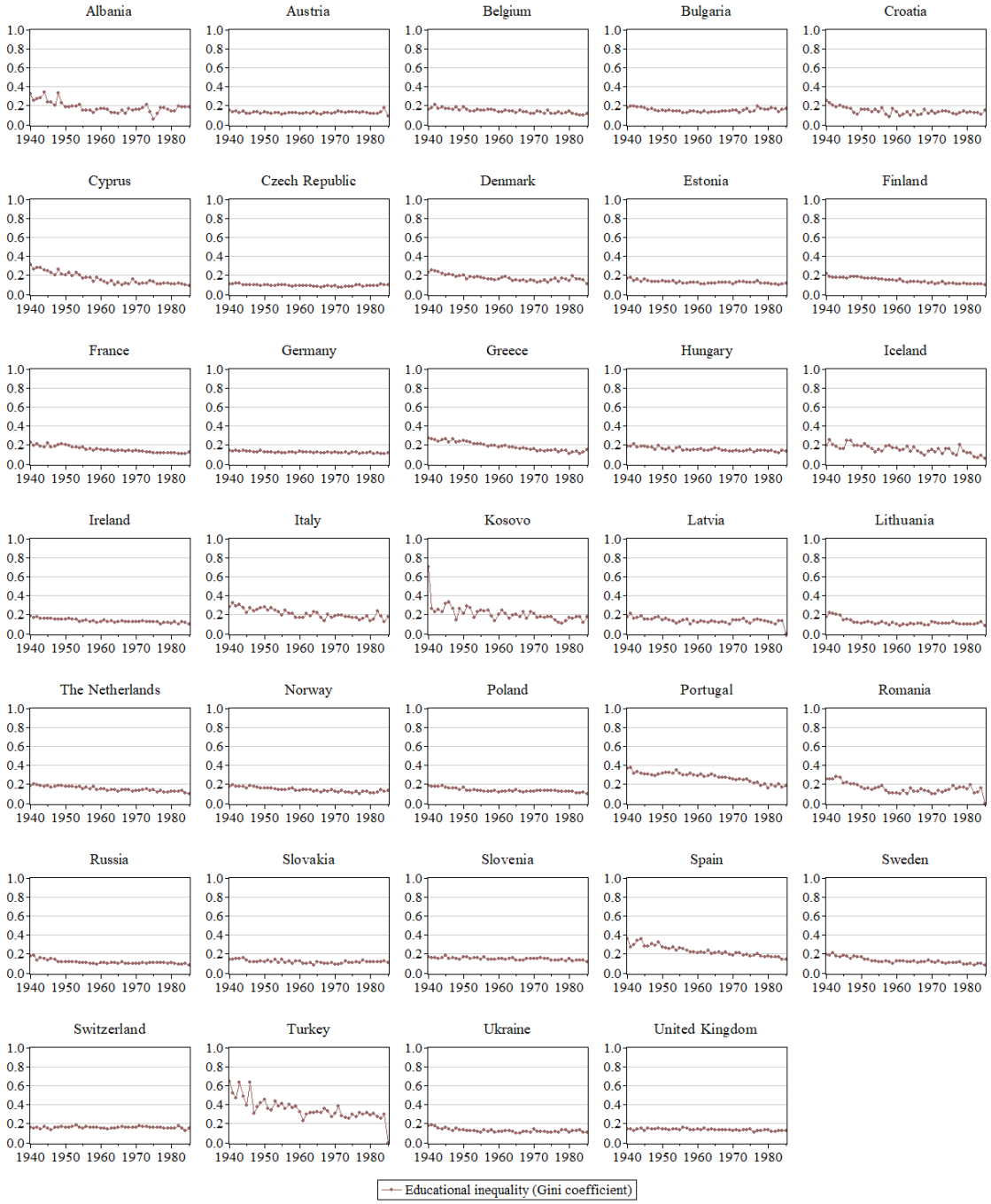

† Dates on the horizontal axis correspond to the ***birth-cohort*** of interest. Dashed lines correspond to country-clustered 95% confidence interval standard error bands.

**Figure A.27:** Edu. Prob. Conditional on *High* Paternal Edu. by Gender & Parental Finances

Male Descendants | Female Descendants

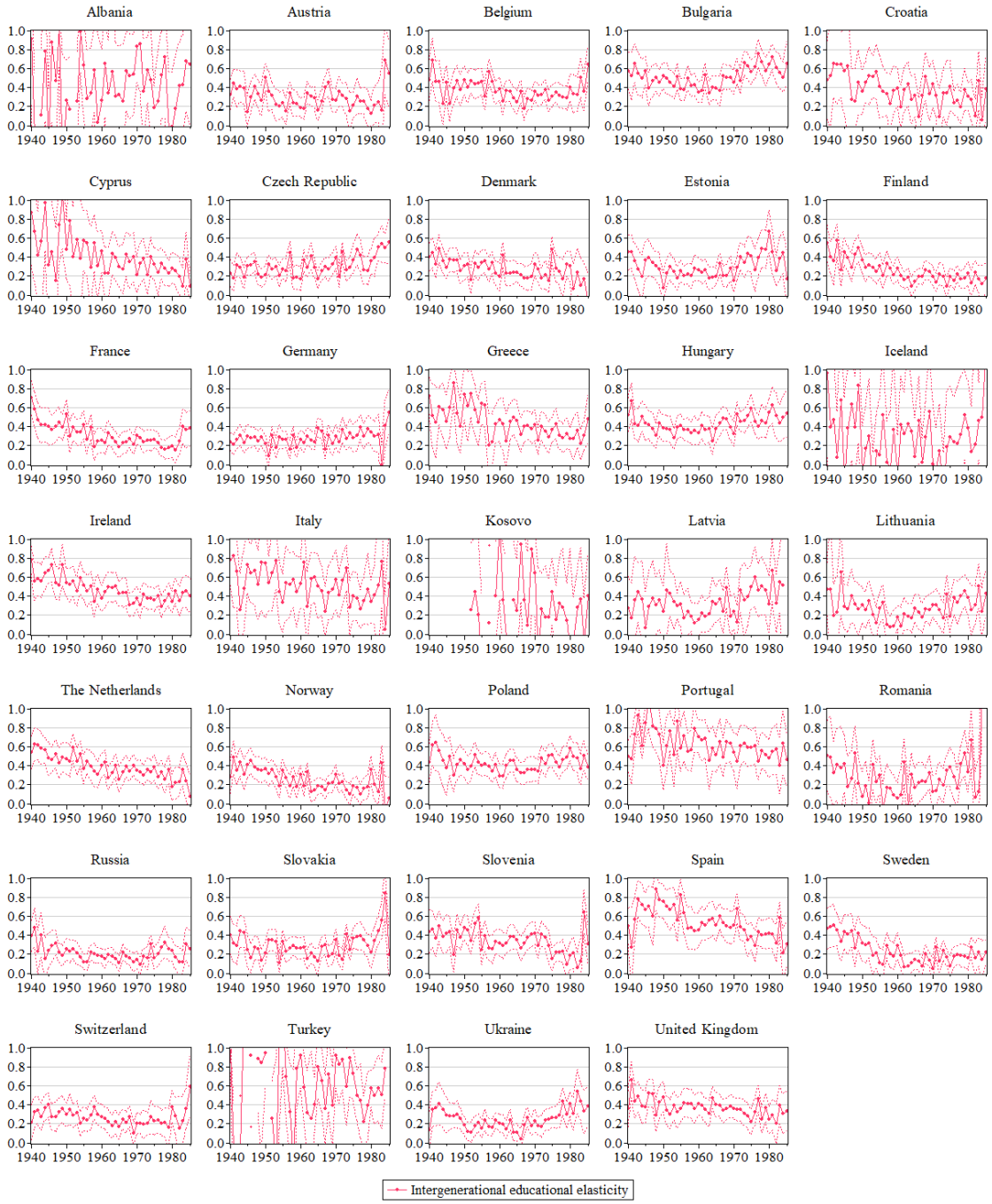

† Dates on the horizontal axis correspond to the ***birth-cohort*** of interest. Dashed lines correspond to country-clustered 95% confidence interval standard error bands.

**Figure A.28:** Educational Inequality by Country



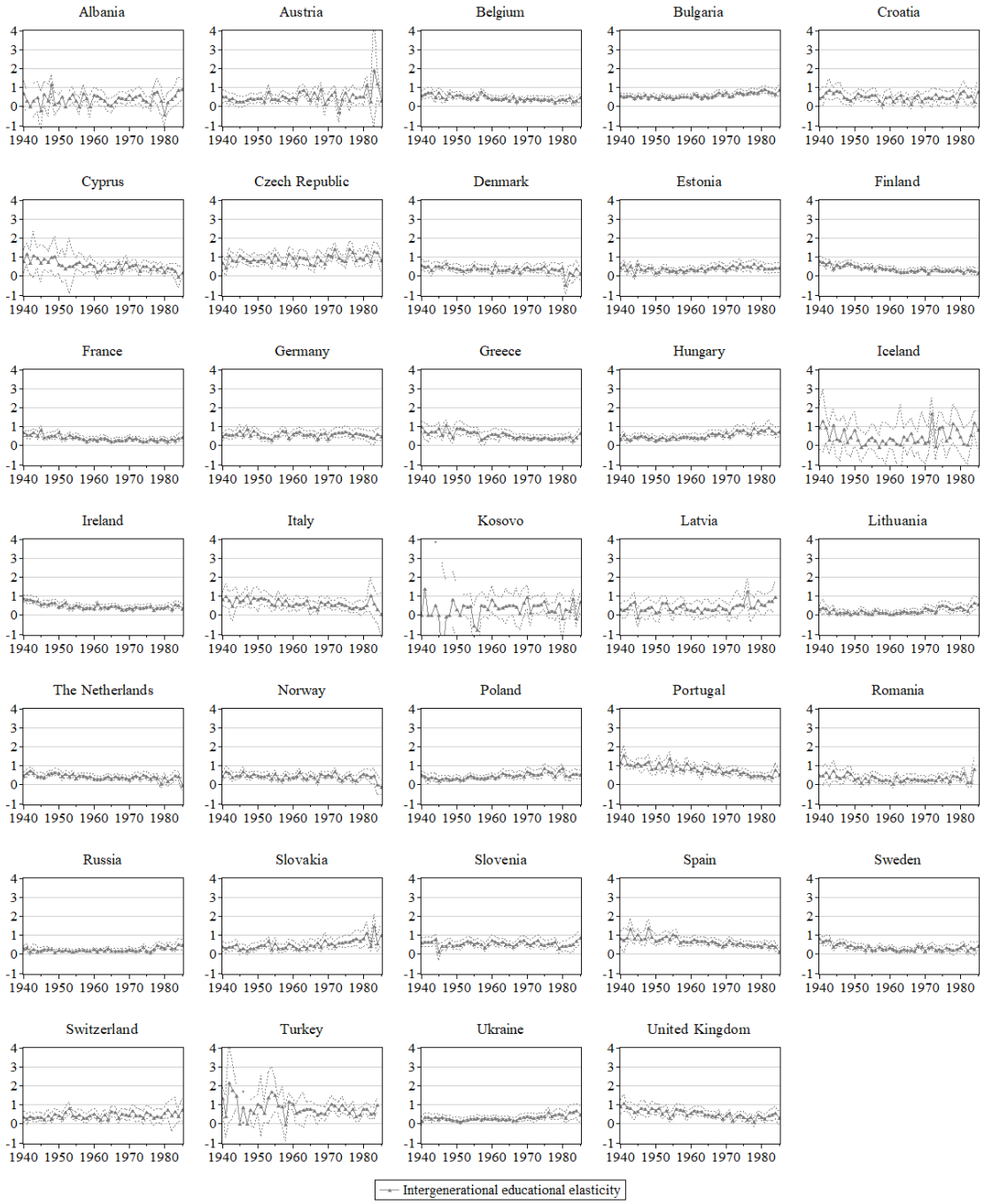

† Dates on the horizontal axis correspond to the ***birth-cohort*** of interest.

**Figure A.29:** Intergenerational Educational Elasticity (via Ordinal Edu. Categories) by Country



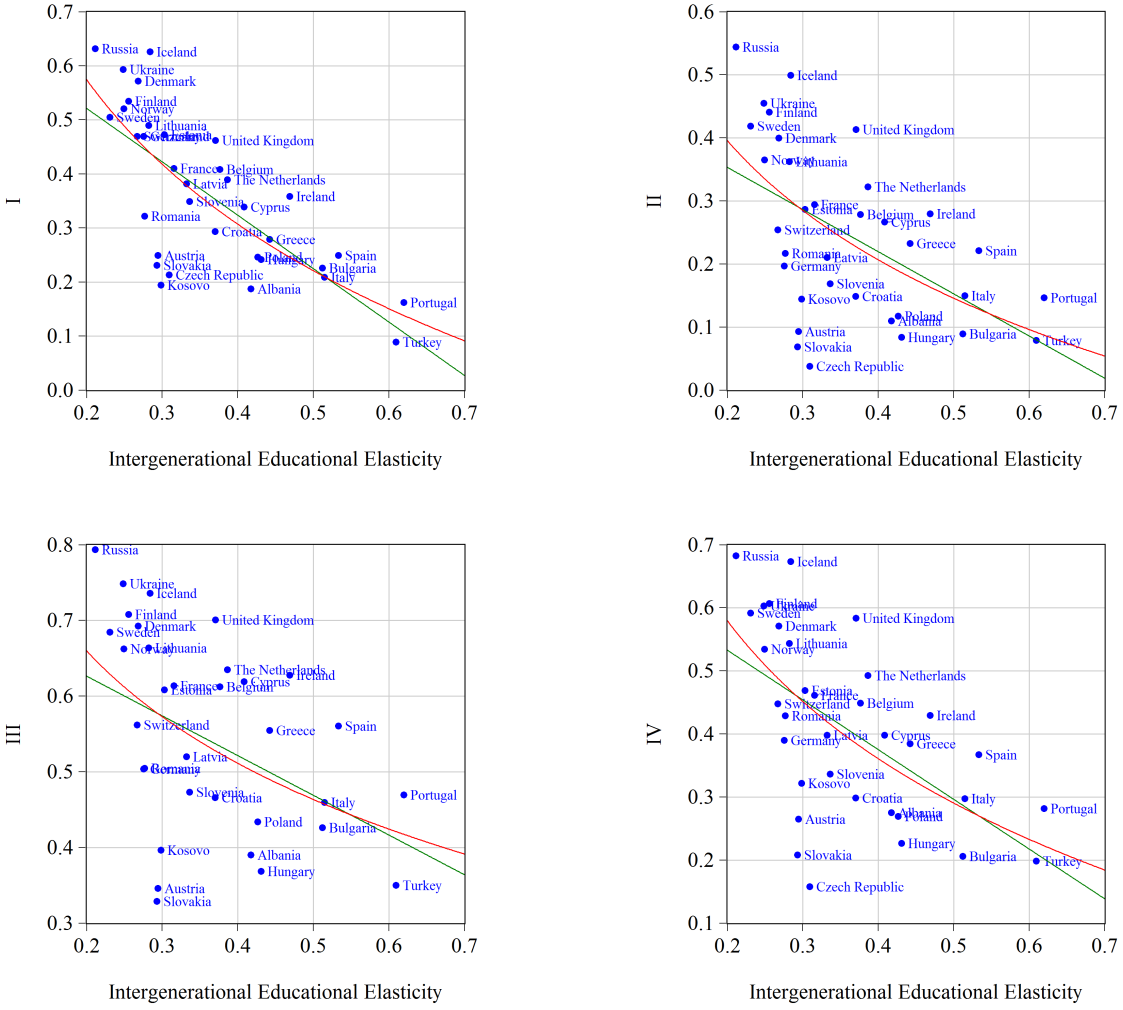

† Dates on the horizontal axis correspond to the ***birth-cohort*** of interest. Dashed lines correspond to 95% confidence interval standard error bands.

**Figure A.30:** Intergenerational Educational Elasticity (via Years of Schooling) by Country




† Dates on the horizontal axis correspond to the ***birth-cohort*** of interest. Dashed lines correspond to 95% confidence interval standard error bands.

**Figure A.31:** Int. Edu. Elasticity (via Ordinal Edu. Cat.) and Relative High Edu. Pros. by Country



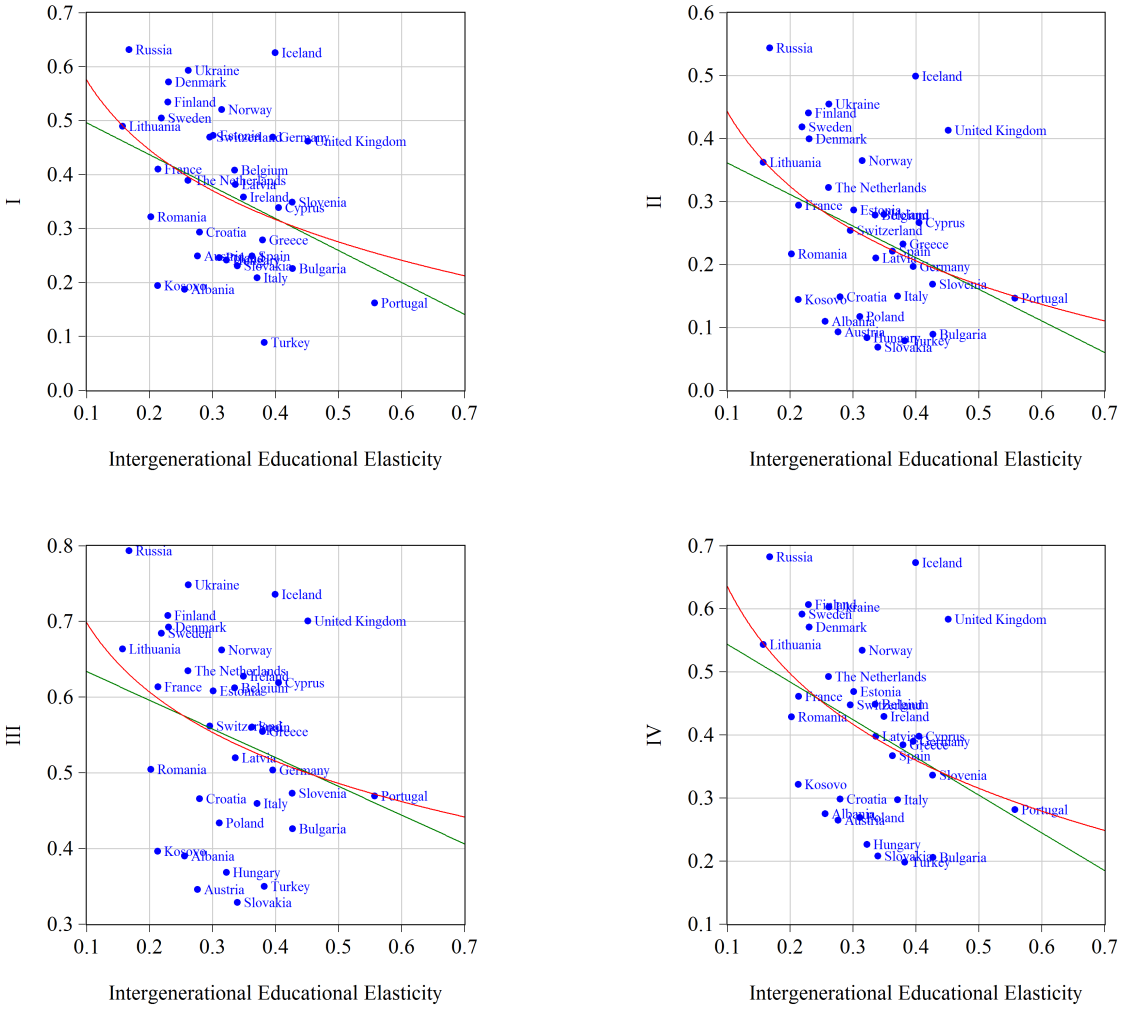

† The red line refers to the non-linear (logarithmic-linear), and the green line refers to the linear fit between the two variables. The measures in the four quadrants refer to high-education probability of descendants born to I) below-high-educated parents relative to high-educated parents II) low-educated parents relative to high-educated parents III) medium-educated parents relative to high-educated parents, and IV) low-educated parents relative to medium-educated parents.

I: $\mathcal{RHEP}_{\text{L\&M/H}} = \frac{\Pr(E=3|P=1\vee 2)}{\Pr(E=3|P=3)} = \frac{\Pr(E=3|P\neq 3)}{\Pr(E=3|P=3)}$ II: $\mathcal{RHEP}_{\text{L/H}} = \frac{\Pr(E=3|P=1)}{\Pr(E=3|P=3)}$

III: $\mathcal{RHEP}_{\text{M/H}} = \frac{\Pr(E=3|P=2)}{\Pr(E=3|P=3)}$ IV: $\mathcal{RHEP}_{\text{L/M}} = \frac{\Pr(E=3|P=1)}{\Pr(E=3|P=2)}$

Cross-sectional linear OLS regressions of the four relative high education prospect variables on intergenerational educational elasticity (via ordinal education categories) yield coefficient estimates (and *standard errors*) of $-0.99(\mathit{0.17})$, $-0.67(\mathit{0.19})$, $-0.52(\mathit{0.21})$, $-0.79(\mathit{0.20})$ with corresponding $p$ values of 0.000, 0.001, 0.018, 0.000, respectively. Cross-sectional OLS regressions of the four relative high education prospect variables on the natural logarithm of elasticity yield coefficient estimates (and *standard errors*) of $-0.39(\mathit{0.06})$, $-0.27(\mathit{0.07})$, $-0.21(\mathit{0.08})$, $-0.32(\mathit{0.07})$ with corresponding $p$ values of 0.000, 0.001, 0.010, 0.000, respectively.

**Figure A.32:** Int. Edu. Elasticity (via Years of Schooling) and Relative High Edu. Pros. by Country



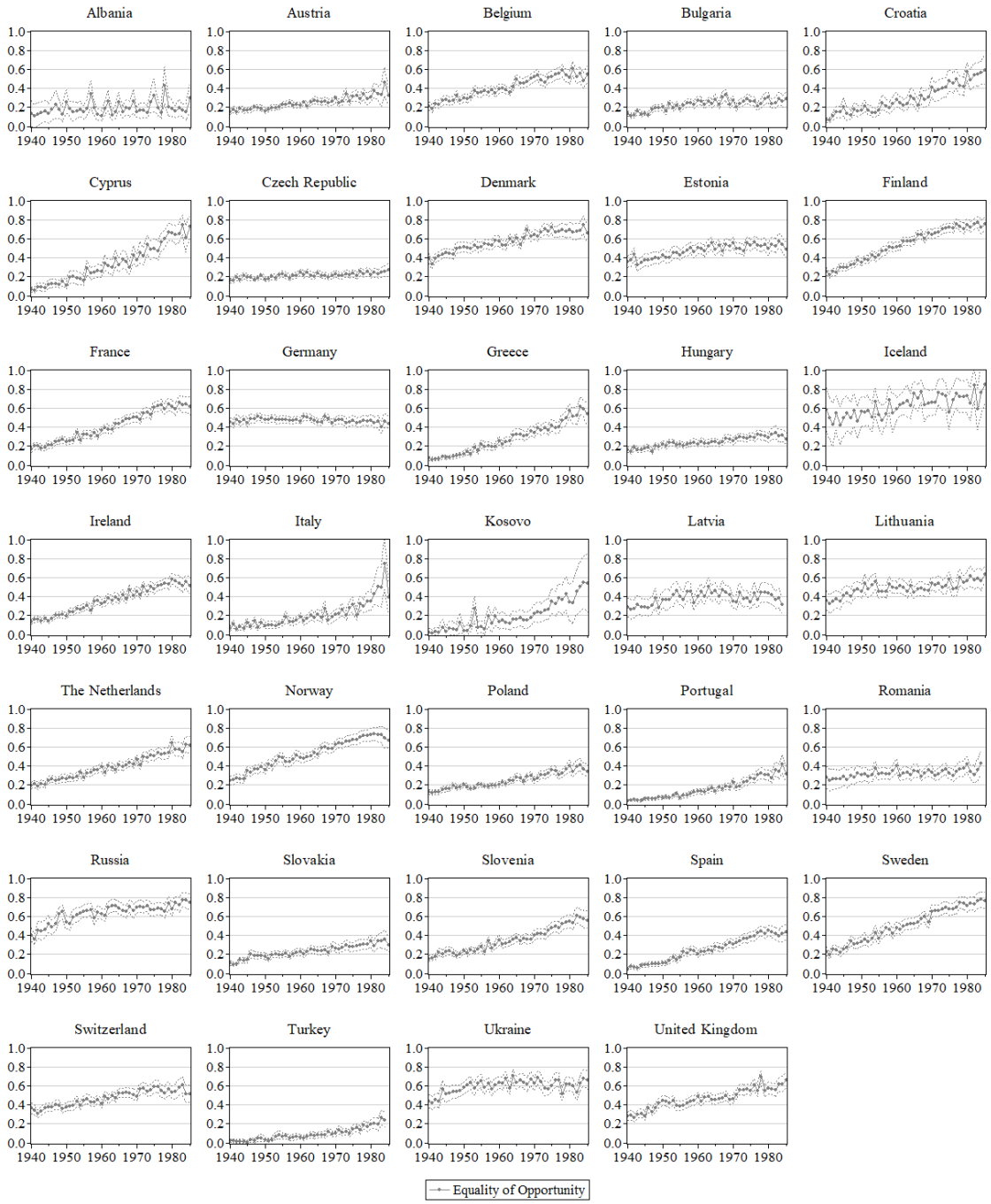

† The red line refers to the non-linear (logarithmic-linear), and the green line refers to the linear fit between the two variables. The measures in the four quadrants refer to high-education probability of descendants born to I) below-high-educated parents relative to high-educated parents II) low-educated parents relative to high-educated parents III) medium-educated parents relative to high-educated parents, and IV) low-educated parents relative to medium-educated parents.

I: $\mathcal{RHEP}_{\text{L\&M/H}} = \frac{\Pr(E=3|P=1\vee 2)}{\Pr(E=3|P=3)} = \frac{\Pr(E=3|P\neq 3)}{\Pr(E=3|P=3)}$ II: $\mathcal{RHEP}_{\text{L/H}} = \frac{\Pr(E=3|P=1)}{\Pr(E=3|P=3)}$

III: $\mathcal{RHEP}_{\text{M/H}} = \frac{\Pr(E=3|P=2)}{\Pr(E=3|P=3)}$ IV: $\mathcal{RHEP}_{\text{L/M}} = \frac{\Pr(E=3|P=1)}{\Pr(E=3|P=2)}$

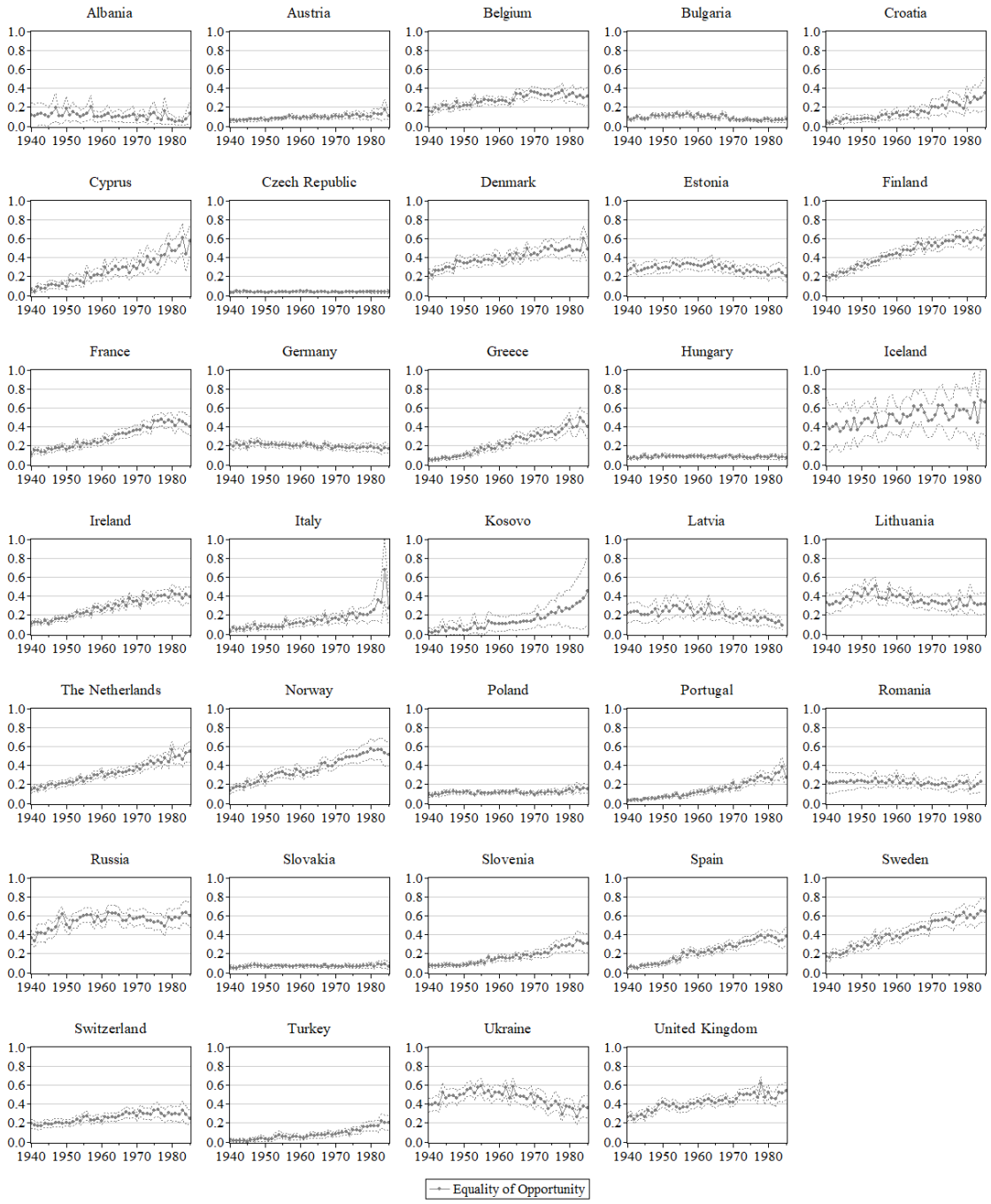
Cross-sectional linear OLS regressions of the four relative high education prospect variables on intergenerational educational elasticity (via years of schooling) yield coefficient estimates (and *standard errors*) of $-0.49(\mathit{0.20})$, $-0.50(\mathit{0.19})$, $-0.52(\mathit{0.19})$, $-0.60(\mathit{0.19})$ with corresponding $p$ values of 0.022, 0.013, 0.011, 0.005, respectively. Cross-sectional OLS regressions of the four relative high education prospect variables on the natural logarithm of elasticity yield coefficient estimates (and *standard errors*) of $-0.18(\mathit{0.08})$ $-0.17(\mathit{0.07})$, $-0.13(\mathit{0.07})$, $-0.20(\mathit{0.07})$ with corresponding $p$ values of 0.031, 0.031, 0.094, 0.016, respectively.

**Figure A.33:** Relative High Education Prospect of *Low* or *Medium* versus *High*-Educated Parents ($\mathcal{RHEP}_{\text{L\&M/H}}$) by Country



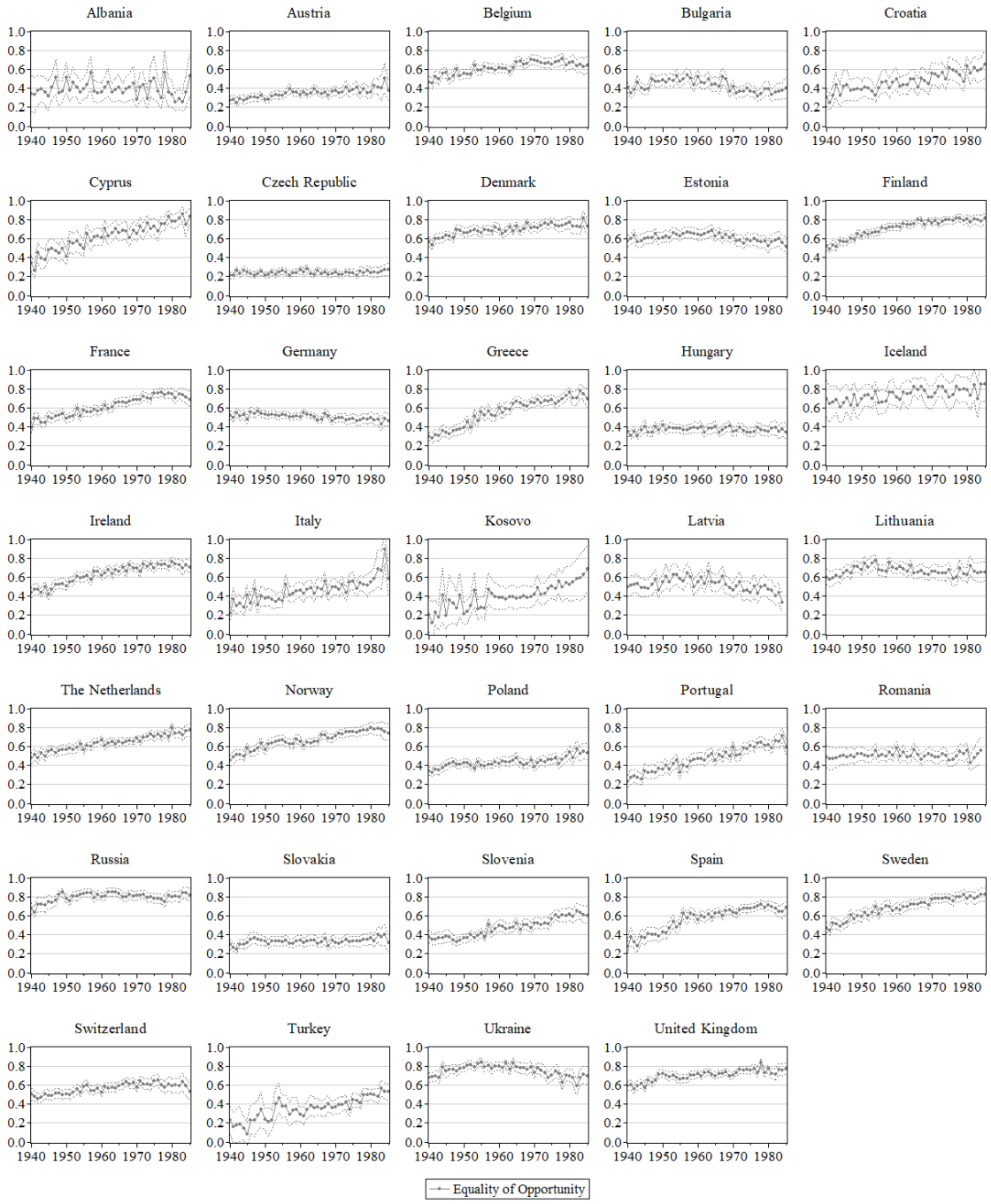

† Dates on the horizontal axis correspond to the ***birth-cohort*** of interest. Dashed lines correspond to 95% confidence interval standard error bands. The relative high education prospect measure refers to the *high* education prospects of descendants born to below-high-educated parents (either *low* or *medium*) relative to *high*-educated parents: $\mathcal{RHEP}_{\text{L\&M/H}} = \frac{\Pr(E=3|P=1\vee 2)}{\Pr(E=3|P=3)} = \frac{\Pr(E=3|P\neq 3)}{\Pr(E=3|P=3)}$

**Figure A.34:** Relative High Education Prospect of *Low* versus *High*-Educated Parents ($\mathcal{RHEP}_{\mathrm{L/H}}$) by Country



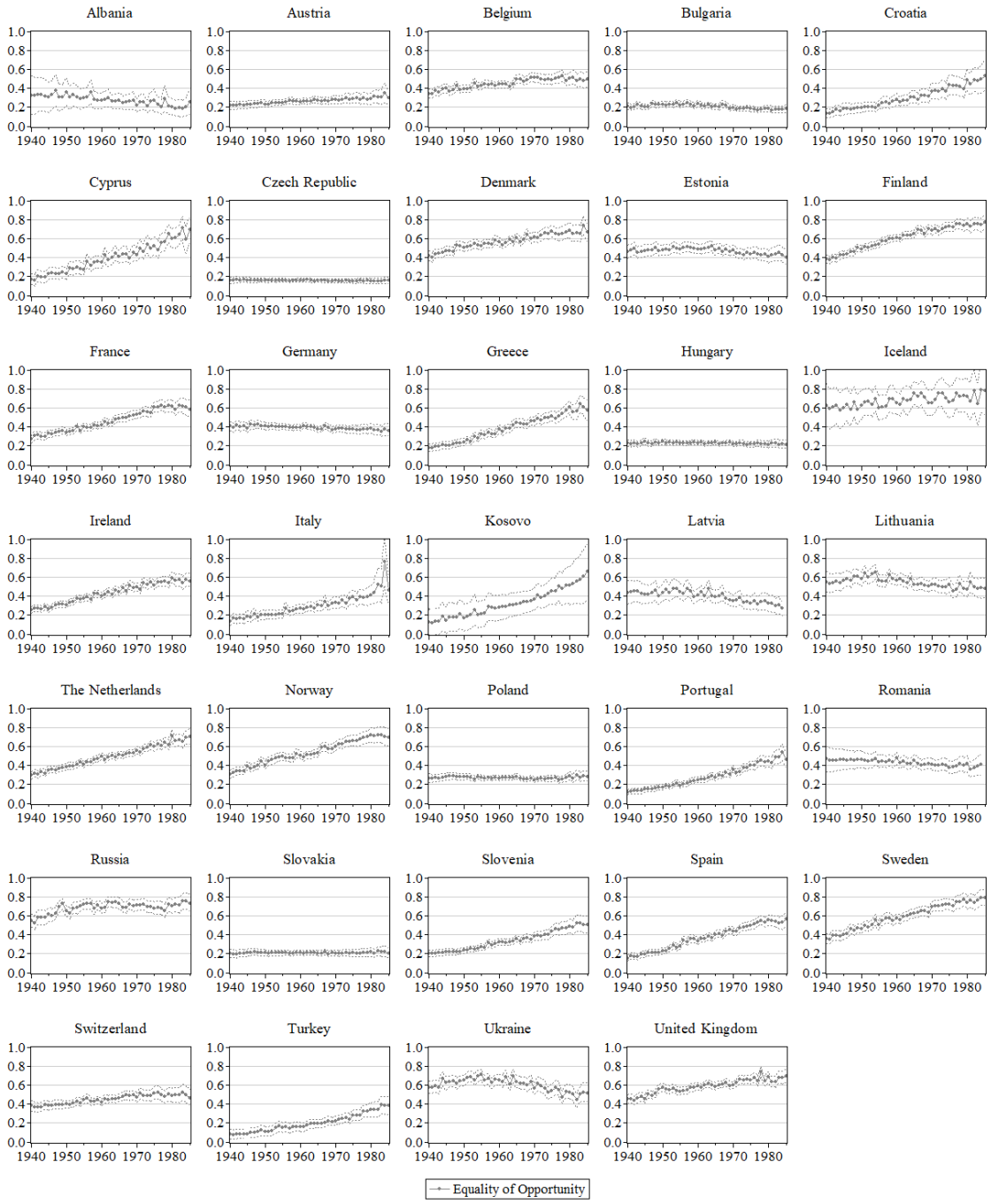

† Dates on the horizontal axis correspond to the ***birth-cohort*** of interest. Dashed lines correspond to 95% confidence interval standard error bands. The relative high education prospect measure refers to the *high* education prospects of descendants born to *low*-educated parents relative to *high*-educated parents: $\mathcal{RHEP}_{\mathrm{L/H}} = \frac{\Pr(E=3|P=1)}{\Pr(E=3|P=3)}$

**Figure A.35:** Relative High Education Prospect of *Medium* versus *High*-Educated Parents ($\mathcal{RHEP}_{\text{M/H}}$) by Country




† Dates on the horizontal axis correspond to the ***birth-cohort*** of interest. Dashed lines correspond to 95% confidence interval standard error bands. The relative high education prospect measure refers to the *high* education prospects of descendants born to *medium*-educated parents relative to *high*-educated parents: $\mathcal{RHEP}_{\text{M/H}} = \frac{\Pr(E=3|P=2)}{\Pr(E=3|P=3)}$

**Figure A.36:** Relative High Education Prospect of *Low* versus *Medium*-Educated Parents ($\mathcal{RHEP}_{\mathrm{L/M}}$) by Country




† Dates on the horizontal axis correspond to the ***birth-cohort*** of interest. Dashed lines correspond to 95% confidence interval standard error bands. The relative high education prospect measure refers to the *high* education prospects of descendants born to *low*-educated parents relative to *medium*-educated parents: $\mathcal{RHEP}_{\mathrm{L/M}} = \frac{\Pr(E=3|P=1)}{\Pr(E=3|P=2)}$

# Tables

**Table A.1:** Descriptive Statistics by Country Group

| Country Group | Number of Obs. | Years of Schooling | | Age | |
|---|---|---|---|---|---|
| | | Mean | Std. Dev. | Mean | Std. Dev. |
| Mediterranean | 31000 | 10.34 | 5.16 | 46.40 | 12.63 |
| Nordic | 30162 | 13.82 | 3.95 | 47.98 | 12.40 |
| Post-Socialist | 69817 | 12.61 | 3.19 | 47.31 | 12.65 |
| Rest of Europe | 65383 | 13.36 | 3.64 | 47.54 | 12.22 |

**Table A.2:** Parental Educational Couple Combinations

| $P$ | $D_1$ | $D_2$ | $D_3$ | $D_4$ | $D_5$ | $D_6$ | Paternal Education | Maternal Education. | Parental *Better* Education |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 0 | 0 | 0 | 0 | 0 | Low | Low | Low |
| 2 | 0 | 0 | 0 | 0 | 0 | 0 | Medium | Low | Medium |
| 2 | 1 | 0 | 0 | 0 | 0 | 0 | Low | Medium | Medium |
| 2 | 0 | 1 | 0 | 0 | 0 | 0 | Medium | Medium | Medium |
| 3 | 0 | 0 | 1 | 0 | 0 | 0 | High | Low | High |
| 3 | 0 | 0 | 0 | 1 | 0 | 0 | Low | High | High |
| 3 | 0 | 0 | 0 | 0 | 0 | 0 | High | Medium | High |
| 3 | 0 | 0 | 0 | 0 | 1 | 0 | Medium | High | High |
| 3 | 0 | 0 | 0 | 0 | 0 | 1 | High | High | High |

**Table A.3:** Intergenerational Educational Regression and Correlation Coefficients Conditional on Parental Education by Country

| | **Regression Coefficient $\beta$ Cond. on Parental Edu:** | | | **Correlation Coefficient $\rho$ Cond. on Parental Edu:** | | |
|---|---|---|---|---|---|---|
| **Country** | **Low** | **Medium** | **High** | **Low** | **Medium** | **High** |
| Albania | 0.36 | 0.39 | 1.05 | 0.27 | 0.22 | 0.53 |
| Austria | 0.13 | 0.62 | 0.43 | 0.10 | 0.18 | 0.11 |
| Belgium | 0.78 | 0.49 | 0.47 | 0.28 | 0.21 | 0.24 |
| Bulgaria | 0.46 | 0.43 | 0.56 | 0.45 | 0.16 | 0.28 |
| Croatia | 0.54 | 0.41 | 0.35 | 0.33 | 0.19 | 0.17 |
| Cyprus | 0.95 | 0.28 | 0.57 | 0.36 | 0.14 | 0.35 |
| Czech Republic | 0.23 | 0.56 | 0.86 | 0.12 | 0.15 | 0.19 |
| Denmark | 0.13 | 0.46 | 0.40 | 0.07 | 0.17 | 0.15 |
| Estonia | 0.19 | 0.32 | 0.45 | 0.13 | 0.17 | 0.23 |
| Finland | 0.72 | 0.31 | 0.38 | 0.26 | 0.17 | 0.24 |
| France | 0.64 | 0.36 | 0.30 | 0.24 | 0.20 | 0.19 |
| Germany | 0.03 | 0.56 | 0.61 | 0.03 | 0.17 | 0.20 |
| Greece | 1.14 | 0.31 | 0.54 | 0.33 | 0.17 | 0.38 |
| Hungary | 0.18 | 0.29 | 0.43 | 0.20 | 0.13 | 0.17 |
| Iceland | 0.43 | 0.58 | 0.48 | 0.27 | 0.21 | 0.21 |
| Ireland | 0.48 | 0.26 | 0.42 | 0.24 | 0.13 | 0.22 |
| Italy | 0.83 | 0.51 | 0.39 | 0.35 | 0.22 | 0.20 |
| Kosovo | 0.52 | 0.17 | 0.75 | 0.33 | 0.11 | 0.40 |
| Latvia | 0.24 | 0.34 | 0.23 | 0.17 | 0.11 | 0.08 |
| Lithuania | 0.15 | 0.21 | 0.34 | 0.20 | 0.11 | 0.20 |
| The Netherlands | 0.40 | 0.35 | 0.38 | 0.28 | 0.14 | 0.18 |
| Norway | 0.24 | 0.39 | 0.45 | 0.14 | 0.16 | 0.21 |
| Poland | 0.26 | 0.55 | 0.71 | 0.23 | 0.17 | 0.25 |
| Portugal | 1.90 | 0.47 | 0.53 | 0.41 | 0.24 | 0.34 |
| Romania | 0.29 | 0.22 | 0.34 | 0.17 | 0.12 | 0.15 |
| Russia | 0.10 | 0.16 | 0.26 | 0.10 | 0.11 | 0.19 |
| Slovakia | 0.19 | 0.41 | 0.69 | 0.15 | 0.11 | 0.16 |
| Slovenia | 0.25 | 0.61 | 0.80 | 0.14 | 0.21 | 0.29 |
| Spain | 0.80 | 0.54 | 0.33 | 0.31 | 0.22 | 0.18 |
| Sweden | 0.33 | 0.27 | 0.36 | 0.26 | 0.18 | 0.21 |
| Switzerland | -0.01 | 0.32 | 0.76 | 0.00 | 0.11 | 0.21 |
| Turkey | 1.21 | 0.56 | 0.35 | 0.27 | 0.32 | 0.29 |
| Ukraine | 0.13 | 0.12 | 0.37 | 0.09 | 0.06 | 0.19 |
| United Kingdom | 5.53 | 0.36 | 0.42 | 0.16 | 0.11 | 0.20 |

# B Appendix: Imputation Algorithm

## Imputation Algorithm and Estimation Procedure

The ESS dataset contains information on descendants' years of schooling, as well as their ordinal categorical educational attainment based on ISCED 1997 definitions. Further, while the ESS dataset contains information on parents' categorical education attainment (via ISCED 1997 categorization), it does *not* keep track of parents' years of schooling or their birth year. Given the data limitations, we pursue the following imputation algorithm:

1. We first calculate sample means $\hat{\mu}_{c,t}$ and standard deviations $\hat{\sigma}_{c,t}$ of years of schooling of *descendants* who were born between 1915 and 1985 for each country, where $c$ refers to country of interest, and $t$ refers to birth-year of descendants. As true population moments should not vary swiftly, but calculated sample moments do so empirically, we first calculate moving averages of the two moment series via a rolling approach with a fixed window size of 10 years. We calculate the weighted mean of the two moments in reverse historical order, since the erratic nature of the two series are more pronounced for the earlier cohorts. For instance, we calculate the weighted average of mean years of schooling for the cohort born in 1945 in country $c$ as $\bar{\mu}_{c,1945} = \frac{1}{10}\sum_{k=1945}^{1954}\hat{\mu}_{c,k}$ or $\bar{\mu}_{c,j} = \frac{1}{10}\sum_{k=j}^{j+9}\hat{\mu}_{c,k}$ for any year $j$ in general.[91] Next, we de-trend the weighted average series by using Hodrick-Prescott filter (with $\lambda = 100$), and derive the time-trends of mean and standard deviation series, $\tilde{\mu}_{c,t}$ and $\tilde{\sigma}_{c,t}$ to proxy for population moments.[92]

2. As done in the education and human capital literature, we assume that parental education follows a normal distribution over years of schooling, with $N \sim (\tilde{\mu}_{c,t-25}, \tilde{\sigma}_{c,t-25})$.[93] In other words, we assume that years of schooling of parents, whose birth years are unobservable, are drawn from a normal distribution with its moments following a backward time-drift of 25 years.[94] Next, using $N \sim (\tilde{\mu}_{c,t-25}, \tilde{\sigma}_{c,t-25})$, we calculate the discretized probability of years of schooling (0-30 years in integers) for parents whose descendants were born between 1940 and 1985 in the countries of interest.

[91] For the latest 10 years, we calculate the weighted average of the moments series with the corresponding feasible window size. For instance $\bar{\mu}_{c,1980} = \frac{1}{6}\sum_{k=1980}^{1985}\hat{\mu}_{c,k}$, i.e. a window size of 6 years, or for any other year $j$ within the latest 10 years, $\bar{\mu}_{c,j} = \frac{1}{\min(10,1985-j+1)}\sum_{k=j}^{\min(j+9,1985)}\hat{\mu}_{c,k}$. Note that these years will not be utilized as inputs for the imputation algorithm, and are calculated for the sake of completeness.

[92] For some countries of interest, number of observations for cohorts born before 1920s are hazardously low, thereby disallowing us to calculate sample standard deviations. In such instances, we extrapolate the de-trended series via cubic spline in `MATLAB` and generate moment series for the missing cohorts. Details on this extrapolation are available upon request.

[93] Our motivation behind the normality assumption is that aside from measurement issues, inborn ability, e.g. IQ, is considered to be normally distributed in almost all social and nature science subfields, and years of schooling, as the proxy for unobservable education ability feeding from inborn ability, could mimic a similar distributional form.

[94] We impose a time-drift in moments, as we document that both the mean and the standard deviation of years of schooling display significant time-trends over time. Results by alternative time-drifts in moments are available upon requests.

3. UNESCO, OECD and other national education sources provide data on minimum and maximum years necessary to complete ISCED 1997 categories. Using this information, we calculate the upper and lower bounds for each ISCED category in each country.[95]

4. Combining the information from the lower and upper bounds of years of schooling for ISCED education categories, and the distributions we impute, we first calculate parents' years of schooling probabilities conditional on their categorical educational attainment, country, and birth year of their descendants. Next, using these conditional probabilities and associated years of schooling values, we calculate *expected* years of schooling for parents of interest. For instance, suppose we impute years of schooling for parents in Belgium whose categorical educational attainment is ISCED 3 and whose descendant was born in 1960. Under this scenario, the necessary years of schooling for completing ISCED 3 requires 10 to 14 years of schooling. Further, the distribution we impute follows $N \sim (\tilde{\mu}_{\texttt{BEL},1960}, \tilde{\sigma}_{\texttt{BEL},1960}) = N \sim (11.071, 3.659)$. These figures suggest that the relevant parents' years of schooling can take five integer values: $P_i = \{10, 11, 12, 13, 14\}$ with the corresponding *unconditional* probabilities of $\Pr(P_i) = \{0.104, 0.109, 0.106, 0.095, 0.079\}$, which come directly from the nature of the normal distribution with the corresponding moment values. Next, we calculate the corresponding *conditional* probabilities of years of schooling by restricting such parents' years of schooling to [10,14] and dividing each feasible probability of years of schooling by the cumulative sum of the probabilities in the restricted interval, i.e. $\widetilde{\Pr}(P_i(j)) = \frac{\Pr(P_i(j))}{\sum_j \Pr(P_i(j))}$ for $j = \{10, 11, 12, 13, 14\}$, which generate $\widetilde{\Pr}(P_i) = \{0.212, 0.221, 0.214, 0.193, 0.160\}$ in this case. Finally, the expected value of years of schooling is clearly: $\overline{P}_i = \sum_{\{j\}} P_i(j) \times \widetilde{\Pr}(P_i^j)$, i.e. for the parents of interest, it would simply be $\overline{P}_i = \sum_{\{j=10,11,12,13,14\}} [P_i(j) \times \widetilde{\Pr}(P_i(j)] = 11.869$.[96]

5. Next, having imputed parents' expected years of schooling, we regress descendants' years of schooling on a constant and associated parents' average years of schooling, and compute coefficient estimates for the equation $E_{it} = \hat{\alpha}_t + \hat{\beta}_t \overline{P}_{it}$. Finally, using the estimated intergenerational education coefficient and sample standard deviations, we also calculate and report intergenerational educational correlation estimates $\hat{\rho}_t = \hat{\beta}_t \frac{\hat{\sigma}_{P_t}}{\hat{\sigma}_{E_t}}$.

[95] Following the ISCED 1997 guidelines, we cluster individuals into 5 ISCED categories: i) ISCED 0 & 1, ii) ISCED 2, iii) ISCED 3, iv) ISCED 4, and v) ISCED 5 & 6. In collecting data for years of schooling intervals for education subcategories, we rely on OECD publications for Portugal, national sources for Albania and Kosovo, and UNESCO publications for the remaining 31 countries.

[96] For 6 countries, namely Croatia, Turkey, Kosovo, Portugal, Ukraine and the United Kingdom, we cannot pin down the upper and lower bounds of years of schooling for the ISCED 4 category. Of these 6 countries, 2 of them, Croatia and Turkey, do not have *any* descendants falling into the ISCED 4 category over time due to the structure of their education systems. For the remaining four countries, we first calculate average years of schooling of descendants who completed the ISCED 4 category, data permitting. Next, using a polynomial fit (of order 2 to 4), we generate a trend line for each of the 4 countries. We then extrapolate the missing earlier cohorts via cubic spline as before, and and compute expected years of schooling for members of ISCED 4 category over time, which we incorporate into our imputed values with the same time drift of 25 years. Further details of this procedure are available upon request.