Intergenerational Educational Mobility in Iraq

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Abstract: This study pioneers an examination of intergenerational educational mobility in Iraq, focusing on cohorts from 1960 to 1989, and utilizing data from the second Iraq Household Socio-Economic Survey (IHSES 2012). It provides a comprehensive analysis of intergenerational educational mobility across national, subnational, and gender-specific dimensions. Our findings reveal a significant level of intergenerational educational mobility from parents to their descendants, yet indicate a discernible diminishing trend over time. We further decompose the intergenerational correlation, revealing a persistent polarization effect, wherein descendants from less educated or disadvantaged backgrounds are more likely to remain disadvantaged. Notably, while educational mobility is higher between parents and sons compared to daughters, there is a marked improvement in the educational attainment of female descendants.

Keywords: Intergenerational mobility, Education, Correlation coefficient decomposition, Gendered educational mobility, Iraq

Jel Codes: I20, I21, I24, I26

Irak'ta Nesiller Arası Eğitim Hareketliliği

Öz: Bu çalışma, İkinci Irak Hanehalkı Sosyo-Ekonomik Anketi'nden (IHSES 2012) elde edilen 1960 ile 1989 yılları arasındaki kohortlara odaklanarak Irak'ta nesiller arası eğitimsel hareketliliği araştıran ilk çalışmadır. Nesiller arası eğitim hareketliliğini, milli, bölgesel ve cinsiyet boyutlarında incelemektedir. Bulgularımız, ebeveynlerden çocuklarına önemli bir nesiller arası eğitimsel hareketlilik düzeyi ortaya koymakla birlikte, zaman içinde belirgin bir azalma eğilimi de göze çarpmaktadır. Nesiller arası korelasyonu ayrıştırdığımızda, daha az eğitimli veya dezavantajlı ailelerden gelen alt-soyun dezavantajlı bir konumda kalma eğilimi olduğunu ortaya koyuyoruz. Eğitim hareketliliği, ebeveynler ve oğulları arasında, kızlarına kıyasla daha yüksektir ancak kızların eğitim düzeyinde dikkate değer bir iyileşme de vardır.

Anahtar Kelimeler: Nesiller arası hareketlilik, Eğitim, Korelasyon katsayısı ayrıştırması, Cinsiyete dayalı eğitim hareketliliği, Irak

Jel Kodları: I20, I21, I24, I26

1. Introduction

An aspect of capitalism involves the passing down of accumulated advantages, particularly in terms of wealth and human capital, from one generation to the next. Economists find the study of intergenerational socioeconomic mobility compelling because it provides insights into the expected socioeconomic status of the next generation. Over the long term, there is a tendency for higher income inequality to coincide with lower intergenerational mobility. Countries with significant income disparities also tend to exhibit a pronounced transmission of intergenerational inequality (Milanovic, 2019). Therefore, by assessing or quantifying intergenerational mobility within a nation, we can gauge the extent of inequality present.

Scholars frequently employ the educational mobility of attainment from one generation to the next as a measure of equal opportunities. Numerous scholars, such as Becker & Tomes (1968), Solon (1999, 2002), Black & Devereux (2010), and Latif (2018), have underscored the pivotal role and impact of parents' educational backgrounds in shaping the educational outcomes of their descendants. The research by Black & Devereux (2010) suggests that improving early childhood education can boost mobility. It is important to note that intergenerational mobility is not solely influenced by heritable cognitive factors but is also significantly shaped by parental investments in their children (Becker & Tomes, 1968). Reduced educational mobility indicates a lower level of opportunity equality, suggesting that individuals with less educated parents are more prone to maintaining a disadvantaged position or achieving lower educational levels. Conversely, those with highly educated parents are more likely to retain a privileged status (Latif, 2018). By examining the intergenerational mobility of education, policymakers can enhance mobility levels by addressing specific factors that contribute to low educational mobility.

This study seeks to investigate intergenerational educational mobility in Iraq, with a specific focus on cohorts from 1960 to 1989. The background information about the educational environment in Iraq during that timeframe offers valuable insights into the significance of this study. In 1958, a military coup brought an end to the Iraqi monarchy, leading to the establishment of a republic. The new government continued the efforts initiated by the monarchy regime by constructing new schools and enhancing educational accessibility. Notably, the budget allocated to the education sector saw a twofold increase, rising from $36 million in 1958 to $67 million in 1960 (Marr, 2012). This surge in funding led to a threefold increase in the number of students across all education levels, contributing significantly to improved literacy rates during that period (Tripp, 2007). With the nationalization of Iraq's oil industry in the 1970s, the government substantially augmented the budget allocated to social programs, including education. This increased funding facilitated the construction of new schools and the hiring of additional teachers (Marr, 2012). Moreover, in 1976, the government enacted three pivotal laws to enhance the education system. Firstly, it established the right to free education from primary to university levels. Secondly, the Compulsory Education Law mandated six years of schooling or completion of primary school. Thirdly, the eradication of illiteracy Law initiated a national campaign to combat illiteracy (De Santisteban, 2005).

The Iran-Iraq war that spanned from 1980 to 1988, lasting eight years, hindered any further progress in the education sector and mitigated the positive effects of preceding reforms. The country, burdened by the prolonged conflict, faced enduring challenges that impacted multiple generations (Roy, 1993). A significant portion of Iraq's resources and budget was redirected towards military objectives, at the expense of social programs, including the education sector. The consequences of the war were extensive, leading to the destruction of numerous schools and the conscription of many teachers and students into the military (ReliefWeb, 2003). Following the protracted conflict, Iraq found itself entangled in another war with Kuwait, attempting an invasion in 1990. This prompted the imposition of economic sanctions by the United Nations Security Council through Resolution 661 on August 6, 1990, which persisted until Resolution 1483 on May 22, 2003, signaling the end of all sanctions. The stringent sanctions had a profound impact,

subjecting the country to a challenging period of economic instability that directly affected the education system, leading to a significant decline in its quality. The repercussions of both war and sanctions were not confined to the generation living during that period but also extended to future generations (De Santisteban, 2005).

The public education sector has experienced detrimental effects due to a series of conflicts and mismanagement, as discussed earlier. As a result, an augmentation in the count of students receiving substandard education leads to a scenario where capital and job opportunities in the market become disproportionately available to individuals with higher qualifications or superior education in the private sector. Consequently, this trend contributes to a continuous escalation of the inequality gap within the country. Moreover, if there is a high degree of educational persistence, the current challenges faced by the present generation may persist into the next. This underscores the importance of examining intergenerational educational mobility, providing insights for relevant authorities to take necessary actions and prevent further deterioration in the educational prospects of the next generation. This research marks a pioneering effort as the first attempt to quantify and explore intergenerational educational mobility in Iraq.

The aim of this study is to measure and identify the trends of intergenerational educational mobility in Iraq and to investigate the impacts of armed conflicts, and sanctions from the 1980s to the 1990s on the mobility patterns across generations. Additionally, this study seeks to identify education mobility between parents and their descendants by decomposing the correlation coefficient based on parents' education levels. Unlike most previous studies that have predominantly focused on the mobility between fathers and their descendants, this research makes a significant contribution by addressing gender disparity in educational mobility. It investigates the mobility patterns from both mothers and fathers to their descendants, separately, and examines the mobility from parents to sons and daughters independently. Additionally, this study provides a detailed analysis of educational mobility across all Iraqi provinces, thereby shedding light on regional gender disparities.

The key findings of this study can be summarized as follows: Firstly, despite the identification of a high level of intergenerational educational mobility in Iraq, there is an observed decline in this mobility over time. Secondly, the transmission of education between generations is notably polarized, indicating that descendants from less educated or disadvantaged families are more likely to remain in a disadvantaged position. Thirdly, although educational mobility is higher between parents and sons compared to parents and daughters, there is a noteworthy improvement in the educational attainment of female descendants. Lastly, the persistence of education varies significantly across provinces.

The remaining sections of the research are structured as follows: Section 2 offers a review of studies on intergenerational educational mobility in different countries. Section 3 outlines the utilized data and methodology. The findings and discussions are presented in Section 4, and the conclusion is provided in Section 5.

2. Theme

Research on intergenerational educational mobility has mainly focused on developed countries due to the availability of extensive and high-quality data sets. Limited data in developing countries has hindered studies in this area. Although there are no studies solely focused on Iraq, limited cross-country panel studies have included Iraq in their analysis of intergenerational educational mobility across various nations. In an extensive analysis conducted by the World Bank, Narayan et al. (2018) examined intergenerational mobility across 148 countries, including 10 in the Middle East and North Africa (MENA) region. The findings reveal that intergenerational educational mobility improved in high-income economies from the 1940s to the 1980s, whereas mobility in developing economies experienced a slight decline, widening the gap between these groups. For the cohort born between the 1960s and the 1980s, the correlation coefficient in developing economies

increased from 0.4 to 0.5. Leone (2019) and Driouchi et al. (2017) conducted notable cross-country studies and found that the correlation coefficient for Iraq was slightly higher than the range observed for developing countries in a World Bank study. For the cohort born in the 1980s in Iraq, they estimated the correlation coefficient to be approximately 0.51. Leone (2019) utilizes harmonized data from 148 countries, focusing on the transmission of educational achievements across generations. The primary finding indicates a stronger persistence of intergenerational educational mobility in less developed countries. In the MENA region, Leone's study estimated correlation coefficient remains steady and has increased over the past five decades. In addition, the results of the Driouchi et al. (2017) study demonstrate that the majority of Arab countries, including Iraq, have experienced high levels of educational mobility. Additionally, Driouchi & Gamar (2016) investigate differences between social mobility and educational attainment in Arab countries compared to Eastern and Central European economies. The study shows a decline in social mobility in Arab countries relative to educational attainment, mirroring similar patterns observed in economically comparable Eastern and Central European nations. Another recent effort is the study by Dendir (2023), which investigated intergenerational educational mobility across 22 nations in Sub-Saharan Africa using recent national census data spanning six cohorts born from the late 1950s to the early 1990s. Using the intergenerational correlation measure, it revealed that most countries exhibited a correlation coefficients ranging between 0.3 and 0.5, indicating moderate to low persistence in educational outcomes across generations.

Another significant aspect to address in connection with mobility involves examining the significance of gendered patterns in the intergenerational transmission of education. Sparse research underscores a potential disparity in intergenerational mobility between sons and daughters, investigating how mothers and fathers influence variations in educational persistence across generations. A recent significant study by Hu & Qian (2023) emphasizes the critical role of mothers in intergenerational educational mobility. Analyzing data from 1.79 million individuals born between 1956 and 1990 across 106 societies, the study reveals that mothers' educational status has become increasingly important, sometimes surpassing that of fathers, especially in recent cohorts. This highlights substantial gender differences, with maternal education being crucial for children's educational outcomes. Another noteworthy effort is the study by Driouchi et al. (2017), which aims to measure intergenerational mobility and educational attainment inequality among women in the Arab world, using annual school attainment data from 1950 to 2010. Despite detecting a notable upward trend in educational attainment and a decrease in education inequality in the Arab world, males have a higher proportion of improvement compared to females. Assaad & Saleh (2018) examined how government policies to expand public basic and secondary schools influenced intergenerational educational mobility in Jordan. They found that mobility increased significantly over time, especially for women. The educational attainment of children with uneducated parents improved notably due to the expanded supply of basic schools, with a greater impact on females, largely due to the availability of mixed-gender schools.

Moreover, according to studies such as Azam & Bhatt (2015), McClendon et al. (2018), Latif (2018), and Aydemir & Yazici (2019), patterns of educational mobility across generations, including gender disparities, may vary significantly across distinct regions and among various ethnic or social groups within a country. Azam & Bhatt (2015) undertook research on the transmission of educational achievement across generations in India, analyzing birth cohorts spanning from 1940 to 1985. The results of their study highlighted variations in the pattern of educational persistence among social groups and significant differences in educational persistence across different states in India. A notable finding from McClendon et al.'s (2018) global study is that Muslim women, on a worldwide scale, have lower educational levels and more pronounced gender gaps compared to all other religious groups, except Hindus. This mirrors earlier observations of diminished female attainment and broader gender gaps in countries where Islam

predominates. However, the study also underscores significant educational progress among Muslim women in more recent cohorts. Latif (2018) investigates the intergenerational persistence of education in Canada for cohorts spanning from 1940 to 1989. The study reveals gender-specific trends in correlation coefficients, indicating an upward trajectory for sons and a downward trend for daughters, alongside variations in educational mobility patterns across generations that are influenced by regional and demographic factors. Aydemir & Yazici (2019) explore the connection between intergenerational educational mobility and economic development in Turkey. Gender plays a role in this relationship, with a less clear association for males, while females demonstrate notable educational advancement in developed regions, reflecting diminished reliance on parental educational achievements.

The exploration of intergenerational educational mobility has gained significant attention among economists, with numerous studies primarily concentrating on developed countries due to the abundance of available longitudinal data. Conversely, research in developing nations has been constrained by data limitations. Despite this trend, the scarcity of accessible data for researchers may contribute to the limited attention given to intergenerational mobility studies in Iraq. Therefore, this paper represents a pioneering initiative to investigate educational mobility across generations in Iraq. Apart from determining the coefficient and trend of educational mobility at both the national and provincial levels, the study will also endeavor to identify gender disparities in educational mobility in Iraq and its individual provinces.

3. Data and Methodology

3.1. Data Description

This study utilizes the second Iraq Household Socio-Economic Survey (IHSES 2012), as no other surveys of a similar nature have been conducted since that time. The IHSES 2012 was developed collaboratively by Iraqi government statistical institutions with support from the World Bank during 2012-2013. The survey results were subsequently published in 2015 (World Bank, 2015). The IHSES 2012 data were collected from 118 districts across all 18 provinces in Iraq, comprising a total sample of 24,944 households and 176,042 individuals nationwide. For the purposes of this study, the focus is on individuals born between 1960 and 1989. Following the extraction of the specific individuals' data targeted for this study, the total number of remaining observations for our analysis is 30,831. These generations are the first to be born and grow up after the shift in the Iraqi political system from a monarchy to a republic in 1958. Furthermore, these generations are particularly influenced by the Iran-Iraq war, which may have transformative effects on the subsequent generation. In addition, the youngest individuals in the selected sample may have completed their education by the time the survey was conducted[1].

Table 1. Descriptive statistics for years of schooling

Cohorts	Obs.	Sample Share	Descendant Years				Parent Years			
			Sons		Daughters		Fathers		Mothers	
			Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
1960-1969	8095	26.26%	8.31	5.37	5.30	5.26	1.18	3.33	0.24	1.41
1970-1979	12705	41.21%	6.68	5.37	5.17	4.90	1.88	4.01	0.45	1.93
1980-1989	10031	32.54%	5.13	5.14	5.06	5.15	2.97	4.90	1.08	3.04
Whole Sample	30831	100.00%	6.89	5.45	5.15	5.08	2.05	4.22	0.60	2.28

The IHSES 2012 solely classifies the educational accomplishments of both parents and their descendants in relation to the highest completed grade, without providing

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[1] According to Iraqi education system, students at least need 22 years to finish university.

specific information on the number of schooling years[2]. When the exact years of education are unavailable, an alternative estimation method, proposed by Black & Devereux (2010), involves substituting the years required to complete a standard education level. Consequently, for the purpose of this study, we categorize the data into five groups: illiterate, primary, intermediate, secondary, and university education and above. Additionally, we convert the data type from categorical to numeric or to the number of years needed to attain the corresponding education level[3]. Table 1 illustrates the range and sample distribution of each cohort, along with the progression of the mean and standard deviation of the years of education completed by both descendants and parents.

The effects of wars and economic sanctions on these cohorts are clearly observable by looking the average of descendants' years of schooling, as presented in Table 1. Despite facing numerous challenges, the impact of policies such as free education, compulsory education, and the campaign to eradicate illiteracy proved remarkably effective. Notably, these policies had a particularly positive influence on women, leading to an increase in literacy rates and educational achievements in primary education (Roy, 1993; De Santisteban, 2005). Examining the data on daughters' years of schooling from Table 1, it is evident that females experienced a lesser degree of impact from these instabilities. It demonstrates a gradual decrease in the average years of school for female descendants, from 5.30 for the 60s cohort to 5.03 for the 80s cohort. However, the average years of school for male descendants notably decreased from 8.31 for the 60s cohort to 5.13 for the 80s cohort. The reduction in female illiteracy rates was particularly noteworthy, driven by factors such as military conflicts and an increased demand for female labor during the Iran-Iraq war. From the onset of the war in 1980 to its conclusion in 1988, there was a substantial decrease in illiteracy rates, especially among females. For instance, the female illiteracy rate decreased significantly from 72.7% to 12.5%, and for males, it decreased from 37.1% to 9.8% (Roy, 1993). Additionally, female participation at the primary level was nearly on par with males during the 1980s, with approximately 47% for females and 53% for males (De Santisteban, 2005).

3.2. Methodology

Scholars commonly employ two widely recognized measures to assess intergenerational educational mobility: the regression coefficient (β_t) and the correlation coefficient (ρ_t). The estimation of the intergenerational educational regression coefficient (β_t) involves a univariate ordinary least squares (OLS) regression, where descendant education attainment is regressed on parental education attainment, as outlined in equations (1) and (2):

$$c_{it} = \alpha_t + \beta_t\, f_{it} + \varepsilon_{it} \tag{1}$$
$$c_{it} = \alpha_t + \beta_t\, m_{it} + \varepsilon_{it} \tag{2}$$

where c_{it} and f_{it} (m_{it}) represent the acquired years of obtained education level of child i and his/her father (mother) of cohort t, respectively.

In this study, our emphasis is on the correlation coefficient (ρ_t), a suitable metric for gauging the evolution of mobility over time. The correlation coefficient (ρ_t) measures the change of how strong relationship between parents and child's education (Aydemir & Yazici, 2019). Parents and descendants' years of schooling should adjust with their respective standard deviation before estimating the correlation coefficient (ρ_t). This adjustment is accomplished by dividing the schooling years variable for parents and descendants by their corresponding standard deviation:

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2 "Descendant" are these individuals who participate in the survey, and we categorize the cohorts according. The information of their "Parent" was also taken from them.

3 Acquired years for all five education levels in Iraq are as follows: 1) illiterate: 0 year, 2) primary: 6 years, 3) intermediate: 9 years, 4) secondary: 12 years, and 5) university: 16 years.

$$c_{it}^a = \gamma_t + \rho\, f_{it}^a + u_{it} \qquad (3)$$

$$c_{it}^a = \gamma_t + \rho\, m_{it}^a + u_{it} \qquad (4)$$

Where $c_{it}^a = \frac{c_{it}}{\sigma_t^c}$, $f_{it}^a = \frac{cf_{it}}{\sigma_t^f}$ and $m_{it}^a = \frac{m_{it}}{\sigma_t^m}$.

According to equation (3) and (4), a higher value of ϱ shows that education attainments' level of descendent is strongly related or influenced by their parents. However, if the value of ϱ near to zero or insignificant this indicates that descendants' education attainment is independent from their parent's education (Öztunalı & Torul, 2022).

In addition, the value of the coefficient ϱ can serve as a metric for the level of inequality in opportunities that is attributable to external factors, such as a child's background or circumstances. This measure is intended to exclude any effects of the child's own efforts or abilities (Checchi, Fiorio & Leonardi, 2013). To underscore this point, the correlation coefficient can be reformulated as follows:

$$\rho_{tf} = \int \underbrace{(c - E(c))(f - E(f))}_{a}\, \underbrace{\Pr(c|f)}_{b}\, \underbrace{\Pr(f)}_{c} \qquad (5)$$

$$\rho_{tm} = \int \underbrace{(c - E(c))(m - E(m))}_{a}\, \underbrace{\Pr(c|m)}_{b}\, \underbrace{\Pr(m)}_{c} \qquad (6)$$

Equations (5) and (6) reveal the influence on the coefficient ϱ stemming from the spread of children's and parents' education around their respective means (a), the change of children education conditional that of their parents (b), and the distribution of parental education (c).

The empirical analog of equation 5 and 6 are used to further decompose of the correlation coefficient to identify the stability of correlation coefficients further,

$$\rho_{tf} = \sum_c \sum_f (c - E(c))(f - E(f))Pr(c|f)\Pr(f) = \sum_c \sum_f r_t(c,f) \qquad (7)$$

$$\rho_{tm} = \sum_c \sum_m (c - E(c))(m - E(m))Pr(c|m)\Pr(m) = \sum_c \sum_m r_t(c,m) \qquad (8)$$

Where $r_t(f,c)$ and $r_t(m,c)$ are absolute contributions to ρ_t of families with f father and m mother education and c descendant education[4]. Tables A1 and A2 in the appendix present the components of $\sum_c \sum_f r_t(c,f)$ and $\sum_c \sum_m r_t(c,m)$, with additional comprehensive details to be supplied in the results section.

4. Results

4.1. Intergenerational Educational Mobility Across Iraq

Figure 1 illustrates the magnitude and trend of the correlation coefficient (ρ_t) between parents and descendants for all cohorts from 1960 to 1989. It reveals two significant findings. Firstly, the correlation coefficients of mothers (ρ_{tm}) with their descendants are noticeably lower than those of fathers (ρ_{tf}). Moreover, the increase of mothers' correlation coefficients (ρ_{tm}) is more rapid when compared to fathers' correlation coefficients (ρ_{tf}). Secondly, despite the generally low intergenerational educational correlation coefficients (ρ_t) in Iraq, particularly in the earlier cohorts, a clear upward trend is evident. For instance, in the 1960-1969 cohort, the coefficients were 0.25 (father) and 0.14 (mother), whereas in the 1980-1989 cohort, they rose to 0.36 (father) and 0.32 (mother). The upward trends in the correlation coefficient align with the findings of the World Bank study, which examined a large group of developing countries (Narayan, et al., 2018).

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[4] In the appendix, we offer the derivation for equations 5 and 7, the same derivation procedures are applicable to equations 6 and 8.

However, the correlation coefficient values observed in this study are lower than the range of 0.4 to 0.5 identified for developing countries in the World Bank study.
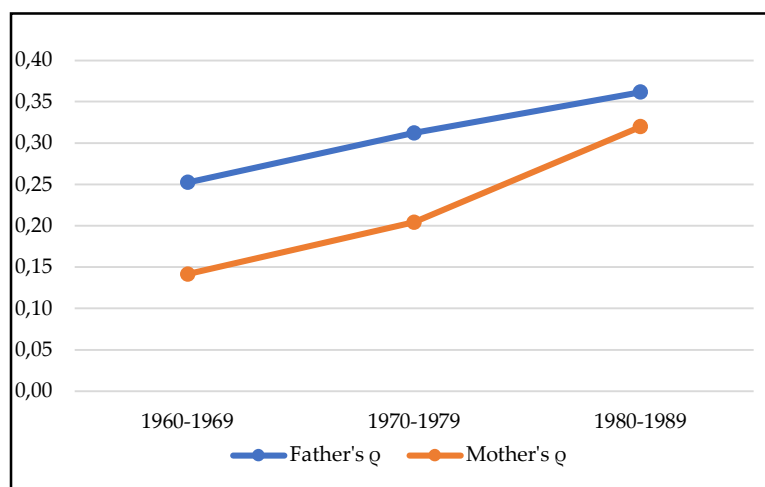

Figure 1. The trend of intergenerational educational correlation coefficients of fathers and mothers with their descendants

The increasing trend of correlation coefficients in Iraq may be attributed to a noticeable rise in the relative contributions of both low and high-educated descendants, conditioned on low and high parental education, respectively, within the 1960-1989 cohorts. A detailed explanation of this phenomenon will be provided later. We identified consistently lower intergenerational educational correlation coefficients in Iraq when compared to earlier studies such as Leone (2019) and Driouchi et al. (2017), which reported an estimated correlation coefficient (ρ) of approximately 0.51. However, the upward trend in correlation coefficients in Iraq aligns with the findings of Leone (2019), who observed a steady or increasing estimated correlation coefficient (ρ) over the last five decades in the MENA region. Similar patterns are evident in two Asian countries, Indonesia and Vietnam, as demonstrated by Hertz et al.'s (2007) study, which covered estimations for 42 different countries. Furthermore, Azam & Bhatt (2015) noted a slight increase in intergenerational correlation in India, and Öztunalı & Torul (2022) showcased an upward trend in correlation coefficients for the cohorts 1965-1985 in Turkey. However, Tansel (2015) represents the initial effort to examine the correlation between parents' and children's education in Turkey over time. Despite an overall decreasing trend in the intergenerational educational coefficient for both mothers and fathers, mothers display a slightly higher coefficient.

Table A1 and Table A2 in the appendex display the element of $r_t(c,f)$ and $r_t(c,m)$ as per equations (7) and (8) for all cohorts, respectively. In both tables, Line 31 provides the correlation coefficients for fathers (ρ_{tf}) and mothers (ρ_{tm}), representing the combined absolute and relative contributions of descendants and parents. Line 6 presents the overall contribution of descendants with illiterate fathers and mothers to ρ. The primary contributors to ρ were descendants with an illiterate father (mother), accounting for 77.61% (92.41%) of the entire sample. The relative contributions of children with an illiterate father significantly decreased over time, from 86.79% for the 1960-1969 cohort to 68.58% for the 1980-1989 cohort. Additionally, the relative contributions of children with an illiterate mother also declined over time, albeit to a lesser extent, from 96.81% for the 1960-1969 cohort to 86.87% for the 1980-1989 cohort. This outcome suggests that the Iraqi community exhibited lower levels of education, a common observation attributed to the series of conflicts the country faced, coupled with limited attention from both the government and families towards education. Additionally, a considerable number of children lacked the opportunity to enroll in primary education. According to Al-Shaikhly

(1974), 43.2% of eligible children did not attend primary school during the academic year 1960-61, a figure that increased to 44.3% by the academic year 1969-70. However, despite the initially low contributions from offspring with educated parents (as indicated in Line 12, 18, 24, and 30 in tables A1 and A2), there was a significant subsequent increase. The total relative contribution of educated father (mother) descendants increased from 13.21% (3.18%) for the 1960–1969 cohort to 31.43% (13.12%) for the 1980–1989 cohort[5].

A noticeable rise in the proportion of illiterate descendants with illiterate fathers is evident in Table A1, increasing from 27.23% for the 1960-1969 cohort to 34.02% for the 1980-1989 cohort (reported in Line 1). Moreover, the relative contributions of illiterate descendants with illiterate mothers increased, as indicated in Line 1 of Table A2, from 28.15% for the 1960-1969 cohort to 38.96% for the 1980-1989 cohort. Besides illiterate descendants with illiterate parents, the primary contributors to both ρ_{tf} and ρ_{tm} are descendants with illiterate parents who are primary school graduate. The absolute and relative contributions of primary school graduate descendants with illiterate parents increased, except for the cohort 1980-1989. Conversely, the absolute and relative contributions of secondary, intermediate school, and university graduate descendants with an illiterate father decreased (reported in Lines 2-5). The eight-year Iran-Iraq war in the 1980s, the Kuwait war in 1990, and subsequent sanctions imposed on Iraq are significant factors contributing to an increase in descendants with uneducated and primary degree holders with parents who were either illiterate or had only completed primary education. These factors may be the primary drivers behind the observed upward trend in the intergenerational educational correlation coefficient in Iraq. Furthermore, the findings suggest that political instabilities in Iraq had a disproportionately greater negative impact on families already facing educational deprivation.

Lines 1, 2, 7, and 8 suggest a limited degree of educational mobility, indicating that children of uneducated and low-educated parents are more likely to have lower educational attainment in this society. Similarly, highly educated descendants tend to come from parents with higher education levels, as observed in lines 22, 23, 28, and 29. These outcomes align with various studies employing similar decomposition methodologies, including Checchi, Fiorio & Leonardi (2013), Azam & Bhatt (2015), and Öztunalı & Torul (2022). A consistent and significant finding is that the transmission of education across generations in Iraq is markedly polarized. This implies that descendants from less educated or disadvantaged families are more likely to persist in a disadvantaged educational position.

4.2. Intergenerational Educational Mobility Across Iraqi Provinces

To perform the regional analysis, the educational mobility of each province is individually calculated for the entire period. The ensuing figure 2 illustrates substantial variations in educational persistence among provinces in Iraq. The differences in government education policies targeting various provinces can be identified as a potential factor contributing to the influence on these outcomes. For instance, Azam & Bhatt (2015) revealed significant disparities in educational persistence across Indian states in their study. They suggested that state-level disparities in education policy and other institutional factors could potentially explain this variation. Chetty, Hendren, Kline & Saez (2014) associated regional disparities in their mobility measures for the United States with local area characteristics, suggesting that differences in public education funding across regions may contribute to variations in intergenerational income mobility. Behrman and colleagues, in their study encompassing 16 Latin American countries, discovered that increased government spending per student on primary education, along with a rise in the average education level of teachers, were both correlated with a reduction in their measurement of educational persistence (Behrman, Gaviria & Székely, 2001). Moreover, drawing on the empirical findings of Daude & Robano (2015), who

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[5] Educated father and mother means those parents whose have primary, secondary, high school, or university degree. We find their values by the sum of relative contribution of line 12, 18, 24, and 30.

analyzed the educational achievements of 18 Latin American countries, a clear negative association emerged between both measures of intergenerational persistence in educational outcomes and the level of public expenditure on education per student relative to the country's GDP per capita. This implies that augmenting public investment in education has the potential to foster increased mobility within the region. In addition, Similar to the outcomes proposed in the studies by Azam & Bhatt (2015) and Latif (2018), variations in intergenerational educational mobility can be influenced by ethnic and demographic factors. Thus, variations in attitudes toward education among ethnic groups, influenced by cultural differences, represent an additional factor that may contribute to the educational mobility gap between provinces in Iraq. Certain cultures may prioritize academic achievement and education, whereas others may have distinct priorities or encounter cultural obstacles that impact educational opportunities. Concerning the three primary ethnic groups in Iraq, namely the Shia-Arabs, Sunni-Arabs and Kurds populations, the perspectives of these ethnic groups may different regarding the importance of education and parental investment in their children's education.
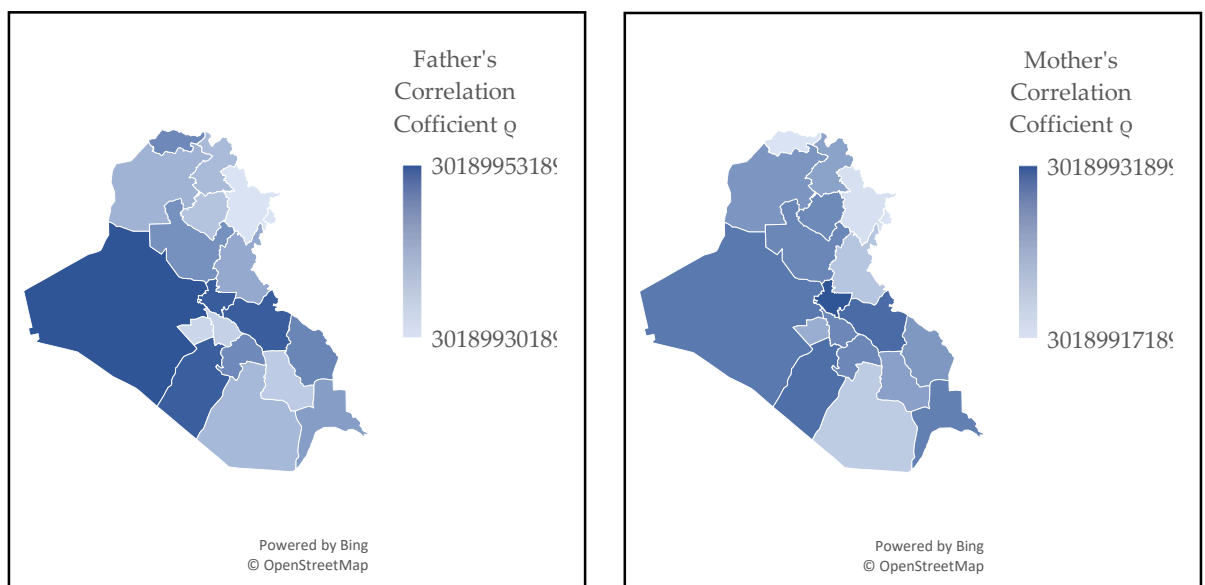
(a) Correlation Coefficient of Father   (b) Correlation Coefficient of Mother

Figure 2. Intergenerational educational correlation coefficient for all Iraqi provinces

4.3. Intergenerational Educational Mobility Across Gender

It is crucial to analyze the educational mobility from parents to their sons and daughters while considering gender disparities. Iraq is notably ranked 154th out of 156 countries on the Gender Inequality Index, signifying its status as one of the worst countries in terms of gender inequality (World Bank, 2021). The study's results underscore the substantial gender disparities in Iraq regarding educational mobility. Figure 3 illustrates a noticeable gender discrepancy in intergenerational educational mobility within Iraq. According to our research, the connection between generations in terms of education tends to be more persistent for daughters compared to sons. Across all cohorts, the correlation coefficient for fathers and mothers with their sons is lower than that with their daughters. This indicates that educational mobility between parents and sons is significantly higher than that between parents and daughters. This finding aligns with research conducted in both developed and developing nations, where it is commonly observed that daughters tend to demonstrate higher levels of intergenerational educational persistence compared to sons. This pattern is consistent with earlier studies, including those by Ranasinghe (2015), Emran & Shilpi (2015), Azomahou & Yitbarek

(2016) and Driouchi et al. (2017), which highlighted that women generally show greater educational persistence than men in countries such as Australia, India, and nine Sub-Saharan African countries, respectively. Additionally, the graphical representation indicates that mothers and their descendants exhibit a higher rate of educational mobility compared to fathers and their descendants. A similar pattern was observed in a study by Tansel's (2015) findings, where the intergenerational educational coefficient for mothers was slightly higher than for fathers. Furthermore, our findings align with Razzu & Wambile (2022), who, in their analysis of nationally representative survey data from 34 countries spanning three-quarters of Africa's population over four decades, identified the level of intergenerational educational mobility by gender.
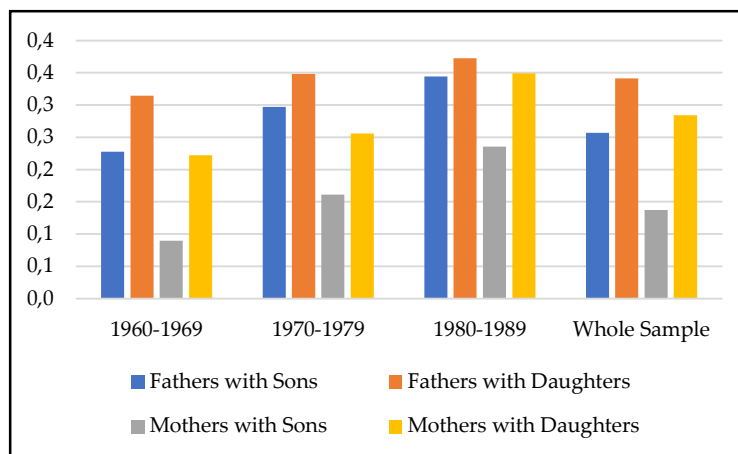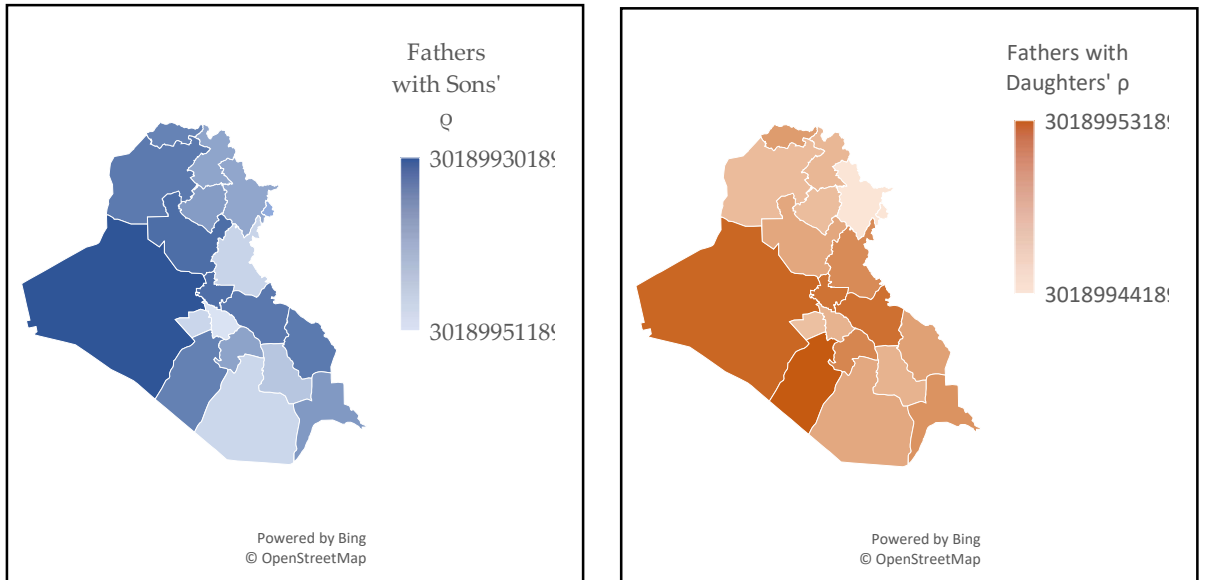

Figure 3. Intergenerational educational correlation coefficient for fathers and mothers with their sons and daughters

As previously noted, the major contributors to the overall sample are parents lacking literacy skills. We also identified a strong persistence in the intergenerational correlation between parental education and the educational status of daughters. Consequently, there is a significantly elevated proportion of illiterate female. This outcome is unsurprising, given that many families in Iraq, especially throughout the last century, regarded their children, especially females, as valuable economic assets for household and agricultural labor. Furthermore, social institutions often exhibited rigidity and discouraged the education of females. This gender disparity is evident in the number of high school graduates during the period 1965-66 to 1971-72, with 11,033 male students compared to 3,715 female students (Al-Shaikhly, 1974).

While there is evidence of a gender disparity or a persistence of education between parents and daughters, there is also a noteworthy improvement in terms of female descendants. The education sector faced significant challenges and quality deterioration due to conflicts and political instability in the 80s and 90s. The impacts of these instabilities are clearly reflected in the selected cohorts, as presented in the descriptive statistic table (Table 1). Despite both sons and daughters experiencing a reduction in the number of school years due to the successive instabilities, it appears that daughters were less affected by this situation. It is also evident in Figure 3, where the correlation of parents with their daughters increased proportionally less than with sons. It occurred due to the positive influence of policies such as free education, compulsory education, and campaigns to eradicate illiteracy in the 70s, particularly benefiting women. Additionally, the rate of illiteracy among females decreased as the demand for female labor increased during the Iran-Iraq war. Conversely, the impact of 70s policies on males were diminished, as many male students were conscripted into the military, leading to a withdrawal from school.
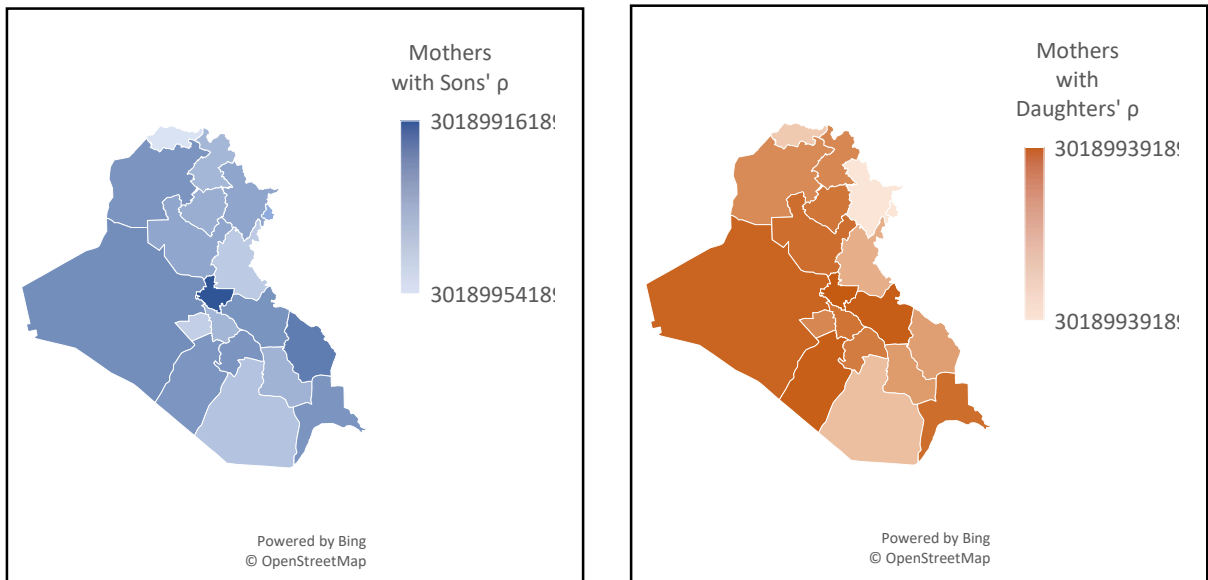
Figure 4 displays the intergenerational correlation coefficient estimates for daughters and sons with their mother and father individually in each province across the country.

The consistent result from these calculations is that, in the majority of provinces, intergenerational persistence is more pronounced between daughters and their parents than sons, regardless of whether the correlation involves mothers or fathers. This diversity can be ascribed to the cultural distinctions among the various ethnic groups in Iraq, making it a promising subject for upcoming research by sociologists.

(a) Correlation Coefficient of Fathers with Sons

(b) Correlation Coefficient of Fathers with Daughters

(c) Correlation Coefficient of Mothers with Sons

(d) Correlation Coefficient of Mothers with Daughters

Figure 4. Intergenerational educational correlation coefficient of parents with sons and daughters separately for all Iraqi provinces

5.   Conclusion

This research marks a pioneering exploration into intergenerational educational mobility in Iraq, focusing on the cohorts spanning 1960-1989. The study utilizes data from the second Iraq Household Socio-Economic Survey (IHSES 2012), a collaborative effort between government institutions and the World Bank Organization. The study focuses on

individuals directly impacted by the eight-year Iraq-Iran war and subsequent political and economic instability. Despite the high degree of educational mobility in Iraq, an observed declining trend in mobility is evident over the specified period for both fathers and mothers and their descendants. Educational mobility from mothers to their descendants surpasses that of fathers, demonstrating a more rapid and persistent trend compared to paternal mobility.

As per the findings of the decomposition analysis, the primary drivers of intergenerational educational mobility in Iraq were traced back to descendants with illiterate fathers and mothers. Over time, the contributions from descendants with illiterate fathers and mothers decreased, whereas those from descendants with educated parents saw an increase. Overall, the results of the decomposition exercise underscore a highly polarized intergenerational transmission of education in Iraq. This suggests that descendants from less educated or disadvantaged families are more likely to remain in a disadvantaged position. Moreover, the analysis indicates that conflicts and political instabilities had a disproportionately negative impact on families with lower educational backgrounds, leading to an increased contribution from descendants with uneducated or less educated parents.

We compute the educational mobility for each province independently throughout the entire period. The level of educational persistence differs significantly among the provinces in Iraq, and these disparities can be attributed to two factors: variations in government educational policies toward different provinces and differences in attitudes toward education among ethnic groups. In addition, we investigate the gender-based differences in educational mobility from parents to their sons and daughters, revealing a pronounced gender disparity in Iraq. Our findings indicate that the intergenerational educational link tends to be more persistent for daughters than for sons. This suggests that educational mobility between parents and sons is considerably higher than that between parents and daughters. Conversely, there is a noteworthy improvement in the educational attainment of female descendants, and the decreasing trend in educational mobility of parents with their daughters is less pronounced than with sons. Two primary factors contribute to this pattern: first, females appear to be less affected by conflicts and war situations compared to males, attributed to the conscription of many male students into the military and withdrawal from school. Second, the policies of free education, compulsory education, and the anti-illiteracy campaign in the 1970s had a more positive impact on women.

This research recommends that to safeguard the future of education and foster improved educational mobility for the next generation, it is crucial for policymakers in the Iraqi government to confront the rising education persistence between generations and mitigate gender imbalances. This necessitates strengthening support for the public education sector and guaranteeing unbiased access to high-quality educational prospects for individuals of all genders. It is imperative to increase and efficiently utilize the allocated budget for investing in the education sector, which is currently insufficient, comprising only 5 percent of the national budget. In addition, apart from the direct impact of education, where parents transmit abilities to their children through both nurture and genetics, there is also an indirect effect. The indirect influence of education involves parents affecting variables associated with their children's education, including investments in their educational pursuits and the overall educational environment (Wang et al., 2022). Investments in the human capital of children play a pivotal role in determining their future earnings and socioeconomic status. Parents can subtly impact their children's lifelong earning potential through factors such as family culture, as well as various monetary and non-monetary investments that mold skills, aptitudes, beliefs, and behavior (Corak, 2013).

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Appendix

Derivations

Derivation of equation (5)

The equation $c_i = \gamma + \rho f_i + u_i$ is a linear regression model where c_i and f_i are random variables representing the ith observed values of the variables C and F, respectively. γ is the intercept, ρ is the regression coefficient (i.e., the slope), and u_i is the error term.

$$c_i = \gamma + \rho f_i + u_i$$

Dividing both sides of the equation by the respective standard deviations of c_i and f_i, we get:

$$\frac{c_i}{\sigma_c} = \left(\frac{\gamma}{\sigma_c}\right) + \left(\frac{\rho}{\sigma_c}\right) * \left(\frac{f_i}{\sigma_f}\right) + \left(\frac{u_i}{\sigma_c}\right)$$

Let's define the standardized random variables $Z_c = \frac{c}{\sigma_c}$, $Z_f = \frac{f}{\sigma_f}$, and $Z_u = \frac{u}{\sigma_c}$. Then, we have:

$$Z_c = \left(\frac{\gamma}{\sigma_c}\right) + \left(\frac{\rho}{\sigma_c}\right) * Z_f + Z_u$$

We want to find the correlation coefficient between Z_c and Z_f, i.e., the value of ρ in the above equation. Rearranging the equation, we get:

$$Z_u = Z_c - \left(\frac{\gamma}{\sigma_c}\right) - \left(\frac{\rho}{\sigma_c}\right) * Z_f$$

Taking the expected value of both sides conditional on Z_f, we get:

$$E[Z_u|Z_f] = E[Z_c|Z_f] - \left(\frac{\gamma}{\sigma_c}\right) - \left(\frac{\rho}{\sigma_c}\right) * Z_f$$

Since $E[Z_u|Z_f] = 0$ (i.e., the error term is assumed to have mean zero), we can solve for ρ to get:

$$\rho = \frac{\left(E[Z_c|Z_f] - \left(\frac{\gamma}{\sigma_c}\right) * E[Z_f]\right)}{\left(\sigma_c * E[Z_f^2]\right)}$$

Using the definitions of Z_c and Z_f, we have:

$$\rho = \frac{\left(E[C|F] - \left(\frac{\gamma}{\sigma_c}\right) * E[F]\right)}{\left(\sigma_c * E[F^2]\right)}$$

Finally, substituting the definitions of C_i and F_i back into the above expression, and using the law of iterated expectation, we get:

$$\rho = \int (C - E[C]) * (F - E[F]) * Pr(C|F) * Pr(F) \, dC \, dF$$

This is the same as the correlation coefficient formula you provided earlier.

Derivation of equation (7)

To find the summation form of the correlation coefficient formula, we can take the partial derivative of ρ with respect to the probability density function (pdf) of C given F. Here's how:

Let $P(c|f)$ be the pdf of C given F. Then, we have:

$$\rho = \int (C - E[C]) * (F - E[F]) * P(C|F) * P(F) \, dC \, dF$$

Taking the partial derivative of ρ with respect to $P(c|f)$, we get:

$$\frac{\partial \rho}{\partial P(C|F)} = \int (F - E[F]) * (C - E[C]) * \delta(P(C|F) - P'(C|F)) * P(F) \, dC \, dF$$

where δ(x) is the Dirac delta function, and $P'(C|F)$ is a slight perturbation of $P(C|F)$ such that the perturbation only affects a small neighborhood around a specific value of C given F.

Next, we integrate over all values of F to get:

$$\frac{\partial \rho}{\partial P(C)} = \iint (F - E[F]) * (C - E[C]) * \delta(P(C|F) - P'(C|F)) * P(F) \, dC \, dF$$

Using the fact that $\delta(P(C|F) - P'(C|F))$ is non-zero only when C is equal to a particular value C' given F, we can simplify the above equation as:

$$\frac{\partial \rho}{\partial P(C)} = \int (F - E[F]) * (C' - E[C]) * P(C' = C|F) * P(F) \, dF$$

Now, we take the partial derivative of the above equation with respect to C, and then we sum over all possible values of C and F to get:

$$\sum_c \sum_f (F_f - E[F]) * (C_c - E[C]) * P(C = c|F = f) * P(F = f) = \sum_c \sum_f r_t(c, f)$$

where $r_t(c, f)$ is the sample correlation coefficient between the observed values of C and F at time t.
Therefore, we have obtained the desired summation form of the correlation coefficient formula.

Table A1. Decomposition of the intergenerational educational correlation coefficient for father (ρ_{tf}): 1960-1989 Cohorts

Line	Cohort / Family Type	1960-1969 $r_t(c, f)$	1960-1969 $\dfrac{r_t(c,f)}{\rho_{tf}}$	1970-1979 $r_t(c, f)$	1970-1979 $\dfrac{r_t(c,f)}{\rho_{tf}}$	1980-1989 $r_t(c, f)$	1980-1989 $\dfrac{r_t(c,f)}{\rho_{tf}}$
1	F:0, C:0	0.0687	27.23%	0.0942	30.17%	0.1230	34.02%
2	F:0, C:6	0.0752	29.77%	0.0971	31.09%	0.0869	24.03%
3	F:0, C:9	0.0242	9.59%	0.0225	7.21%	0.0177	4.90%
4	F:0, C:12	0.0212	8.39%	0.0115	3.67%	0.0052	1.44%
5	F:0, C:16	0.0298	11.82%	0.0211	6.75%	0.0151	4.19%
6	**F:0**	**0.2191**	**86.79%**	**0.2464**	**78.89%**	**0.2480**	**68.58%**
7	F:6, C:0	0.0020	0.79%	0.0063	2.01%	0.0153	4.23%
8	F:6, C:6	0.0058	2.30%	0.0163	5.22%	0.0232	6.41%
9	F:6, C:9	0.0031	1.21%	0.0043	1.37%	0.0055	1.52%
10	F:6, C:12	0.0023	0.93%	0.0025	0.80%	0.0023	0.65%
11	F:6, C:16	0.0049	1.93%	0.0057	1.82%	0.0059	1.62%
12	**F:6**	**0.0181**	**7.15%**	**0.0350**	**11.22%**	**0.0522**	**14.43%**
13	F:9, C:0	0.0003	0.12%	0.0013	0.40%	0.0048	1.33%
14	F:9, C:6	0.0011	0.44%	0.0045	1.42%	0.0093	2.58%
15	F:9, C:9	0.0014	0.54%	0.0027	0.87%	0.0032	0.89%
16	F:9, C:12	0.0009	0.37%	0.0012	0.39%	0.0011	0.30%
17	F:9, C:16	0.0019	0.75%	0.0032	1.02%	0.0045	1.26%
18	**F:9**	**0.0056**	**2.24%**	**0.0128**	**4.11%**	**0.0230**	**6.35%**
19	F:12, C:0	0.0003	0.12%	0.0005	0.17%	0.0019	0.53%
20	F:12, C:6	0.0007	0.28%	0.0020	0.63%	0.0053	1.47%
21	F:12, C:9	0.0006	0.22%	0.0012	0.39%	0.0025	0.69%
22	F:12, C:12	0.0007	0.26%	0.0012	0.38%	0.0015	0.41%
23	F:12, C:16	0.0016	0.62%	0.0023	0.74%	0.0041	1.14%
24	**F:12**	**0.0038**	**1.51%**	**0.0072**	**2.31%**	**0.0153**	**4.23%**
25	F:16, C:0	0.0003	0.10%	0.0007	0.22%	0.0029	0.79%
26	F:16, C:6	0.0008	0.32%	0.0024	0.77%	0.0064	1.77%
27	F:16, C:9	0.0007	0.27%	0.0015	0.48%	0.0031	0.85%
28	F:16, C:12	0.0008	0.32%	0.0012	0.37%	0.0022	0.61%
29	F:16, C:16	0.0033	1.30%	0.0051	1.64%	0.0087	2.40%
30	**F:16**	**0.0058**	**2.31%**	**0.0109**	**3.48%**	**0.0232**	**6.42%**
31	**ρ_{tf}**	**0.2524**	**100.00%**	**0.3124**	**100.00%**	**0.3616**	**100.00%**

Table A2. Decomposition of the intergenerational educational correlation coefficient for mother ($\boldsymbol{\rho_{tm}}$): 1960-1989 Cohorts

Line	Cohort / Family Type	1960-1969		1970-1979		1980-1989	
		$r_t(c,m)$	$\dfrac{r_t(c,m)}{\rho_{tm}}$	$r_t(c,m)$	$\dfrac{r_t(c,m)}{\rho_{tm}}$	$r_t(c,m)$	$\dfrac{r_t(c,m)}{\rho_{tm}}$
1	M:0, C:0	0.0399	28.15%	0.0663	32.46%	0.1246	38.96%
2	M:0, C:6	0.0461	32.50%	0.0761	37.27%	0.1014	31.70%
3	M:0, C:9	0.0161	11.33%	0.0188	9.22%	0.0222	6.95%
4	M:0, C:12	0.0138	9.76%	0.0102	5.01%	0.0075	2.34%
5	M:0, C:16	0.0214	15.07%	0.0205	10.02%	0.0221	6.92%
6	**M:0**	**0.1372**	**96.81%**	**0.1919**	**93.97%**	**0.2779**	**86.87%**
7	M:6, C:0	0.0002	0.16%	0.0009	0.43%	0.0050	1.56%
8	M:6, C:6	0.0008	0.54%	0.0031	1.52%	0.0113	3.52%
9	M:6, C:9	0.0005	0.38%	0.0018	0.87%	0.0040	1.25%
10	M:6, C:12	0.0005	0.36%	0.0009	0.43%	0.0017	0.53%
11	M:6, C:16	0.0013	0.93%	0.0022	1.07%	0.0045	1.40%
12	**M:6**	**0.0034**	**2.37%**	**0.0088**	**4.32%**	**0.0264**	**8.24%**
13	M:9, C:0	0.0001	0.04%	0.0000	0.02%	0.0009	0.27%
14	M:9, C:6	0.0001	0.04%	0.0005	0.22%	0.0019	0.59%
15	M:9, C:9	0.0001	0.09%	0.0004	0.17%	0.0014	0.43%
16	M:9, C:12	0.0001	0.04%	0.0002	0.10%	0.0007	0.22%
17	M:9, C:16	0.0003	0.17%	0.0007	0.36%	0.0024	0.76%
18	**M:9**	**0.0005**	**0.37%**	**0.0018**	**0.87%**	**0.0072**	**2.26%**
19	M:12, C:0	0.0000	0.01%	0.0001	0.02%	0.0002	0.05%
20	M:12, C:6	0.0000	0.00%	0.0001	0.07%	0.0008	0.26%
21	M:12, C:9	0.0000	0.02%	0.0001	0.04%	0.0003	0.10%
22	M:12, C:12	0.0001	0.07%	0.0001	0.03%	0.0004	0.14%
23	M:12, C:16	0.0002	0.11%	0.0005	0.25%	0.0013	0.42%
24	**M:12**	**0.0003**	**0.22%**	**0.0009**	**0.42%**	**0.0031**	**0.97%**
25	M:16, C:0	0.0000	0.00%	0.0001	0.03%	0.0002	0.06%
26	M:16, C:6	0.0001	0.04%	0.0001	0.06%	0.0006	0.19%
27	M:16, C:9	0.0000	0.01%	0.0001	0.03%	0.0004	0.12%
28	M:16, C:12	0.0001	0.04%	0.0001	0.04%	0.0005	0.17%
29	M:16, C:16	0.0002	0.14%	0.0005	0.26%	0.0036	1.12%
30	**M:16**	**0.0003**	**0.22%**	**0.0009**	**0.42%**	**0.0053**	**1.65%**
31	$\boldsymbol{\rho_{tm}}$	**0.1417**	**100.00%**	**0.2042**	**100.00%**	**0.3199**	**100.00%**