The Social Mortality Gradient and Social Mobility: New Insights from Early Scottish Chartered Accountants

ABSTRACT

This paper examines the prevalence and benefits of upward social mobility in the early accountancy profession by analyzing the lifespan of chartered accountants admitted to membership in Scotland between 1853 and 1940. We find that 76 percent of the chartered accountants in our sample had experienced upward social mobility, a greater percentage than found in previous studies. The chartered accountants in our sample experienced an average life expectancy premium of approximately three years over the general population, irrespective of social origins, and were less likely to die from most preventable causes than the general population. Upwardly mobile chartered accountants achieved lifespans consistent with their achieved professional status rather than their previous social class. While the findings confirm the existence of a social mortality gradient, the increase in longevity is likely attributable to the superior resources of higher social class and other factors affecting self-selection into the accountancy profession.

Keywords: social class; social mobility; socio-economic status; social mortality gradient; selection effects; accountancy profession.

I. INTRODUCTION

The accounting profession in both the U.K. (The Institute of Chartered Accountants in England and Wales (ICAEW) 2017) and U.S. (American Institute of Certified Public Accountants (AICPA) 2022) is committed to increasing diversity.[1] Diversity of social class has received less attention than other aspects (J. Li, A. Li, Chattopadhyay, George, and Gupta 2018), but a report commissioned by the U.K. government identified accounting as a profession that had insufficient upward social mobility (Cabinet Office 2009).[2] One of the report's findings was that upwardly mobile individuals have improved life chances (Cabinet Office 2009), for example enjoying better healthcare and longevity than those from lower socio-economic backgrounds (Woods 2000; Donkin 2014). The positive association between socio-economic status and lifespan is termed the social mortality gradient. No prior study has investigated the lifespan of chartered accountants, despite the potential of lifespan to offer insights into upward social mobility and socio-economic status. The starting point for this paper is that if the social mortality gradient theory holds, then chartered accountants should live longer than the general population regardless of overall improvements in healthcare, economic development, and education.

We begin by asking whether chartered accountants live longer than the general population in our sample period. This question is investigated using data relating to death of members who were admitted between 1853 and 1940 to either the Society of Accountants in Edinburgh (established in 1853), the Institute of Accountants and Actuaries in Glasgow (1853), or the Society of Accountants in Aberdeen (1867).[3] This provides the necessary background

[1] Potential benefits of diversity—broadly defined to include gender, ethnicity, disability, and social class—have been advanced (Ashley and Empson 2016; Edgley, Sharma, and Anderson-Gough 2016), with empirical evidence relating to the business case for diversity both outside (Herring 2009; Slater, Weigand, and Zwirlein 2008) and inside (Cameran, Ditillo, and Pettinicchio 2018) of accounting.

[2] Upward social mobility refers to moving up in the social hierarchy (HM Government 2011).

[3] These are the three predecessor bodies that together became The Institute of Chartered Accountants of Scotland (ICAS) in 1951.

for investigating our primary research question, namely whether those members of low socio-economic status families had a different lifespan than those of high socio-economic status families. We address this by combining data on the death of the early Scottish chartered accountants with details of their social background as indicated by the occupations of their fathers. We contribute to the understanding of social class and social mobility in the accounting profession by providing new insights, facilitated by using a larger dataset than previous studies, into social class and social mobility of members, and longevity benefits of professional status.

Consistent with the social mortality gradient, we find that the chartered accountants in our sample experienced a life expectancy premium of an average of three years over the general population across the period under investigation. They were also less likely to die from preventable causes except for deaths caused by respiratory diseases, as we discuss later. Our study contributes new insights into the association between social mobility and lifespan in a setting where adult socio-economic status is held relatively constant. We find more upward social mobility than previous studies, with 76 percent of chartered accountants in our period experiencing upward social mobility. Upwardly mobile chartered accountants in our study period benefitted from lifespans consistent with their new professional status rather than their social class at birth. Possible explanations include better access to a range of resources and/or characteristics particular to chartered accountants.[4] For example, personal traits such as risk aversion, conscientiousness, and higher intelligence may have driven their self-selection into accountancy careers.

II. SOCIAL STATUS, SOCIAL MOBILITY, AND LIFESPANS OF EARLY SCOTTISH CHARTERED ACCOUNTANTS

The Social Mortality Gradient, Socio-Economic Status, and Lifespan

[4] Resources include money and non-financial resources such as education, medical care, sanitation, and nutrition, that often, albeit not necessarily, stem from and can then be converted into financial resources.

The existence of a social mortality gradient has long been postulated, starting with scientific investigation in the 17th century.[5] The gradient has been found across different countries and time-points (Antonovsky 1967; McKeown 1978; Szreter 1988; Marmot 2005), despite healthcare and infrastructure improvements (Wilkinson 1996; Szreter and Mooney 1998). Research in England, Scotland, and Wales was aided by three key developments in census-taking.[6] A decennial census was conducted from 1801. A new registration service to administer the census was established in 1841. A new five-level social classification was introduced in 1921 (see Registrar-General 1927, Table A) based on occupation rather than industry.[7] The new classification was much more detailed than previous ones, enabling more consistent analysis of mortality. The analysis was published separately with the Registrar-General (1927, viii) concluding that "mortality increases regularly from Class I to Class V" (with Class I being the highest social class).

The social mortality gradient continues to be widely accepted and developed to reflect modern conditions (see, for example, Sen 1983; Link and Phelan 1995), hence its usage to underpin our analysis. Those from higher social classes continue to outlive those from lower social classes (Hattersley 1999; Donkin, Goldblatt, and Lynch 2002; Office for National Statistics (ONS) 2017) and professionals typically outlive non-professionals (Katikireddi, Leyland, McKee, Ralston, and Stickler 2017). A reason proposed in the research literature is that such people have greater access to risk-mitigating knowledge, lifestyle practices, and technologies (Link and Phelan 1995; Warren and Hernandez 2007).[8]

The resources channel

[5]See, for example, Orwell 1946; Henry 1965; Peller 1965; Antonovsky 1967; Horrox 1994; Woods 2007.

[6] Census-taking dates back to the Babylonians in 4000BC. In England, the first thorough survey, commonly known as the Domesday Book, took place in 1086. Facsimile images are available online (Powell-Smith 2010). Other means of tracking early social mobility data included the use of surnames (Clark, Cummins, Hao, and Diaz Vidal 2015).

[7] This recognized that different types of worker within an industry can have different working conditions and lifestyles (Woods 2000).

[8] It is impossible to know whether, and to what extent, people living in prior centuries could make independent lifestyle choices. However, the persistence of the gradient suggests that, although the precise mechanisms are unknown, the gradient is resilient.

U.K. government reports have attributed persistent longevity inequality despite medical advances to socio-economic circumstances (Black 1980; Acheson 1998). Although income levels are important (Jackson 1994; Wilkinson and Pickett 2008), the resources at the disposal of people of higher socio-economic status also encompass other resources such as superior education, knowledge, prestige, power, and social connections (Link and Phelan 1995). In the modern era, Phelan, Link, Diez-Roux, Kawachi, and Levin (2004) reasoned that higher socio-economic groups would be better able to prevent preventable diseases such as lung cancer (for example, by not smoking), but would not be able to utilize these resources for diseases that were not preventable, such as brain cancer. We therefore consider preventable causes of death but recognize that knowledge of what constitutes a preventable cause of death varies across time as human knowledge improves.

During our sample period, it is clear that the level of resources possessed by different socio-economic groups directly affected birth and early childhood conditions, and had long-lasting effects (Flinn et al. 1977; Donkin et al. 2002; Luo and Waite 2005). Such conditions include fetal development and childhood height and weight.[9] Several U.K. 20th century studies shed further light. Adult socio-economic status appears to be important, with a steep inverse relationship being found between U.K. civil service job grade and mortality (Marmot et al. 1991; Marmot, Bosma, Hemingway, Brunner, and Stansfeld 1997; Brunner, Shipley, Blane, Smith, and Marmot 1999). The studies also found a strong association between employment grade and a father's social class (Marmot, Shipley, Brunner, and Hemingway 2001) even where moderated by subsequent life course (Case and Deaton 2017) or financial affluence (Chandola, Bartley, Sacker, Jenkinson, and Marmot 2003). Disadvantage may also accumulate across

[9]See Barker (1990, 1992) for a discussion of pre- and post-natal conditions and Fogel (2004) for a review of the effects of malnutrition, as contributing factors to the social mortality gradient.

generations.[10] Yet, causal interpretations remain problematic (Chandra and Vogl 2010; Case and Paxson 2011; Gow, Larcker, and Reiss 2016).

The resources available to different groups are affected by occupational choice that, in turn, affects the health of different occupational groups.[11] How people spend their money also affects lifespan. Today, this applies especially to the effect of smoking on health, illness, and mortality.[12] However, it is difficult to get data on smoking prevalence by social class in our sample period as statistical analysis of mortality undertaken at that time made no mention of it (Ansell 1874; Registrar-General 1927).[13] However, Hilton (2000) shows that concerns about the health effects of smoking were being openly expressed as early as the 1850s and, from the late 19th century onward, medical concern was growing (Axon 1872; Drysdale 1892; Mann 1908).[14]

Selection Channel

The 1921 census data shows that there were differences in the causes of death among doctors, lawyers, and the clergy, even though all were in Class I (Registrar-General 1927;

[10] Cumulative disadvantage from one birth cohort to the next is offered to explain declining life expectancies in the U.K. (Institute and Faculty of Actuaries 2018) and in U.S. middle-aged non-Hispanic whites (Case and Deaton 2017).
[11] Factors associated with social class and occupation include the prevalence of some medical conditions among particular social classes (Chaturvedi, Jarrett, Shipley, and Fuller 1998), reflecting the physical and psychosocial working conditions associated with individual occupations (Hämming and Bauer 2013), with particularly steep gradients found for infectious and parasitic diseases, respiratory diseases, and accidents, poisonings, and violence (Susser, Watson, and Hopper 1985).
[12]By the first half of the 20th century, around 80 percent of men and 40 percent of women smoked (Hilton 2000). Now, in the U.K. (Office for National Statistics (ONS) 2020) and U.S. (Pampel, Mollburn, and Lawrence 2014), smoking is significantly less common among higher social classes.
[13] Literature, social commentaries, and etiquette manuals show that smoking was engaged in by the higher social classes, and that concerns were beginning to be raised among the middle and upper, but not the lower, social classes about potential harmful effects (Rosen 2010). Evidence from the mid- to late-20th century in the U.K. (Taylor et al. 2003) and U.S. (Surgeon General 2014) also suggests that smoking prevalence was related to socio-economic status, while recent evidence suggests that more highly educated people (a proxy for social status) (Denney, Rogers, Hummer, and Pampel 2010; Alkan and Ünver 2022) and those with better networks (Christakis and Fowler 2008) are less likely to smoke.
[14]With smoking in particular, it is not clear in our sample period whether any particular social groups modified their habits based on this emerging knowledge. While early Scottish chartered accountants may have been more aware of such concerns due to their higher level of education, the fact that smoking prevalence was very high throughout U.K. society suggests that most would have continued to smoke regardless. Using U.S. data, Rogers, Hummer, Krueger, and Pampel (2005) found that for earlier cohorts there was no significant correlation between education and smoking. However, they found a positive correlation between childhood socio-economic status (SES) and smoking, which later turned into the negative correlations now seen in the U.K. This shows that better resources associated with high SES may have both positive and negative health outcomes.

Britten 1928), indicating that resources alone cannot explain the social mortality gradient.[15] Therefore, in addition to the resources channel, we need to consider factors that may affect selection into the professions. We examine intelligence as a factor affecting selection since professions have high educational standards (Abbott 1988).[16]

Childhood intelligence appears to be associated with longevity. Within the timeframe of this paper, a study of all Scottish children born in 1921, who were in Scottish schools in 1932, found that childhood mental ability scores in IQ tests were positively related to survival to at least the age of 76 (Whalley and Deary 2001), with those children who were from a lower social class or from less affluent backgrounds being associated with lower scores (Hart et al. 2003a) and greater likelihood of death before the age of 65 (Hart et al. 2005).[17] Other Scottish data from the timeframe examined in this paper also show that high childhood intelligence has been associated with lower death rates attributed to coronary heart disease, stroke, smoking-related cancers, injuries, dementia, and respiratory and digestive diseases (Hart et al. 2003b; Deary, Whiteman, Starr, Whalley, and Fox 2004; Calvin et al. 2017). Hart et al. (2003a) found that the effect of childhood IQ on such mortality was partly influenced by social factors. Later, we extend the discussion of the selection channel by examining other specific characteristics.

Social Status of Early Scottish Chartered Accountants

[15] Medical practitioners had a statistically significant higher likelihood of dying from road accidents, pneumonia, suicide, respiratory diseases, and influenza, likely reflecting greater occupational exposure to such causes, while barristers had a considerably higher likelihood of dying from diseases of the heart and digestive system, and peptic ulcers, which may indicate an opulent lifestyle. The mortality rate for barristers was significantly above the average while that for clergymen was significantly below (Registrar-General 1927).

[16] This is not to suggest that only intelligence is required because factors such as social background, the type of school and university attended, and networks, have also been found to affect entry to the accountancy profession (C. Paisey, N. Paisey, Tarbert, and Wu 2020), nonetheless, the passing of entry examinations requires a certain degree of intelligence (Duff 2017).

[17] Possible explanations are that intelligence represents learning, reasoning, and problem-solving skills useful in preventing chronic disease and accidental injury, and in adhering to complex treatment regimens (Gottfredson and Deary 2004). Additionally, educational attainment (Elo 2009) and intelligence (Herrnstein and Murray 1994) also influence occupational choice and, therefore, lifestyles, which indirectly affect health and mortality.

The founders of the professional accountancy associations in Edinburgh, Glasgow, and Aberdeen were typically from the upper or upper-middle classes (Kedslie 1990a, 1990b; Lee 1996, 2010; Walker 1995, 2004). Before being placed in Class I for analysis of the 1921 census (Registrar-General 1927), chartered accountants in Scotland were already living in the better areas of cities, employed servants, and had high-status neighbors, such as lawyers (Walker 1988; Edwards and Walker 2010; Lee 2011). They were often privately educated and able to pay the high training costs necessary for entry into the profession (Walker 1991).

There were differences between the social background of chartered accountants in the Edinburgh and Glasgow societies, demonstrating that social status also varied with location.[18] The divisions between Lowland (where most chartered accountants were situated) and Highland Scotland were also stark, with the Lowlands being more aligned with England than the Highlands (Davidson 2000).[19] Differences also existed between and within urban and rural areas (Glass 1964; Liczbińska 2010; Chetty et al. 2016). The chartered accountants examined here joined the founding societies of either Aberdeen, Edinburgh, or Glasgow. These cities had different characteristics in the time period under examination, which could have impacted on lifespan.[20] We therefore analyze life expectancy for members of the three societies.[21]

Edwards and Walker (2010) used data from the 1881 census that only identified "accountants" and, as they acknowledge, was not intended as a social status hierarchy. We use the 1921 census classification of occupations which reliably distinguished "chartered

[18] Edinburgh chartered accountants came mainly from the highly respectable upper and middle classes (Lee 2004), often from legal families, while most in Glasgow came from the merchant classes (Briston and Kedslie 1986; Kedslie 1990b), which is consistent with Edwards and Walker's (2010) findings about Edinburgh accountants in the 1881 census.

[19] Edwards and Walker (2010)'s conclusion applied to the U.K. as a whole, not just to Scotland, so a finding of similar social standing throughout both England and Lowland Scotland is not surprising.

[20] For example, Aberdeen's economy centered around farming, fishing, and granite quarrying, Edinburgh was dominated by the law and banking, and Glasgow was predominantly an industrial city. Weather varied, as did pollution and housing conditions, both within and between cities.

[21] Our data do not enable us to investigate location further because the founding institute does not necessarily equate to where the early Scottish chartered accountants were born, grew up, worked, or died. While it is reasonable to assume that many people would have trained with the institute closest to where they lived, we can see from our data that place of death was not necessarily the same as institute location. This matters because some locations had better access to healthcare and this can add to expected life (Finkelstein, Gentzkow, and Williams 2021).

accountants" from "accountants" for the first time. It was also intended to be a social status hierarchy, which allows us to extend the insights of Edwards and Walker (2010). Importantly, following the changes in the 1921 census, the social mortality gradient had been identified as a concern. This helps to avoid the difficulties of utilizing modern theoretical perspectives to test historical data (Barzun and Graff 1977, 43; Previts and Bricker 1994).

This section has shown that during the sample period, Scottish chartered accountants had lifestyles that are consistent with high social status (Edwards and Walker 2010). This observation, combined with evidence on the social mortality gradient, leads to the following initial hypothesis:

H1: Early Scottish chartered accountants lived longer than the general population.

The findings relating to this hypothesis provide necessary background for consideration of the impact on lifespan of social mobility and the role of the resource and selection channels.

Social Mobility of Early Scottish Chartered Accountants

The term "social mobility" refers to changes in social position (McKnight 2015) and can be upward or downward, horizontal, intra- or inter-generational, absolute, or relative. This paper focuses on "upward social mobility", where individuals are "upwardly mobile".

The accountants who founded the three Scottish professional accounting bodies (Macdonald 1984; Kedslie 1990a) and those who joined in the first twenty-five years (Lee 2004) came predominantly from higher social class backgrounds. Nonetheless there is evidence that just under 30 percent experienced upward social mobility (Briston and Kedslie 1986). There were also geographical differences, with more of the early Edinburgh chartered accountants coming from elite-upper and upper-middle class backgrounds than those in Glasgow and Aberdeen (Lee 2004).

Beyond the early days, there is evidence that the accountancy profession became more socially diverse. Edinburgh chartered accountants recruited 36 percent of their number from lower social classes between 1880 and 1941, while in Glasgow 53 percent of the chartered accountancy students in the 1930s came from lower classes (Matthews 2017). Interestingly, a present-day study of newly qualified Scottish chartered accountants shows that 73 percent have parents in the professional and managerial classes (Paisey et al. 2020). Therefore, the proportion of upwardly mobile Scottish chartered accountants, which increased as the profession expanded, seems to have returned to nearly the original levels.[22]

Recent interest has turned to social mobility. Emerging evidence indicates that the social mortality gradient is sensitive to social mobility, specifically that those who have enjoyed high socio-economic status from childhood have better health and greater longevity than those from lower socio-economic status in childhood but who then achieved high socio-economic status in adulthood. Factors that appear to differentially affect children of different socio-economic groupings include levels of cumulative stress (Zannas and Chrousos 2017) and likelihood of college attendance (Power, Matthews, and Manor 1996). In the U.K., this has led to calls to increase access to higher education for under-represented demographics (Montacute and Cullinane 2018). These calls lend credence to the notion that increased educational achievement leads to a healthier life (Easterbrook, Kuppens, and Manstead 2016).

Selection Into Chartered Accountancy

We now extend the importance of the social mortality gradient's selection channel in the general population to the factors that are particularly associated with chartered accountancy. High levels of conscientiousness (Hill, Turiano, Hurd, Mroczek, and Roberts 2011) and risk

[22] However, social mobility in accounting is also characterized by fluidity, as evidenced by both upward and downward social mobility among immigrants to the United States of America (Lee 2009), among recent high rates of students majoring in accounting (Leiby and Madsen 2017), and partners in Big 4 accountancy firms, many of whom were from less high socio-economic status family backgrounds (Carter and Spence 2014).

aversion (Simon-Tuval, Shmueli, and Harman-Boehm 2016) tend to lead to longer lives. Evidence from earlier periods is lacking, but high levels of conscientiousness have been found among accounting students (Davidson and Etherington 1995; Perlow and Kopp 2004; Farag and Elias 2016). Risk aversion has been found in accounting students (Leiby and Madsen 2017) and professionally qualified accountants (Martin and Previts 1982; Helliar, Lonie, Power, and Sinclair 2002; R. Hoitash, U. Hoitash, and Kurt 2016). Selection into accountancy can also be influenced by the perceptions of potential recruits about whether they will fit into the profession (Jacobs 2003; Duff 2017).[23]

In summary, we investigate whether a life expectancy premium exists by virtue of socio-economic status at birth, as indicated by the occupations of the chartered accountants' fathers, or because of subsequent factors. Subsequent factors include the accountants' lifestyles brought about by adult socio-economic status and associated resources, which may relate to ability to prevent certain causes of death, and other selection effects that may play a role in increased longevity. We therefore hypothesize that, even though the socio-economic status of all chartered accountants in adulthood may be similarly high, their life expectancy will be also influenced by their childhood social class:

> **H2: Early Scottish chartered accountants from low socio-economic status families have a different lifespan than early Scottish chartered accountants from high socio-economic status families.**

We do not predict a direction in this hypothesis as the literature review has shown that there are competing views on the link between family socio-economic status and lifespan. Evidence from outside accounting (Hart et al. 2003a; Zannas and Chrousos 2017) points to low childhood social status being associated with poorer health and shorter lifespan. However, accountants from lower social status and/or traditionally under-represented groups, such as females, are

[23] With all selection effects, a degree of caution is required. It cannot be assumed that choices and democratic rights in the current era existed to the same extent in the sample period. However, the evidence suggests that chartered accountants are likely to possess these particular personality traits.

likely to be more conscientious (Davidson and Etherington 1995) and risk-averse (Leiby and Madsen 2017) than high social status or male accountants. These qualities are associated with longer lifespan (Hill et al. 2011; Simon-Tuval et al. 2016). We combine data on age and cause of death with social origins, intelligence, gender, location, changes over time, incidence of various causes of death, and ability to prevent preventable cause of death to test our second hypothesis.

III. RESEARCH METHOD AND DATA

We collected data from two main sources. Our primary data source is the ICAS, which provided a record of 7,881 member deaths. In order to comply with ICAS data protection requirements, we received only details of gender, date of birth, date of admission to membership (joining date), and date of death. The death observations in the ICAS dataset related to the period beginning 1951, the date when the bodies in Edinburgh, Glasgow and Aberdeen amalgamated to form the ICAS. At that time, ICAS had transferred the details of current, living, members but had not transferred the details of members of the three founding bodies who had died prior to the 1951 amalgamation. The archived records of the founding bodies could not be used because they did not consistently record dates of birth and deaths. Therefore, our second source is a hand-collected record of 1,284 deaths before 1951 taken from *The Accountant's Magazine*. We estimate that the 9,165 deaths from these two sources represent approximately 87.5 percent of all ICAS members who have died since foundation in 1853 (see Table 1). 756 cases for which birth and/or death details were missing were excluded. The remaining observations were manually checked for obvious data errors, such as age at death or at admission being too low or too high to be likely. This led to the exclusion of 23 observations, leaving 8,386 observations. We then manually collected death details from *The Accountant's Magazine* from 1951 to identify and cross-check the data provided directly by ICAS as names were necessary to collect further data from death and birth certificates.

To calculate reliable life expectancy estimates from the death data only, we limited our sample to members who were admitted to ICAS before 1941 since the oldest surviving member, who had been admitted on September 26, 1940, had just died. We thus include only membership year cohorts for which we have complete data on longevity. Finally, we excluded 318 duplicate records and 108 war deaths. Chartered accountants suffered a disproportionately high war death rate in both world wars, but especially so in the First World War (Walker 2017). Their inclusion would distort not only our analysis, but also the comparability of the ICAS data to the general population. Our final sample size is 4,043 members of ICAS and preceding bodies for whom we have complete records with details of birth, admission, death, and gender for year group cohorts where we can be certain that all members have died. This enables a complete distribution of the actual life expectancy for these cohorts to be calculated. The sample selection is summarized in Table 1.

Each record was then manually matched with the corresponding male or female cohort expectation of life taken from the 2016-based National Population Projections Lifetable template for England and Wales (Office for National Statistics (ONS) 2018). For example, if a male ICAS member joined ICAS in 1910 at the age of 24, we use cohort life expectancy data for a man of 24 years of age in 1910. We use English life tables rather than the Scottish equivalents because the English life tables break down life data into shorter time periods. This is appropriate because not all ICAS members died in Scotland and, crucially, provides greater precision in data while being consistent with Scottish data. We compared the Scottish and English life tables for our time period and confirmed that there was no significant difference in life expectancy in the two countries.[24] We use cohort life expectancies that are calculated using age-specific mortality rates, which allow for known or projected changes in mortality in later

[24] A phenomenon, colloquially known as the "Glasgow effect," shows wide health inequalities between Glasgow and the rest of Scotland and the U.K. A review of data from 1925 to 2005 shows that this dates predominantly from the 1970s (Campbell, Ballas, Dorling, and Mitchell 2013), so would have had little effect on the deaths reported in this paper.

years and provide an unbiased benchmark for the actual lifespans of the ICAS members.[25] We calculated the actual number of years lived by each individual in our sample after their admission to ICAS and the difference between actual and expected values.

We collected data on paternal occupation (as a proxy for childhood social status), and on cause of death from death certificates. We used death certificates when we could positively identify the person based on exact name spelling, and correct dates of birth and death (or years where exact dates were unavailable). If we could not match these details, we searched for a birth certificate in order to ascertain the father's occupation. This generated 2,074 cause of death observations and 3,113 fathers' occupations.

Based on Susser et al. (1985), we selected and mapped three categories of causes of death that had the highest gradient linked to social class and could be classed as preventable: infectious and parasitic diseases, diseases of the respiratory system, and accidents, poisonings and violence. We use an ESRC/Cambridge University dataset (Davenport 2012a) for the population data to 1949 and the detailed data on causes of death in Scotland available from the World Health Organization for the period from 1950 (World Health Organization (WHO) 2019). Since Scottish classification underwent a number of changes for each period (Davenport 2012b), the causes of death are mapped separately, using the highest-level classification when possible. We categorize the causes of death as follows: 1 = Infectious and parasitic diseases; 2 = Diseases of the respiratory system; 3 = Accidents, poisonings, and violence; 0 = Others (excluding war deaths). We use the list of occupations as prepared for analysis of the 1921 census (Registrar-General 1927, Table A) to allocate fathers' occupations to social classes.

[25] We do not use period life expectancy, which is an estimate of the average number of years people would live if they experienced a particular area's age-specific mortality rates for the remainder of their life. This differs from how long a person could expect to live because death rates are likely to change in the future. We calculate cohort life expectancy because this is regarded as a more appropriate measure of expected average lifespan and is an unbiased benchmark for the actual lifespans of the ICAS members.

Our dataset has several advantages. It eliminates infant mortality as a major cause of inequalities in life expectancy. It spans a longer timeframe (87 years) than previous studies of the social class of accountants. It avoids definitional difficulties because we focus on "chartered accountants" rather than simply "accountants." This dataset covers a considerably larger population than previous studies that focused on subgroups such as "leading accountants," which makes it less likely to be skewed by an elite, wealthy, group of people who hold the highest positions.

Sample Characteristics

Descriptive statistics relating to 4,013 men and 30 women are presented in Table 2.[26] The age at admission/joining shows a wide range because the age of the founding members spanned the full range when the three original bodies were formed. The typical joining age is approximately 21 to 28 years (24.91 +/−3.52 years), which reflects a typical apprenticeship duration following full-time education. The mean age at death is 71.88 years (median = 74). We can identify the founding body for most members who joined before 1951. The institute in Glasgow was bigger than its counterpart in Edinburgh, while the Aberdeen body was always small. Our data reflects this distribution, with 2,511 Glasgow, 1,332 Edinburgh, and 191 Aberdeen members.

Panel A of Table 3 shows the distribution of our sample by admission decade. ICAS grew over the years. Accordingly, the number of observations increases for later years, such that 69 percent of our sample joined ICAS in the period from 1921 to 1940. Someone admitted to ICAS in 1921 would have been approximately 24 years of age, hence would have been born around 1897. Our admissions from 1853 to 1940 thus represent chartered accountants born from circa 1786 to 1916. This provides a broad timeframe for our study, and 87.5 percent

[26] The gender split is in line with expectations since the first female member of ICAS was only admitted in 1923 with 25 being admitted in the period to 1929 (Shackleton 1999).

coverage of ICAS membership, hence improving the extent and depth of our data relative to prior studies that utilized smaller samples or were based on more limited census data (for example, Macdonald 1984; Briston and Kedslie 1986; Kedslie 1990a, 1990b; Lee 2004; Edwards and Walker 2010).

IV. RESULTS

Life expectancy is often estimated at birth (i.e., how long, on average, a baby born in a particular year could expect to live). However, since infant and child mortality was high prior to the 20th century, it is often preferrable to consider life expectancy at a later age. To that end, we use a point in time common to all the accountants in our sample: their joining date. This allows us to control for factors such as parents' wealth and social class that are not directly related to the accounting profession, but are likely to affect childhood mortality. This enables us to use a more accurate test for the social mortality gradient theory, where our main explanatory variable for differences in life expectancy is belonging to the accountancy profession.

Panel A of Table 2 shows that ICAS predecessor members experienced significantly longer lifespans (46.98 years) than the general population (43.98 years) based on the date when the members joined their professional body. This mean premium of approximately three years (median = five years) is significant at the 1 percent level and is the first result supporting our hypothesis H1.

In Panel B of Table 2 we present univariate analysis showing the difference between the remaining life expectancy for ICAS members at admission (using general population data) and their actual lifespan after admission, as classified by time period, founding body, and gender. The life expectancy premium was 4.54 years for members admitted from 1853 to 1900, and fell to 2.81 years for members admitted from 1901 to 1940.

We have data for 4,034 members regarding which of the three founding bodies they joined (Edinburgh, Glasgow, or Aberdeen). Prior research had indicated that the Edinburgh accountants came predominantly from higher social classes, often with legal backgrounds, whereas the Glasgow accountants were typically from merchant classes. The Edinburgh accountants might therefore live longer than those from Glasgow if original social background is used a determinant of life expectancy. However, when we split the 4,034 observations geographically, we do not find such a pattern. On average, the difference between actual and expected longevity for Aberdeen members (3.91) exceeded that for Edinburgh (2.87) and Glasgow (2.94) members by 1.04 and 0.97 years, respectively. However, these differences are not statistically significant due to the small sample size of known Aberdeen members (191 people). The difference between Glasgow and Edinburgh members is negligible, which provides preliminary evidence that pre-admission social class did not influence overall life expectancy.

Men lived 2.98 years longer than the general male population. The higher life expectancy premium of a little more than six years for females should be interpreted with caution as very few women, most likely from high status backgrounds, entered the profession in the early years. When we test for gender differences in the subsample of members admitted since 1923, when the first woman was admitted, the gap widens slightly, but is still not statistically significant. In general, longer life expectancy is particularly pronounced for earlier time periods, while gender and geographic location do not make a significant difference.

Table 3 presents time trends in life expectancy using non-overlapping cohorts for statistical testing, following Hatcher, Piper and Stone (2006). Table 3, Panel A shows a substantially higher life expectancy premium for members admitted before 1870 (over 11 years), compared with those admitted later (between 1.37 and 4.98 years, depending on the exact time period), with differences statistically significant at the 1 percent level. This finding is consistent with the pre-1870 accountants being from a higher social class. Table 3, Panel B also shows that they were older than more recent members when they joined the accounting bodies. Even after the initial decline, however, there remains a significant life expectancy premium over the general population.

Figure 1 plots the average life expectancy premium (Figure 1A) and post-admission expected and actual lifespan (Figure 1B) by year of admission. Figure 1B shows clearly a variable, but almost always positive, life expectancy premium for the members of the three bodies.[27] The life expectancy at admission also varies, although less so, but with a slight upward trend that would be expected given better life expectancy throughout the 20th century. This is also consistent with whole-population life tables reflecting advances in medical practice. Overall, Tables 2 and 3 and Figure 1 show clear support for the social mortality gradient (H1).

Social Origins versus Social Mobility

The literature review has shown that there are several possible explanations for the significant improvement in longevity enjoyed by Scottish chartered accountants compared to the general population. Their longevity could be attributable either to their better financial status and access to other resources after joining the profession, to a higher social class to which they belonged by birth, to the effects of self-selection into the accountancy profession, or a combination of these factors. In this section, we aim to disentangle the effect of social class at birth and social mobility that enabled upwardly mobile accountants to benefit from the greater

[27] In early periods, the lows and highs on the life expectancy graph do not always correspond to specific events, but rather reflect the small number of observations. For example, the dip in both expected and actual life expectancies in 1866 is caused by the fact that we only have data for three new members joining the profession, with an above-average age of 37 years. We therefore aggregate data over time periods to provide more robust results. However, some of the dips in the life expectancy premium correspond to periods of significant wars, when the members of the accountancy profession were possibly overrepresented compared to the population, and which likely resulted in above-average mortality due to war-related injuries and illnesses. For example, we observe lower premiums in or around 1873 (Third Anglo-Ashanti War), 1879 (Second Anglo-Afghan War and Anglo-Zulu War), 1902 (Second Boer War) and 1917 (World War I).

resources at their disposal. To this end, Table 4 presents the distribution of our chartered accountants by social class of their parents (Panel A), tests for the association between childhood social class and other factors (Panel B), and the distribution of career progression and longevity variables by social background (Panel C). We refer to selection effects later.

Table 4, Panel A shows that a disproportionate number of accountants (24 percent) had upper or middle class fathers compared to only 2 percent of the general population. Only 0.2 percent of accountants had fathers who were in unskilled occupations, which is significantly lower than the corresponding 12 percent general population. These differences in social class distribution are clearly pronounced and strongly statistically significant. Panel B of Table 4 presents the non-parametric tests for the association between childhood social class on one hand, and gender, ICAS original body, and time period on the other hand. The results show that there are significant differences in social class among members from different institutes, as well as across time periods, but not between genders.

Given these observations, we investigate the effect of childhood social class on life expectancy of members of the accountancy profession. Panel C of Table 4 presents mean values of the main variables of interest, classified by childhood social class, and the value of F-test for differences between categories. The only statistically significant difference is the somewhat higher age of admission for members from lower social classes (for example, children of unskilled workers on average were admitted at the age of 27.17 years compared to 24.98 years for children in the highest social class). This result might reflect differences in education and career opportunities. It is also in line with Fogel (2004), who shows that chronic malnutrition, which affects susceptibility to infections, is the key determinant of lifespan over time and across classes. Age at death, post-admission lifespan, and longevity premium are all not significantly different between childhood social classes. This evidence provides further support for the claim that more of our accountants' health and longevity benefits are likely to stem from the resources provided by the higher social standing after admission rather than from a high social class childhood prior to joining the profession. This also reinforces the potential benefits of upward social mobility. However, our results are also consistent with an alternative hypothesis of selection effects, where factors associated with accountants, such as risk-aversion and intelligence, can also result in higher longevity even after controlling for socio-economic status at birth.

Table 5 presents the results of multiple regressions that further refine the results presented in Table 4 by controlling for age at admission, population life expectancy, gender, and time period when a person was born. Column 1 of Table 5 presents the base case regression of the age at death on age at admission, time-, age- and gender-specific expected age at death, and indicator variables for time period and gender. We observe that the results are similar to those presented in the previous univariate estimations, with significantly longer life (compared to the general population) observed for the earliest time period. Columns 2, 3, and 4 add two types of proxies for childhood social class to the base case regression. Based on Lee (2004), we use an indicator variable for the Edinburgh society (omitted founding body category) as a proxy for higher social status in Columns 2 and 3, with dummies for Aberdeen and Glasgow representing lower social status. Column 4 uses dummy for father's occupation as a proxy for childhood social status. Since we cannot observe father's occupation for every case, in Column 3 we also re-run the regression reported in Column 2, using the smaller sample with all data available, to see whether the coefficient changes result from the sample change or from the use of a different proxy for social status. In Column 5 we combine all available variables in one regression.

In all four regressions, our proxies for social class are not statistically significant. The only evidence for the impact of childhood social class on longevity is the positive impact of being located in Aberdeen over Edinburgh, which we observe in Columns 3 and 5. This may be also considered as evidence of the longevity advantages of rural over urban areas given that Aberdeen, at the time, represented a less urbanized area than Edinburgh. However, such interpretation is not supported due to the lack of significant differences between Aberdeen and Glasgow. Therefore, we cannot reject the null hypothesis that childhood social class does not affect longevity of accountants in our sample. Figure 2 presents the time series of the life expectancy premiums, classified by social class (Figure 2A) and geographic location (Figure 2B). These graphs show that, while in the earlier time periods higher social classes enjoyed relatively higher life expectancy, this difference disappeared beginning with the cohorts that joined accounting institutes at the end of the 19th century. Around the same time, the small longevity advantage of Glasgow over Edinburgh members was reduced to nearly zero. Based on the results in Tables 4 and 5 and Figure 2, we do not find a confirmation that birth status or early childhood factors explain the longer lifespans enjoyed by the chartered accountants.

Factors Contributing to Longer Lifespan of Chartered Accountants

Our final analysis turns to the possible channels through which belonging to the accountancy profession might provide the longevity benefits documented above. Following social mobility theory, higher socio-economic status is likely to lead to improved health, lower mortality, and higher life expectancy. Panel A of Table 6 presents the analysis of the prevalence of three major categories of the preventable causes of death (CODs) in our sample. Overall, 20.64 percent of identified CODs belong to one of the three preventable categories, with respiratory diseases accounting for most of these deaths. Panel B shows the distribution of preventable CODs by (childhood) social class. Although there is a modest increase of the share of preventable CODs from 18 percent in the highest class to 25 percent in the second lowest one, these differences are not statistically significant. Note also that no deaths in the lowest class are attributed to one of these preventable CODs. Thus, once we control for high social class in adulthood, childhood social class cannot be related to health and longevity outcomes.

Panel C demonstrates that the percentage of preventable CODs among the typically higher class Edinburgh accountants (22.2 percent) is not statistically different from the other bodies. Panel D indicates that the pattern did not significantly change over time. Finally, Panel E relates different categories of CODs to longevity. Deaths from infectious diseases and violent causes are associated with lower lifespans. Deaths from respiratory diseases tend to happen later in life, and we therefore observe a higher longevity premium for this category. Therefore, we cannot simply relate the preventable cause of death to longevity. In the further analysis we compare different CODs against the general population, controlling for time period and age.

In Table 7 we combine the factors that we considered in Table 6 as potential contributors to dying from a preventable cause, in a set of multiple regressions. Columns 1 and 2 of Table 7 present the results of estimating probit regressions, where the dependent variable is equal to 1 for a preventable cause of death, and 0 otherwise. Columns 3 and 4 estimate linear probability regressions. The univariate results shown in Table 6 are generally confirmed when controlling for all factors in one regression. Living in Glasgow appears to weakly reduce the chances of dying from a preventable cause (by about 4 percent compared to the base case of Edinburgh (omitted category), using linear probability estimates). Belonging to the highest social class also reduces probability of death from preventable causes by 4 percent compared to the base case of social classes III, IV and V combined. However, this effect does not apply to social class II.

In Table 8 we compare the mortality from different causes in our sample to the population of Scotland, using 65 years as a breakpoint for age categories. Our time periods are based on the cause of death reporting changes in Scotland, with several earlier periods merged into one (1863 – 1910) in order to obtain sufficient numbers of observations. Panel A presents the results for deaths below age 65 and Panel B presents deaths at age of 65 and over. Each cell in the corresponding panels shows (1) the percentage of deaths from the specified CODs in the sample, (2) in the general population, and (3) p-value of left-tailed binomial tests of the null hypothesis that the sample proportion of deaths from that COD is the same as the general population. (The alternative hypothesis is that accounting professionals are less likely to die from these preventable CODs).

Table 8, Panel A, demonstrates that there was a dramatic decline in two out of three categories of preventable CODs, namely infectious and respiratory diseases, over a time of improved healthcare and sanitation. While almost 30 percent of deaths in under-65s in 1863–1910 were caused by infectious and parasitic diseases, their share declined to only 1 percent in 1968–1978. Similarly, deaths due to respiratory diseases fell from 18 percent in 1863-1910 to only 8 percent in 1968–1978. A similar trend is seen among the accountants, although their percentage of deaths from preventable causes is generally considerably lower compared to the Scottish population. For example, their percentage of infectious diseases declined from 18 percent to zero. In sum, the accountants consistently outperform the general population when all three categories of preventable CODs are combined. Health improvements lowered the total percentage of preventable CODs examined from 57 to 19 percent, while the share of these deaths among ICAS members also declined from 37 to 9 percent. Therefore, better overall population health provided a natural limit to the health-related benefits of belonging to the accountancy profession.

Interestingly, the rate of deaths from respiratory diseases among older accountants in the earliest and in the most recent time periods has exceeded the population deaths from such illnesses (Table 8, Panel B). For example, in the most recent time period, almost 25 percent of the deaths of chartered accountants aged 65 and over were due to respiratory diseases compared to 14 percent in the general population. This difference is both large and highly statistically significant. In the only incidence of the respiratory deaths being higher in our sample compared to the population in the younger cohort (reported for the time period 1968–1978, see Panel A), the difference is not statistically significant, and the results are virtually identical (8.3 percent in the sample versus 7.9 percent in the general population; left-sided p-value of 0.653 versus right-sided p-value of 0.491). Yet, despite this result, we still find a positive gap in longevity between the accountants and the general population, even in the most recent period. A likely explanation for the discrepancy is that the effect of the three categories of preventable diseases on life expectancy is not the same. For example, median ages at death for infectious, respiratory, and violent deaths in our sample are 52, 79, and 51.5 years, respectively. Respiratory illnesses take longer to develop and, therefore, decrease lifespan to a lesser extent. Thus, dying from a respiratory disease appears to be both a preventable death and a result of living long enough to allow such a disease to develop.

There are two factors that might help explain the higher prevalence of deaths from respiratory diseases among accountants: smoking and air quality in big cities. Recent large-scale epidemiological studies show that almost all deaths due to lung cancer can be traced directly to smoking. For example, Jha et al. (2013) estimate that 93 percent of lung cancer deaths among male smokers could be attributed to smoking. The associated hazard ratio was 14.6, meaning that the rate of deaths from lung cancers was almost 15 times higher among male smokers compared to male non-smokers. However, only 60 percent of male smokers' deaths from all causes can be traced back to smoking (hazard ratio of 2.8) (Jha et al. 2013). Although previous studies suggest that smoking is a critical factor, our data do not allow us to analyze this in detail as we do not have information on whether accountants in our sample were smokers. We observe only 35 cases (1.8 percent of our identified causes of death) where lung cancer is listed as a cause of death. Although the mean longevity premium of −0.2 years and the median of 2 years are both below the premiums found for the entire sample of chartered accountants, there is insufficient direct evidence to suggest that smoking-related deaths significantly impact our results based on the low number of cases. However, it is likely that smoking is one of the causes for the uptick in respiratory deaths in our sample based on the clear link between smoking and respiratory diseases in general (Jha et al. estimate the corresponding hazard ratio for male smokers at 9.0), and on the prior studies that suggest high prevalence of smoking among higher socio-economic status individuals. Another possible (and not mutually exclusive) explanation for the higher rates of respiratory diseases among chartered accountants is the higher level of air pollution in major cities.[28] Since accountants would often have resided in cities in order to be closer to their clients, they would have been exposed to more air pollution than the rural population. These examples show that there were also hazards associated with the higher socioeconomic status of chartered accountancy.

Overall, the results reported in Table 8 support the earlier observation that better health conditions serve as a channel for translating the socio-economic advantage of higher social class into higher longevity. At the same time, dwindling differences in preventable CODs between our accountants and the general population might explain why the longevity premium decreases over time. Panel B shows that, for the older age category, the differences between accountants and the population are almost negligible, and actually negative for the latest time period. Therefore, it seems that the health and longevity benefits of chartered accountants were primarily in reducing premature deaths from preventable causes in the younger population.

In order to test whether intelligence levels (Calvin et al. 2017; Gottfredson and Deary 2004) and IQ scores (O'Toole 1990; O'Toole and Stankov 1992) might have contributed to the higher life expectancy observed among chartered accountants, we use the unique international context data from the Scottish Mental Survey. The Moray House Test No. 12 (MHT) intelligence test was administered on Wednesday, June 1, 1932 to children who were born in

[28] Other possible sources of lung cancer include exposure to asbestos and radon, and indoor and outdoor pollution, due to the use of coal and firewood for heating and cooking, and coal mining and coal-burning power plants. Central Scotland, where most chartered accountants lived, had many coal mines. While the health consequences of such factors were not known in our time period, they are likely to have adversely affected the life expectancy of the baseline general population more than those living in larger homes in more affluent, less high density, and polluted areas.

Scotland in 1921. The test results were highly correlated (with the coefficient of correlation of 0.8) with the Stanford-Binet Intelligence Test.[29] The population average MHT score for boys was 34 (out of 76). We obtained anonymized scores for a matched sample of 25 of our chartered accountants born in 1921 (mean MHT = 53). The (untabulated) t-test for the difference with the population score reveals that the difference is highly significant (at the 1 percent level).[30] Therefore, we can conclude that ICAS members at that time had significantly higher intelligence compared to the population. This may have contributed to their longer lifespan.

Overall, we find that accountants in our sample had a significantly higher life expectancy than the general population. This result is consistent across time periods, and across both men and women in our sample. We find that modern improvements in public health and welfare did not lead to the disappearance of this longevity premium. Since Scottish chartered accountants enjoyed high socio-economic status (Edwards and Walker 2010) and high intelligence, our results are consistent with the social mortality gradient theory. However, our tests cannot rule out the alternative explanation that other factors, such as high intelligence and possibly risk-aversion (which are also positively correlated with longevity), are likely to influence self-selection into the accountancy profession.

Data and Methodology Limitations

Problems associated with research on mortality include bias in samples due to age, place of residence, social class, and likelihood of death being commemorated (Vena, Sultz, Carlo, Fiedler, and Barnes 1987). We acknowledge that our method of collecting data on the earliest members of the ICAS results in under-representation because *The Accountant's Magazine* was not published until 1897. It is also possible that deaths were more likely to be

[29] Further details of the Scottish Mental Survey are available in Deary, Whalley and Starr (2009).
[30] We provided names and dates of birth of accountants in our sample born in 1921, to Professor Ian Deary, Director of Lothian Birth Cohorts, University of Edinburgh. Researchers from this center matched these details to the children who took the test in 1932 and provided us the summary statistics of the resulting matched sub-sample.

reported for people who died during their working life than for retirees. However, our estimated inclusion of approximately 87.5 percent of deaths limits these effects. The inclusion of younger deaths would bias our results toward finding a lower average age at death. However, we still find a large gap between the general population and chartered accountants' life expectancy so we posit that this does not undermine our results. The true gap is likely to be greater than our results indicate.

V. DISCUSSION AND CONCLUSIONS

Our findings show that members admitted to the three Scottish accountancy bodies between 1853 and 1940 benefitted from a life expectancy premium that averaged three years, but varied over time. Belonging to a higher social class was associated with the highest longevity benefits in the early years, when the general level of health care and sanitation was the lowest. The average life expectancy gain for accountants joining before 1860 was a staggering 13.44 years. Since chartered accountants enjoyed a high status in society (Edwards and Walker 2010), these findings are consistent with the social mortality gradient theory.

The effects of selection into the accountancy profession also need to be acknowledged since the longevity gains levelled off rather than disappeared. Those who joined after 1931 lived an average 2.52 years longer than the general population. This was also a time when an expanding accountancy profession provided more opportunities for upward social mobility. Since these accountants possessed above-average intelligence, our findings are consistent with both the existence of a social mortality gradient and with specific selection effects.

Our most important contribution to the literature is in the attempt to disentangle the effects of social origin and social mobility on the longevity benefits derived from being in a higher social class, while also being mindful of selection effects. Our data on the occupation of the fathers of ICAS members (our proxy for social status at birth), combined with the geographical location of each member's original accountancy body (which also reflects different class backgrounds) (Kedslie 1990b; Matthews 2017), deliver evidence that is consistent with the notion that longer life expectancy is not driven by social status in childhood. Therefore, the longevity benefits that we find appear to come either from higher social status in adulthood, which confirms the benefits of upward social mobility, or from the effects of non-random self-selection into the profession that is driven by factors such as high intelligence and risk-aversion, which are positively correlated with longevity, or both.

We then investigate the possible factors that facilitated these benefits. Our early finding of the relative lack of importance of social origins suggests that it is unlikely that high social status in childhood continues to ensure longer life expectancy. A possible mechanism, recognized over a long timeframe (for example Registrar-General 1927; Link and Phelan 1995) is based on professionals having better access to a range of resources, which reduce the chance of premature death from common preventable causes. To test this conjecture, we use causes of death as noted on death certificates and identify three categories of common preventable causes (infectious and parasitic diseases; respiratory diseases; and accidents, poisonings and violence) in order to compare the relative frequency of their occurrence in our sample with that in the population (controlled for gender, age, and time period). We find that most deaths from preventable causes were significantly less frequent among ICAS members compared to the population, especially in the under 65 age category. This difference persists even as advances in healthcare reduced the prevalence of preventable causes of death significantly across the entire population, which is consistent with Link and Phelan’s (1995) findings. Another possible mechanism to explain the positive correlation between chartered accountancy and longevity is the non-random matching of people with careers. If factors influencing accounting career selection, such as risk-aversion and high intelligence, are also correlated with healthier behaviors, our results on deaths from preventable causes are also consistent with selection effects. It is important to note, however, that our finding that chartered accountants in the oldest age groups were more likely to die of certain respiratory conditions than the general population is a specific exception to Link and Phelan's (1995) theorization. This finding highlights potential direct costs to upward social mobility in the form of class- and occupation-related illnesses that may be more prevalent in higher socio-economic status populations.

Taken together, our findings provide new insights into social mobility in the early accountancy profession in Scotland. At an individual level, we find greater upward social mobility than prior research. For entrants between 1853 and 1940, only 24 percent were inter-generationally stable, while 44 percent moved from Class II to Class I, which is consistent with evidence that most upward mobility is to an adjacent class (Goldthorpe 1987). The fact that 32 percent moved from Class III or below to Class I shows that a high degree of social mobility was possible. Our finding that upwardly mobile accountants had improved lifespans provides support for one important benefit of upward social mobility. However, our anomalous finding of more respiratory deaths among chartered accountants aged 65 and over highlights an individual cost of high achieved socio-economic status despite greater longevity overall.

The overall longevity benefit does, however, need to be contextualized. In the period under consideration, the growth of professional accountancy bodies owed much to the increased need for accountancy services, but labor markets can be influenced by events beyond the control of those they most affect. For example, the Scottish Highland clearances offered opportunities for eminent Edinburgh accountants to act as trustees on insolvent estates at a time when famine directly affected the Highlanders' life chances (Walker 2003). Therefore, the benefit experienced by chartered accountants could be as a result of their greater opportunities or choices. It could also due to the reduction of the wealth of people such as the Highlanders, which resulted in a gap because the general population had artificially or regulatorily lower life expectancy. Similarly, the slave trade was profitable, and required detailed accounting practices throughout the 17th and 18th centuries through conversion of slave exchanges, holdings, and outputs into monetary terms (Fleischman and Tyson 2004). Later, trade with Britain's colonies, which is now viewed as having impoverished many of the colonial regions, flourished (Poovey 2003). Scottish professionals, including chartered accountants, were over-represented in relation to their population size (Devine 2008) in leading roles in the East India Company and the Canton-based Jardine Mathieson & Co. (McGilvary 2011). Thus, while the growth of accountancy bodies provided enhanced opportunities, including upward social mobility, these also had a social cost.

This is the first true study of the life expectancy of chartered accountants because Registrar-General (1927) and (Woods 2000) did not examine the accountancy profession. Our study includes a large sample size over a long timeframe and avoids definitional difficulties as it only includes "chartered accountants." Our study uses a consistent method of classifying occupations (Registrar-General 1927) and uses death statistics from the same time period for consistency (Hatcher, Piper, and Stone 2006). Overall, by drawing on official government sources to examine socio-economic status, social mobility, and cause and age of death, it shows an early accountancy profession that grew rapidly, provided considerable opportunities for upward social mobility, and enabled its members to have a long lifespan.

Future research could be undertaken to compare in more detail the life expectancy of chartered accountants with that of other professionals and to investigate whether the findings we report are also evident in other countries. Also, it would be informative for future research to investigate whether the upward social mobility that we find is consolidated in the next generation, with the children of upwardly mobile chartered accountants maintaining the socio-economic status of their parent. Finally, the number of females in our sample is small because this project was confined to chartered accountants admitted before 1941 since there were still living members in subsequent admission years. When a future project extending the time period becomes possible, gender effects could be investigated more reliably.

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TABLE 1: Sample selection

Data provided by ICAS on its 160th anniversary—total estimated number of members of ICAS and previous constituent bodies in Edinburgh, Glasgow, and Aberdeen (per email of 10/24/14)	29,741	
Note provided by ICAS in email of 10/24/14: "This figure is based on the data we hold within our database, however I have a spreadsheet of membership numbers from 1864, which notes: "Just under 1,000 original members who had resigned or died before 1951, were not included in the amalgamated ICAS Membership Roll Book in 1951. Only active members were entered in admission date order with the appropriate membership numbers corresponding to the date of admission.")"	1,000	Maximum
	30,741	
Membership alive at 160th anniversary date (per email of 10/24/14)	(20,261)	
Best estimate of total number of ICAS members who had died by 160th anniversary	10,480	
Total deaths obtained: From ICAS: 7,881 From *The Accountants Magazine*: 1,284	9,165	87.5%
Not usable because of missing data (756) or entries being outside plausible range (23)	(779)	
	8,386	
Number excluded because not all members of the relevant year group had died	(3,917)	
Excluded duplicates	(318)	
Excluded war deaths	(108)	
Total number of deaths used in current study	**4,043**	

TABLE 2: Life expectancy and actual longevity for ICAS members

Panel A of this table presents summary statistics of the age at admission and death, remaining life expectancy for ICAS members at the moment of their admission (using general population data), of the actual lifespan after the admission, and of the difference between the two. Panel B shows the difference between the remaining life expectancy for ICAS members at the moment of their admission (using general population data) and the actual lifespan after the admission, classified by time period, ICAS originating body, and gender. Values of t-statistics (for the mean) and Wilcoxon signed rank test (for the median) are reported in parentheses. The null hypothesis of equality between different groups is tested using ANOVA F-test (for the difference in means), Wilcoxon/Mann-Whitney test (for the difference in medians for two groups) and Kruskal-Wallis test (for the difference in medians for more than two groups). The asterisks *, **, *** denote statistical significance at 10 percent, 5 percent, and 1 percent level, respectively.

Panel A. Whole sample (N = 4043)

Variable	Mean	Std.dev.	25%	Median	75%	Min	Max
Age at admission	24.91	3.52	23	24	26	18	67
Age at death	71.88	13.89	64	74	82	22	103
Life expectancy at admission	43.98	4.20	38	45	47	10	56
Actual life between admission and death	46.98	14.34	38	49	57	0	80
Life expectancy premium	3.00*** (13.81)	13.81	-5	5*** (16.43)	13	-46	34

Panel B. Univariate analysis of the factors underlying life expectancy premium

Factor	Mean	ANOVA F-test	Median	Median test	N
Admission year		6.18**		2.62***	4043
- 1853 to 1900	4.54		7		441
- 1901 to 1940	2.81		5		3602
ICAS originating body		0.48		0.55	4034
- Aberdeen	3.91		5		191
- Edinburgh	2.87		5		1332
- Glasgow	2.94		5		2511
Gender		1.46		0.99	4043
- Male	2.98		5		4013
- Female	6.03		8.50		30
Gender – 1923 – 1940 only		1.94		1.24	2600
- Male	2.56		4		2570
- Female	6.03		8.50		30

TABLE 3: Time trends in the life expectancy premium

Difference between the remaining life expectancy for ICAS members at the moment of their admission (using population data) and the actual lifespan after admission, classified by the members' admission year. The null hypothesis of equality between different groups is tested using ANOVA F-test (for the difference in means), and Kruskal-Wallis test (for the difference in medians). The asterisks *, **, *** denote statistical significance at 10 percent, 5 percent, and 1 percent level, respectively.

Panel A. Life expectancy premium

Admission year	Mean	ANOVA F-test	Median	Median test	N obs
All	3.00	5.14***	5	45.16***	4043
1853–1860	13.44		16		32
1861–1870	11.89		12		27
1871–1880	4.98		5		61
1881–1890	5.53		8.5		122
1891–1900	1.37		3		199
1901–1910	3.51		7		349
1911–1920	3.42		5		475
1921–1930	2.73		4		1311
1931–1940	2.52		4		1467

Panel B. Age at admission

Admission year	Mean	ANOVA F-test	Median	Median test	N obs
All	24.91	30.78***	24	110.91***	4043
1853–1860	32.84		29		32
1861–1870	27.15		25		27
1871–1880	25.57		24		61
1881–1890	24.50		24		122
1891–1900	25.64		24		199
1901–1910	24.79		24		349
1911–1920	25.75		25		475
1921–1930	24.64		24		1311
1931–1940	24.59		24		1467

TABLE 4: Social background of the chartered accountants

Panel A of this table presents distribution of the social background of the 3,113 chartered accountants for whom we have data on the father's profession. Classification of social class relates to the five categories (I–V) set out in Registrar-General (1927). Percent of population in each category is based on the Registrar-General data from the same source. The last column of Panel A presents the p-values for the two-sided binomial probability test, where the null hypothesis is that the number of observed individuals in each social class is consistent with the population percentage of this social class. Panel B presents non-parametric tests of association between social background and gender, ICAS originating body, and time period. Phi coefficient is the non-parametric measure of association between two categories, distributed between 0 and 1. Pearson χ^2 test measures statistical significance of association between the categorical variables. Panel C presents mean values of quantitative measures of career progression and longevity, categorized by the social background, and the results of the ANOVA F-test for equality of means.

Panel A. Social class distribution

Social class category*	Category description	Number of observations	Percent of observations	Percent of population in the category	p-value for binomial test
I	Upper and middle	753	24.19	2.20	0.000
11	Managerial and technical	1366	43.88	20.24	0.000
111	Skilled occupations	927	29.78	45.48	0.000
IV	Partly skilled	61	1.96	19.96	0.000
V	Unskilled	6	0.19	12.10	0.000
Total		3113	100.00	100.00	

Panel B. Relation between social class and other factors

Variable	Phi	Pearson χ^2	p-value
Gender	0.05	6.32	0.18
ICAS founding body	0.16	78.36	0.00
Time period	0.12	44.16	0.00

Panel C. Social background, career progression and longevity

Social class	Age at admission	Age at death	Lifespan after admission	Longevity premium
I	24.98	71.51	46.53	3.23
II	24.68	71.29	46.61	2.37
III	24.98	70.97	45.98	2.06
IV	25.72	71.49	45.75	1.79
V	27.17	65.50	38.33	-3.50
Total	24.87	71.24	46.37	2.46
ANOVA F-test	3.30	0.44	0.82	1.15
p-value	0.01	0.78	0.52	0.33

TABLE 5: Life expectancy and social class: Multiple regressions

This table presents regressions of actual (*ex post*) age of the ICAS accountants at death on their age at admission, expected age at death (calculated as the age at admission plus the general population-based life expectancy at admission, specific for their gender, year of admission, and age at admission), time period dummy based on year of birth, gender, and two different proxies for childhood social class: geographic location and father's occupation. Dummy for founding body being Edinburgh is omitted category. Columns (3)–(5) use the subsample of individuals for whom we have father's occupation data available. Values of t-statistics are in parentheses. The asterisks *, **, *** denote statistical significance at 10 percent, 5 percent, and 1 percent level, respectively.

Independent variables	Dependent variable: Actual age at death				
	(1)	(2)	(3)	(4)	(5)
Constant	16.05	16.29	27.89	25.22	26.84
	(0.84)	(0.85)	(1.30)	(1.17)	(1.24)
Age at admission	-0.15	-0.15	-0.22**	-0.21*	-0.22**
	(-1.61)	(-1.61)	(-2.00)	(-1.96)	(-1.98)
Expected age at death	0.87***	0.86***	0.69**	0.73**	0.70**
	(2.98)	(2.94)	(2.13)	(2.24)	(2.14)
Female	4.49	4.67	7.15**	6.63**	6.97**
	(1.46)	(1.52)	(2.13)	(1.98)	(2.07)
Year of birth:					
Before 1839	10.24***	10.35***	10.26**	10.24**	10.12**
	(2.81)	(2.84)	(2.50)	(2.50)	(2.46)
1840–1859	2.25	2.39	2.57	2.59	2.50
	(0.74)	(0.78)	(0.76)	(0.76)	(0.74)
1860–1879	-0.53	-0.74	-0.03	-0.02	-0.07
	(-0.27)	(-0.37)	(-0.02)	(-0.01)	(-0.03)
1880–1899	0.30	0.39	1.54	1.57	1.53
	(0.23)	(0.31)	(1.07)	(1.09)	(1.06)
1900–1909	-0.44	-0.39	0.02	0.07	0.04
	(-0.59)	(-0.53)	(0.03)	(0.08)	(0.04)
Founding body:					
- Aberdeen		1.39	1.98*		2.08*
		(1.30)	(1.70)		(1.77)
- Glasgow		0.48	0.42		0.48
		(1.01)	(0.77)		(0.89)
Social background					
- Class I (Upper and middle)				0.96	1.10
				(0.56)	(0.64)
- Class II (Managerial and technical)				0.56	0.64
				(0.33)	(0.38)
- Class III (Skilled)				0.34	0.38
				(0.20)	(0.22)
Adj. R^2	0.02	0.02	0.02	0.01	0.01
Number of observations	4043	4034	3113	3113	3113

TABLE 6: Causes of death: Descriptive statistics and association with other factors

Panel A of this table presents distribution of the causes of death of the 2,074 chartered accountants for whom we have this data available. Panels B to D present percentage of causes of death, identified as preventable, classified by social class, ICAS originating body, and time period. ANOVA F-test measures statistical significance of association between the variables. Panel E presents mean values of longevity, categorized by the cause of death, and the results of the ANOVA F-test for equality of means.

Panel A. Cause of death distribution

Cause of death category	Category description	Number of observations	Percent of observations
1	Infectious and parasitic diseases	59	2.84
2	Diseases of the respiratory system	331	15.96
3	Accidents, poisonings and violence	38	1.83
(1 + 2 + 3)	Total preventable causes	428	20.64
0	All others	1,646	79.36
Total		2,074	100.00

Panel B. Relation between cause of death and social class

Social class	Number of preventable deaths	Number of total deaths	Percent preventable causes of death
I	97	540	17.96
II	194	908	21.37
III	126	576	21.88
IV	8	32	25.00
V	0	2	0.00
Total	425	2,058	20.65
ANOVA F-stat (p-value)			1.02 (p = 0.40)

Panel C. Relation between cause of death and originating accountancy body

Originating body	Number of preventable deaths	Number of total deaths	Percent preventable causes of death
Aberdeen	21	88	23.86
Edinburgh	152	685	22.19
Glasgow	255	1,301	19.60
Total	428	2,074	20.64
ANOVA F-stat (p-value)			1.21 (p = 0.30)

Panel D. Relation between cause of death and time period

Admission date	Number of preventable deaths	Number of total deaths	Percent preventable causes of death
Before 1901	61	327	18.65
1901 and after	367	1,747	21.01
Total	428	2,074	20.64
ANOVA F-stat (p-value)			0.93 (p = 0.33)

Panel E. Cause of death and longevity

Cause of death category	Category description	Age at death	Longevity premium
1	Infectious and parasitic diseases	53.98	−13.47
2	Diseases of the respiratory system	76.26	7.22
3	Accidents, poisonings and violence	52.37	−16.29
(1 + 2 + 3)	Total preventable causes	71.07	2.28
0	All others	70.47	2.03
Total		70.59	2.08
ANOVA F-test		76.37	0.12
p-value		0.00	0.73

TABLE 7: Preventable causes of death: Multiple regressions

This table presents regressions of the causes of death, identified as preventable, on gender, time period dummy, age at admission, and two different proxies for childhood social class: geographic location (with Edinburgh as omitted category) and father's occupation. Columns (1) and (2) present probit regression coefficients, while columns (3) and (4) present the results of estimating linear probability models (LPM). Values of *z*-statistics (probit) or *t*-statistics (LPM) are in parentheses. The asterisks *, **, *** denote statistical significance at 10 percent, 5 percent, and 1 percent level, respectively.

Independent variables	Dependent variable: Death from a preventable cause			
	Probit	Probit	LPM	LPM
	(1)	(2)	(3)	(4)
Constant	−0.68***	−0.80***	0.25***	0.21***
	(−8.85)	(−3.46)	(10.95)	(3.21)
Female	0.50	0.50	0.17	0.17
	(1.56)	(1.55)	(1.63)	(1.62)
Admission date before 1901	−0.10	−0.10	−0.03	−0.03
	(−1.08)	(−1.15)	(−1.08)	(−1.13)
Founding body:				
- Aberdeen	0.03	0.02	0.01	0.01
	(0.18)	(0.15)	(0.20)	(0.18)
- Glasgow	−0.12*	−0.13*	−0.04*	−0.04*
	(−1.82)	(−1.85)	(−1.82)	(−1.79)
Social background				
- Class I (Upper and middle)	−0.16*	−0.16*	−0.04*	−0.04*
	(−1.84)	(−1.83)	(−1.80)	(−1.79)
- Class II (Managerial and technical)	−0.02	−0.02	−0.01	−0.01
	(−0.25)	(−0.23)	(−0.26)	(−0.24)
Age at admission		0.005		0.001
		(0.55)		(0.53)
McFadden R^2 /Adj. R^2	0.00	0.01	0.01	0.00
Number of observations	2058	2058	2058	2058

TABLE 8: Major causes of death by age category and time period: Comparison with Scottish population data

Each cell in this table shows (1) the percentage of deaths from the specified CODs in the sample, (2) same in the population, and (3) the p-value of left-tailed binomial test of the null hypothesis that the sample proportion of deaths from this COD is the same as the population proportion against the alternative hypothesis that accounting professionals suffer relatively less from these preventable CODs. Due to the small number of observations for females, this table presents results for males only. There is no column for the 1979–1999 period for under-65s because there was only one death during this period in the corresponding ICAS subsample. The asterisks *, **, *** denote statistical significance at 10 percent, 5 percent, and 1 percent level, respectively. In cases where the sample proportion of deaths exceeds the population proportion, we also present the results of right-tailed binomial test. The symbols ^, ^^, ^^^ denote statistical significance of such a test at 10 percent, 5 percent, and 1 percent level, respectively.

Panel A. Age at death under 65 years

Causes of death	Time period				
	1863–1910	1911–1924	1925–1949	1950–1967	1968–1978
Infectious and parasitic diseases					
- Sample percentage	18.4*	17.1	10.3***	1.0***	0.0
- Population percentage	29.6	17.8	16.3	4.1	0.9
- Binomial test p-value	0.054	0.550	0.007	0.010	0.420
Diseases of the respiratory system					
- Sample percentage	6.1**	7.3**	10.3	7.0	8.3
- Population percentage	17.6	18.1	12.8	9.5	7.9
- Binomial test p-value	0.019	0.046	0.156	0.132	0.653
Accidents, poisonings and violence					
- Sample percentage	12.2	2.4*	7.6*	2.0***	1.0***
- Population percentage	9.9	9.4	11.0	8.7	9.9
- Binomial test p-value	0.792	0.092	0.061	0.000	0.001
Total for three categories					
- Sample percentage	36.7***	26.8**	28.3***	10.0***	9.4***
- Population percentage	57.1	45.3	40.0	22.3	18.7

- Binomial test p-value	0.003	0.012	0.000	0.000	0.009
Total number of sample deaths in the time/age category	49	41	223	201	96

Panel B. Age at death 65 years and over

Causes of death	Time period					
	1863–1910	1911–1924	1925–1949	1950–1967	1968–1978	1979–1999
Infectious and parasitic diseases						
- Sample percentage	0.0	6.7	0.6*	1.2	0.6	1.4^^^
- Population percentage	5.7	2.9	2.7	0.9	0.5	0.4
- Binomial test p-value	0.259	0.945	0.067	0.817	0.778	0.999
Diseases of the respiratory system						
- Sample percentage	26.1	20.0	8.7	9.8	16.7^	24.6^^^
- Population percentage	17.1	16.6	11.1	10.5	13.8	14.3
- Binomial test p-value	0.916	0.780	0.201	0.401	0.940	1.000
Accidents, poisonings and violence						
- Sample percentage	0.0	0.0	0.0**	0.0***	0.9	0.9**
- Population percentage	2.3	2.3	2.5	2.2	1.9	1.9
- Binomial test p-value	0.586	0.498	0.017	0.004	0.135	0.034
Total for three categories						
- Sample percentage	26.1	26.7	9.3***	11.0	18.2	26.8^^^
- Population percentage	25.1	21.8	16.3	13.6	16.3	16.6
- Binomial test p-value	0.650	0.810	0.008	0.133	0.843	1.000
Total number of sample deaths in the time/age category	23	30	161	246	324	585

Figure 1. Life expectancy in the accountancy profession

This figure presents average life expectancy premium (Figure A) and remaining lifespan versus matched population-based life expectancy (Figure B), in years, at the time of admission to an accountancy body. Life expectancy premium is defined as the difference between the actual lifespan after admission to ICAS and the remaining life expectancy at admission using population data for corresponding age and time period.

Figure A. Life expectancy premium

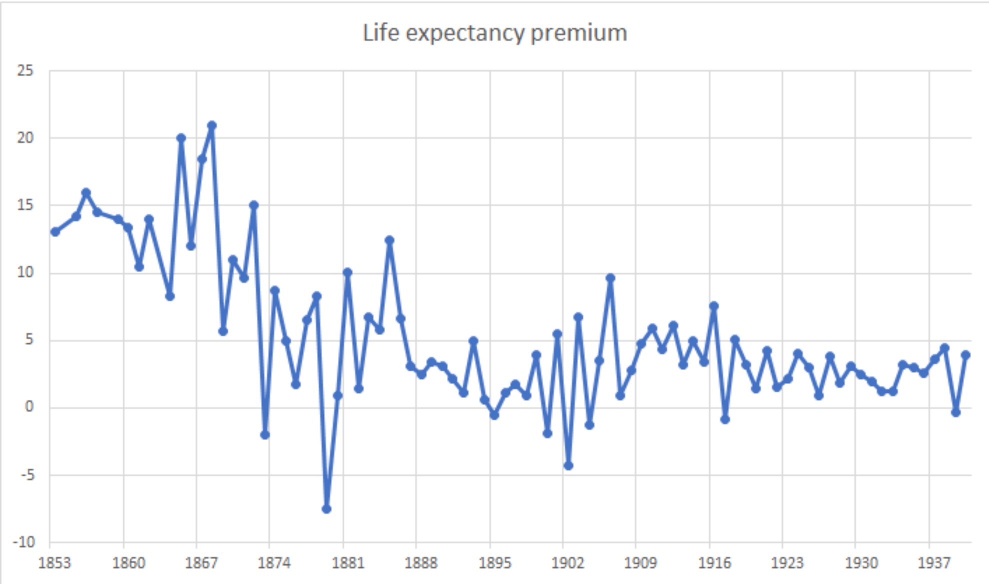

Figure B. Actual life expectancy (lifespan) of ICAS members and matched general population-based life expectancy

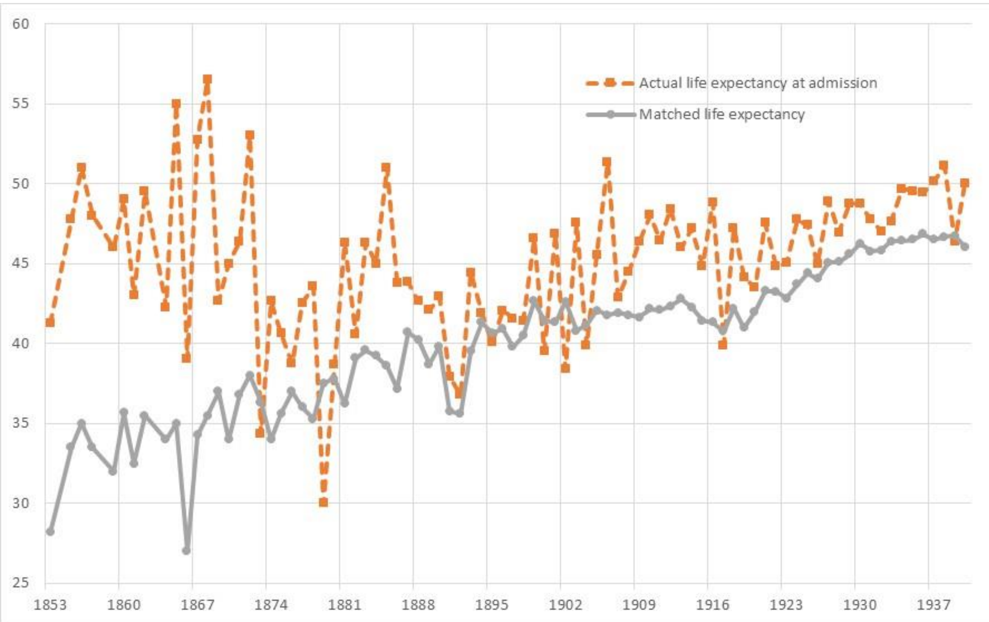

Figure 2. Evolution of life expectancy premium by social background and geographic location

This figure presents life expectancy premium by time period of admission, classified by social class and ICAS originating accountancy body. Classification of the social class into five categories was made according the 1927 Registrar-General report. Due to the small number of observations, categories 3, 4, and 5 are grouped together.

Figure A. By social class

Figure B. By ICAS originating accountancy body