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Born to run behind? Persisting birth month effects on earnings

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ABSTRACT

The relative age effect is an established phenomenon in the literature, but estimates of its strength and duration vary. With Norwegian registry data we investigate how birth month affects earnings throughout the full course of life (20 to 68 years) for all Norwegian men born during the 1940s. We compare earnings across birth month within school cohorts, and observe earnings both at given points in time ("Social age") and at given exact ages ("Biological age"). Our findings suggest that, albeit significant earnings differences at given ages, the effects cancel out over the full course of life and leave no imprint on life earnings.

1. Introduction

When Norwegian children begin their first year of school in August every year, the oldest pupils in class are nearly one year older than the youngest. This is the result of the school entry cut-off date, which in Norway is January 1st. A common and much-aired concern among parents is that this relative age disadvantage affects their children's experience of school. This concern is neither misplaced nor unwarranted given that a substantial literature consisting of contributions from economists, sociologists, and psychologists have demonstrated that such a relative age effect appears to be at work on school performance and educational achievement.[1] However, to what extent this relative age effect matters to the full employment of ability, optimal allocation of talent, and complete utilization of economic capacity is still unknown: The duration of the relative age effect has remained elusive due to data limitations.

In this study, we investigate the association between birth month and earnings over the full course of life. Notably, unlike the GPA, which is a one-shot measure for all individuals, independent of time and age of observation, earnings change continuously throughout the life trajectory. The interaction between time and age of observation of earnings is therefore likely to have a substantial impact on estimated effects. This has two important implications: First, birth month effects may change over the life trajectory. We therefore measure two different earnings effects: *i*) birth month effects at given age levels and investigate if such effects are constant across age levels; and *ii*) how life earnings differ across birth months. Observing earnings through the entire working career allows us to provide a more comprehensive picture of how birth month affects productivity and career paths. Second, it is far from obvious who the relevant peers to compare are. In particular, at what point in time should we observe earnings for the peers of comparison? Birth month effects on GPA are the result of comparisons at a given point in time between individuals in the same school cohort. We refer to such a comparison as one between individuals at the same 'social age'. A similar comparison for earnings is therefore a natural extension. Individuals at the same social age enroll and graduate from school and potentially enter the labor market at the same point in time: They march in pace on the career trajectory, and constitute each other's social reference group. However, an obvious disadvantage to comparing individuals at the same social age is that the biological age differs at time of observation. Therefore, an alternative approach is to compare individuals born in different birth months but observe earnings at their same biological age. Since individuals born in different birth months enroll into school at different biological ages, this implies that time since graduation and labor market experience differ at time of observation.

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[1] See e.g. Bedard and Duhey (2012); Crawford et al. (2010); and Solli (2017). However, although the vast majority of studies on relative age effects find effects favoring the relatively older, there are also some studies that find suggestive evidence on the opposite, see e.g. Lincove and Painter (2006); Crone and Whitehurst (1999); and Cobley et al. (2009).

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Consequently, when comparing earnings across birth months, one must choose either to hold biological age constant at time of observation or to hold work experience (i.e. social age) constant at time of observation. In this study we do both, which also allows us to investigate how birth month estimates differ between these two approaches: *i*) Observing earnings at a given point in time and compare across birth months for individuals at same social age; and *ii*) observing earnings at a given biological age and compare across birth months.

Birth month may generate persisting effects on earnings through several channels. First, birth month has been shown to be associated with school performance and educational achievement, which in turn are likely to serve as mediators for long-term effects on earnings and on career choices.[2] Second, the age differences within a classroom imply that individuals compare themselves to – and are being compared to – peers that are at other physical and mental maturity levels. This relative standing in class, referred to as the relative age effect, may affect social roles and development, such as selection of school electives and extracurricular activities and even self-esteem and aspirations that persist into adulthood.[3] Third, when comparing earnings for individuals at the same social age, the biological age difference may have an impact on productivity and earnings through differences in cognitive functioning, physical abilities, stamina, health and energy. For instance, being older and more mature may be an advantage at young ages, while being younger and healthier may be an advantage at older ages. Fourth, when comparing individuals of the same biological age, time elapsed since graduation and entry into the labor market differ. This is especially important during early career years, when human capital through work experience is growing at its fastest. Fifth, when comparing for given social age, parental age is likely to differ by nearly one year between the youngest and oldest pupils in class. This age difference may pick up time trends in parents' education level, which in turn may affect their child's outcomes.[4] Finally, birth month may affect retirement decisions through *i*) eligibility of old age retirement at the exact 62nd and 67th birthday; and *ii*) entitlements since they are a function of number of years an individual has been occupationally active. In addition, all the above-mentioned effects may interact and generate additional differential effects. Our intentions are not to disentangle various mechanisms contributing to persisting birth month estimates.[5] This study intends to identify the association between birth month and earnings throughout the working career, map the empirical regularities, and illuminate on how the two different approaches yield different answers. Consequently, 'advantages' or 'disadvantages' refer only to higher or lower earnings, disregarding utility due to various choices.

In order to identify persisting birth month estimates on earnings we utilize a unique registry database with information on annual earnings for all Norwegians in a period spanning 42 years from 1967 to 2008. This rich database provides information about earnings for nearly the entire work career for cohorts born during the 1940s. With unique personal identifiers, we merge data on earnings to registry databases on demographic information, which allows us to compare life earnings across birth months, and to observe how birth month estimates on earnings develop from early to late career ages and stages. Since we only have available data for annual earnings for calendar years and not earnings at given biological ages, we approximate earnings at a given biological age by computing a weighted average of annual earnings in two consecutive years.

We find that birth month estimates over the life trajectory depend crucially on the choice of comparison group, i.e. whether we compare across birth month for individuals at the same social age or the same biological age. Consistent with previous findings on comparisons at given social age, we find that people who are born in December (the youngest in class) have an earnings disadvantage in early adulthood. Surprisingly, however, this disadvantage translates into an advantage at older ages. When comparing individuals at the same biological age, however, December-born individuals have an advantage in early adulthood, most likely because they enter the labor market one year younger than those born in January (the subsequent month). At the biological age of 30, there is no earning differential, despite December-born individuals' additional year of labor market experience.

When investigating non-discounted life earnings as an overall measure of persisting birth month effects, we find no significant effects. In other words, birth month related advantages or disadvantages at specific age levels appear to be too small to leave a significant footprint on life earnings, or they cancel out over the full course of life. When investigating present value of life earnings, we find statistically significant, but economically insignificant effects. Furthermore, we find that the choice of comparison group is particularly important when investigating present value of life earnings. Birth month related earnings advantages and disadvantages occur at different stages of the life trajectory depending on choice of comparison group. Since discounting implies attaching less weight to earnings obtained at older ages, the impact on life earnings tends to be positive if advantages occur early in life. Consequently, when comparing individuals at the same social age, December-born individuals have lower life earnings since their late career advantage is given less weight. On the other hand, if comparing individuals at the same biological age, December-born individuals have higher life earnings, since the early career advantage is given more weight. As noted, however, all birth month estimates on life earnings are small and economically insignificant.

Our findings contribute to the existing literature in two ways: First, we utilize unique registry data that allow us to follow given cohorts throughout their career, rather than relying on synthetic cohorts or snapshot images for a given ages. We carefully investigate the birth month estimates on earnings over the full course of life, and demonstrate that the effect on earnings changes over the life trajectory. Consequently, birth month estimates on earnings at a given age level are not representative for long-term effects throughout the career. Second, we demonstrate the importance of choice of comparison group when investigating birth month effects.

The article proceeds as follows: A brief overview of the theoretical framework and existing empirical evidence on birth month effects on earnings is given in Section 2. Section 3 describes our empirical strategy and different approaches to identify birth month effects on earnings. Section 4 describes our data. Results are presented in Section 5, and Section 6 concludes and offers brief comments on policy implications.

2. Theoretical framework and previous literature

Our paper joins an extensive literature on birth month effects. The empirical evidence for birth month effects on school performance is

[2] Birth month effects on school performance may be generated by differences in age at school start, age at test, relative age differences within the classroom, and higher probability of being selected into more advanced tracks at school. See e.g. Jürges and Schneider (2011); Mühlenweg and Puhani (2010); and Segev and Cahan (2014) for empirical evidence on tracking related to birth month.

[3] Thompson et al. (2004) show that differences in performance lead to variation in self-esteem and confidence, and they find significant relative age effects on suicide and depression. Dhuey and Lipscomb (2008) find that the oldest in class are significantly more likely to participate in high school leadership activities. Elder (2010) find that the youngest is class are significantly more likely to be diagnosed with ADHD. There are also some few studies finding a reversed relative age effect, as e.g. Gibbs et al. (2012) that finds a relative age effect reversal that occurs from the junior league to the most elite levels of Canadian hockey.

[4] Notably, this is a time trend effect, not a birth month effect.

[5] There are some recent attempts to separate and identify the different mechanisms, see e.g. Crawford et al. (2014). Investigating the impact on in-school test scores, they find that age at test is the most important factor in explaining observed differences.

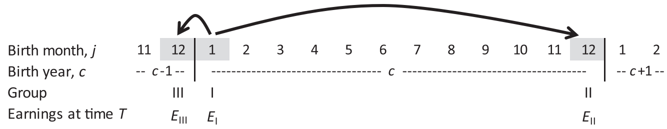

Fig. 1. Timeline of birth months.

particularly convincing.[6] Existing empirical evidence on the impact on earnings is, however, relatively scant and inconclusive, partly since there are several approaches to identify birth month effects and they are being used interchangeably in the literature. The following stylized model illustrates how two frequently used approaches capture different mechanisms and consequently lead to different birth month estimates. The model is parsimonious and intended only to illustrate some main mechanisms, and is not an attempt at a full count of all potential birth month effects.

Assume that earnings (E) observed at a given point in time is affected by biological age, $f(A)$; labor market experience (time since graduation), $h(W)$; age at school start, $g(SS)$; relative age in class, $k(R)$; and other individual characteristics that are balanced across birth months. The earnings differential, dE, between individuals with different birth months is:

$$dE = f(A)dA + h(W)dW + g(SS)dSS + k(R)dR$$

An obvious identification challenge is the strong (or even perfect) correlation between A, W, SS, and R. The two most frequently used approaches to identify the impact of these mechanisms are to compare earnings for individuals *i*) at a given social age, i.e. within the same school cohort, consequently holding work experience (W) constant; or *ii*) at a given biological age, i.e. around the cut-off date for school enrollment, holding age (A) constant. Fig. 1 illustrates a timeline of birth months, and shows how different year and month specific birth cohorts are compared when utilizing the two approaches. Birth year is defined according to the school cohort and enrollment regulations, which in Norway coincides with the calendar year.[7] The shaded cells refer to the oldest individuals within a school cohort (Group I) and the youngest individuals in two adjacent school cohorts (Group II and Group III). Notably, at a given point in time Group III and Group I are of approximately the same biological age.

When comparing earnings at a given social age, earnings of Group I and Group II are compared (E_{II} vs E_I), while comparing for at a given biological age implies comparing earnings of Group I and Group III (E_{III} vs E_I). Earnings are observed at the same point in time for all three groups. By focusing attention on individuals born very close to the cut-off date, Group I and Group III are of similar biological age, and the biological age difference between Group I and Group II is 12 months. Assuming that the impact of A, W, SS and R on earnings is linear, the reduced form effect on earnings, dE, shows that the two approaches capture the following mechanisms:

$$dE = 12f(A) + 12g(SS) + 12k(R) + 0h(W) = 12[g(SS) + k(R) + f(A)] \tag{1}$$

$$dE = 0f(A) + 12g(SS) + 12k(R) - 12h(W) = 12[g(SS) + k(R) - h(W)] \tag{2}$$

Eq. (1) shows that when comparing the youngest and oldest individuals within a school cohort, i.e. at same social age, the reduced form effect on earnings is generated by the 12 months biological age difference (A), relative age difference (R) and age at school start (SS). Since individuals at the same social age graduate and enter the labor market at the same point in time, there is no difference in labor market experience. Eq. (2) shows that when comparing earnings at the same biological age for the youngest and oldest individuals in their respective school cohorts, the reduced form effect on earnings is generated by an additional year of labor market experience (W), the 12 months age difference at time of school start (SS), and the 12 months of relative age difference (R). Clearly, the two approaches yield closely related but different birth month estimates, and is complementary in terms of understanding the implications of enrollment regulations and practices in school.

The existing empirical evidence on birth month effects on earnings for given social age is limited to Solli (2017) on Norwegian data, Crawford et al. (2013) on UK data and Kawaguchi (2011) on Japanese data. Solli and Kawagushi investigate early career earnings and find that the youngest pupils within a school cohort have 4 to 5% lower earnings than their oldest peers when observed at ages 30 to 34. Crawford et al. (2013) find no birth month effects on earnings when investigating earnings on the whole cross-section of individuals aged 25–64. However, they do not differentiate across ages. To our knowledge, no studies investigate how birth month effects within school cohorts persist and develop throughout life.

Two particularly relevant contributions utilizing the second approach with comparisons for given biological age, are Fredriksson and Öckert (2014) and Black et al. (2011). Fredriksson and Öckert (2014) investigate Swedish data, and similarly to our study, follow given cohorts throughout the career. They find that, on average, age at school start only affects the allocation of labor supply over the life-cycle. They also investigate effects of school starting age on life earnings and find that older school starters have lower life earnings due to late labor market entry and consequently a loss in labor market experience. Black et al. (2011) utilize Norwegian registry data to identify the effect of school starting age. When investigating earnings at ages 24–35, they find a negative effect on early-career earnings of starting school at an older age, but the effect has disappeared by age 30. This suggests that, at age 30, the disadvantage of having one year foregone labor market experience is off-set by the advantage of being older when starting school.[8]

Hence, the existing literature suggests that those starting school when they are older and are among the oldest in class, have in their early career *i*) higher earnings than their younger class mates, but *ii*) lower earnings than their peers of same biological age who started school one year younger. The remaining question is whether these effects persist throughout life.

3. Empirical strategy

When identifying the impact on earnings of age differences, an obvious first question is: The age difference as compared to whom? When we investigate GPA we compare grades and test scores at a given point in time between individuals in the same school cohort, referred to as individuals at the same social age. Since birth month effects on school performance are likely to translate into earning differences, a similar framework for earning comparisons is a natural extension. Individuals at the same social age enroll and graduate from school and potentially enter the labor market at the same point in time: They march in pace along the career trajectory. The relevance of social age is supported by empirical evidence that suggests that social age is as important as biological age when predicting timing of important life events that may affect earnings, such as marriage and age at first birth.[9] Social age and timing of entry into the labor market may also affect earnings through differential labor supply effects at the extensive

[6] See e.g. Bedard and Duhey (2006) and Solli (2017).

[7] This implies that if the cut-off date for school enrollment were August 1st, month=1 are individuals born in August. When the cut-off date for school enrollment is January 1st, month=1 refers to individuals born in January, and month=12 refers to individuals born in December.

[8] Other recent studies investigating the impact of age at school start include Bedard and Duhey (2012) who find a positive effect on earnings of starting school older, and Dobkins and Ferreira (2010) who find no effects on labor market performance of school starting age.

[9] See Skirbekk et al. (2004).

margin, since entitlements in the public pension system are not only determined by life earnings, but also are strongly affected by number of years as occupationally active. On the other hand, due to the pension regulations, the opportunity cost of working beyond retirement age was very high, since the pension payments were heavily deducted against earnings. Moreover, postponing retirement did not increase future pension payments, as it would in an actuarial pension system. Thus, individuals were strongly incentivized to retire when they reached retirement age.

An obvious disadvantage when comparing individuals at the same social age is that the biological age differs at the time of observation. At all ages, differences in biological age may affect productivity and earnings through differences in cognitive functioning, physical abilities, stamina, health and energy. Therefore, an alternative approach is to compare individuals born in different birth months and observe their earnings at same biological age. Rather than utilizing the discontinuity around the cutoff for school enrollment, we will construct a measure for (annual) earnings at a given biological age by computing a weighted average of annual earnings in two consecutive years. For instance, July-born individuals' earnings from the 34th to the 35th birthday is the average of their earnings the calendar years they turn 34 and 35.

Our intention is to identify long-term effects on earnings related to age differences at school start and within the classroom. Such age differences may exceed a full year, since some pupils delay school start or enroll earlier than what the administrative regulations stipulate. An obvious challenge by estimating effects of observed age differences is the likely bias due to selection into such non-compliance with enrollment regulations. A common approach is therefore to utilize statutory age at school start as an instrument for actual age at school start and relative age in class. We apply a similar method and estimate effects of birth month. Hence, individuals that in fact were the oldest in class due to delayed school start are being treated as if they were among the youngest. The estimates therefore represents a reduced form estimate, and should be considered a lower bound of the true effect.[10]

We group individuals according to their birth month, and estimate two measures of birth month effects on long-term earnings: Age specific birth month effects, and birth month effects on life earnings. For both measures, we will identify birth month estimates for *i*) given social age and *ii*) given biological age.

3.1. Birth month estimates on earnings across age

We first investigate the age earning profile across birth months. For visual presentation of observed earnings, we compute average earnings for individuals of the same age and birth month.

$$AE_j^a = \frac{\sum_i E_{i,j}^a}{N_j^a} \qquad a = 20, 21, \ldots, 68; j = 1, 12; \quad i = 1, 2, \ldots, N_j^a \tag{3}$$

in which $AE_j{}^a$ denotes average earnings for individuals born in birth month j at age a. $E_i{}^a$ is earnings for individual i at age a. $N_j{}^a$ is the number of individuals born in birth month j observed at age a. For a visual impression of the age earning profiles across birth month, we will give special attention to the oldest (j = 1) and youngest (j = 12) in a school cohort, and plot the observed $AE_j{}^a$-values for all age levels 20–68. Notably, for the youngest in a school cohort, we will present the age earning profile for earnings observed both at a given social age and at a given biological age.

Second, for the same sample of individuals (j = 1, 12) we estimate two separate age-earnings profiles, one for social and one for biological age. We employ the following model:

$$E_i^a = d_1 + d_2a_i + d_3a_i^{\,2} + d_4D_i + d_5D_ia_i + d_6D_ia_i^{\,2} + \sum_c \delta_c Coh_{i,c} + u_i^{\,a} \tag{4}$$

in which a = 20, 21, ..., 68. $E_i{}^a$ denotes earnings for individual i at (social or biological) age a, the coefficient d_2 captures the effect of age on earnings, and d_3 the curvature in the age-earnings profile. D_i is a binary indicator that takes the value 1 for December-born individuals and 0 for January-born individuals. The coefficient d_4 captures the level effect on earnings of being born in December compared to January. The coefficient for the interaction term D_ia_i, d_5, captures the first-order slope effect on earnings across ages of being a December-born individual, and d_6 the second-order curvature effect on the age-earnings profile between individuals born in January and in December. $Coh_{i,c}$ is a set of dummy variables controlling for cohort fixed effects. The stochastic variable $u_i{}^a$ is assumed to be nicely behaved, and mean-zero, constant variance. The coefficients of interest are d_4, d_5 and d_6, which together reflect differences in earnings profiles between December-born and January-born individuals.

Third, as a more direct measure of birth month related earnings differences over age, we calculate and plot the observed ratios in average earnings of January-born and December-born individuals:

$$RatioE^a = \frac{AE_{12}^a}{AE_1^a} \qquad a = 20, 21, \ldots\ldots, 68 \tag{5}$$

in which $Ratio\_E^a$ encompasses the ratios between earnings of January-born and December-born individuals at age a. If the ratio equals one, average earnings are similar for January-born and December-born individuals at this specific age.

Importantly, focusing attention exclusively on individuals born in January and December may represent a misleading picture of birth month effects on earnings if January-born and December-born individuals systematically differ from individuals born between February and November on other characteristics than month of birth. In particular, individuals born just before (after) the cut-off date for school enrollment are substantially more likely to enroll into school one year later (earlier) than according to the statutes. Such non-compliance with enrollment regulations may severely affect the birth month estimates on earnings in two ways: First, the relative age effect is reversed, since December-born individuals who delay school-start may be the oldest pupil in class. Second, with the presence of non-compliance not all individuals within a given cohort graduate the same year. This affects number of years of labor market experience and consequently earnings at a given age. This is particularly acute for early career earnings when human capital accumulation through work experience grows at its fastest. Our fifth analysis of age-specific earnings is therefore to investigate whether the birth month effect applies to individuals born throughout the full year. Birth month effects will be estimated by the following procedure[11]:

We estimate birth month effects for earnings observed at a given point in time for all 12 months. Since estimated effects may change over age, we estimate the birth month effects on earnings for several ages. In particular, we investigate the birth month effects on earnings

[10] If data on age at school enrollment had been available, we could have adjusted the estimates for the proportion non-compliers by doing a 2SLS. Such data are unfortunately not available to us, and we cannot estimate the first stage relationship. Except for the reduced form estimates to be somewhat smaller in absolute terms since they are unadjusted for non-compliance, the interpretation of reduced form and 2SLS estimates are similar.

[11] Another potential challenge when comparing earnings across birth months is that background characteristics that also affect earnings may be correlated with birth month. Buckles and Hungerman (2013) discover systematic differences in parental resources across birth month when investigating US data. Unfortunately, parents are identified for relatively few individuals in our analytical sample, and we have no possibility to control appropriately for family characteristics. However, Solli (2017) investigates Norwegian registry data for younger cohorts (born between 1969 and 1991), and finds no association between birth month and parent characteristics.

for the individuals when they are a = 20, 30, 40, 50 and 60 years old, employing the following regression model for each age level:

$$E_i^a = \alpha^a + \sum_{j=2}^{12} \beta_j^a D_{i,j} + \sum_c \delta_c^a Coh_{i,c} + u_i^a \tag{6}$$

in which $E_i{}^a$ is earnings for individual i at age a. $D_{i,j}$ are dummy variables for birth months j = 2 to j = 12, that are unity if individual i is born in month j and zero otherwise. January, i.e. j = 1, serves as the reference category. The eleven β_j for j = 2 to j = 12 are the age specific birth month estimates. Eq. (6) is run separately for a = 20, 30, 40, 50 and 60, and separately for biological and social age. $Coh_{i,c}$ is a set of dummy variables controlling for cohort fixed effects.

This leaves us with a total of 5 ∗ 12 = 60 estimates of β_j from the estimation for given social age, and another 60 β_j-estimates for given biological age. The estimates gives us the following information: First, the pattern in birth month estimates, β_j, at a given age reflects to what extent the birth month effects apply to individuals born throughout the whole year, or if January-born and December-born individuals are "outliers" with respect to earnings at given ages. If estimated birth month effects in fact reflect age differences within class, we would expect to find that being born in November or earlier yields an effect similar to – but smaller than – that of December-born individuals when compared to January-born individuals. Put differently, if being relatively younger than cohort peers serves as a disadvantage, the birth month coefficients should reveal a pattern of gradually larger coefficient estimates (in absolute value). Consequently, a single significant estimate for being born in e.g. March is unlikely to reflect a relative age effect. Second, the pattern in birth month estimates across age levels, reflects the persistence of birth month effects and how such effects may change over life.

3.2. Birth month estimates on life earnings

Our second measure for persisting birth month effects is the difference in life earnings across birth months. While differences across birth months at given ages are snapshot pictures of persisting birth month effects, differences in life earnings provide an overall measure of how birth month may affect productivity and opportunities in the labor market.

We calculate life earnings as the sum of annual earnings observed for each individual, and estimate the following regression model:

$$L_i = \sum_a E_i^a = \alpha + \sum_{j=2}^{12} \beta_j D_{i,j} + \sum_c \delta_c Coh_{i,c} + u_i \tag{7}$$

in which L_i is non-discounted life earnings for individual i, $E_i{}^a$ is annual earnings for individual i at age a, $D_{i,j}$ are binary indicators that takes the value 1 for individuals born in birth month j, and 0 otherwise. $Coh_{i,c}$ controls for cohort fixed effects and u_i is a stochastic error term. The coefficients of interest are β_2 - β_{12}. If birth month leaves an imprint on life earnings we would expect to find significant estimates. The estimates capture differences in life earnings across birth month, and thus provide a relevant measure for the overall birth month effect. Finally, as a measure of the economic impact of persisting birth month effects, we calculate discounted life earnings and investigate the birth month effect on the present value of life earnings.

4. Data

Our empirical analysis utilizes a unique registry database prepared by Statistics Norway. It contains information on annual earnings for each calendar year from 1967 to 2008 for all residents of Norway. Earnings are measured as total pension-qualifying earnings reported in the tax registry, and include labor earnings, sick benefits, unemployment benefits, and parental leave payments. Data on earnings are merged with registry databases that contain information on individual demographic attributes (gender, birth date) and country of birth.

Information on earnings is available for the period from 1967 to 2008, so we observe earnings for a total of 42 years. This is a period slightly too narrow to follow any individual through the entire working career. In order to capture the entire life span relevant for labor market participation we include in our analysis all cohorts born between 1940 and 1949.[12] We standardize all earnings observation to 2008-level. Standardization indexes for each year from 1967 to 2008 are constructed from earnings observations for those aged 30 to 55 with positive earnings in our sample.[13]

From the standardized earnings observations we construct these outcome variables for each individual[14]:

1. Age specific earnings
2. Life earnings: The sum of standardized earnings from age level 20 to age level 68

We limit our analytic sample to those registered as residents of Norway as of December 30, 1992.[15] We restrict our analysis to men. Furthermore, we exclude immigrants from our analysis since they were not exposed to the Norwegian cut-off regulations, and birth date registrations are less accurate for immigrants than for individuals born in Norway. Altogether, this leaves us with a sample of 267,693 men born in the period 1940–1949, with earnings observations from age level 20 to 68. The total number of earnings observations is 11,153,836, distributed across birth months and ages as shown in Table A1 in Appendix A.[16] We observe that the number of earnings observations for the youngest and oldest age levels is smaller than for age levels 27 to 59, where all cohorts are observed.[17]

[12] See illustration in Fig. A1 in Appendix A.

[13] Nominal earnings are standardized to 2008 level in order to ensure that average earnings remain constant, and thereby are comparable, over our period of observation. The standardization is conducted following this procedure: $E_i(t)$=$NE_i(t)$*[ANE(2008)/$ANE(t)$] in which $E_i(t)$ is standardized earnings for individual i in year t; $NE_i(t)$ is nominal earnings for individual i in year t; and $ANE(t)$ is average nominal earnings in year t. Outliers each year are replaced with the 95th percentile when constructing the standardization indexes.

[14] Earnings of outliers (within age, birth-month, and cohort-specific groups) are replaced with the 95th percentile.

[15] This implies that individuals who died or emigrated from Norway prior to 1992 are not in our analytic sample. If migration and/or mortality rates differ across birth months, our analytical sample may suffer from a particular strain of survivor bias. To our knowledge, there is no empirical evidence supporting a pattern in which migration probabilities differ across birth months. It has been shown that mortality (suicide) rates differ slightly across birth months (Thompson et al., 2004), but the very small number of suicides is unlikely to affect our estimates. On the other hand, at the administrative registration date in 1992, December-born individuals are nearly one year younger than January-born individuals. Since mortality rates increase with age, December-born individuals are more likely to survive until this registration date. However, the oldest individuals in our analytic sample turn 52 years old in 1992, an age level at which mortality rates are still very small. Hence, the two effects are likely to be small and also to counterbalance each other.

[16] Notably, earnings for December-born individuals enter into our sample twice, since they serve as observations both for month j=0 and month j=12. For example, earnings in 1974 for those born in December 1944 enter into our sample as an observation for j=12 at social age 30 to compare with those born in January 1944, and as an observation of j=0 at biological age 29 to compare with those born in January 1945. These additional entries for December observations are not included here when we count number of observations in our sample.

[17] In particular, the number of observations for the oldest ages is small since we limit our analytic sample to individuals born at the earliest in the year 1940. Individuals born during the 1930s attended school during WWII, when school buildings were occupied, teachers were deported, and the school experience in general was abnormal. A relative age effect originating from the classroom is likely to be affected by this, and these cohorts are therefore excluded from our analytic sample.

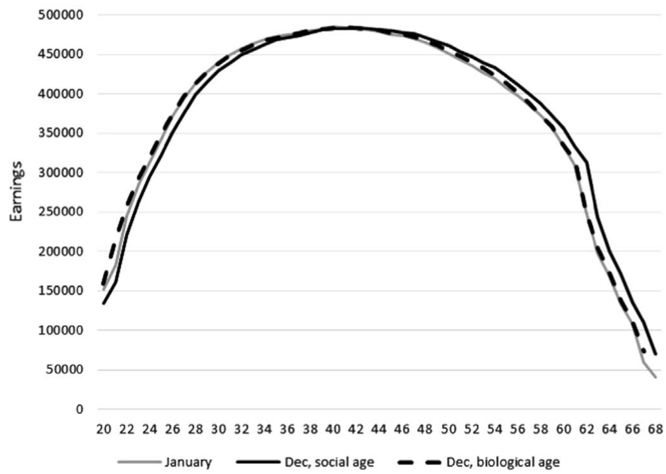

Fig. 2. Observed earnings across social age for January-born and December-born individuals. 2008-NOK. Note: Observations are calculated employing Eq. (3).

5. Results

5.1. Age specific earnings

Our first investigation of persisting birth month effects is age earnings profiles. As noted in Section III we will focus attention on the oldest (January-born) and youngest (December-born) within school cohorts. In Fig. 2 we have plotted the observed earnings profiles across social and biological age for January-born and December-born individuals. Each observation is calculated using Eq. (3).

Fig. 2. illustrates three birth month specific earnings profiles for the age interval 20–68. The figure shows that the earnings profiles follow an inversed U-shape pattern in which earnings increase during early working years and decrease as retirement nears.[18] The kink at age 62 is due to eligibility for early retirement at the 62nd birthday. The official retirement age in Norway is at the 67th birthday, and we also see a slight kink at that age.

When comparing January-born individuals to December-born individuals at the same social age, we see that earnings are higher during early career years, but that their younger peers catch up in their early 40s. Thereafter the birth month effect reappears with a reversed sign: December-born individuals have higher earnings in late career years. In fact, the earnings profile for December-born individuals resembles that of January-born individuals, but is slightly shifted in time. This suggests that even if December-born individuals graduate from compulsory school at the same time as January-born individuals, their earnings path throughout life resembles but lags behind their peers of the same social age. The visual impression is that the shift in the earnings profile reflects the biological age difference between the January and December-born individuals. A possible explanation of this shift in the earnings profile is that during young ages the relatively oldest (January-born individuals) have the advantage of being stronger and faster, while at old ages the relatively youngest (December-born individuals) have the advantage of being stronger and healthier. Alternatively, different mechanisms dominate at different age levels. For instance, December-born individuals may have a disadvantage when entering the labor market due to poorer school performance and educational achievement.[19] As the individuals grow older, however, the impact of health and physical strength becomes more important, giving December-born individuals an advantage.[20]

This leads us to the second approach, in which we observe earnings at a given biological age. We find that December-born individuals have an advantage in early career years, since they enter the labor market one year earlier. This advantage appears to fade out by age 30, and thereafter the earnings profiles are similar. This implies that even if December-born individual enter the labor market one year earlier than January-born individuals, this has no impact on earnings after the age of 30. A possible explanation is that, after the age of 30, the advantage of an additional year of labor market experience is less pronounced, and counterbalanced by the negative effect of relative age from school or school starting age.

We investigate whether the earnings profiles are significantly different by estimating Eq. (4). Fig. 2 suggests that the earnings profile for December-born individuals is shifted in time compared to January-born individuals of the same social age, but otherwise similar. If it is the case that the earnings profile of December-born individuals simply is transposed to the right, we would expect to find statistically significant estimates of d_4 and d_5 but not on d_6 (the latter reflects curvature of the earnings profiles).[21] Comparisons for given biological age show that December-born individuals have a trajectory of earnings at a higher starting level than individuals born in January. They reach given levels of earnings at a younger age, potentially because they enter the labor market at a younger biological age. Table 1 summarizes the results.

In Model 1 we examine whether the two earnings profiles for given social age are statistically similar. We find statistically significant interaction estimates for the intercept and curvature, which suggest that the earnings profiles are not identical. Furthermore, the significant interaction estimate for curvature suggests that the difference between the earning profiles for January and December-born individuals is not only due to a parallel time/age shift, as suggested by Fig. 2. Put differently, despite the visual similarity, January-born and December-born individuals appear to follow statistically different earnings paths through life. Model 2 reports the corresponding estimates when comparing earnings at a given biological age. All interaction terms are statistically significant, which suggests that the earnings profiles are statistically different also when observing earnings at a given biological age. Summing up, the models indicate statistically significant differences between the earning profiles, but the difference appears to be small.[22] Below we shall further investigate the economic significance.

As a more direct measure of the earnings differences between January-born and December-born individuals, we calculate and plot the observed ratios of average earnings throughout their careers, as given in Eq. (5). Fig. 3 presents the earnings ratios, and reflect the vertical distances between the earnings profiles in Fig. 2. The solid line

[18] The age-wage profile reaches its maximum 10years later, see Fredriksson and Öckert (2014) on Swedish data. This suggests that the drop we observe in the 40s is due to fewer working hours and/or lower labor market participation.

[19] Notably, existing empirical evidence for birth month effects on educational achievement is identified for younger cohorts than those included in our analysis. The birth month effect may be different for older cohorts. For instance, if today's schooling system to a larger extent favor mature pupils than the schooling system in the 1950s, we would expect to find stronger birth month effects on educational achievement today than for the cohorts under study here. This conjecture is consistent with the growing gender gap in school performance, the gender gap being argued to be due to girls maturing faster than boys. However, Fredriksson and Öckert (2014) find that school reforms implemented in Sweden in the 1950s reduced the impact of birth month on educational achievement. The Norwegian schooling system was reformed in the 1960s in line with the Swedish reforms, suggesting stronger birth month effects for the cohorts investigated in this study.

[20] Investigations of younger cohorts (born during the 1950s) display a similar pattern in earning differences; results are not reported here.

[21] To see this, consider the relation $y=a+bx+cx^2$. If we perform a variable-transformation and let $x=z-1$, we obtain $y=a+b(z-1)+c(z-1)^2=a+bz+cz^2+(c-b-2cz)$. From this we see that the intercept and the first-order coefficient are affected by variable-transformation, but not the second-order coefficient.

[22] Mean earnings would be similar in the two models if we observed earnings over the entire life span. However, since some individuals have earnings before the age of 20 and after the age of 68, and the observation window is slightly different in the two models, we see a small difference in mean earnings in the two models.

Table 1
Earnings observations for given social and biological age (1000 2008-NOK).

	Social age Model 1	Biological age Model 2
Constant	−518.88** (3.095)	−520.152** (3.093)
Age	48.467** (0.1508)	48.466** (0.1507)
Age^2	−0.580** (0.0018)	−0.580** (0.0017)
December-born	−26.297** (4.3273)	36.102** (4.3242)
Age ∗ December-born	0.060 (0.2144)	−1.7227** (0.2142)
Age^2 ∗ December-born	0.013** (0.0025)	0.02024** (0.0025)
RSS	8.5370e+10	8.5253e+10
Mean	414.87	415.05
St. dev	237.58	237.34
R^2	0.1115	0.1110
N	1,702,275	1,702,275

Notes: Estimated standard deviation of coefficient estimates in parenthesis. ** denotes statistical significance at 1% level.

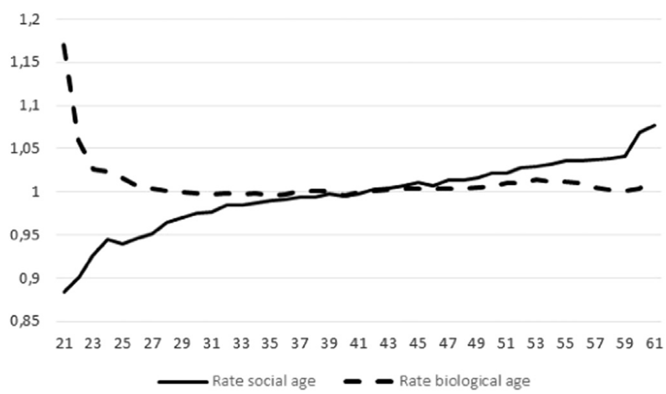

Fig. 3. Ratios of average earnings at each age level. Notes: Graphs correspond to Eq. (5). In the figure we have excluded ages below 21 and above 61. The reason is that the ratios are strongly affected by entry to and exit from the labor market at these ages, which completely overshadow the ratios during main working ages. See Fig. A2 in Appendix A for the full life span 20–68.

represents earnings ratios for given social age, and the dotted line represent earnings ratios for given biological age.

Consistent with Fig. 2, we observe that for social age, December-born individuals experience an earnings disadvantage in early adult years, i.e. until the early 40s, which gradually translates into anadvantage in late adult years. Initially, the disadvantage of December-born individuals is substantial, making their earnings around 10% lower than earnings of January-born individuals. At age 60, the advantage of December-born individuals is around 10% compared to January-born individuals.

The dotted line represents the earnings ratio between December-born and January-born individuals observed at the same biological age. December-born individuals' advantage of entering the labor market one year earlier is clearly translated into an initial earnings advantage. However, this earnings advantage decreases rapidly, and by the age of 30 the difference is negligible.

Findings from previous studies on relative age effects on early career outcomes are consistent with Fig. 3. Compared to January-born individuals, December-born individuals at the same social age have a disadvantage, and December-born individuals of the same biological age have an advantage. Importantly, Fig. 3 shows that observing earnings at a specific age level does not provide a representative picture of persisting birth month effects, and it documents how sensitive such estimates are to the choice of age at observation. It is key that studies of earnings differences between individuals born in different months include the whole life span in order to achieve a complete picture of persisting birth month effects on earnings. Furthermore, the figure demonstrates that an inference made at a given age level fully depends on the choice of comparison group.

In order to investigate birth month effects on earnings, we have focused attention on the differences between the oldest and youngest within a cohort. However, January-born and December-born individuals are substantially more likely not to comply with the school enrollment regulations, which in turn is likely to affect earnings at a given age level due to less labor market experience for those who delay school start and consequently graduation year. In particular, we would expect non-compliance to affect early career earnings when human capital accumulation is at its fastest, and, potentially, this could be the reason behind the pattern in earnings differential at young age levels.[23] In order to investigate if individuals born between February and November are affected similarly by relative age differences, we investigate birth month effects for all birth months at given age levels, employing formulas given in Eq. (6). Results are reported in Table 2. January-born individuals serve as the reference category. The estimates associated with being born in December reflect the corresponding earnings differences displayed in Fig. 3.

Table 2, Panel A provides us with two important findings. First, when we compare estimates for a given social age, i.e. vertically within a column, we find that the birth month effect on earnings is close to linear across birth month for all age levels. This implies that the birth month effect is not only present for the very youngest and oldest within a cohort, for instance due to non-compliance with enrollment regulations, but applies to individuals born throughout the entire year. Second, when comparing estimates for given birth months, i.e. horizontally along a row in the table, we find that the estimated birth month coefficients increase monotonically over age. This reflects that the disadvantage of being younger than January-born individuals translates into an advantage as the individuals grow older.

The estimates in Table 2, Panel B do not display a similar pattern for earnings observed for given biological ages. At age 20, we see a clear pattern that individuals born later in the year have higher earnings, reflecting the early career advantage of entering the labor market at a younger biological age. This advantage fades rapidly away as the individuals grow older, and we find no significant estimates for older age levels.

5.2. Life earnings

Results so far suggest that compared to December-born individuals January-born individuals have *i*) an early career advantage and late career disadvantage when earnings are observed at a given social age and *ii*) an early career disadvantage when earnings are observed at a given biological age. The final question is if these earnings differentials leave an imprint on total career earnings. We now turn to an investigation of birth month effects on life earnings. Results from regressions of the model described in Eq. (7) are reported in Table 3. All estimate procedures include controls for cohort fixed effects. This is important since we lack information about earnings for specific age levels for some cohorts.[24]

When investigating non-discounted life earnings, we find positive but statistically insignificant estimates for being a December-born.[25] This suggests that when comparing January-born individuals to their December-born peers at *i*) same social age, the initial advantage is

[23] Note, however, that it is less likely that non-compliance and later labor market entry should become an advantage in older ages.

[24] Cohort fixed effects deal with the challenge of not having earnings data for the complete working career for all cohorts, given that birth month effects are constant across cohorts. When investigating each cohort separately, we find that the birth month estimates reveal a similar pattern for each cohort. The results are not reported here.

[25] Obviously, without discounting life earnings would be similar when adding up over social or biological age. However, since some individuals have earnings before the age of 20 and after the age of 68, i.e. outside of our observation window, and the observation window is slightly different in Panel A and Panel B, we find some small differences in the two panels also in the case of no discounting.

Table 2
Birth month effects on earnings at given social and biological ages (1000 2008-NOK).

	Panel A: Social age					Panel B: Biological age				
	Age 20	Age 30	Age 40	Age 50	Age 60	Age 20	Age 30	Age 40	Age 50	Age 60
Feb	−2.51	0.52	0.16	4.64+	4.47	0.09	1.37	0.34	4.00	2.59
	(2.28)	(1.66)	(2.09)	(2.49)	(3.01)	(2.13)	(1.61)	(2.05)	(2.46)	(2.95)
Mar	−2.43	0.76	1.92	4.43+	8.73**	2.67	2.28	1.92	3.23	5.01+
	(2.20)	(1.60)	(2.01)	(2.40)	(2.89)	(2.06)	(1.55)	(1.97)	(2.37)	(2.84)
Apr	−4.55*	−1.04	0.33	2.87	3.65	2.51	1.33	−0.03	0.86	−2.25
	(2.20)	(1.60)	(2.00)	(2.39)	(2.88)	(2.06)	(1.54)	(1.97)	(2.36)	(2.83)
May	−5.21*	−2.55	0.29	4.90*	9.26**	4.82*	0.66	0.84	2.29	1.21
	(2.21)	(1.61)	(2.01)	(2.41)	(2.90)	(2.06)	(1.55)	(1.98)	(2.38)	(2.85)
Jun	−7.37**	−3.28*	0.93	6.24*	15.37**	4.79*	0.89	0.83	3.41	5.11
	(2.25)	(1.63)	(2.05)	(2.45)	(2.95)	(2.10)	(1.58)	(2.02)	(2.42)	(2.90)
Jul	−5.35*	−4.11*	−1.50	4.97*	9.47**	8.52**	0.32	−1.32	1.18	−2.99
	(2.27)	(1.65)	(2.06)	(2.46)	(2.97)	(2.12)	(1.59)	(2.03)	(2.43)	(2.91)
Aug	−3.28	−5.74**	−1.56	5.17*	15.68**	10.87**	0.17	−2.18	1.42	0.56
	(2.31)	(1.67)	(2.09)	(2.50)	(3.00)	(2.16)	(1.61)	(2.06)	(2.47)	(2.95)
Sep	−8.84**	−6.19**	−3.85+	5.00*	12.71**	7.68**	0.65	−2.89	−0.05	−3.79
	(2.27)	(1.64)	(2.06)	(2.46)	(2.96)	(2.12)	(1.59)	(2.02)	(2.43)	(2.90)
Oct	−12.20**	−5.01**	−0.02	4.75+	16.99**	8.54**	2.31	−0.14	−0.42	−0.45
	(2.32)	(1.67)	(2.09)	(2.50)	(2.99)	(2.17)	(1.61)	(2.05)	(2.47)	(2.94)
Nov	−14.07**	−8.35**	−2.09	5.65*	19.39**	9.24**	0.10	−2.54	0.75	0.45
	(2.40)	(1.70)	(2.14)	(2.55)	(3.06)	(2.24)	(1.65)	(2.10)	(2.52)	(3.01)
Dec	−17.09**	−11.21**	−2.44	9.22**	23.96**	7.22**	−1.27	−1.95	2.43	3.08
	(2.34)	(1.68)	(2.10)	(2.51)	(3.01)	(2.18)	(1.62)	(2.07)	(2.48)	(2.96)
Mean	145.68	435.87	483.67	455.70	342.87	157.72	440.34	483.73	452.52	332.17
St. dev.	138.76	171.46	214.76	256.61	271.70	129.53	166.31	211.84	254.06	267.35
R^2	0.0012	0.0016	0.0005	0.0006	0.0016	0.0006	0.0011	0.0005	0.0006	0.0014
N	90,769	267,693	267,693	267,693	207,870	90,769	267,693	267,693	267,693	207,870

**, * and + denote significance at 1, 5 and 10% level.

Table 3
Birth month effects on life earnings (1000 2008-NOK).

	Panel A: Social age			Panel B: Biological age		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
February	79.27	35.41	13.16	77.76	42.93	24.12
	(62.03)	(37.69)	(24.44)	(62.63)	(38.21)	(24.87)
March	121.33*	59.07	27.17	119.93*	75.23*	50.00*
	(59.64)	(36.24)	(23.50)	(60.22)	(36.74)	(23.91)
April	18.23	−8.06	−19.26	17.30	16.77	15.30
	(59.50)	(36.15)	(23.44)	(60.07)	(36.65)	(23.85)
May	63.24	Sep. 15	−15.12	62.91	42.93	31.45
	(59.89)	(36.38)	(23.60)	(60.46)	(36.89)	(24.01)
June	85.97	14.03	−18.06	87.00	57.24	40.80
	(60.91)	(37.01)	(24.00)	(61.50)	(37.52)	(24.42)
July	12.41	−26.02	−40.38+	12.33	24.37	28.87
	(61.32)	(37.26)	(24.16)	(61.92)	(37.77)	(24.59)
August	55.85	−8.50	−34.48	56.64	50.49	46.10
	(62.10)	(37.73)	(24.47)	(62.70)	(38.25)	(24.90)
September	10.05	−48.12	−68.83**	16.21	22.75	25.73
	(61.13)	(37.14)	(24.08)	(61.72)	(37.65)	(24.51)
October	68.91	−15.01	−49.28*	80.58	67.68	59.26*
	(62.10)	(37.73)	(24.47)	(62.69)	(38.25)	(24.90)
November	47.65	−36.28	−67.97**	60.15	55.19	52.10*
	(63.51)	(38.59)	(25.03)	(64.13)	(39.12)	(25.46)
December	76.81	−40.72	−86.64**	97.89	64.41	48.12
	(62.42)	(37.93)	(24.60)	(63.03)	(38.45)	(25.03)
Discount rate (percent)	0	2	4	0	2	4
Mean	16.87	11.12	7.72	16.88	11.17	7.78
St. devs	6.40	3.89	2.54	6.46	3.95	2.59
R^2	0.0059	0.0109	0.0279	0.0061	0.0111	0.0291
N	267,693	267,693	267,693	267,693	267,693	267,693

Note: **, * and + denote significance at 1, 5 and 10% level.

cancelled out by the later disadvantage; and *ii*) same biological age, the initial disadvantage is not sufficiently strong to leave a significant imprint on life earnings. In line with this, the birth month estimates are very small and constitute at most 2% of a standard deviation.[26]Furthermore, we find no pattern in the estimates that could suggest that birth month have an impact on life earnings.

The birth month estimates on non-discounted life earnings serve as an aggregate measure of persisting birth month effects, as measured by the graph area between the age-earning profiles in Fig. 2. However, when investigating the economic impact of persisting birth month effects, discounting life earnings to present value is the relevant measure. We estimate measures for present value in line with our two approaches using several discount rates.

Table 3, Models 2 and 3 report birth month coefficients on present value of life earnings at age 20, with a discount rate of 2 and 4%, respectively. We find that when earnings are observed at a given biological age, there are no significant birth month estimates, and no pattern that would suggest a birth month effect on life earnings. When earnings are observed at a given social age, however, individuals born in December have significantly lower life earnings than those born in January. The reason is that when discounting, events early in the career are attached relatively more weight. Hence, December-born individuals' early career disadvantage is not cancelled out by the late career advantage. However, also with discounting, the effect on life earnings is small and constitutes only 3% of a standard deviation. Furthermore, the results appear too sensitive to the choice of the discount rate to allow sharp inferences regarding effects on life earnings. In sum, the findings do not lend much support for a life-long imprint on earnings from birth month.[27]

6. Conclusion

The relative age effect is a well-established phenomenon in the literature, in particular on school performance and educational achievement. Empirical results on earnings are less conclusive, partly due to different identification strategies: First, a number of studies identifies the impact on earnings at a given age, disregarding the possibility that earnings effects may be age sensitive. Having data on annual earnings for a period of 42 years, our contribution is that we identify age specific birth month effects over the full course of life, in addition to effects on life earnings. Second, it is not obvious which the relevant comparison groups are: While some studies make comparisons across birth months for individuals of the same social age, i.e. within a school cohort, other studies make comparisons for individuals of the same biological age, allowing labor market experience to differ. The two approaches give complementary but substantially different results. In this study, we utilize both approaches.

When comparing across birth months for similar social age, we find a significant association between birth month and earnings for all age levels, displaying a somewhat unexpected pattern. We find that the youngest individual within a school cohort have an earnings disadvantage in early adulthood and an advantage at older ages.

When making comparisons for a given biological age, we find that the youngest individuals within a school cohort have an early career advantage since they enter the labor market at a younger age. However, by the age of 30 this advantage appears to have faded out. All our findings are consistent with the existing literature on early career outcomes, but demonstrate that snapshot images at given biological or social age levels do not provide a representative image of persisting relative age effects over life.

Birth month effects on non-discounted life earnings serve as an aggregate measure of persisting relative age effects. When investigating non-discounted life earnings, we find no birth month effect. This suggests that age specific advantages or disadvantages cancel out or are too small to leave an imprint on life earnings.

In order to investigate the economic impact of birth month related earnings differences, we discount earnings and estimate the birth month effect on present value of life earnings. We find no birth month effect when earnings are observed at a given biological age. However, when observing earnings at a given social age, we find that January-born individuals have higher life earnings than their younger peers. The disparity between the two comparisons is due to different timing on the life trajectory of earnings advantages and disadvantages, and that discounting implies attaching less weight to late career outcomes. However, the effects are small and constitute at the most only 3 % of a standard deviation.

Establishing the duration and strength of the birth month effect on earnings may have important policy implications. Despite solid empirical evidence for birth month effects on school performance and educational achievement, our analysis shows that the imprint on life earnings is small. Hence, the concern for the youngest pupils appears less warranted. However, even if we do not find a significant imprint on life earnings, we do find significant age-specific effects. These earnings differences may be important even if the reduced form effects cancel out on the full course of life, in particular if the effects are linked to selection into sub-segments of vocations with high pay but with limited duration, or that relative age effects in school stimulate different personality traits that generate talent for specific occupations.

Acknowledgements

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Appendix A.

See Appendix Figs. A1 and A2. See Appendix Table A1.

[26] Earnings deflators are constructed from average earnings in each year, see footnote 13. If deflating earnings with consumer prices rather than average earnings, earnings at old ages are higher due to real wage growth over time. This also implies that earnings differences across birth months are larger at old ages than young ages. When investigating life earnings deflated with consumer prices we find significant and positive effects for individuals born in October to December in Model 1 in Panel A, since they experience their relative age advantage at ages where real earnings are higher (results not reported here).

[27] When transforming the outcome variable to log of earnings, we find no statistically significant birth month estimates.

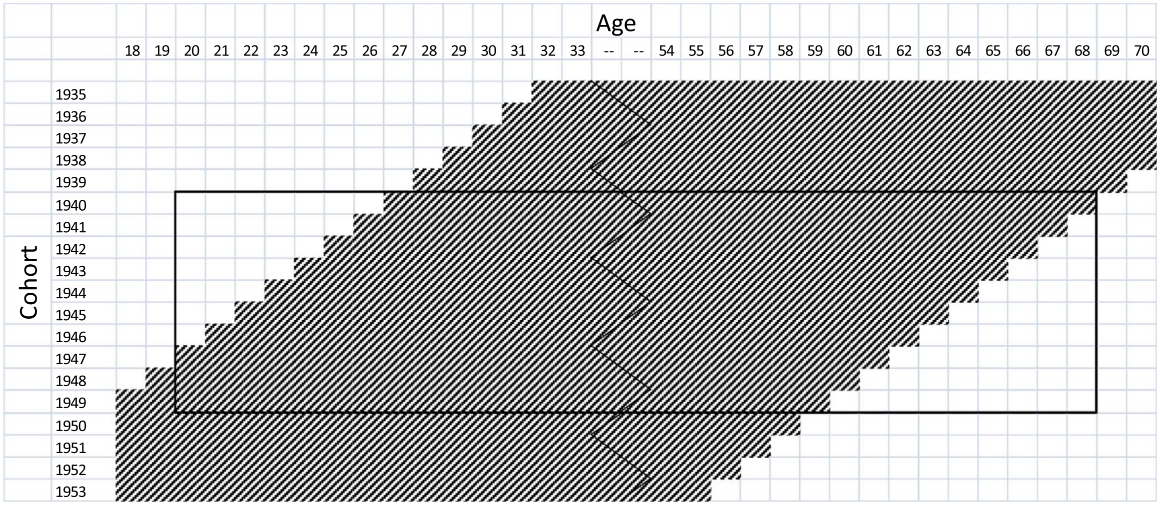

Fig. A1. Earnings observations available (shaded cells), and observations included in analytic sample (shaded cells in dark frame), by cohorts and age.

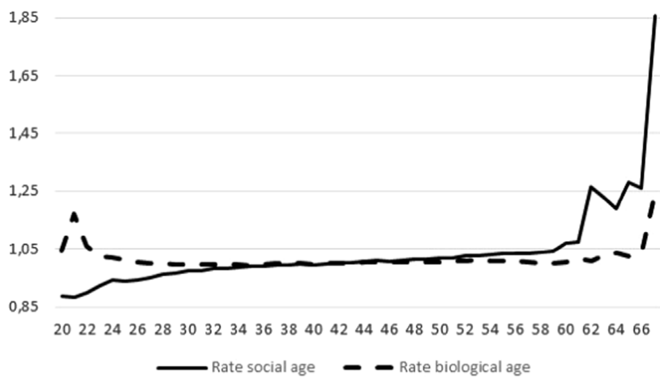

Fig. A2. Earnings ratios between January-born and December-born individuals for given social and biological ages 20–68.

Table A1
Number of earnings observations, by age level and birth month.

	Total	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Total	11,153,836	879,502	886,016	1,044,386	1,055,784	1,025,959	954,405	928,339	882,371	941,056	883,021	808,366	864,631
20	90,769	7,326	7,415	8,611	8,676	8,573	7,947	7,614	7,093	7,625	6,952	6,137	6,800
21	123,236	9,806	10,160	11,821	11,871	11,722	10,680	10,274	9,692	10,244	9,538	8,418	9,010
22	152,177	12,267	12,403	14,514	14,651	14,328	13,158	12,636	11,887	12,604	11,850	10,585	11,294
23	180,094	14,562	14,589	17,161	17,191	16,784	15,604	14,922	14,169	14,935	13,968	12,626	13,583
24	204,811	16,356	16,461	19,279	19,382	18,987	17,643	16,914	16,141	17,050	16,182	14,623	15,793
25	227,422	18,168	18,179	21,305	21,422	20,880	19,550	18,828	18,033	19,063	18,087	16,332	17,575
26	247,184	19,466	19,623	23,120	23,276	22,694	21,255	20,559	19,623	20,856	19,674	17,888	19,150
27	267,693	21,112	21,268	25,068	25,338	24,630	22,910	22,281	21,175	22,584	21,187	19,394	20,746
59	267,693	21,112	21,268	25,068	25,338	24,630	22,910	22,281	21,175	22,584	21,187	19,394	20,746
60	238,246	18,922	22,274	22,558	21,809	20,331	19,801	18,884	20,159	18,893	17,331	18,522	18,922
61	207,870	16,374	19,392	19,706	18,950	17,674	17,298	16,487	17,537	16,648	15,275	16,269	16,374
62	176,924	13,853	16,457	16,662	16,057	14,963	14,667	14,082	14,959	14,235	13,257	13,946	13,853
63	144,457	11,108	13,247	13,467	12,908	12,230	12,007	11,483	12,340	11,649	10,976	11,736	11,108
64	115,516	8,865	10,554	10,687	10,302	9,752	9,645	9,288	9,980	9,337	8,809	9,452	8,865
65	87,599	6,679	7,907	8,147	7,846	7,306	7,359	7,006	7,649	7,219	6,768	7,163	6,679
66	62,882	4,807	5,789	5,956	5,643	5,267	5,367	5,034	5,534	5,005	4,771	4,953	4,807
67	40,271	3,089	3,763	3,916	3,750	3,360	3,453	3,142	3,521	3,100	3,062	3,171	3,089
68	20,509	1,645	1,948	2,062	1,936	1,655	1,722	1,552	1,728	1,513	1,506	1,596	1,645

Notes: Numbers of observations are constant between age levels 27 to 59 years.

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