Ability Matters: Effects of Youth Labor-Market Opportunities on Long-Term Labor-Market Outcomes*

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Abstract
Utilizing registry data from cognitive ability tests for all Norwegian males born between 1962 and 1973, I study whether labor-market conditions at the age of graduation have differential effects on earnings and employment for different ability groups. I find that low-ability males are more vulnerable to local business cycles at the expected time of labor-market entry. In particular, I demonstrate that low-ability males suffer larger long-term earnings losses than the rest of the population.

Keywords: Business cycle; careers; graduation

JEL classification: E32; J31; J24

1. Introduction
The early years of a career are important for future labor-market outcomes. Studies show that about 66 percent of lifetime wage growth occurs during the first 10 years of a career (see, e.g., Topel and Ward, 1992). Notably, young people’s employment prospects in these early years could be influenced by the business cycle. Young people are often called the population at risk, as they have little work experience, and during recessions they are often the last to be hired and the first to be fired. Research on youth vulnerability shows that they experience more unemployment and underemployment and less employment than adults during recessions (see, e.g., Bell and Blanchflower, 2011a,b; Hoynes et al., 2012). Despite declining in countries in the European Union following the financial crisis, youth unemployment rates remain at a very high level: 20.3 percent in 2015 (for young people under the age of 25).1

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1 Figure obtained from the Eurostat database at http://ec.europa.eu/eurostat/data/database (retrieved 9 September 2016), Labor market/Employment and unemployment/LFS series-
In this paper, I explore the possible long-term effects on labor-market outcomes of entering the labor market when local unemployment rates are high, with a particular focus on identifying differential effects across young people of different abilities. There are at least three important mechanisms through which poor labor-market entry conditions can affect long-term labor-market outcomes. First, poor labor-market entry conditions might lead to unemployment or poor job quality. This effect might be especially pronounced for low- as compared with high-ability individuals if it is more difficult for them to find a high-quality job (see, e.g., Devereux, 2002), or any job (see, e.g., Hines et al., 2002; Elsby et al., 2010; Öckert, 2011; Hoynes et al., 2012), at times with a high unemployment rate at graduation time. Such initial differential effects could persist or become amplified in the long run if low-ability individuals struggle to escape the low-quality job, or if a low-quality job hampers their human-capital accumulation (see, e.g., Becker, 1962). Second, lower earnings or expectations of lower earnings might affect the incentive to work now and in the future, and a concave replacement rate in welfare programs would provide low-ability individuals with stronger incentives to stay out of work compared with youths of higher ability. Last, poor labor-market opportunities might reduce the opportunity cost of schooling and thereby encourage youths to complete their current educational track or undertake higher education, which, in turn, could improve future labor-market outcomes (Becker, 1962; Micklewright et al., 1990). The magnitude of the opportunity cost of schooling might depend on the ability type, providing differential incentives to continue with education.

The time at which to measure labor-market entry conditions is not straightforward. Both the year of observed entry into employment and the year of leaving education are endogenous. Individuals might experience prolonged unemployment when the unemployment rate is high, which will delay entry into the first job. Moreover, several empirical studies have documented an increase in school enrollment rates and school completion during recessions (Gustman and Steinmeier, 1981; Clark, 2009; Öckert, 2011; Johnson, 2013; Reiling and Strøm, 2015). In the empirical strategy, I follow Raaum and Røed (2006) and address such endogeneity problems by including all men (regardless of educational achievements) born in the period 1962–1973, and by looking at unemployment rates at the typical age when Norwegian men leave school and enter the labor market (and not the time of actual entry). Moreover, I employ a model using a weighted unemployment rate at entry where the timing of actual labor-market entry is based on the distribution of labor-market entry ages.

detailed annual survey results/Total unemployment/Unemployment rates by gender, age, and nationality.

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The analysis uses high-quality registry data covering the entire Norwegian population. Importantly, the data include information about cognitive ability. This allows me to investigate heterogeneous effects across youths, employing a measure of ability that is available for everyone, and not only for those who have entered college, as in Oreopoulos et al. (2012) or Liu et al. (2016). The empirical model includes regional and year fixed effects. The estimates are identified from differences in how local unemployment rates change over time across regions. After accounting for regional and cohort fixed effects, the identifying assumption is that the difference in earnings observed between regions with high and low unemployment rates would be the same if they were not subject to the difference in the local unemployment rate. I include region-specific linear time trends and observable individual and parental characteristics determined prior to labor-market entry, to assess the validity of this identifying assumption.

I find that for low-ability males, a one percentage point increase in the local unemployment rate at the expected time of labor-market entry reduces earnings at age 30–35 by about three percent and increases the likelihood of a weak labor-market attachment, defined as having earnings below the 20th percentile, by about 17 percent. In contrast, for high- and medium-ability youths, there are limited or no effects on employment or earnings in general, except that high unemployment rates at times of labor-market entry reduce the likelihood of ending up with particularly high earnings at age 30–35.

I also investigate whether family background affects vulnerability to the local unemployment rate at the time of expected labor-market entry. Interestingly, the long-term earnings for youths of low-educated fathers are particularly negatively affected by the unemployment rate at the time of expected labor-market entry. A review of the average effect on long-term earnings reveals no differential effects across low-, medium- and high-ability young men with low-educated fathers. However, the negative effects on the long-term earnings of the low-ability youths are attributable to the greater likelihood of ending up with particularly low earnings, while the effects for high-ability youths are attributable to a lower likelihood of ending up with particularly high earnings.

There is a large body of recent literature on the effects of labor-market entry conditions on long-term labor-market outcomes (Burgess et al., 2003; Oyer, 2006; Raaum and Røed, 2006; Stevens, 2008; Genda et al., 2010; 2

2 The measure, cognitive ability, is constructed from the Norwegian Army ability tests administered at the time of military conscription (normally at age 18). I am grateful to the Norwegian Armed Forces for access to their data. The views and conclusions expressed in this paper are those of the author and cannot in any way be attributed to the Norwegian Armed Forces.
Kahn, 2010; Kwon et al., 2010; Oreopoulos et al., 2012; Brunner and Kuhn, 2014; Kondo, 2015; Liu et al., 2016). The present paper is related to that of Raaum and Røed (2006). Using Norwegian data, they find that young men who face a high local unemployment rate at the time when they are 16 and 19 are more likely to end up unemployed or experience non-employment in adulthood. Moreover, Raaum and Røed (2006) investigated the differential effects across youths with different family backgrounds and, surprisingly, they find that the effects of unemployment at ages 16 and 19 for less advantaged youths in particular are not very different from the average effects for all youths. A few recent studies have explored the differential effects of labor-market entry conditions on earnings across education (Genda et al., 2010), gender (Hershbein, 2012; Kondo, 2015), blue- and white-collar workers (Brunner and Kuhn, 2014), and ethnic groups (Kondo, 2015). In general, these studies reveal that highly educated, blue-collar and male workers experience more persistent negative effects on earnings if they face poor labor-market conditions at labor-market entry than less-educated, white-collar or female workers.

The present paper makes two main contributions. The first is the benefit of having a direct measure of ability (cognitive ability) that is available for everyone. This direct measure of ability circumvents issues of endogenous sample selection that could arise if educational achievements were used to define the low- and high-ability groups. Since the young men with the lowest abilities might not even complete high school and are unlikely to enter college, using such observed measures of educational achievements as a proxy for ability would also restrict the sample under investigation to the relatively advantaged youth groups. Having the ability measurements for everyone, I avoid disregarding the effects on those who might be most seriously affected by poor labor-market entry conditions. Second, the rich registry data allow me to explore the effects of labor-market entry conditions across youths of different ability levels and with different family backgrounds, as well as the interaction between ability and family background.

II. Why Should We Expect Long-Term Effects on Labor-Market Outcomes?

There are many mechanisms through which the labor-market opportunities faced by youths might affect long-term labor-market outcomes. First, there might be an effect on human-capital accumulation through work experience. In the human-capital model of Becker (1962), on-the-job training through improving skills or learning new ones will increase workers’ future productivity, which can translate into higher long-term wages. Time spent unemployed or in a poor-quality job with few
opportunities for learning could imply no or low accumulation of human capital. The level of acquired human capital might also affect the level of employment in adulthood. A labor-supply model would support this. If two individuals have the same initial abilities and same preferences for working, but different levels of productive human capital, then the most productive worker has a higher likelihood of being employed.

The effect on human-capital accumulation can be heterogeneous. For example, low-skilled youths are likely to suffer most during a recession in terms of unemployment (Devereux, 2002; Hoyne et al., 2012) and job quality (see, e.g., Devereux, 2002). Likewise, Öckert (2011) found that, in terms of unemployment, a recession hits low-ability youths much harder. The initial differential effect on earnings could persist or become amplified in the long run if they consequently suffer larger losses to their human-capital accumulation and do not manage to switch into better jobs as the economy improves. In particular, we might not expect any long-term effect on the earnings of low-ability individuals, if there are more diminishing returns on human capital or fewer training opportunities in jobs for low-ability compared with high-ability individuals, irrespective of labor-market conditions. Then, as the economy recovers, the unlucky low-ability individuals catch up more quickly with the low-ability individuals who entered the labor market when the economy was booming, while the high-ability individuals suffer higher losses to their human-capital accumulation. Similarly, Genda et al. (2010) suggest that labor-market entry conditions have more persistent effects on the long-term earnings of college graduates than on those of high-school graduates.

Second, and related to the first mechanism, lower earnings and expectations thereof for the future might also affect incentives to work. To conceptualize this, assume that individuals enter the labor market if the expected benefits of entering exceed the expected benefits of not entering (leisure time, etc.). Lower wages might reduce the expected benefits of working, and some individuals might decide to work fewer hours or not to work at all. Moreover, the size of government transfers,

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3 There is a large body of theoretical literature on cyclical occupational upgrading that explains this (see, e.g., Reder, 1955; Okun et al., 1973; Devereux, 2002; McLaughlin and Bils, 2001).
4 Becker (1962) postulated a positive relationship between ability and human-capital investment, implying that low-ability individuals are more likely to be employed in jobs with diminishing return on human capital. A strong correlation between cognitive ability and educational attainment and between cognitive ability and adult earnings is observed in the data supporting this line of interpretation.
5 Empirical evidence suggests a causal relation between the value of labor-market participation and the claiming of disability benefit (see, e.g., Black et al., 2002; Autor and Duggan, 2003; Rege et al., 2009). Hence, we might also expect local labor-market entry conditions to affect the use of disability programs.
such as unemployment benefits or disability benefits, is linked to the utility gain of re-entering employment. Consequently, there could be a more persistent effect of labor-market entry conditions on labor-market attachment in countries with more generous welfare benefits. Variation in the unemployment rate at entry could also provide differential incentives for high- and low-ability individuals to work, especially because the replacement rate of benefits from welfare programs is often a concave and capped function of prior earnings, giving a higher ratio for low-income workers than that for high-income workers. For example, if there is a negative effect on long-term earnings from poor labor-market entry conditions, then a concave replacement rate in welfare programs would provide low-ability individuals with stronger incentives to stay out of work. This suggests that low-ability individuals, who are also more likely to be the low earners, will face a lower opportunity cost of exiting the labor market into welfare programs. Hence, we might expect a more pronounced effect of entry conditions on the long-term labor-market attachment of low-ability individuals.

A third mechanism that might affect long-term labor-market outcomes is the effect on human capital of education, which can translate into higher wages and a lower probability of unemployment (see, e.g., Becker, 1962). This might occur if poor labor-market opportunities increase the likelihood of unemployment or a poor-quality job, thereby reducing the opportunity costs of schooling and motivating youths to continue their education (see, e.g., Becker, 1962). The loss in opportunity cost of schooling might depend on ability. Öckert (2011) argued that there might be a larger reduction in the opportunity cost of schooling for low-ability youths than for high-ability youths, as the former are more likely to suffer unemployment. On the other hand, although high-ability individuals are less likely to suffer unemployment during a recession, they might still suffer a larger earnings loss if they became unemployed or entered a lower-quality job. Thus, the heterogeneity of the reduction in opportunity cost is ambiguous (Öckert 2011). However, if an increase in demand for higher education is not met by increased capacity in universities, this might result in higher admission standards during recessions. Using Swedish data, Öckert (2011) demonstrated that more students enroll when

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6 Non-employment subsidies might reduce the income return of getting a job (see, e.g., Mortensen, 1977). Similarly, Røed and Zhang (2003) show that a decrease in unemployment compensation increases the escape rate from unemployment.

7 Experience of unemployment might also affect long-term health, and this could translate into lower long-term labor-market attachment for low-ability individuals. (see, e.g., Tella et al., 2003; McKee-Ryan et al., 2005; Rege et al., 2009; Sullivan and von Wachter, 2009).

8 Micklewright et al. (1990) argue that high unemployment rates reduce family income, which can restrict access to family credit and hence discourage further school enrollment.
unemployment is high, and he used the compulsory school grade-point averages of students to show that response to unemployment rates is almost entirely driven by the top one-third of the students. If poor entry conditions in particular induce high-ability youths to enter (or remain in) higher education, then we might expect moderate negative or positive and persistent effects on long-term earnings for them.

Last, unemployment could affect inter-regional mobility (see, e.g., Pissarides and Wadsworth, 1989). High local unemployment rates at the time of labor-market entry might then motivate some young men to move to another region. Moreover, high-skilled individuals are more likely to relocate to another region if they become unemployed because the opportunity cost of remaining unemployed is higher for the high-skilled than for the low-skilled (see, e.g., Greenwood, 1975; Pekkala and Tervo, 2002). As high-ability youths have higher earnings and education than low-ability youths, they might be more likely to move to another region if they face poor labor-market opportunities at the time of graduation. This could potentially increase the prospects of high-ability youths finding a job and result in a weaker or non-existent effect on long-term earnings.

III. Background

In this section, we describe some of the relevant features of Norwegian institutions. In Norway, compulsory education consists of 10 years of schooling (seven years in primary school and three years in secondary school). Children have compulsory schooling from the age of six up until the age of 16.9 Students with special needs are given extra and special tutoring. Thus, unlike some countries, such as the US, it is extremely rare for students in Norway to graduate from compulsory school at ages other than 16. After lower secondary school, a young person can choose to continue with upper secondary school (high school) for three years, preparing for an academic education, or with three to four years of vocational schooling,10, typically finishing around the age of 19. Unlike completion of compulsory schooling, there is thus more variation in the age of the students graduating from high school.

A young person can choose to enter the labor market following primary or secondary education, or continue with tertiary education. However, in addition to primary education, Norwegian military service is mandatory

9 In 1997, a large primary-school reform was implemented in Norway, moving the school starting age from seven to six. The new system also increased the number of years spent in primary education from nine to ten. However, the age when youths finish compulsory education did not change.

10 This could consist of schooling and apprenticeship, but it might be as little as one year of schooling.
for every male in Norway and lasts for one year. The typical age of military conscription is from 18 to 20. Hence, it is expected that a large proportion of young Norwegians do not enter the labor market immediately after graduating from high school.

The Norwegian tertiary educational system, including colleges and universities, is publicly financed and tuition is free of charge. The welfare state also grants students generous scholarships and loans to cover living expenses during studies (from high school through university).

In Norway, the public welfare system is universal and generous. As discussed in Section II, a reduction in future earnings could also affect long-term labor-market attachment, and the magnitude of this effect is linked to the size of the replacement rates of welfare programs. The public welfare services in Norway are mainly provided by the Norwegian National Insurance Program. Some of the important services provided are unemployment insurance, disability benefits, sick-leave compensation, occupational rehabilitation benefits, and means-tested social assistance. The earnings replacement rate for unemployment insurance or disability benefits is above 60 percent, which is high compared with other countries. As a result of these generous non-employment subsidies in Norway, the long-term effects on labor market outcomes of young men entering the labor market in a recession might be more pronounced than for countries with less generous welfare systems.

IV. Data

To investigate the impact of labor-market entry conditions on adult labor-market outcomes, I have used several registry databases provided by Statistics Norway. These provided me with a rich longitudinal dataset containing records for every Norwegian from the period 1967–2009. The available variables include socioeconomic data (earnings and years of education) and demographic information (gender, age, number of children, and ethnicity). There are also geographic identifiers for municipality of residence.

I focus this analysis on the 1962–1973 male cohorts, to ensure the availability of outcome measures when the individual reaches the age of 35. As one of the main features of this paper is to study differential effects across ability types, I restrict the sample to men, as I have cognitive ability measurements only for them. These cohorts amount to 376,464 Norwegian-born men who were alive at age 16. To focus on the differential effects of the local unemployment rate across ability types, I exclude 19,977 men for whom cognitive ability data are missing. I also exclude 2,775 men without reported information on their education to ensure that the sample is the same for all of the dependent variables in the analysis. I exclude
21,912 men who could not be matched to a region of residence at birth. Last, I exclude 3,663 men who cannot be matched to both parents, in order to ensure clean covariates for birth order and family size. The final sample includes 328,137 men.

The key outcome variable is the log of the individual’s mean annual earnings between the ages of 30 and 35. Annual earnings include labor-related income from wages, self-employment, and work-related transfers such as sickness benefits and unemployment benefits. The earnings variable is adjusted for inflation and real wage growth using annual earnings thresholds defined by the Norwegian Social Insurance Scheme. I focus on earnings after age 30 for several reasons. First, almost all individuals have completed their education by this time. Second, at this age, I am more likely to capture returns to schooling that could occur if some individuals decided to undertake higher education when they faced a high unemployment rate at times when they would otherwise be likely to enter the labor market.

To explore the effect on labor-market attachment, I use information on annual earnings, as the data do not cover wages and working hours for the relevant time period. I define having a weak labor-market attachment as earning less than the 10th or the 20th percentile of your ability group’s annual earnings at age 30–35. Finally, I construct a measure of very successful, defined as having earnings higher than the 80th and 90th percentile of the ability group’s earnings at age 30–35.

To investigate the effect labor-market entry conditions have on educational attainment, I employ the outcome higher education, indicating more than 14 years of completed education. I also include a variable for moving, indicating whether the individual lived in a different region than the birth region at age 16 or age 25, to explore the effect on mobility.

Cognitive ability is a variable constructed from the Norwegian Army ability tests administered at the time of military conscription (normally at age 18). Military conscription is mandatory for every Norwegian man (but not for the cohorts of women in the data period). The test is based on the

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11 In order to include individuals with zero annual earnings in the log earnings transformation, I replace earnings below the seventh percentile with earnings at the seventh percentile. In Online Appendix Table B.1, I include several analyses in which I change the censoring of the earnings variable to show that the censored results (Column 5) are essentially the same as a one percentage point change from the mean earnings in the linear model (Column 1).

12 I will also look at earnings at other times in life, for example mean earnings at age 35 and accumulated earnings in the time period when the individuals are aged between 25 and 35 (see Online Appendix Table B.2).

13 Online Appendix Table F.2 includes alternative measures of education such as years of education and having more than 12 years of completed education (indicating high-school completion). In contrast to all other outcomes, which are measured at age 35, education is measured at age 34. This is because I do not observe educational attainment after 2007.
Fig. 1. Years of schooling

Notes: This figure displays the distribution in educational attainment measured as years of schooling at age 34 across ability type. Standard school entry age is six years, implying that youths with 10 years of schooling are assumed to enter the labor market at age 16, and youths with 13 years of education are assumed to enter the labor market at age 19.

The scale ranges from one to nine, and follows the stanine method (Standard NINE), which scales test scores to a mean of five and a standard deviation of two. The mean and median cognitive ability in the sample analysed are both five. On the basis of cognitive ability, I construct subsamples that represent three categories: low ability, medium ability, and high ability (< 4, 4–6, ≥ 7). Low and high ability roughly correspond to the bottom quintile (19 percent) and the top quintile (22 percent), respectively. These ability categories are constructed to focus specifically on the lower parts of the ability distribution, which was likely not included in previous studies restricted to individuals who had attended college (Oreopoulos et al., 2012; Liu et al., 2016). Figure 1 presents a detailed description of educational attainment for each subsample broken down by ability. For the high- and low-ability youths, empirical results from these tables confirm that low-ability youths are most vulnerable when entering the labor market at times with high unemployment rates.

14 Online Appendix Figure A.1 presents a histogram showing the distribution of cognitive ability.

15 Results employing alternative ability categories are given in Online Appendix Tables C.1 and C.2. The empirical results from these tables confirm that low-ability youths are most vulnerable when entering the labor market at times with high unemployment rates.
medium-ability subsamples, most individuals have 13 years of education, and are therefore expected to enter the labor market around age 19. We also see that the majority of low-ability individuals have 10 years of education, which suggests that 16 is a critical age for most individuals in this category.

The key explanatory variable is the weighted local unemployment rate around the expected time of labor-market entry (UREntry). To construct this variable, I first assume that individuals enter the labor market after finishing their education, using education in years plus the standard school entry age of six years to approximate labor-market entry age (see Figure 1, showing the distribution in years of education for each ability group).

Then, I set the weights equal to each ability group’s distribution in terms of entry age. Finally, I employ these weights to construct the weighted labor-market entry condition for the low-, medium- and high-ability youths. The unemployment rate at each age from 16 to 24 is thereby weighted by the fraction of individuals in each group who are assumed to enter the labor market at this age, for each ability group separately.

The region of residence and the local unemployment rate are based on the regional classification standard (labor-market regions) used by Statistics Norway for the level between municipality (419 in our data) and county (19 in Norway), and there are 46 such regions in Norway. The main criteria used for defining the regions are the labor market and trade and commuting areas. The region of residence is determined by where the child is born. I use birth region and not region of residence at the time of expected labor-market entry, because the region of residence at this age could be an endogenous factor. For example, high-ability individuals might decide to move to another region when the unemployment rate is high, thus leaving a negatively selected group of individuals behind. By using commuting regions, I mitigate the problem of youth mobility between smaller municipalities, because individuals are less likely to move between regions than between municipalities. In particular, 62 percent of young men live in a different municipality than their birth municipality.

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16 As the regression equation (equation (1)) in Section V includes cohort fixed effects that vary according to ability group, the weighting scheme as such will not influence the estimation results.

17 Online Appendix Table D.1 displays the association between the actual unemployment rate at the approximated time of labor-market entry and the weighted unemployment rate at the expected time of labor-market entry. We see that there is a strong correlation between the weighted unemployment rate and the actual unemployment rate, suggesting that the weighted unemployment rate is a appropriate measure for the local unemployment rate that the youths in each ability category face at the time of expected labor-market entry.
at age 16 or age 25, while only 27 percent live in a different region at age 16 or 25.\(^{18}\)

On the basis of the annual unemployment data for each municipality, I construct a measure of regional unemployment-to-population rates, calculated as the proportion of individuals registered as unemployed in each region.\(^{19}\) Information about the number of individuals registered as unemployed in each municipality is not available before 1975, and the sample is restricted to individuals who were 16 years old in the years 1978–1989 and 35 in 1997–2008. Moreover, in the unemployment-to-population rates, the population consists of all individuals in each region in the age range 16–66 years.\(^{20}\) This unemployment rate is merged with the region of residence at birth. The unemployment rate for the full population, rather than the youth unemployment rate, is used because municipal-level data on the number of individuals registered as unemployed are not available for the relevant age categories.

A large number of individual and parental characteristics, based on the time when an individual was 16, are included in the models. Unless otherwise stated, I include the following set of control variables in all models: dummy variables for birth order, maternal education, paternal education, and family size; linear and quadratic terms for maternal age at the time of the child’s birth and log of mean paternal earnings when the child was 8–10 years of age.\(^{21}\) I also include fixed effects for region of residence at birth and birth cohort.

Table 1 presents summary statistics for the key variables of interest. I present separately the means and standard deviations for the low-ability, medium-ability, and high-ability groups. We can see that at age 35, the higher-ability individuals have higher earnings, are more likely to be employed, are far less likely to claim disability benefits, and have attained a higher level of education. We also see that the parents of higher-ability individuals have obtained higher levels of education, are older at the time

\(^{18}\) In Online Appendix Table E.1, I use birth region and municipality to identify region of residence. This gives smaller coefficients (see Column 4) and is likely because moving causes attenuation bias and less precision, as the unemployment rate in the birth municipalities will not be relevant for individuals who have moved. In Column 5, I include controls for the weighted unemployment rate in other labor-market regions within the county of residence. We see that the unemployment rate at entry in the labor-market region is most relevant for long-term earnings.

\(^{19}\) Individuals in an active labor-market program are not included because this information is not available at a disaggregated level for the years 1975–1995.

\(^{20}\) Information about the actual labor force in each municipality is not available for the analysis period 1977–1995.

\(^{21}\) I focus on paternal earnings when the child was 8–10 years old, as we do not observe earnings before 1967, and earnings after this age are more likely to be correlated with the local unemployment rate at the time when the child is 16 years old.
Table 1. *Summary statistics*

|                                | Low ability | Medium ability | High ability |
|--------------------------------|-------------|----------------|--------------|
| Mean earnings at age 30–35     | 354.0       | 425.4          | 494.1        |
|                                | (161.9)     | (176.0)        | (208.9)      |
| Earnings at age 35             | 364.5       | 447.2          | 526.9        |
|                                | (187.0)     | (208.9)        | (245.8)      |
| DP recipient at age 35         | 0.0525      | 0.0168         | 0.00716      |
|                                | (0.223)     | (0.129)        | (0.0843)     |
| Education years at age 34      | 11.48       | 13.20          | 15.27        |
|                                | (1.608)     | (2.197)        | (2.474)      |
| Completed high school          | 0.397       | 0.739          | 0.933        |
|                                | (0.489)     | (0.439)        | (0.250)      |
| Higher education               | 0.0222      | 0.215          | 0.574        |
|                                | (0.147)     | (0.411)        | (0.495)      |
| Moved                          | 0.216       | 0.265          | 0.348        |
|                                | (0.411)     | (0.441)        | (0.476)      |

**Control variables**

|                                | Low ability | Medium ability | High ability |
|--------------------------------|-------------|----------------|--------------|
| Paternal education years       | 10.06       | 11.27          | 12.94        |
|                                | (2.165)     | (2.685)        | (3.218)      |
| Maternal education years       | 9.694       | 10.54          | 11.80        |
|                                | (1.632)     | (2.049)        | (2.551)      |
| Paternal earnings (child’s age 8–10) | 369.5 | 415.1          | 474.2        |
|                                | (137.2)     | (155.1)        | (176.9)      |
| Father’s age at child’s birth  | 29.92       | 29.92          | 30.23        |
|                                | (7.057)     | (6.857)        | (6.708)      |
| Mother’s age at child’s birth  | 26.42       | 26.69          | 27.22        |
|                                | (5.966)     | (5.839)        | (5.640)      |
| Maternal birth cohort (year)   | 1941.0      | 1941.0         | 1940.7       |
|                                | (7.123)     | (7.073)        | (6.908)      |
| Birth cohort (year)            | 1967.4      | 1967.7         | 1967.9       |
|                                | (3.336)     | (3.354)        | (3.362)      |
| Birth order                    | 2.233       | 2.055          | 1.887        |
|                                | (1.237)     | (1.146)        | (1.068)      |
| Family size                    | 3.062       | 2.897          | 2.786        |
|                                | (1.261)     | (1.154)        | (1.070)      |
| Cognitive ability              | 2.467       | 4.999          | 7.611        |
|                                | (0.701)     | (0.777)        | (0.731)      |
| UREntry                        | 2.011       | 2.396          | 2.744        |
|                                | (0.908)     | (0.974)        | (0.980)      |
| Observations                   | 63,555      | 191,396        | 73,186       |

*Notes:* Standard deviations in parentheses for mean statistics. Earnings are measured in NOK (2009)/1,000. DP indicates disability pension. Family size refers to the number of children in the family. Moved indicates whether the individual lived in a different region than the birth region at age 16 or age 25. UREntry is the weighted local unemployment rate around the expected time of labor-market entry.

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of the child’s birth, have fewer children, and the fathers have higher earnings.

Online Appendix Figures A.2(a) and A.3(a) show the average unemployment and weighted unemployment rates in Norway at the time when the cohorts in this sample entered the labor market (aged between 16 and 24). We see that the unemployment rate increased in the periods 1980–1984 and 1987–1993. In Figures A.2(b) and A.3(b), we see strong regional variations across labor-market regions around the mid 1980s and the early 1990s.

V. Empirical Strategy

My empirical analysis involves estimating equation (1) separately by ability group \( j = \{\text{low}, \text{med}, \text{high}\} \)

\[
y_{icr}^{j} = \eta_{c}^{j} y_{c}^{j} + \alpha_{r}^{j} + \beta_{j} \text{UREntry}_{cr}^{j} + \lambda_{i} x_{i} + \varepsilon_{icr}^{j}. \tag{1}
\]

In equation (1), \( y \) denotes a long-term outcome, which varies across individuals (\( i \)), cohorts (\( c \)), and regions of birth (\( r \)). The specification includes cohort (region) fixed effects, \( \alpha_{c}^{j} (\alpha_{r}^{j}) \), and observed covariates, \( x_{i} \), measured prior to age 16. UREntry is the weighted regional unemployment rate at expected time of labor-market entry as explained in Section IV. The coefficient of primary interest is \( \beta_{j}^{\text{low}} \), which measures how the long-term outcome of a particular ability group is affected by variation in local unemployment at the expected time of entry.

To test whether sensitivity to local unemployment at entry varies across ability groups, I also estimate a pooled and fully interacted model. The estimates from this pooled model are, of course, equivalent to estimating equation (1) separately by ability group, but the pooled model provides a more convenient way of testing whether sensitivity to local unemployment differs across groups. For example, it allows me to directly estimate \( \beta_{\text{low}}^{\text{low}} - \beta_{\text{med}}^{\text{med}} \) and the standard error associated with this difference.

The ordinary least-squares (OLS) estimators of \( \beta_{\text{low}}^{\text{low}}, \beta_{\text{med}}^{\text{med}}, \) and \( \beta_{\text{high}}^{\text{high}} \) will be unbiased provided that the local unemployment rate at the time of expected graduation is determined by exogenous economic shocks and is independent of unobservable determinants of adult labor-market performance. The inclusion of cohort fixed effects prevents permanent differences across cohorts, such as cohort sizes or trends in educational attainment, from biasing the parameter of interest \( \beta_{\text{low}}^{\text{low}}, \beta_{\text{med}}^{\text{med}}, \) and \( \beta_{\text{high}}^{\text{high}} \). It also eliminates variation due to annual cyclical changes in unemployment rates. Given the regional fixed effects, the primary remaining source of variation is, thus, that different regions are subject to different changes in the local unemployment rate compared with the overall annual variation.
After accounting for regional and cohort fixed effects, the crucial identifying assumption is that the difference in earnings observed between regions with high and low unemployment rates would be the same if they did not experience the difference in the local unemployment rate. This assumption might be violated if regions of high unemployment had different time trends from regions of low unemployment. For example, there might be a decrease in parental education over time in these regions if poor labor-market prospects caused selective migration. Hence, over time, there might be a systematic compositional change in characteristics between cohorts residing in high- and low-unemployment regions, and this compositional change might also be related to youth (adult) labor-market outcomes. To investigate the plausibility of compositional changes between cohorts, I include the vector $x_i$ of observable individual and parental characteristics expected to influence adult labor-market performance. All variables in the $x_i$ vector are measured prior to the age of 16, the first time that some young people enter the labor market. Variables observed after age 16 could be influenced by the weighted unemployment rate at the expected time of labor-market entry (e.g., work experience, educational attainment, marital status, number of dependents, etc.) and are therefore not included in the regression.

The identifying assumption might also be undermined if there were an underlying structural change in some regions. One example of such a structural change would be an underlying trend in the educational attainment in some regions, resulting in lower regional unemployment. Such a trend in educational attainment might also boost earnings in these regions. To investigate the plausibility of this scenario, I include interactions between the regional indicators and a linear time trend. This controls for linear time trends in earnings that are specific to a region. These region-specific linear time trends eliminate a substantial part of the variation used to identify any effect of the weighted unemployment rate at the expected time of labor-market entry on long-term earnings, with a possible loss of precision.

As the main goal of this analysis is to identify differential effects of labor-market entry conditions across individuals of different ability, we have to assume that cognitive ability is not influenced by the weighted labor-market entry conditions. Cognitive ability is measured around age

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22 I will also present a number of alternative formulations in Table 3, including a model with the current unemployment rate.

23 Although I do control for parental education in equation 1, the trend in average educational attainment in each region could potentially show in a different development pattern in some regions during the period, as there is a very high increase in overall educational attainment in this period (NOU, 1994). Nonetheless, as educational attainment is probably endogenous to the local unemployment rate, this variable cannot be included as a covariate.
18, so this assumption might be violated if, for example, some individuals facing a high unemployment rate before age 18 are motivated to undertake more years of schooling. There is a growing body of literature documenting an effect of schooling on cognitive skills (Brinch and Galloway, 2012; Carlsson et al., 2015). However, substituting cognitive ability as an outcome variable and employing equation 1 reveals coefficients of weighted labor-market entry conditions on cognitive ability that are small and not statistically significant (results not reported).

VI. Empirical Results

In this section, I follow the approach described in Section V to estimate the effect of the local unemployment rate at the time of expected labor-market entry on labor-market outcomes across the three different ability categories. The main results show that low-ability males suffer larger long-term earnings losses than the medium- and high-ability males. I further employ several robustness tests to investigate the robustness of these findings. I also look at alternative outcomes to investigate the possible mechanisms. Last, I employ subsample analyses to investigate differential effects across family background.

Main Results for Earnings

The estimated effects of labor-market entry conditions (UREntry) on earnings between ages 30–35 are presented in Table 2. The first column presents the results of separate regressions based on equation 1 on the three ability categories defined in Section IV, without covariates (x). From Column 1, we see that low-ability individuals suffer a substantially larger earnings loss if they face a high unemployment rate at the time of expected labor-market entry than medium- and high-ability individuals. This aligns well with the discussion in Section II. For low-ability youths, we see a long-term earnings loss of 2.9 percent. For medium- and high-ability individuals, these losses are substantially smaller and not statistically significant.

As discussed in Section V, one concern with respect to the empirical strategy is unobserved compositional change in the cohorts in different regions that is systemically correlated with UREntry. If this happens, then including covariates for the observable characteristics of the individuals and their parents in the regression model could change the estimates. As we see in Column 2, the inclusion of these covariates has only a modest impact on the coefficients, suggesting that such compositional changes do not seriously affect the estimates. In Column 3, we additionally control for paternal earnings at child’s age 8–10 years. This factor does not have
Table 2. *Long-term earnings and unemployment at expected time of labor-market entry*

| Panel A: effect on long-term earnings (subsamples across ability) | (1) | (2) | (3) | (4) | N  |
|---------------------------------------------------------------|-----|-----|-----|-----|----|
| UREntry\textsubscript{low ability}                           | −0.0293*** | −0.0298*** | −0.0309*** | −0.0208**  | 63,555 |
| (0.0094)                                                      | (0.0096) | (0.0098) | (0.0086) |     |    |
| UREntry\textsubscript{medium ability}                         | −0.0084*  | −0.0077  | −0.0069  | −0.0011  | 191,396 |
| (0.0050)                                                      | (0.0050) | (0.0050) | (0.0074) |     |    |
| UREntry\textsubscript{high ability}                           | −0.0069  | −0.0043  | −0.0019  | 0.0086   | 73,186  |
| (0.0074)                                                      | (0.0077) | (0.0077) | (0.0140) |     |    |

| Panel B: differences across subsamples (low ability omitted) pooled sample | (1) | (2) | (3) | (4) | N  |
|---------------------------------------------------------------------------|-----|-----|-----|-----|----|
| Medium ability x UREntry\textsubscript{medium ability}                    | 0.0209** | 0.0221*** | 0.0240*** | 0.0197*  | 328,137 |
| (0.0081)                                                                 | (0.0081) | (0.0082) | (0.0107) |     |    |
| High ability x UREntry\textsubscript{high ability}                        | 0.0224*  | 0.0255*  | 0.0289** | 0.0294*  | 328,137 |
| (0.0125)                                                                 | (0.0133) | (0.0140) | (0.0160) |     |    |

| Additional covariates                                                      | x   | x   |     |     |    |
| Paternal earnings at child’s age 8–10                                      | x   |     |     |     |    |
| Regional-specific linear time trend                                        |     |     | x   |     |    |

| N                                                                           | 328,137 | 328,137 | 328,137 | 328,137 | 328,137 |

*Notes:* OLS regressions, with robust standard errors clustered by region in parentheses. ***, **, and * indicate statistical significance at the 1, 5, and 10 percent levels, respectively. The dependent variable is the log of mean earnings at age 30–35. The coefficients presented in each column in Panel A are from regressions employing equation 1 separately for the low-, medium-, and high-ability subsamples. All models include regional and birth cohort fixed effects. Additional covariates are mother’s and father’s education; years of education (<10, 10–11, 12–15, ≥16 and missing) in 5×2 categories; indicators for birth order and family size (representing 1, 2, 3, 4, 5, 6+); linear and quadratic terms for mother’s age at birth of child. Column 3 also includes a control for paternal earnings (log of paternal mean earnings for the period when the child is aged 8–10). In Panel B, the coefficients in each column are from a fully interacted pooled model (low ability omitted) explained in Section V, giving the differences between $\beta^{low} - \beta^{med}$ and $\beta^{low} - \beta^{high}$, and the standard error associated with this difference.

A substantial effect on the coefficients. Paternal earnings at this time could be correlated with UREntry and are thus not included in the preferred model.

As mentioned in Section V, the effects that UREntry have on long-term earnings might vary systematically by region over time for reasons that are independent of labor-market opportunities, such as unemployment experience or job quality. Column 4 includes region-specific linear time trends to allow for this possibility. This reduces the estimated effects. In particular, the coefficient is positive but insignificant for high-ability individuals. Comparing empirical results in Column 1 with Column 4 in Panel B, we see that the differences across ability groups are basically invariant to adding a region-specific time trend.
The results revealed in Table 2 suggest that long-term earnings of low-ability youths are more vulnerable to poor local labor-market conditions around the time of expected labor-market entry compared with the rest of the population.

**Robustness**

Exposure to a high unemployment rate subsequent to labor-market entry might affect someone just as much as UREntry did. For example, the later unemployment rate could prevent promotions or wage growth through job mobility, irrespective of the unemployment rate faced around the time of expected labor-market entry. This could potentially confound the estimates, given that business-cycle shocks might be correlated with the local labor-market conditions at the time of expected labor-market entry. The rich registry data allow me to investigate this by including the local unemployment rate history. In Table 3, I isolate the effect of UREntry from the effect of the local unemployment situation at a later stage and investigate how local unemployment rates at other ages affect long-term earnings.

Columns 2 and 3 of Table 3 are similar to the results in Column 2 of Table 2. However, for each of the separate regressions performed for low-, medium-, and high-ability groups, I also include weighted labor-market conditions constructed in the same way as for UREntry but five (Column 2) and seven (Column 3) years forward in time. Comparing the preferred model in Column 1 with Columns 2 and 3 in Table 3, we see that the estimated effect of UREntry is only modestly influenced by the inclusion of the full unemployment rate history. Hence, I find little evidence that the effects on long-term earnings of UREntry are largely explained by correlation of the local unemployment rate at expected age of graduation with those later in life.24 For the high-ability individuals in Columns 2 and 3, long-term earnings seem to be positively affected by the local unemployment rates faced five or seven years after weighted labor-market entry age. In Column 4, I include the mean unemployment rate faced at age 30–35, at the same time as when the outcome mean earnings is measured. Here too, the estimates for UREntry are only modestly affected by the inclusion of subsequent unemployment rates.

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24 This is also emphasized in Online Appendix Table D.2, where I apply the same strategy to explore whether youths are more vulnerable to the weighted labor-market unemployment rate one to five years after completing their education. From this table, it seems that the age around the time when they are expected to complete their education is a critical age with respect to long-term labor-market outcome, especially for low-ability individuals.
Table 3. Effect of earlier and subsequent unemployment rates on long-term earnings

| Subsample across ability | (1)     | (2)     | (3)     | (4)     | (5)     | (6)     | N   |
|--------------------------|---------|---------|---------|---------|---------|---------|-----|
| UREntry_{low ability}   | −0.0298*** | −0.0293*** | −0.0261*** | −0.0303*** | −0.0303*** | 63,555  |
|                         | (0.0096) | (0.0093) | (0.0090) | (0.0093) | (0.0091) |         |     |
| UREntry_{medium ability} | −0.0077 | −0.0078 | −0.0077 | −0.0073 | −0.0080 | 191,396 |
|                         | (0.0050) | (0.0051) | (0.0051) | (0.0046) | (0.0051) |         |     |
| UREntry_{high ability}  | −0.0043 | −0.0076 | −0.0024 | −0.0044 | −0.0101 | 73,186  |
|                         | (0.0077) | (0.0071) | (0.0067) | (0.0076) | (0.0083) |         |     |
| UR_{low ability} (at)   | 0.0055  | 0.0107  | −0.0100 | −0.0108* | −0.0098 |         |     |
|                         | (0.0071) | (0.0080) | (0.0098) | (0.0061) | (0.0073) |         |     |
| UR_{medium ability} (at) | 0.0013 | −0.0002 | −0.0133** | −0.0013 | 0.0003 |         |     |
|                         | (0.0046) | (0.0053) | (0.0054) | (0.0029) | (0.0031) |         |     |
| UR_{high ability} (at)  | 0.0197** | 0.0148* | 0.0021  | −0.0106** | −0.0074** |         |     |
|                         | (0.0086) | (0.0088) | (0.0111) | (0.0050) | (0.0035) |         |     |

Unemployment rate (UR_{j} (at)) indicates:

- UREntry_{j}^{+5}
- UREntry_{j}^{+7}
- UR at ages 30–35
- UR at age 13
- UR at age 13

Notes: OLS regressions, with robust standard errors clustered by region in parentheses (*p < 0.10, **p < 0.05, ***p < 0.01). The full sample includes 328,137 observations (low, medium, and high ability; 63,555, 191,369, and 73,186). The dependent variable is log of mean earnings at age 30–35. Each column gives the empirical results of estimating equation (1) separately by ability group \( j = \{\text{low, med, high}\} \). Column 1 replicates the preferred model in Table 2 Column 2. The models in Columns 2-5 are identical to Column 2 in Table 2, but for each regression conducted separately for the ability groups, with the inclusion of earlier or subsequent unemployment rate (UR_{j}). UREntry_{j}^{+5} and UREntry_{j}^{+7} is the weighted labor-market conditions constructed for each ability group in the same way as for UREntry_{j} but five (Column 2) and seven (Column 3) years forward in time. Column 4 contains the mean local unemployment rate faced at age 30–35 and Column 5 contains the unemployment rate faced at age 13. Column 6 omits UREntry_{j} and contains unemployment rate at age 13.
As an additional robustness test, I include the unemployment rate at age 13 in Columns 5 and 6 (Column 6 omits UREntry). I expect unemployment rates at this time to be unrelated to long-term earnings. I observe a weak association between the local unemployment rate at age 13 and long-term earnings for low- and high-ability youths. This might be explained as paternal job loss affecting school performance and later long-term earnings (see Rege et al. (2011) for empirical evidence on how children’s school performance could be affected by paternal job loss). Alternatively, there might be a correlation between unemployment rate at age 13 and the unemployment rate that some of these young men face at the expected time of labor-market entry.

I provide some additional robustness analyses in Online Appendix Tables B.2 and D.3. First, low-ability youths are predicted to enter the labor market earlier than medium- and high-ability youths, and are thus likely to have more years of job experience at the time when the outcome earnings at age 30–35 is measured. In Online Appendix Table B.2, I investigate whether the differential effect observed in our preferred model (Column 2) Table 2 is explained by differences in years of labor-market experience across the three ability categories. First, in Column 1, the dependent variable is replaced by a variable that captures weighted earnings 11 years after the weighted labor market-entry age defined in Section IV of each ability category. Comparing Columns 1 (Table B.2) and 2 (Table 2), we see that the effect of UREntry on weighted earnings is essentially the same as on earnings at age 30–35.25

Second, in Figure 1, we see that the distribution in years of education is larger for the high-ability youths compared with the low-ability youths. Thus, the weighted unemployment rate around expected time of entry will be weighted over more years for the high-ability subsample. In Online Appendix Table D.3, I employ two alternative strategies to identify labor-market entry year, using years of education to approximate the age at which most youths in each ability category enter the labor market. Although the coefficients in this model are slightly smaller, the effect on long-term earnings of the unemployment rate at the expected time of labor-market entry is significantly larger for low-ability youths compared with medium- and high-ability youths.

In summary, the robustness analyses in this section confirm that the unemployment rate around the time when youths, mainly those of low-ability, are expected to enter the labor market, is particularly important in determining their long-term earnings.

25 I also look at the effect on earnings at age 35 and on accumulated earnings for the time period 30–35 and 25–35, and find that the coefficient produced by these models echoes the results in Table 2 (see Online Appendix Table B.2).
Table 4. Effect on employment, education, and moving (subsample across ability)

|                | (1) Earnings <10p | (2) Earnings <20p | (3) Earnings >80p | (4) Earnings >90p | (5) Higher education | (6) Moved | N  |
|----------------|-------------------|-------------------|-------------------|-------------------|----------------------|----------|----|
| UREntry^low ability | 0.0180*** (0.0066) | 0.0349*** (0.0084) | −0.0097* (0.0057) | −0.0064 (0.0039) | 0.0022 (0.0041) | −0.0016 (0.0079) | 63,555 |
| UREntry^medium ability | 0.0028 (0.0036) | 0.0042 (0.0050) | −0.0088** (0.0034) | −0.0042 (0.0033) | 0.0017 (0.0056) | 0.0098 (0.0068) | 191,396 |
| UREntry^high ability | −0.0020 (0.0059) | −0.0008 (0.0066) | −0.0191*** (0.0046) | −0.0080* (0.0043) | 0.0102 (0.0079) | 0.0499*** (0.0105) | 73,186 |

Notes: OLS regressions, with robust standard errors clustered by region in parentheses (*p < 0.10, **p < 0.05, ***p < 0.01). Coefficients are from separate regressions, by ability group j = [low, med, high], where all models are identical to the preferred model in Table 2 Column 2, but with different outcome variables. The dependent variables in Columns 1 and 2 are indicator variables for having earnings at age 30–35 below the 10th or 20th percentile, defined separately for each ability group. In Columns 3 and 4, the dependent variable indicates earnings at age 30–35 above the 80th or 90th percentile, defined separately for each ability group. The dependent variable in Column 5, higher education, indicates at least 15 years of education. The means of the dependent variable in Column 5 for the low-, medium-, and high-ability youths are 0.022, 0.215, and 0.574, respectively. Column 6, Moved, indicates whether the youths had moved out of the birth region at age 16 or at age 25. The means of the variable Moved for the low-, medium-, and high-ability youths are 0.216, 0.265, and 0.348, respectively.

Results for Labor-Market Attachment, Education, and Moving

In Table 4, I investigate the possible mechanisms through which the local unemployment rates at the time of expected labor-market entry could cause differential effects on long-term earnings for individuals of different ability types. I will first look at adult employment as a possible mechanism affecting long-run earnings.

In Section II, I hypothesize that the negative effects on earnings and employment would be most pronounced for low-ability youths. I investigate this in Columns 1 and 2 of Table 4, exploring whether we can detect differential effects on labor-market attachment across ability types (see Section IV for definitions of labor-market attachment), and find that the estimates in Columns 1 and 2 align well with this expectation.

First, in Columns 1 and 2, we see that the unemployment rate at the time of expected labor-market entry significantly increases the likelihood of low-ability youths ending up with low earnings. I find that the likelihood of having earnings below the 20th percentile increases by as much as 17 percent (3.49/0.2) for the low-ability youths if UREntry increases by one percentage point. However, the effect of this increase on the likelihood of a youth having low earnings is small, and insignificant for the medium- and high-ability youths. The differences in the detected effect between low-ability and medium- and high-ability youths are statistically significantly different from zero (t = 2.235, t = 2.273 in Column 1 and t = 3.529, t = 3.4 in Column 2).
Second, in Online Appendix F.1, I employ an additional robustness test to see whether this is really about ending up with a weak labor-market attachment by exploring the effect on employment and claiming disability benefits at age 35. The results of this regression echo the findings in Columns 1 and 2 in particular, showing a substantial effect on the likelihood of claiming disability benefits at age 35 for the low-ability youths.

It is worth noting that if unemployment rates at the time of expected labor-market entry affect labor-market attachment at age 30–35, then the negative effect on earnings at age 30–35 (shown in Table 2) could stem entirely from the reduction in labor-market attachment or the increase in disability utilization, and not from a reduction in wages. The plausibility of this theory could be examined by re-estimating the preferred model from Table 2 using different sample restrictions based on labor-market attachment at age 30–35. However, this type of sample restriction might be problematic because, as demonstrated in Table 4, it is endogenous to the local unemployment rates youths face at the time of expected labor-market entry.

In Columns 3 and 4, I implement an alternative strategy for exploring whether reduced employment is the mechanism of primary importance for explaining the negative effect on earnings observed in Table 2. That is, I present the estimated effects on alternative earnings percentiles of the local unemployment rates at the time of expected labor-market entry. If the entire earnings effect observed in Table 2 is explained by an effect on labor-market attachment, then we should not expect \( \text{URREntry} \) to have any effect on the likelihood of having particularly high earnings. In Columns 3 and 4, high earnings is defined as being above the 80th or the 90th percentile of each ability group’s mean earnings at age 30–35.

Column 3 reveals that those of low, medium and high ability are less likely to have long-term earnings above the 80th percentile if they faced a high \( \text{URREntry} \). Interestingly, the results show a stronger effect for high-ability youths, but the differences in effect across the three ability categories are insignificant (difference between low and medium ability \( t = 0.155 \) and between low and high ability \( t = 1.133 \)). In general, the results suggest that the effects on labor-market attachment observed in Columns 1 and 2 are not the only important mechanisms explaining the effect of \( \text{URREntry} \) on long-term earnings. Moreover, comparing the estimated effect for the medium- and high-ability individuals in Column 1 with that observed in Column 3 (Table 4), we also see that any effect on earnings observed for these individuals (in Table 2, Column 2) appears

\[ \text{URREntry} \]

See Online Appendix F for definition of the employment measure.
to be mainly driven by a reduction in the likelihood of ending up with particularly high earnings.

In Section II, I address how admission standards in high schools and colleges might increase during recessions due to an increase in the number of applicants. Thus, I expect the unemployment rate at the time of expected labor-market entry to have a stronger effect on education for individuals of the high-ability type than for the low-ability type. If it does, the long-term effects on earnings for the high-ability type reflect both a negative effect on earnings for those who actually enter the labor market and a mitigating positive effect on earnings for those who undertake higher education. In Column 5, I investigate such potentially heterogeneous effects of UREntry by considering the likelihood of undertaking higher education. The estimates in Column 5 are consistent with expectations showing that the effect on higher education is larger for high-ability youths. However, the effects for all ability categories are small and statistically insignificant, and there are no significant differences across the individual ability categories.

Although the estimated effect for high-ability individuals is not very large and is insignificant, it could support the hypothesis that the differential effects across ability type of the local unemployment rates at the time of expected labor-market entry on long-term earnings (shown in Table 2) are explained as an indirect effect on the likelihood of high-ability individuals undertaking higher education. I explore this hypothesis in Online Appendix Table F.2 by including years of education (Column 3) and an indicator variable for higher education (Column 4) in the preferred model from Table 2, Column 2. The estimated coefficients produced by these models need to be interpreted with caution, as the included control variables for educational attainment could be endogenous to the local unemployment rate at the time of expected labor-market entry. Comparing Column 2 of Table 2 with Column 3 and Column 4 of Online Appendix Table F.2, we see that these inclusions have only a modest effect on the point estimates. This does not support the hypothesis that the differential effect detected in Column 2 of Table 2 is explained as an indirect effect on educational attainment for the high-ability youths.

As outlined in Section II, some young men might decide to move to another region with better labor-market opportunities if they face poor labor-market entry conditions in their region of residence. We expect that this will be most relevant for high-ability youths because they are more likely to benefit most from moving. The plausibility of this theory is shown

27 In Online Appendix Table F.2, Column 1 shows the effect of completing high school (Column 1) and number of years of education (Column 2). The effect of UREntry on completing high school and years of education is small and insignificant for the three ability categories.
in Column 6 of Table 4, where I look at the likelihood of individuals living in a different region than the birth region at age 16 or age 25. As expected, the results of this model reveal that high-ability youths are more likely to move if they face high UREntry, while the effect on the mobility of low- and medium-ability youths is small and statistically insignificant.

The differential effects on mobility across the three ability categories are statistically significant only across the low- and high-ability youths. It is conceivable that moving could help counteract the negative effect of poor labor-market entry conditions for high-ability youths and thereby explain the observed differential effect on long-term earnings seen in Column 2 of Table 2. I explore this possibility in Online Appendix Table F.2 by controlling for moving (Column 5) and restricting the sample to young men that have not moved to another region (Column 6). The results of these models reveal slightly larger long-term effects on earnings for medium- and high-ability youths compared with the coefficients in Column 2 of Table 2, but the effect on long-term earnings is still larger for low-ability youths compared with medium- and high-ability youths. As revealed in Column 6 of Table 4, moving is endogenous to the UREntry rate, and therefore any interpretations of these results should be made with caution.

In general, the results in Table 4 suggest that the differential effect on long-term earnings that was detected across low-, medium-, and high-ability youths in Table 2 might exist because the low-ability youths face a stronger reduction in their long-term labor-market attachment than medium- and high-ability youths. We also saw that the weaker effect on long-term earnings detected for medium- and high-ability youths is not explained by a counteracting effect due to educational attainment or moving.

Subsample Analyses, Paternal Education, and Ability

Family background might also help counteract the negative effect of initial labor-market conditions. If so, the detrimental effect of labor-market conditions at the expected time of labor market entry might be more pronounced for youth from disadvantaged family backgrounds compared with youth from advantaged family backgrounds. It is well documented in the literature that education, type of occupation, and social and behavioral outcomes are transferred from parent to children (see Björklund and Salvanes, 2011; Black and Devereux, 2011; Dohmen et al., 2011). Type of occupation, industry, and skills level are also relevant determinants of vulnerability during recessions (see, e.g., Devereux, 2000; Hines et al., 2002; Elsby et al., 2010; Hoynes et al., 2012). Moreover, as outlined in Section II for high-ability youths, the children of parents with a higher education might also have better school grades and therefore better chances
of finding a job or continuing with education during economic downturns. This might all be explained as correlation in parental and child innate ability and talent. However, several studies also suggest a causal effect of, for example, parental education on child outcomes (see the review in Björklund and Salvanes, 2011). Parents with higher socioeconomic status might be better connected or better at mentoring the youths to find employment, continue with education or move to another region with better employment opportunities. For example, Kramarz and Skans (2014) show that firms are more likely to hire children of employed parents with high wages and long tenure, suggesting that they use the qualities of the parents as a signal of youth reliability. They also show that the effects of such social ties are stronger when the position of the graduates is weak (bad grades and low education) or the unemployment rate is higher.

Table 5 investigates this, first by comparing the effect of UREntry across the sons of fathers with low and high education (Panel A). We see that young men with low-educated fathers are more vulnerable to poor labor-market entry conditions than young men with high-educated fathers. In particular, Columns 1 and 2 of Panel A reveal significantly larger negative effects on long-term earnings and labor-market attachment for young men with low-educated fathers compared with young men with high-educated fathers.

Interestingly, in Columns 4 and 5, we see that UREntry is also a much stronger predictor of the likelihood of young men with high-educated fathers undertaking higher education or moving to another region. A one percentage point increase in the UREntry increases the likelihood of undertaking higher education by about 3.6 percent (0.0137/0.3806) for youth of high-educated fathers. Meanwhile, the effect for youths of low-educated fathers is significantly smaller in magnitude and negative but insignificant. This might suggest that the small effect on earnings detected for young men with high-educated fathers is related to the positive impact on educational attainment or moving. The results in Panel A might reflect a combination of child ability and parental environment, because the education of fathers is correlated with the child’s ability. Table 5

28 High-educated fathers have more than 11 years of schooling. This category thus includes fathers who have completed high school and fathers with further education.

29 The effect on education and moving on young men with high-educated fathers is small. When a dummy for higher education and moving is included in the estimation model used in Column 1, there are still large differential effects across young men with high-educated and low-educated fathers. The results of this estimation should be interpreted with caution; however, as education and moving are endogenous to the UREntry, factors other than education and moving might also explain the large differential effects on long-term earnings across young men with fathers with high and low education.
Table 5. Subsample by paternal education and ability

| Outcome variable | (1) LogEarnings 30–35 | (2) Earnings < 20p | (3) Earnings > 80p | (4) Higher educ. | (5) Moved | N |
|------------------|------------------------|--------------------|-------------------|-----------------|----------|---|

**Panel A: subsamples across father’s education**

| UREntry | father’s education < 12 years | | | | | |
|---------|-------------------------------|-----------|-------------------|---------------|----------|---|
|         | -0.0215*** (0.0059) | 0.0199*** (0.0065) | -0.0116*** (0.0042) | -0.0022 (0.0043) | 0.0033 (0.0074) | 184,103 |
|         | UREntry | father’s education ≥ 12 years | | | | |
|         | 0.0011 (0.0053) | -0.0016 (0.0048) | -0.0068 (0.0049) | 0.0137** (0.0053) | 0.0412*** (0.0091) | 144,034 |

**Panel B: subsample across ability (father’s education < 12 years)**

| UREntry | low ability, father’s education < 12 years | | | | | |
|---------|-------------------------------------------|-----------|-------------------|---------------|----------|---|
|         | -0.0391*** (0.0108) | 0.0426*** (0.0099) | -0.0142** (0.0063) | -0.0004 (0.0024) | -0.0064 (0.0084) | 47,613 |
|         | UREntry | medium ability, father’s education < 12 years | | | | |
|         | -0.0087 (0.0054) | 0.0033 (0.0064) | -0.0116** (0.0047) | -0.0041 (0.0063) | 0.0002 (0.0073) | 109,696 |
|         | UREntry | high ability, father’s education < 12 years | | | | |
|         | -0.0239** (0.0117) | 0.0142 (0.0124) | -0.0332*** (0.0098) | -0.0084 (0.0128) | 0.0482*** (0.0141) | 26,794 |
Table 5. Continued

| Outcome variable | (1) LogEarnings 30–35 | (2) Earnings <20p | (3) Earnings >80p | (4) Higher educ. | (5) Moved | N |
|------------------|-----------------------|-------------------|------------------|-----------------|-----------|---|
| **Panel C: subsample across ability (father’s education ≥12 years)** | | | | | | |
| UREntry<sub>low ability, father’s education ≥12 years</sub> | 0.0008 | 0.0112 | 0.0072 | 0.0122 | 0.0220 | 15,942 |
| | (0.0152) | (0.0123) | (0.0137) | (0.0118) | (0.0150) | | |
| UREntry<sub>medium ability, father’s education ≥12 years</sub> | −0.0031 | 0.0018 | −0.0101** | 0.0082 | 0.0343*** | 81,700 |
| | (0.0073) | (0.0063) | (0.0045) | (0.0066) | (0.0089) | | |
| UREntry<sub>high ability, father’s education ≥12 years</sub> | 0.0067 | −0.0091 | −0.0113* | 0.0171* | 0.0549*** | 46,392 |
| | (0.0079) | (0.0068) | (0.0057) | (0.0096) | (0.0117) | | |

Notes: OLS regressions, with robust standard errors clustered by region in parentheses (*p<0.10, **p<0.05, ***p<0.01). Each coefficient in the table is from a separate regression. The models in Panel A employ equation 1, but instead of defining the sub-groups on the basis of cognitive ability, Panel A separates them into groups of youth with low-educated fathers (father’s education <12 years) and high-educated fathers (father’s education ≥12 years). The UREntry in Panel A is now recalculated for the youth with low-educated fathers and high-educated fathers separately, employing education in years to approximate entry age as explained in Section IV. The models in Panels C and B also employ equation 1 separately for the low-, medium-, and high-ability youths, where the age distribution used to define UREntry<sub>low ability, father’s education ≥12 years</sub>, UREntry<sub>medium ability, father’s education ≥12 years</sub>, and UREntry<sub>high ability, father’s education ≥12 years</sub> is again re-weighted separately for the subsamples including young men with low-educated fathers (Panel B) and young men with high-educated fathers (Panel C). The dependent variables in Columns 2 and 3 are indicator variables for earnings at age 30–35 below the 20th percentile and 80th percentile, respectively, defined separately for each ability group. The dependent variable in Column 5, Higher education, indicates having at least 15 years of education. In Column 5, Moved indicates whether the youth had moved out of the birth region at age 16 or at age 25. Means of dependent variables in Columns 4 and 5 (Panels B and C) for each ability group are included in Online Appendix Table F.3.
B and C show whether the estimated effect for the low-, medium-, and high-ability youths differs across youths of high- and low-educated fathers.

Panel B of Table 5 focuses on a sample of youths with low-educated fathers. Interestingly, in Column 1, we see that the differences in the effect on long-term earnings across the low-, medium-, and high-ability youths is small, especially when comparing the coefficient for the low- and high-ability youths. However, the large negative effect on long-term earnings for the low-ability youths seems to be explained through an effect on labor-market attachment (see Column 2 of Panel B). Low-ability youths are significantly more likely to suffer a larger reduction in long-term labor-market attachment if they face higher UREntry compared with the medium- and high-ability youths ($t = 4.367$ and $t = 2.004$). Meanwhile, Column 3 reveals that for the high-ability youths, the large long-term effect on earnings seems to be explained by a lower likelihood of having very high earnings. In particular, for the high-ability youths, the point estimate in Column 3 of Panel B is significantly larger than the point estimate detected for the low- and medium-ability youths ($t = 1.755$). One explanation for the larger effect on higher earning detected for the high-ability type could be that high unemployment rates at the time of expected labor-market entry prevent wage growth through promotion or job mobility, and that this is most important for high-ability workers. An alternative explanation is that the high-ability youth suffer larger losses to their human capital compared with the low-ability youth and thus do not end up in very high paying jobs, as suggested in Section II.

In Column 4 of Panel B, I explore whether there are differential effects of UREntry on the likelihood of undertaking higher education across abilities for youth of low-educated fathers. The estimated effects of UREntry on higher education are small and not statistically significant for the three ability categories. Thus, the differential effect detected in Columns 2 and 3 of Panel B is not explained as an indirect effect on higher education. In Column 5 of Panel B, we see that high-ability youths are more likely to move if they faced high unemployment rates at the expected time of labor-market entry, meanwhile the coefficient is small and not statistically significant for the low- and medium-ability type.

Panel C of Table 5 shows the effect of UREntry on earnings, education, and moving for youths of high-educated fathers across low-, medium-, and high-ability youths. In general, the estimated coefficients from Columns 1–5 in Panel C do not reveal any significant differential effect on earnings, labor-market attachment, or education across ability for young

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30 Similarly, Kwon et al. (2010) show that cohorts entering the labor market during a boom are promoted faster than those entering during a recession.
men with high-educated fathers. If ability is correlated with compulsory school grades for young men with high-educated fathers and admission standards increase during recessions (as discussed in Section II), we would expect a stronger effect on the likelihood of the high-ability youths in Table 5, Panel C, Column 4 undertaking higher education, but the results do not support this hypothesis.

The results in Columns 2 and 3 of Panel B compared with Panel C give the impression that cognitive ability is more important for determining youth vulnerability to labor-market conditions at the expected time of entry for young men with low-educated fathers compared with young men with high-educated fathers. This might suggest that high-educated fathers are able to insulate their low-ability sons from the detrimental consequences of being exposed to high unemployment at the time of expected entry.

VII. Conclusion

In this paper, I investigate the effects local unemployment rates at typical labor-market entry times have on the long-term labor-market outcomes of males, with a particular focus on identifying differentiated effects across youths of different abilities. The time when different types of young men enter the labor market might be endogenous; the empirical model employs information about years of education for low-, medium-, and high-ability youths to approximate labor-market entry ages and thereby construct a measure of weighted unemployment rates at the approximate time of labor-market entry.

Several studies predict that low-skilled youth will suffer most in terms of unemployment or job quality during recessions (see, e.g., Hines et al., 2002; Elsby et al., 2010; Hoynes et al., 2012), but the existing body of literature that has investigated the long-term effects on labor-market outcomes for less advantaged or low-skilled youth is mixed. In the analysis in the present paper, I applied a direct measure of ability that is available for every Norwegian man (cognitive ability). Employing this measure shows that low-ability individuals who experienced poor labor-market conditions at their expected time of labor-market entry suffer from a persistent reduction in earnings and a substantially weaker labor-market attachment at age 30–35.

The empirical results demonstrate that a one percentage point increase in the local unemployment rate at the time of expected labor-market entry reduces the earnings of individuals at age 30 and 35 by about

31 Only for the outcome in Column 5 of Panel C do we see that high-ability youths are significantly more likely to move to another region than the low-ability youths if they face high UREntry (t = 1.823).
three percent and increases the likelihood of having a weak labor-market attachment by about 17 percent. Moreover, youths who faced poor labor-market entry conditions are less likely to have particularly high earnings in adulthood, suggesting that an effect on labor-market attachment is not the only mechanism explaining the long-lasting reduction in earnings. This paper also finds that the effect on earnings and labor-market attachment is particularly strong for low-ability youth with low-educated fathers, while youth with high-educated fathers are more likely to undertake higher education if unemployment rates are high at the time when they would typically enter the labor market.

Supporting Information

The following supporting information can be found in the online version of this article at the publisher’s web site.

Online Appendix

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