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Valtion taloudellinen tutkimuskeskus
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Abstract

This paper uses matched employer-employee panel data on university graduates who obtained a Master's degree in 1988–2004 to study how facing adverse economic conditions upon graduation affects short- and long-term labor market outcomes in Finland. Among all graduation cohorts, the average graduate faces large and persistent negative effects on real annual earnings that last for at least the first ten years after graduation. There is also a persistently higher probability of being unemployed that lasts for roughly seven years. When only considering the cohorts who graduated after the exceptionally deep Finnish 1990s depression, the effects on earnings only last for the first five years and there appear to be little to no effects on unemployment. Female graduates face smaller earnings losses on average, potentially reflecting gender differences in fields of study, employing sector and labor market attachment. The empirical results appear not to be significantly affected by selective timing or place of graduation.

Key words: labor market, unemployment, business cycle fluctuation, higher education

JEL classes: E32, I23, J22, J23

Contents

1 Introduction

An extensive literature in economics shows that economic conditions at the time of graduation from university are important for subsequent labor market outcomes. Cohorts facing a depressed economy upon graduation have, on average, lower wage levels and annual earnings, lower-level initial jobs and are more likely to be unemployed or underemployed even many years after entry than cohorts graduating under better economic conditions.[1] Thus even temporary differences in economic conditions can result in arguably unfair long-run disparities between "lucky" and "unlucky" cohorts. For example, Oreopoulos et al. (2012) show using Canadian administrative data that college graduates on average suffer earnings losses lasting for as long as ten years when graduating into a recession.[2] Furthermore, students of e.g. different majors differ in how susceptible they are to persistent negative career effects (Altonji et al. 2016, Oreopoulos et al. 2012).

Previous research has identified a number of possible mechanisms underlying these persistent differences. These mechanisms include e.g. increased costs of job search (Oreopoulos et al., 2008, 2012), occupational/task down-grading and reduced opportunities to accumulate relevant kinds of human capital (Gibbons and Waldman, 2006), worse promotion paths (Kwon et al. 2010, Kahn 2010) and cyclical skill mismatch (Liu et al., 2016). Understanding the magnitude and persistence of the effects of facing adverse economic conditions at labor market entry, recognizing the most important mechanisms behind them, and identifying those most at risk of long-term adverse effects are essential for designing effective policy interventions as well as improving school-to-work and employment programs.

In this paper, I study the short- and long-term effects on labor market outcomes of graduating from university under adverse economic conditions in Finland.[3] My sample consists of individuals who obtained a Master's degree between 1988 and 2004 and turned 22–35 in the year of graduation. To my knowledge, this paper provides the first attempt at studying these issues in the Finnish context. I use register-based matched employer-employee panel data provided by Statistics Finland that contains information on e.g. the employment status, earnings, and educational attainment of university graduates.

Studying the Finnish context extends the existing literature in two ways. First, the data allow exploiting substantial business cycle fluctuations, especially the unusually deep depression Finland experienced in the early 1990s. Studying this time period allows investigating whether the

[1] Several studies have also found negative effects of facing adverse economic conditions upon labor market entry among young workers, blue-collar workers, and workers with at most a high-school degree, for example. See, for example, Gardecki and Neumark (1998), Ellwood (1982), Neumark (2002), Burgess et al. (2003), Raaum and Røed (2006), Umkehrer (2015), Fernández-Kranz and Rodríguez-Planas (2017), and Liu et al. (2014).

[2] Studies using U.S. data include, for example, Kahn (2010), Altonji et al. (2016), Oyer (2006), and Kondo (2015). Studies using European data include, for example, Brunner and Kuhn (2014) (Austria), Cockx and Ghirelli (2016) (Belgium), Fernández-Kranz and Rodríguez-Planas (2017) (Spain), and Liu et al. (2016) (Norway). For an extensive literature review, see Chapter 2 of Päällysaho (2017).

[3] Given the recent challenging economic conditions in Finland, this research topic has gained some coverage in the Finnish media. For example, an article in *Helsingin Sanomat* (see Puttonen 2016, in Finnish), one of the largest subscription newspapers in Finland, addresses the concerns of students about to graduate into an economic contraction.

negative career effects differ substantially between those who graduate into a severe economic depression and those who face a more ordinary downturn, something which has not been explored extensively in the literature. Second, the Finnish labor markets are generally seen as more rigid than labor markets in the United States, for example. These differences enable studying whether certain institutional features are associated with larger earnings losses or differences in the underlying mechanisms driving the negative effects.

The empirical strategy of this paper follows the existing literature and uses idiosyncratic variation in the regional unemployment rate in the year of graduation to identify the causal effect of poor initial economic conditions on labor market outcomes. Consistently with previous studies, I find that graduating from university under adverse economic conditions causes sizable and persistent earnings losses for the average graduate. Facing a six percentage points (corresponding roughly to a standard deviation) higher regional unemployment rate in the year of graduation lowers real annual earnings on average by 12.6% in the first year after graduation. For the whole sample, this initial effect is halved only after 9–10 years. When only the cohorts who graduated after the severe 1990s depression are considered, earnings losses are smaller and also less persistent, being limited to the first 5–6 years after graduation.

For the whole sample, I also find a persistently higher probability of unemployment that lasts roughly for the first seven years after graduation. However, these effects are driven entirely by the cohorts who faced the 1990s depression. This result suggests that the major mechanisms behind the earnings losses under more ordinary business cycle variation are not related to unemployment, but instead lie elsewhere. Finally, I contribute to the relatively scarce evidence on the gender differences in the effects by finding larger earnings losses for male graduates than for female graduates. These gender differences potentially reflect differences in fields of study, employing industries and labor market attachment. All my empirical results are robust to e.g. various alternative variable definitions and model specifications. Furthermore, selective timing and place of graduation are unlikely to significantly bias the results.

The effects on earnings I find for all cohorts are in keeping with previous evidence from the United States (Altonji et al. 2016, Kahn 2010), Canada (Oreopoulos et al., 2012) and Belgium (Cockx and Ghirelli, 2016). In comparison, the smaller effects found for cohorts who did not face the 1990s depression are more in keeping with e.g. the evidence of Liu et al. (2016) for Norway, a rather similar country in terms of labor market features. Interestingly, the effects on unemployment sharply contrast with previous studies using Canadian and U.S. data that find little to no effects on unemployment, but are instead consistent with evidence from Norway. These differences could reflect institutional differences with respect to wage setting systems, wage rigidity and unemployment insurance system, for example. Finally, the gender differences are largely in keeping with the somewhat scant existing evidence (see e.g. Kondo, 2015).

The rest of this paper proceeds as follows. Section 2 briefly discusses the relevant features of the Finnish institutional environment and the time period of the study.[4] Section 3 describes the data, sample construction and the main variables used in the analyses. Section 4 presents the

[4]See Chapter 4 of Päällysaho (2017) for a more extensive discussion.

empirical strategy and discusses its potential problems. Section 5 presents the empirical results, relates them to the existing literature, and provides a range of sensitivity and robustness checks. Section 6 concludes. Additional figures and tables are provided in the Appendix.

2 Institutional Setting and Time Period

This paper studies the time period 1988–2014 and the first ten post-graduation years of university graduation cohorts 1988–2004. During the time period of interest, the Finnish economy faced unusually large business cycle fluctuations for an advanced economy. Most notably, after the economic boom of the late 1980s, Finland experienced in the beginning of the 1990s what Gorodnichenko et al. (2012) call "the deepest economic contraction in an industrialized country since the 1930s and the deepest recorded peace-time recession in Finnish history". The existing literature has not studied an equally severe economic contraction.

The devastating effects of the 1990s depression on the labor market and the macroeconomy as a whole, as well as its intergenerational effects, have been widely studied.[5] For example, real GDP fell by 11%, real consumption by 10%, and investment levels were at worst only 55% of their levels in 1990 (Gorodnichenko et al., 2012). The unemployment rate rose dramatically, more than quadrupling from less than 4% before the crisis to more than 16% in 1993 (see Figure 1). The number of long-term unemployed (unemployed for over a year) rose from roughly 3,000 in 1990 to roughly 140,000 in 1995 (Kiander, 2001, p. 82).

Despite the depth of the 1990s depression, the following upturn began quickly. This change was particularly driven by the export sector that benefited from the quickly devaluing Finnish mark after the government decided to float the currency (Kiander, 2001, Chapter 6). The unemployment rate began falling steadily after 1993–1994 (see Figure 1). After a long period of stable economic conditions and falling unemployment, Finland also faced a recession in 2008 due to the global financial crisis. The effects of the crisis were larger than in many other countries: for example, real GDP fell by 8.3% in 2009 according to Statistics Finland. Unemployment rate also started rising persistently, except for a short decline in 2010–2011 (see Figure 1).

According to the existing literature, the effects of facing adverse economic conditions upon labor market entry depend on the country's labor market institutions.[6] Finnish labor markets can be broadly characterized as having 1) a moderate level of employment protection and 2) an extensive collective wage bargaining system. According to the indicators of the Organisation for Economic Co-operation and Development (OECD) measuring regulations on worker dismissals, the strictness of the Finnish employment protection legislation (EPL) is below the OECD mean. However, it is clearly stricter than in the U.S. and Canada, for example. Compared to more similar economies (e.g. Sweden, Germany), the regulation of permanent workers is more lenient whereas the regulation of temporary workers is stricter (Böckerman et al., 2017).

[5] For comprehensive studies, see e.g. Kiander (2001) and Kalela et al. (2001).

[6] See, for example, Fernández-Kranz and Rodríguez-Planas (2017), Genda et al. (2010), Cockx and Ghirelli (2016), and Brunner and Kuhn (2014). See also Chapter 2 of Päällysaho (2017).

Similarly to other Nordic countries, collective labor bargainings determine wages for the vast majority of workers in Finland.[7] Even though no statutory minimum wage exists, collective bargains result in a wide range of industry-specific minimum wages and specific wage levels depending on individual characteristics (e.g. educational attainment, experience, skills, job difficulty and location). While the bargains by default apply to members of the negotiating unions and employer organizations, they can be extended to cover all workers in the relevant sector if the fraction of workers who belong to the negotiating unions is representative enough. Because union participation rates in Finland are high (varying between 70% and 80% since 1988, similarly with Sweden), around 90% of all workers are covered by a collective bargain in Finland (Böckerman et al., 2017).

Many studies look at the effects of the extensive collective bargains on wage rigidity. Real wage rigidity has remained relatively stable in Finland since the mid-1980s (Vainiomäki, 2016), and evidence from the International Wage Flexibility Project (see Dickens et al., 2007) indicates that real wages in Finland are more rigid than in many other countries (e.g. Belgium, the U.S., or Norway). Böckerman et al. (2010) use payroll record data on private sector workers for the years 1985–2001 and find that real wages respond to business cycle fluctuations mainly at the macroeconomic level (average wages adjust) rather than the microeconomic (individual) level.

Vainiomäki (2016), on the other hand, finds that the within-firms variance in wages is larger than the between-firms variation.[8] He also notes that after the 1990s depression, wage dispersion increased more between firms, meanwhile within-firm variance was larger in the 2000s. The larger role of within-firm variance suggests that potential earnings losses from graduating into a recession could come from e.g. task downgrading. However, Böckerman et al. (2017) conclude based on a literature review that it is hard to find clear empirical evidence that a stricter EPL or more extensively bargained wages would cause sizable negative employment effects.[9]

Two other relevant institutional features in the Finnish context are the tertiary education and unemployment insurance systems. In Finland, tertiary education is offered in universities and polytechnics.[10] A degree reform in 2005 mandated the majority of tertiary education programs to begin following the current two-cycle structure compatible with the Bologna Process guidelines. Even though all the graduation cohorts studied in this paper (1988–2004) pre-date the reform, Finnish universities had already started to move towards the current system from the late 1980s. Moreover, since 1994 universities increasingly moved to the current two-cycle degree structure

[7] See Asplund (2007) and Sauramo (2012) for good overviews of the Finnish collective wage bargaining system.

[8] An increasing between-firms wage variation can reflect increasing productivity differences between firms or increasing matching of high-productivity workers to firms paying high wages, for example. Increasing within-firm wage variance can in turn reflect increasing variation in tasks or employee characteristics within firms, for instance. (Vainiomäki, 2016, pp. 7–8.)

[9] They instead find negative effects on labor turnover and job creation. This finding could imply that in countries with stricter EPL and more rigid wage levels, an adverse economic shock could cause a persistent reduction in the hiring rate of graduates. From this perspective, unemployment could be a relevant mechanism through which the adverse effects on labor market outcomes materialize. Some studies support this hypothesis (see e.g. Liu et al. 2016, Cockx and Ghirelli 2016, and Genda et al. 2010).

[10] Tertiary education is preceded by nine years of basic education in comprehensive school (normally ages 7–16) and three years of upper secondary education either in the more academic general upper secondary school (lukio) or vocational upper secondary school (ammattikoulu). Both tracks provide eligibility to tertiary education.

and a five-year target completion time, except for engineering and medicine degrees.[11] Thus, the degrees university graduates obtained during the time period of interest were arguably similar to current degrees.[12] (Niemelä et al., 2012)

University students were eligible for student benefits during the whole time period 1988–2004. A comprehensive reform of the benefit system in 1992 altered the former mainly loan-based system by significantly increasing the role of the student grant, making it account for roughly two thirds of the total benefits.[13] At the same time, the student grant also became subject to taxation. The reform also made student loans market-based, after which the demand for loans plummeted as real interest rates rose sharply: less than one fifth of university students took out the loan, compared to nearly half of the students before the reform (Raivola et al. 2000; Häkkinen and Uusitalo 2003; Kela 2011, Appendix 7). After the 1992 reform, the student benefit system only saw more minor changes.[14]

In Finland, eligibility for unemployment insurance (UI) requires an individual to be registered as an unemployed job seeker in an Employment and Economic Development Office (TE-toimisto), search for a full-time job and be ready to accept a potential job offer.[15] The individual also has to form an activation plan that may entail participation in different forms of active labor market policies (ALMP). In contrast to many other European countries (see e.g. Esser et al. 2013), UI is provided through a *voluntary state-subsidized system* where benefits are paid out by UI funds that are mostly administered by labor unions. The state subsidizes and supervises the system, but also regulates it by e.g. mandating that UI must be provided in the same manner by all funds. Roughly 90% of all employed persons belonged to a UI fund in 2015 (Kyyrä et al., 2017).

UI funds pay earnings-related benefits provided that the individual satisfies the employment condition, which currently requires having worked and contributed payments to the fund in at least 26 weeks ("contribution weeks") of the last 28 months ("review period"). In comparison to other European countries, the analyses of Esser et al. (2013) (using the systems in 2010) indicate that the Finnish UI system has net replacement rates for both regular UI benefits and UI assistance that are close to those of e.g. Germany, Sweden and Denmark and benefit duration

[11] These tendencies were motivated by attempts to make degrees more internationally comparable and to cut study times and dropout rates. However, despite the five-year target of degree completion, the median study length in Finland has been roughly 6–6.5 years for most years since 1987 (Häkkinen and Uusitalo 2003, Official Statistics of Finland 2004, 2014).

[12] Furthermore, the data I use contains degree codes that have been converted to match all degrees to a common classification system of degrees (see Subsection 3.1).

[13] There were several reasons for the reform. These include e.g. the deregulation of the financial sector, the 1990s depression, and aims to increase equality in access to tertiary education, incentivize full-time studying and cut graduation times (Raivola et al. 2000; Häkkinen and Uusitalo 2003; Kela 2011, Appendix 7). Regarding the last objective, Häkkinen and Uusitalo (2003) find that the reform only had a relatively small effect on graduation times. However, because the reform coincided with the 1990s depression, the authors emphasize that it is hard to argue that these effects were mostly due to the reform.

[14] Two changes are worth noting. The student grant was reduced by roughly 10% and the housing supplement was reduced to account for 67% of the rent (from 75%) in 1995. In 1998, the earnings threshold used in determining the size of the student grant was changed from a monthly threshold to a calendar-year threshold. This change allowed students to work alongside studies more flexibly than before.

[15] This part draws especially from Kyyrä et al. (2017), who provide an excellent overview of the system and discuss the changes in it since the year 2000. For extensive analyses the Finnish UI system, see Section 2 of the study as well as Uusitalo (2005).

mirroring that of Denmark but longer than of Germany and Sweden. Furthermore, the number of contribution weeks to UI funds (ignoring the length of the reference period) needed for UI entitlement is roughly similar to that in Sweden but less than in Germany and Denmark.

Uusitalo (2005) identifies two broad periods between 1984 and 2005 during which the generosity of UI system evolved in opposing directions. Until the 1990s depression, the system became more generous: for example, the former system of a downwards-graduated replacement rate on earnings-related benefits was abandoned in 1989, basic unemployment allowance increased according to evolution of the mean wage rate, and the entitlement period was lengthened. In contrast, after the 1990s depression and roughly until 2003, the system became more stringent due to e.g. stricter eligibility conditions and reductions in benefit levels.

Kyyrä et al. (2017, Section 2) note that since 2003, changes in the UI system have made the employment condition less stringent (e.g. through reductions in required contribution weeks), especially for those claiming benefits for the first time. Altogether these changes made the employment condition closer to the situation in the early 1990s. In contrast, changes to the entitlement period have made the system less generous. Moreover, the benefit levels became more generous until 2012. When assessing the overall effect of these changes for an individual entering a new spell of unemployment, the authors conclude that UI benefits became more generous during the time period 2002–2014. Benefits became more generous on average for workers with 3–19 years of work history while being similar to the situation in the early 2000s for those with less than three years of work history. However, the authors note that younger unemployed individuals are under-represented in their calculations. The validity of these analyses to e.g. recent university graduates thus has to be taken with caution.

3 Data

3.1 Data and Main Variables

For the empirical analyses, I use the Finnish Longitudinal Employer-Employee Data (FLEED) provided by Statistics Finland.[16] FLEED contains individual-level matched employer-employee panel data on all Finnish residents aged 15–70 for the time period 1988–2014.[17] Unique encrypted personal identifiers allow following the same individuals over time. The data contain annual information on individuals' basic characteristics (age, gender, nationality, region of residence etc.), marital and socioeconomic status, family type and size, employment (e.g. number of months spent employed and unemployed), main type of activity during the whole year and in the last week of the year, educational attainment (year of completion for and type of the highest completed degree), and income (earned income, capital income, wage and salary income, received

[16]The FLEED data has limited access. Access can be obtained through an application process. For detailed information, see `https://tilastokeskus.fi/tup/mikroaineistot/index_en.html`.

[17]I use the total FLEED data set. Statistics Finland also provides a 1/3 random sample of the data prepared for research use. For data description of the sample-based FLEED, see `http://stat.fi/tup/mikroaineistot/me_kuvaus_henkilo_en.pdf?_ga=1.135788659.353869278.1484721616`.

unemployment benefits, pensions etc.). The FLEED data also include some information on the individual's employer, including the type of ownership, legal form and industry of the enterprise. However, the data unfortunately do not contain detailed information on the structure of earnings (wage levels, working hours etc.) or form of contract (full-/part-time employment).

The information in the FLEED data comes from the Employment statistics (*Työssäkäyntitilasto*) published by Statistics Finland. Data for the Employment statistics are collected mainly from various administrative and statistical data files (around 40 data files in total). These include, for example, the register data files of the Tax Administration, the register of job applicants maintained by The Ministry of Economic Affairs and Employment (MEAE), and numerous register data files of Statistics Finland (e.g. the Register of Completed Education and Degrees, the Student Register, and the Register of Enterprises and Establishments). The reference period for the statistics is the last week of the year, but some of the information is collected throughout the statistical year (e.g. number of months spent employed/unemployed, annual earned income etc.). (Official Statistics of Finland, 2016b)

I construct three main outcome variables concerning labor market outcomes from the FLEED data. First, total annual real earned income (converted to 2012 euros using Statistics Finland's consumer price index data), henceforth simply "real annual earnings", measures the total annual wage, salary and entrepreneurial income subject to state taxation. The second outcome variable is a dummy variable for being unemployed, henceforth simply "unemployment". In the main results, I define a person as unemployed if her main activity during the last week of the year is being unemployed. I prefer this definition because the Employment statistics, from which the information in FLEED come, defines an individual as unemployed if she is registered as unemployed in MEAE's register of job applicants in the last working day of the year.

Since FLEED consists of individual-year observations (instead of e.g. monthly/quarterly individual-level observations as in Fernández-Kranz and Rodríguez-Planas 2017), there are also other ways to define the unemployment variable. I thus use two alternative definitions to show that my empirical results are insensitive to different unemployment definitions (see Section 5.4). These alternatives define individuals as being unemployed if they are unemployed for at least one or three months during the year.[18] Finally, the third outcome variable is a dummy variable for whether the individual has received unemployment benefits during the year. Since the receipt of unemployment benefits strongly correlates with being unemployed, using this outcome variable provides another way of assessing the effects on unemployment.

As a proxy for the economic conditions university graduates face upon graduation, I use the unemployment rate in the year of graduation in the individual's region of residence as the main

[18]These alternative unemployment variables are constructed from the same variable that measures the number of months spent unemployed. A problem with this variable is that the way it is constructed changes during the time period of interest. For the period 1988–2004, each month is considered *separately*: if the individual is unemployed for at least 16 days during the month, she is considered unemployed for the whole month. Starting from 2005, the number of months spent unemployed is calculated based on the number of days spent unemployed during *the whole year*. This clearly creates problems for the comparability of the values across years. This is another reason why I prefer the definition used for the main results.

regressor.[19] I compute the regional unemployment rates directly from FLEED because long enough time series data are not readily available. Although FLEED also allows using the larger major regions (*suuralue*, 5 in total) as the choice of geographical area, I prefer regions (*maakunta*, 19 in total) for three reasons. First, the greater number of regions allows me to exploit more variation in economic conditions for identification. Second, previous studies have used similar geographical areas.[20] Lastly, in the empirical analyses I work with grouped data, where groups are defined by graduation cohort and region of residence in the year of graduation, and cluster standard errors at the group level (see Section 4). Using regions instead of major regions allows me to work with more groups and thus alleviates the concerns of unreliable statistical inference due to having too few clusters (see Cameron et al. 2008, Cameron and Miller 2015, Section VI, and Angrist and Pischke 2009, Chapter 8). Nevertheless, I show in Subsection 5.4 that using a major regional specification also yields similar results.

Two kinds of unemployment rates are published in Finland. Statistics Finland publishes unemployment rates based on the sample-based Labor Force Survey (LFS), whereas the Ministry of Economic Affairs and Employment publishes unemployment rates based on register data on job seekers in its Employment Service Statistics (*Työnvälitystilasto*). Mainly because of differences in the definitions of unemployment, the two unemployment rates differ from each other, with the MEAE unemployment rates consistently being higher.[21] Since the employment information in the Employment Statistics is based on MEAE's Employment Service Statistics and FLEED is constructed using the information of the Employment Statistics, I follow the Employment Statistics's definitions of employment and unemployment when computing the unemployment rates. I compute the FLEED-based regional unemployment rates as follows: for each year in each region, I identify all individuals aged 15–70 who belong to the workforce (i.e. the employed and unemployed) based on their main type of activity in the last week of the year, drop all other individuals, and calculate the share of unemployed among the labor force (i.e. $\frac{\text{no. of unemployed}}{\text{(no. of employed)+(no. of unemployed)}} \times 100\%$). Major regional and national unemployment rates are computed in a similar way.[22]

To inspect the reliability of the FLEED-based unemployment rates, Figure 1 shows the FLEED-based national unemployment rates along with annual averages for Statistic Finland's LFS-based

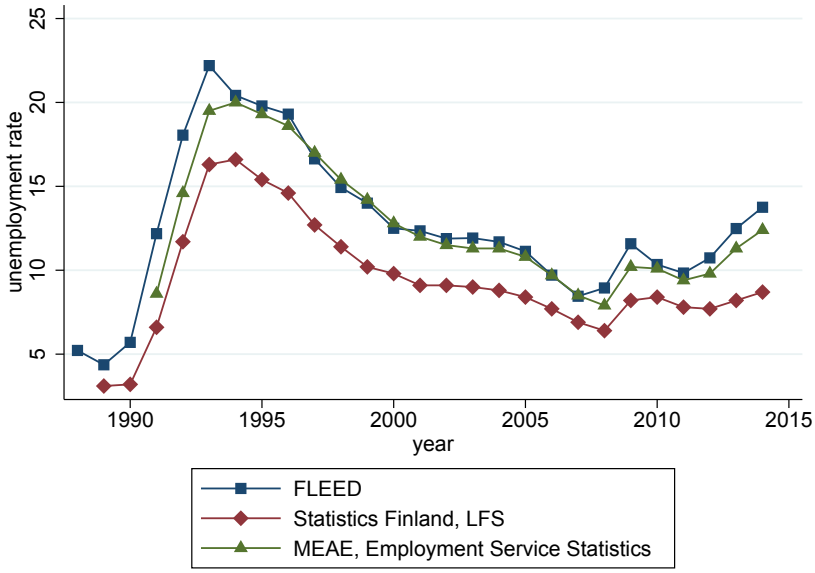
[19] FLEED contains the individual's annual region (and major region) of residence (in the last day of the calendar year) using a fixed year of region division (2014). Thus, past municipal consolidations do not affect the information on (major) region of residence and unemployment rates reflect changes in the economic situation of the same fixed regions and major regions.

[20] For example, Liu et al. (2016) use Norwegian counties, which are similar to Finnish regions in terms of population size, as the geographical areas in their analyses.

[21] In the LFS, a person is unemployed "if he/she is without work during the survey week, that is, has not done paid work or has not worked as self-employed, has sought work as an employee or self-employed in the past four weeks and could start work within two weeks." In the Employment Service Statistics, a person is unemployed if she is registered as a job seeker at an Employment and Economic Development Office, and either is not employed or working full-time as an entrepreneur or a self-employed worker, or is employed but fully laid off or her regular weekly working time is under four hours. (Official Statistics of Finland, 2016a)

[22] The unemployment rates I compute are not internationally comparable. Unlike the LFS unemployment rates, which use definitions of unemployment and employment that follow International Labour Organization (ILO) and European Union (EU) guidelines, the MEAE unemployment rates are not internationally comparable because of varying standards used by labor force administrations and differences in legislature on unemployment benefits in other countries. (Official Statistics of Finland, 2016a)

Figure 1: National Unemployment Rates, 1988–2014



Notes: This figure contains the time series of national unemployment rates for the time period 1988–2014 computed using FLEED. See Subsection 3.1 for information on how these rates are computed. For the sake of comparison, the figure also includes the annual average unemployment rates published by Statistics Finland's Labour Force Survey and Ministry of Economic Affairs and Employment's Employment Service Statistics. The publicly available time series for the LFS unemployment rates and MEAE's unemployment rates start from 1989 and 1991, respectively.

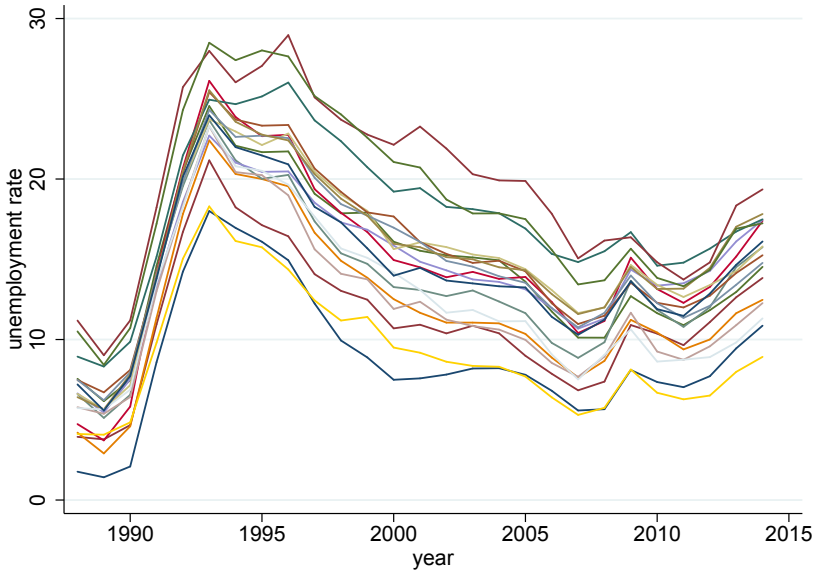
unemployment rates and the unemployment rates from MEAE's Employment Service Statistics. Due to the different definitions of unemployment, the FLEED and MEAE unemployment rates are consistently higher than Statistics Finland's LFS unemployment rates. The FLEED and MEAE unemployment rates are also very close to each other, which is not surprising given that the same underlying definitions of unemployment are used in both time series.[23] Encouragingly, all three unemployment rate time series evolve very similarly, thus capturing the business cycle variation in similar ways.[24] All in all, this graphical comparison shows that the FLEED-based unemployment rates used for the analyses in this paper are reliable, at least at the national level.

Figure 2 presents the time series of FLEED-based regional unemployment rates (excluding the Åland region). While the unemployment rates evolve quite similarly over time in all regions, there is considerable cross-sectional variation each year between regions. For example, during the 1990s depression the peak unemployment rate in some regions was under 20% whereas in others it was more than 25%. There is also clear idiosyncratic variation beyond the common overall trend in the evolution of regional unemployment rates. As I discuss in Section 4, I use this idiosyncratic variation to identify the effects on labor market outcomes. Major regional unemployment rates are presented in Figure A1 in the Appendix.

[23]There are notable differences only for the years 1991–1993, i.e. during the 1990s depression, where the FLEED unemployment rates are roughly three percentage points higher. From there on the annual differences are at most 1.3 percentage points, with differences being well below one percentage point for most years.

[24]One exception is the recent recession: starting from 2010/2011, the FLEED and MEAE unemployment rates rise more quickly than the LFS unemployment rate which only sees a muted rise in comparison.

Figure 2: Regional Unemployment Rates, 1988–2014



Notes: This figure contains the time series of unemployment rates for the time period 1988–2014 for all Finnish regions (excluding Åland). The unemployment rates are computed using FLEED. See Subsection 3.1 for information on how these rates are computed.

3.2 Sample Formation

The population of interest in this paper is Finnish university graduates who received a Master's degree for the first time between 1988 and 2004 and turned 22–35 in the year of graduation. I limit my analysis to university graduates for two reasons. First, most of those obtaining a Master's degree enter the labor market and start searching for a full-time job afterwards. This would not be the case if I also included those who obtained a bachelor's degree, because most university students go on to obtain a Master's degree in Finland. The year of obtaining a Master's degree thus offers a reliable and plausible timing of labor market entry. Second, highly-educated workers like university graduates typically have strong labor market attachment. They are also more likely to make a career where they gradually progress to more advanced tasks. This means that for highly-educated workers, jobs early on in the career are important for accumulating appropriate kinds of human capital. Thus focusing on university graduates allows studying whether, and to what extent, poor economic conditions upon graduation disrupt their careers.

I form the main sample used in the analyses as follows. First, I identify the individuals who obtained a Master's degree for the first time between 1988 and 2004 and for whom age and region of residence in the year of graduation are known. The time period I choose allows studying the first ten years after graduation for all graduation cohorts. The level of the highest completed

Table 1: Descriptive Statistics for the FLEED Sample

Variable	Mean	Std. Deviation	Observations
Male	0.446	0.497	1417740
Age in year of graduation	27.4	2.71	1417740
Year of graduation	1997	4.87	1417740
Unemployed	0.0361	0.187	1417740
Regional UR in year of graduation	12.9	5.94	1417740
Major regional UR in year of graduation	13.1	5.84	1417740
Real annual earnings (in 2012 euros)	39740	25586	1403609
Receives unemployment benefits	0.118	0.322	1417740

Notes: This table gives descriptive statistics for the individuals of the FLEED sample used in the analyses. See Subsection 3.2 for detailed information on how the sample is formed.

degree is obtained from the code of qualification variable included in FLEED.[25] After identifying these individuals, I drop all observations pre-dating graduation and only keep those who turned 22–35 in the year of graduation, thus keeping approximately 89% of all individuals (roughly 154,000 individuals and 2,730,000 observations in total). Out of these individuals I only keep those who appear in the data in each of the first ten years after graduation. Fortunately, in doing so I only drop roughly 12,000 of the individuals and 125,000 observations. Finally, I drop the graduates whose region of residence in the year of graduation is Åland because of the very low number of observations. After these steps, I have the final sample, hereafter the "FLEED sample", containing 141,774 individuals and 1,417,740 individual-year observations in the time period of interest, i.e. 1–10 years since graduation (and 2,602,090 observations overall).

Table 1 presents descriptive statistics for the FLEED sample. Table A1 in the Appendix presents more detailed descriptive statistics for the main outcome variables for each year after graduation. Table 1 shows that the average age in the year of graduation is 27 years, the average year of graduation is 1997, and roughly 45% of the graduates are males. Mean real annual earnings during the whole time period (first ten years after graduation) is roughly 39,700 euros. Earnings grow quite rapidly each year, though, starting from around 29,400 euros in the first year after graduation and being over 49,000 euros by the tenth year (Table A1). Each year, 3.6% of the individuals are unemployed during the last week of the year and 11.8% receive unemployment benefits. Both the shares of unemployed and unemployment benefit receivers fall during the first ten years after graduation, starting from being 5.5% and 21.9% in the first year and ending up being 2.9% and 8.7% in the tenth year, respectively (Table A1).

Table 1 also shows that there is considerable variation in the regional unemployment rates graduates face upon graduation: the mean (and median) unemployment rate is roughly 13%, but ranges widely between 1.4% and 29% (not shown). Graduation cohort sizes by region and major region of residence in the year of graduation are presented in Tables A2 and A3 in the

[25]Information on degrees comes from Statistics Finland's Register of Completed Education and Degrees. A completed degree is included in the register only if the individual has a Finnish personal ID number. For this reason, the sample does not include e.g. many foreigners who have completed a Master's degree in a Finnish university but do not have a Finnish ID. Degrees are classified using the 6-digit Finnish Standard Classification of Education 2010 system and are comparable across years. For a complete list of degree classifications, see `http://tilastokeskus.fi/meta/luokitukset/koulutus/001-2010/koko_luokitus_en.html`.

Appendix. Both tables show that graduation cohort sizes have an increasing trend over time at the national level. There is large regional variation in graduation cohort sizes, with Uusimaa having roughly 3000–4000 graduates and Central Ostrobothnia less than 100 graduates each year, for example. I note in Subsection 5.4 that my empirical results are not sensitive to excluding graduates from Uusimaa. At the more coarse major regional level, the cross-sectional variation is smaller.

4 Methodology

4.1 Empirical Strategy

The aim of this paper is to estimate the magnitude and persistence of the effects on labor market outcomes of facing adverse economic conditions upon graduation. As a proxy for local economic conditions upon graduation, I use the regional unemployment rate in the year of graduation in the individual's region of residence.[26] As in the previous literature (e.g. Liu et al. 2016 and Oreopoulos et al. 2012), identification of the effects on labor market outcomes uses the idiosyncratic variation in regional unemployment rates, after controlling for regional fixed effects and calendar year effects.[27]

For the empirical analyses, I collapse the individual-level panel data and instead work with grouped panel data containing annual observations for groups defined by graduation cohort, denoted by c, and region of residence in the year of graduation, denoted by r.[28] The grouped panel data thus consist of group-specific means of the outcome variables for each calendar year t. Collapsing the individual-level microdata is sensible because individual-level observations are not independent since the main regressor of interest, the unemployment rate in the region of residence in the year of graduation, only varies at the cr-group level. Using grouped panel data takes care of this within-group correlation of individual-level observations.[29]

With the grouped panel data, I estimate the main empirical results using Equation 1 given

[26] Some studies in the literature (see e.g. Liu et al. 2016) use the unemployment rate of the region of the *college/university* from which the individual has graduated. Unfortunately, I do not have information on the location of the university.

[27] More specifically, calendar year effects capture the component of regional business cycle variation that is common to all regions. After regional fixed effects are also controlled for, identification then uses the residual within-region variation in unemployment rates, over and above the variation commonly shared with all other regions.

[28] This approach is suggested by e.g. Angrist and Pischke (2009, pp. 312–313) (in a cross-sectional context), Bertrand et al. (2004) and Cameron and Miller (2015), and it also follows the existing literature (see e.g. Oreopoulos et al. 2012 and Liu et al. 2016). Furthermore, I see the use of grouped data as a more conservative approach in this case because I do not have information on many potentially important individual-level control variables (e.g. background information on parents).

[29] As e.g. Moulton (1990) and Angrist and Pischke (2009, pp. 308–315) illustrate, if within-group correlation is not accounted for, the usual heteroskedasticity-consistent standard errors can be severely biased downwards, even with the presence of a small within-group correlation.

below:

$$\bar{y}_{crt} \;=\; \alpha \;+\; \sum_{e=1}^{10} \beta_e \, UR_{cr0} \;+\; \phi_t \;+\; \theta_r \;+\; \gamma_e \;+\; \chi_c \;+\; \theta_r \times \gamma_e \;+\; u_{crt}, \qquad (1)$$

where $\bar{y}_{crt}$ is the group-specific mean of the outcome variable (logarithmic real annual earnings, unemployment dummy, dummy for receiving unemployment benefits etc.) for graduation cohort c from region r in calendar year t, UR_{cr0} is the regional unemployment rate facing regional graduation cohort cr in the year of graduation, α is the constant term, u_{crt} is the error term, ϕ_t denotes calendar year effects, and θ_r, γ_e, χ_c denote fixed effects with respect to region of residence in the year of graduation, potential work experience (years since the year of graduation) and graduation cohort, respectively.

In Equation 1, graduation cohort fixed effects χ_c capture time-invariant differences between the characteristics of different graduation cohorts at the *national* level. Potential work experience fixed effects γ_e capture the common labor market experiences of all individuals with the same amount of potential work experience. Following Liu et al. (2016, p. 5), I also include the interaction term $\theta_r \times \gamma_e$ to allow the experiences of individuals with the same amount of potential work experience to vary by region of residence in the year of graduation. Because I work with panel data containing group-specific means of the outcome variable, I estimate the model with Weighted Least Squares (WLS) using group sizes as weights. As pointed out by Angrist and Pischke (2009, pp. 40–41, 312–314), this produces point estimates that are identical with estimates from a regression with the same set of regressors as in Equation 1 but using individual-level observations for the outcome variables instead.[30] Finally, I cluster the standard errors at the group (cr) level in order to take into account that group-specific means of outcome variables are serially correlated (because the underlying individual-level outcomes are serially correlated).[31]

Assuming the main identifying assumptions hold (see Subsection 4.2), the coefficient of interest in Equation 1, β_e, gives the causal effect on the labor market outcome variable in potential experience year e of a percentage point increase in the regional unemployment rate in the year of graduation, UR_{cr0}. In order to assess the persistence of the effect, I allow this coefficient to variate by years of potential work experience, $e \in \{1, \ldots, 10\}$.[32,33] Therefore, we more specifically have $\sum_{e=1}^{10} \beta_e \, UR_{cr0} = \sum_{j=1}^{10} \beta_j \, [\, UR_{cr0} \cdot 1(e = j) \,]$, where $1(e = j)$ is an indicator function equal to one when potential work experience equals $j \in \{1, \ldots, 10\}$. Since potential work experience fixed effects, γ_e, and the interaction term $\theta_r \times \gamma_e$ are included, the causal effects

[30] To avoid problems with perfect multicollinearity and to be able to identify calendar year effects, graduation cohort fixed effects, and potential work experience fixed effects separately, I omit one of the graduation cohort dummies from the model (see Oreopoulos et al., 2012, p. 7, footnote 10).

[31] As Angrist and Pischke (2009, pp. 318–319) note, this is the simplest and most widely used way of addressing serial correlation in studies using group-structured panel data. It is incidentally also the approach followed in many previous studies relevant to this paper (see e.g. Oreopoulos et al. 2012, and Liu et al. 2016).

[32] I use *potential* years of work experience (i.e. years since the year of graduation) instead of *actual* work experience because of the endogeneity of actual work experience. For example, graduates who are unemployed at some point during the first 10 years since graduation can be different in unobserved ways from those who are always employed. The data I use do not have information on actual work experience, either.

[33] I begin to look at the effects from the first year after graduation ($e = 1$) to avoid making misleading comparisons in the year of graduation: for example, I could compare the earnings of those graduating at the beginning of the year and starting to work to those graduating in May and starting to work.

should be interpreted as average deviations from the career trajectory of a graduate who faces favorable regional economic conditions upon graduation (low UR_{cr0}) for a graduate *from the same region* who faces adverse economics conditions (high UR_{cr0}).

4.2 Threats to Validity

The main identifying assumption that needs to be satisfied to be able to interpret the coefficients of interest in Equation 1, β_e, causally is that the error term u_{crt} be uncorrelated with the regional unemployment rate in the year of graduation, UR_{cr0}. This assumption holds if changes in regional unemployment rates arise from changes in aggregate labor demand that are uncorrelated with graduation cohort characteristics. Obvious threats to the validity of this assumption are selective timing and region of graduation. Intuitively, if a significant fraction of students strategically postpone their graduation or select their region of residence in the year of graduation in response to adverse shocks in the local labor market, the set of coefficients (β_e) are subject to selection bias. I discuss both of these threats in turn.

Hypothetically, in adverse economic conditions individuals who are more motivated and competent are more likely to graduate and enter the labor market. If this selective timing of graduation is common, it would imply that the estimated effects on labor market outcomes only provide lower bounds of the true effects. I partly address this problem by including graduation cohort fixed effects, χ_c, which capture differences between graduation cohort characteristics at the *national* level. However, if there remains considerable variation between regions in how changes in the regional unemployment rate affect graduation cohort composition, the coefficient of interest β_e can still be biased.

Unfortunately, the FLEED data do not have information on the duration of education.[34] However, as a robustness check I inspect in Subsection 5.4 whether the regional idiosyncratic variation in unemployment rates correlates with the variation in regional graduation cohort sizes. If no such correlation is observed (or the correlation is only limited), it would suggest that selective timing of graduation is not a serious threat to the validity of the empirical analyses.

Another potential problem is selective place of graduation. Empirical evidence suggests that more educated individuals are more likely to move in response to changes in the local and more distant labor market conditions (see e.g. Wozniak, 2010). Since June 1994, when the Municipality of Residence Act[35] (201/1994) came into effect, university students have been able to register their migrations to the place of study as permanent moves. A concern is that this could lead to selective migrations to regions with e.g. better employment opportunities upon graduation. A related problem is that the last day of the year is used as the reference point in FLEED when defining the region of residence. For example, if an individual graduates in May, she can move to another region during the same year, perhaps in response to adverse economic conditions

[34] In studies where data on duration of education is available, selective timing of graduation can be acknowledged by instrumenting for the unemployment rate in the year of graduation with the unemployment rate in the *predicted* year of graduation (see Oreopoulos et al. 2012 and Liu et al. 2016).

[35] *Kotikuntalaki* in Finnish.

in the region from which she graduated. Because these possibilities would make the region of residence correlated with regional unemployment rate in the year of graduation, selective region of graduation could bias the estimate of interest, β_e. Intuitively, the bias is negative if graduates strategically choose the region with the best employment prospects upon graduation.

Assessing whether selective place of graduation is a serious threat is hard because FLEED does not contain information on the region of the university in which the graduate was enrolled. However, the region of residence in the year *before* the year of graduation arguably serves as a decent approximation of the region of the university. Therefore, as a robustness check I investigate in Subsection 5.4 whether there is a negative correlation between the regional unemployment rate in the year of graduation in the region of residence of the year before graduation and the probability that the region of residence in the year of graduation is the same as in the year before graduation. If there is no negative correlation (or only a small one), it would suggest that selective place of graduation is not a large concern.

5 Results

5.1 Descriptive Evidence

Before presenting the main regression results, I show graphical evidence on the labor market experiences of different graduation cohorts. This descriptive analysis motivates why studying the Finnish context is relevant by clearly showing how disruptive the 1990s depression was for the careers of the university graduates who faced it upon or after graduation.[36] Figures 3 and 4 present the evolution of mean logarithmic real annual earnings and mean unemployment for graduation cohorts 1988–2004 of the FLEED sample at the national level.[37] Each solid curve in both figures represents the evolution of mean real annual earnings or share of unemployed for a single graduation cohort over time. To compare different graduation cohorts at the same stage in their careers, the dashed lines connect the earnings or unemployment experiences of different cohorts with the same amount of potential work experience.[38]

Three things stand out from Figure 3. First, there are large differences between cohorts in the evolution of mean earnings.[39] The between-cohorts variation in real annual earnings one

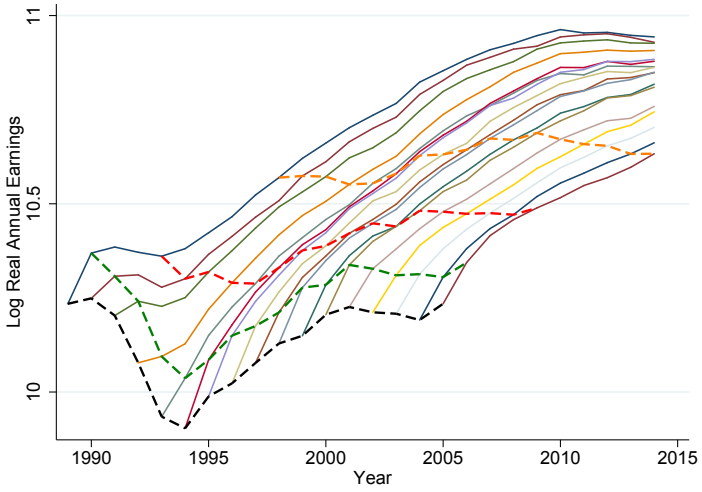
[36] These graphical comparisons are similar to those in the existing literature, see e.g. Oreopoulos et al. (2012), Liu et al. (2016), and Brunner and Kuhn (2014).

[37] The figures have been constructed by first aggregating the individual-level panel data to groups defined by graduation cohort (year of graduation) and calendar year and then computing the group-specific means of logarithmic real annual earnings and shares of unemployed for each year after the year of graduation.

[38] As explained in Subsection 3.2, each individual in the FLEED sample appears in the data in each of the first ten years after graduation. Thus the cohort-specific means in Figures 3 and 4 are always computed using the same individuals for this time period. However, after the first ten years after graduation, some individuals may not appear in the data in some years.

[39] Note that when plotting the cohort-year-specific means in Figure 3, missing values of logarithmic real annual earnings (due to zero or missing values) are ignored. Fortunately, within the first ten years after graduation, only around 20,000 observations (or 1.4% of all observations) are ignored; roughly 14,000 of them due to missing values and 6,000 due to zero earnings. When not limiting to the first ten years, only around 1.53% of all observations ignored. Composition bias is thus not a large issue.

Figure 3: Earnings Profiles by Graduation Cohort



Notes: This figure presents the evolution of mean logarithmic real annual earnings for graduation cohorts 1988–2004 at the national level. Dashed lines connect the mean logarithmic real annual earnings of all cohorts at one (black), two (green), five (red) and ten (orange) years of potential experience. Earnings measure the total annual earned income, i.e. the sum of wage and entrepreneurial income subject to state taxation. Computed using the FLEED sample. See Subsection 5.1 for more discussion.

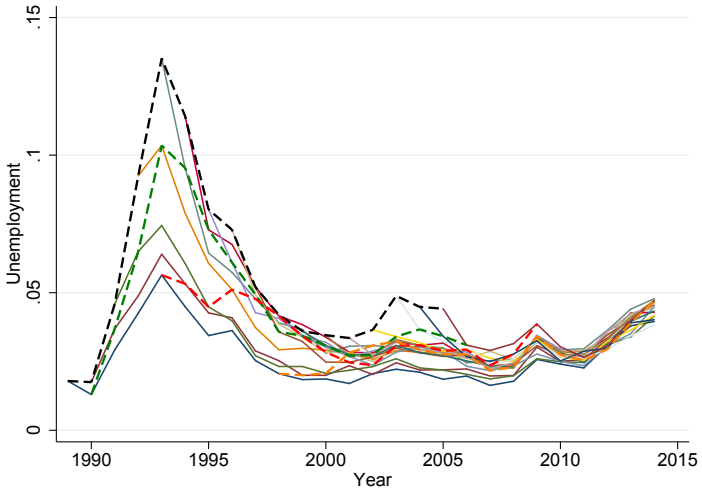
year after graduation (black dashed line) is sizable and clearly coincides with the business cycle variation in Finland. For example, real annual earnings one year after graduation were roughly 31,700 euros for cohorts who graduated just before the 1990s depression (cohorts 1988 and 1989), whereas for cohorts graduating during the depression (in 1992 and 1993) they were roughly 24,000 euros, approximately 25% lower. Initial mean real annual earnings started to rise after the depression ended and the subsequent economic upturn started.[40]

Second, the mean real annual earnings of different graduation cohorts converge as potential work experience accumulates. Earnings two years after graduation (green dashed line) still clearly differ between cohorts and this variation coincides with the business cycle variation. However, there is less variation across cohorts five years (red dashed line) and ten years (orange dashed line) after graduation. Graduates who face adverse economic conditions at the beginning of their careers thus seem to catch up luckier cohorts over time. Nevertheless, it is striking that even ten years after graduation the mean real annual earnings of cohorts who faced the 1990s depression early on (cohorts 1988–1993) are still 6–8% lower than of those cohorts who graduated after the depression (in 1996 and later). Finally, the evolution of earnings over time follows a similar pattern for all cohorts: mean logarithmic real annual earnings are a concave function of years since graduation. The growth rate of earnings is thus higher early on in the career and slows down over time. This result is consistent with findings from several other countries and supports the result of Topel and Ward (1992) that wage rates increase more rapidly early on in the career.

There are similar differences between graduation cohorts in the incidence of unemployment.

[40]However, note that only for the cohorts who graduated in 1999 and later were the mean real annual earnings one year after graduation similar to those who graduated just before the depression.

Figure 4: Unemployment Profiles by Graduation Cohort



Notes: This figure presents the evolution of mean unemployment (fraction of unemployed) for graduation cohorts 1988–2004 at the national level. Dashed lines connect the unemployment experiences of all cohorts at one (black), two (green), five (red) and ten (orange) years of potential experience. An individual is defined as being unemployed if she is unemployed during the last week of the year. Computed using the FLEED sample. See Subsection 5.1 for more discussion.

Figure 4 shows that the shares of unemployed among different cohorts vary considerably early on in the labor market.[41] For example, one year after graduation (black dashed line) the share of unemployed among cohorts who graduated just before the depression (cohorts 1988 and 1989) was just 1.8%, whereas among the unlucky cohorts of 1992 and 1993 who graduated during the depression it was as high as 11–13%.[42] We can also see that during the 1990s depression, shares of unemployed were much lower for older cohorts.[43] More years of (potential) work experience thus appear to help weather adverse economic conditions, although the incidence of unemployment also rises among more experienced cohorts.

As with earnings, Figure 4 also shows that the shares of unemployed converge between graduation cohorts over time. Although the variation in mean unemployment is clear and pro-cyclical two years after graduation (green dashed line), it is smaller five years (red dashed line) and ten years (orange dashed line) after graduation. This diminishing variation again suggests that the effect of economic conditions upon graduation dissipates over time. However, it also reflects the fact that the majority of graduation cohorts faced more favorable economic conditions five and especially ten years after graduation. During more stable economic conditions (from 2000 and onwards), differences in the shares of unemployed between graduation cohorts are small two years after graduation and afterwards.

[41] There are no missing values with respect to the unemployment variable. However, as already noted, after the first ten years after graduation some individuals may not appear in the data in some years.

[42] Not surprisingly, these shares of unemployed are considerably lower than the unemployment rates for the overall population, indicating that high-educated workers are less susceptible to unemployment even when facing very adverse economic conditions.

[43] For example, in 1993 the share of unemployed among the graduates who had just entered the labor market (cohort 1992) was 13.5%, whereas among those who graduated in 1988–1990, it was 5.6–7.4%.

5.2 Effects on Earnings and Unemployment

Table 2 presents the main results of this paper. The estimates measure the effects of facing a percentage point higher regional unemployment rate in the year of graduation on the logarithmic real annual earnings, unemployment and receipt of unemployment benefits of an average graduate belonging to regional graduation cohort cr. I estimate the effects using Equation 1 and the whole FLEED sample, i.e. the first ten post-graduation years for graduation cohorts 1988–2004. There are 306 ($= 17 \times 18$) cr-groups in total and thus the grouped panel data used for estimations contain 3060 group-year-observations.

Column (1) of Table 2 indicates that one year after graduation, real annual earnings decline by 2.1% in response to a percentage point higher regional unemployment rate. However, the effect on earnings is remarkably persistent: the initial effect is reduced by roughly a quarter five years after graduation and is halved only after 9–10 years. Moreover, the coefficients for each of the first ten years after graduation are statistically significant at the 1% level.[44] However, as Cockx and Ghirelli (2016, p. 168) discuss, interpreting an estimate of the effect in response to a percentage point increase in the unemployment rate is challenging because the variations in and levels of unemployment rates over time vary across countries depending on e.g. labor market institutions. This caveat makes it difficult to compare the estimates with other ones obtained in the literature with different data sets.[45]

To illustrate the magnitude of the effects more transparently, we can compare an average graduate who faces the mean regional unemployment rate in the year graduation to an otherwise similar graduate who faces a standard deviation, or roughly 6 percentage points (see Table 1), higher unemployment rate. Initially, adverse economic conditions upon graduation decrease real annual earnings by 12.6%. Five years after graduation, real annual earnings are 8.9% lower, and ten years after graduation they are still 6% lower.[46]

Column (2) shows the effect on unemployment for the average graduate. Facing a percentage point higher regional unemployment rate upon graduation increases the probability of unemployment by 0.33 percentage points in the first year after graduation. Since roughly 5.5% (3.6%) of graduates are unemployed in the FLEED sample one year after graduation (each year during the whole time period) (see Table 1 and Table A1 in the Appendix), this implies roughly a 6%

[44] As already noted, invalid observations with either zero or missing real annual earnings are not included when estimating the effects on earnings. To see whether regional economic conditions upon graduation are associated with changes in the composition of earned income recipients, I estimated Equation 1 using the fraction of valid earnings observations in a cr-group in year t as the outcome variable. There is indeed a persistent and statistically significant negative effect on the fraction of valid observations, which indicates that the estimates in Column (1) of Table 2 are subject to selection bias. However, all estimates in all years of potential work experience are small, indicating roughly a per-year reduction of 0.12 percentage points in the fraction of valid observations in response to percentage point increase in regional unemployment rate. Therefore the bias does not affect the validity of the estimates in any meaningful way. The same conclusion holds for all the sensitivity and heterogeneity analyses that follow.

[45] Furthermore, I already noted in Subsection 3.1 that the FLEED-based unemployed rates I compute are not internationally comparable due to differences in the definitions of unemployment.

[46] Note that the earnings variable here refers to *earned income* and therefore does not take into account e.g. received unemployment benefits. Thus the effects on e.g. total real disposable income are likely to be somewhat smaller in magnitude and persistence.

Table 2: Effects On Group-Specific Means of Logarithmic Real Annual Earnings, Unemployment and Receipt of Unemployment Benefits: Graduation Cohorts 1988–2004.

Effect by Years of Potential Experience (β_e)	(1) Log Earnings	(2) Unemployment	(3) Unemp. Benefits
1	-0.0210***	0.0033***	0.0089***
	(0.0023)	(0.0005)	(0.0012)
2	-0.0178***	0.0024***	0.0049***
	(0.0023)	(0.0005)	(0.0011)
3	-0.0163***	0.0025***	0.0036***
	(0.0023)	(0.0004)	(0.0010)
4	-0.0151***	0.0024***	0.0039***
	(0.0022)	(0.0004)	(0.0009)
5	-0.0148***	0.0021***	0.0034***
	(0.0023)	(0.0004)	(0.0010)
6	-0.0140***	0.0018***	0.0029***
	(0.0023)	(0.0004)	(0.0009)
7	-0.0125***	0.0013***	0.0019**
	(0.0023)	(0.0004)	(0.0009)
8	-0.0115***	0.0008*	0.0007
	(0.0022)	(0.0004)	(0.0009)
9	-0.0105***	0.0005	-0.0003
	(0.0022)	(0.0004)	(0.0009)
10	-0.0099***	0.0005	-0.0009
	(0.0022)	(0.0004)	(0.0009)
R^2	0.964	0.791	0.924
Observations	3060	3060	3060

Notes: This table contains the results from estimating Equation 1 for group-specific means of logarithmic real annual earnings, unemployment and receipt of unemployment benefits using the whole FLEED sample. Groups are defined by graduation cohort (year of graduation) and region of residence in the year of graduation. Standard errors clustered by graduation cohort and region of residence in the year of graduation are in parentheses.
Statistical significance: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

(9.2%) increase in the probability of unemployment. The effect is roughly halved after six years and is no longer statistically significant at the 5% level after seven years. Thus the effect on unemployment is not as persistent as the effect on real annual earnings. Continuing the earlier hypothetical comparison, a graduate who faces a 6 percentage points higher regional unemployment rate upon graduation has a 2 percentage points higher probability of being unemployed in the following year. After six years, she still has roughly one percentage point higher probability of being unemployed.

Finally, Column (3) presents the effects on the probability of receiving unemployment benefits. I also look at this outcome because the reference period used for defining unemployment (last week of the year) is rather arbitrary and likely to understate the incidence of unemployment in any given year.[47] As Column (3) shows, the effects on the receipt of unemployment benefits are indeed larger. Continuing the earlier hypothetical comparison, an unlucky graduate has roughly a 5.4 percentage points higher probability of receiving unemployment benefits one year after graduation. Given that on average 21.9% (11.8%) of the individuals receive unemployment benefits one year after graduation (in any given year during the whole time period) in the FLEED sample (see Tables 1 and A1), this corresponds to a roughly 24.7% (45.5%) higher probability. This initial effect is almost three times larger than the initial effect on unemployment, but it is almost halved already in the following year. The effect becomes statistically insignificant after seven years, which is not surprising given the obvious high correlation between receiving unemployment benefits and being unemployed.

5.3 Heterogeneity

Next, I estimate the effects on earnings and unemployment separately for cohorts who faced the 1990s depression upon or shortly after graduation (cohorts 1988–1995) and cohorts who graduated after the depression generally under more favorable economic conditions (cohorts 1996–2004) using Equation 1. Given that the 1990s depression was an unusually deep economic contraction even from an international perspective, this heterogeneity analysis serves as a check for whether cohorts who faced the depression drive the main results. If this is indeed the case, the external validity of the main results to e.g. more recent Finnish graduation cohorts might be questionable.

Columns (1)–(2) and (3)–(4) in Table 3 present the estimates for cohorts 1988–1995 and 1996–2004, respectively. The results clearly differ from the main results. Among cohorts 1988–1995 the effect on earnings is statistically significant at the 5% level only in the first year after graduation. The effects are also smaller: for example, the initial effect is only half of that estimated for all graduation cohorts (cf. Column (1) of Table 2). In contrast, the effects on unemployment are more similar: the initial effect and further effects up to the fifth year are roughly 20% smaller in magnitude in comparison to the main results. Since the effects are no longer statistically significant at the 5% level after five years, the effects for unemployment are less persistent than

[47] Furthermore, accepting a part-time job or a very short-term full-time job can leave an individual entitled to partial unemployment benefits.

Table 3: Effects on Group-Specific Means of Logarithmic Real Annual Earnings and Unemployment: Graduation Cohorts 1988–1995 vs. 1996–2004.

	Cohorts 1988–1995		Cohorts 1996–2004	
Effect by Years of Pot. Exp (β_e)	(1) Log Earnings	(2) Unemployment	(3) Log Earnings	(4) Unemployment
1	-0.0103**	0.0028***	-0.0237***	-0.0022*
	(0.0044)	(0.0009)	(0.0063)	(0.0012)
2	-0.0073*	0.0018*	-0.0152***	-0.0009
	(0.0043)	(0.0009)	(0.0048)	(0.0007)
3	-0.0065	0.0020**	-0.0123***	-0.0006
	(0.0042)	(0.0009)	(0.0043)	(0.0006)
4	-0.0059	0.0021**	-0.0106**	-0.0009
	(0.0042)	(0.0009)	(0.0041)	(0.0006)
5	-0.0064	0.0019**	-0.0087**	-0.0009
	(0.0042)	(0.0009)	(0.0042)	(0.0007)
6	-0.0061	0.0015*	-0.0074*	-0.0004
	(0.0043)	(0.0009)	(0.0039)	(0.0007)
7	-0.0049	0.0009	-0.0058	-0.0002
	(0.0042)	(0.0009)	(0.0038)	(0.0007)
8	-0.0042	0.0004	-0.0044	-0.0004
	(0.0042)	(0.0009)	(0.0036)	(0.0006)
9	-0.0034	0.0000	-0.0043	-0.0004
	(0.0042)	(0.0009)	(0.0035)	(0.0006)
10	-0.0027	-0.0001	-0.0049	-0.0003
	(0.0042)	(0.0009)	(0.0033)	(0.0006)
χ^2_{10}-*value*	90.360	111.197	27.452	13.809
p-value	0.000	0.000	0.002	0.182
R^2	0.965	0.850	0.974	0.649
Observations	1440	1440	1620	1620

Notes: This table contains the results from estimating Equation 1 for group-specific means of logarithmic real annual earnings and unemployment separately for graduation cohorts 1988–1995 and 1996–2004 using the FLEED sample. Groups are defined by graduation cohort (year of graduation) and region of residence in the year of graduation. Standard errors clustered by graduation cohort and region of residence in the year of graduation are in parentheses.
The χ^2_{10} and p values correspond to the χ^2-test of joint significance $H_0 : \beta_1 = \cdots = \beta_{10} = 0$.
Statistical significance: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

for the whole sample. Thus, among graduation cohorts who all faced the 1990s depression, those who faced relatively more adverse economic conditions upon graduation face larger costs. However, the earnings losses are smaller and more short-lived than among all graduation cohorts. We can therefore conclude that the 1990s depression hurt graduation cohorts in rather equal ways: the timing of graduation matters less than among all cohorts.

When restricting the analysis to cohorts 1996–2004, the effects on earnings and unemployment again differ from those obtained for the whole FLEED sample. First, the effects on earnings are less persistent (see Column (3)), being statistically significant at the 5% level only in the first five years after graduation. A percentage point increase in the regional unemployment rate in the year of graduation on average leads to a decline of roughly 2.4% in real annual earnings in the first year after graduation. This initial effect is similar to that obtained for the whole sample. However, earning losses are less persistent because the initial effect is halved already by the third year after graduation. Furthermore, among these cohorts adverse economic conditions upon graduation on average do not seem to affect the probability of being unemployed: a χ^2-test does not reject the null hypothesis that the effects on unemployment are zeroes in all years (see Column (4)).

The above analyses show that the main results are driven to a sizable extent by cohorts who faced the 1990s depression. This finding accentuates the fact that the depression indeed hurt the careers of university graduates for a long time. Furthermore, the differences between the effects among cohorts who did and did not face the depression shows that the mechanisms behind the earnings losses differ between the two groups. For the unlucky cohorts who faced the depression, a persistent effect on unemployment is a relevant channel through which the adjustment to a depressed labor market happens. In contrast, unemployment is not an important mechanism for those who graduated after the depression, indicating that other mechanisms seem to be more relevant. These alternative channels could include part-time employment, wage and working hours reductions, poorer quality of initial employment, skill mismatch, task down-grading etc.

The effects of graduating under adverse economic conditions may differ between men and women. Potential gender differences may be driven by a combination of differences in field of study, occupation, industry and labor market attachment, for instance. Table 4 presents the results of estimating Equation 1 separately for males (column (1) and (2)) and females (columns (3) and (4)) using all graduation cohorts. As can be seen, the effects on both earnings and unemployment are similar in terms of persistence. However, the earnings losses for the average female graduate are somewhat smaller in each of the first ten years since graduation. In contrast, there appear to be no clear gender differences in the effects on unemployment in terms of magnitude.

Gender differences are clearer when I restrict the analysis to cohorts 1996–2004. The estimates in Column (1) of Table 5 indicate that earnings losses for the average male graduate are quite similar to those found for the whole sample in Column (1) of Table 2. In response to a percentage point increase in the regional unemployment rate in the year of graduation, real annual earnings fall by 3.1% in the first year after graduation. The initial effect is halved only after 6–7 years and remains statistically highly significant in each of the first ten years after graduation. In contrast,

Table 4: Effects On Group-Specific Means of Logarithmic Real Annual Earnings and Unemployment Separately for Males and Females: Cohorts 1988–2004.

	Males		Females	
Effect by Years of Pot. Exp. (β_e)	(1) Log Earnings	(2) Unemployment	(3) Log Earnings	(4) Unemployment
1	-0.0213***	0.0032***	-0.0191***	0.0033***
	(0.0030)	(0.0006)	(0.0028)	(0.0006)
2	-0.0183***	0.0026***	-0.0157***	0.0023***
	(0.0030)	(0.0006)	(0.0027)	(0.0006)
3	-0.0172***	0.0025***	-0.0141***	0.0025***
	(0.0029)	(0.0006)	(0.0026)	(0.0006)
4	-0.0164***	0.0026***	-0.0124***	0.0023***
	(0.0029)	(0.0006)	(0.0025)	(0.0006)
5	-0.0160***	0.0023***	-0.0123***	0.0019***
	(0.0029)	(0.0006)	(0.0026)	(0.0006)
6	-0.0147***	0.0018***	-0.0119***	0.0017***
	(0.0030)	(0.0005)	(0.0026)	(0.0006)
7	-0.0133***	0.0012**	-0.0104***	0.0013**
	(0.0029)	(0.0006)	(0.0026)	(0.0006)
8	-0.0119***	0.0006	-0.0097***	0.0010*
	(0.0029)	(0.0005)	(0.0026)	(0.0006)
9	-0.0106***	0.0005	-0.0090***	0.0005
	(0.0028)	(0.0005)	(0.0025)	(0.0006)
10	-0.0101***	0.0002	-0.0083***	0.0007
	(0.0028)	(0.0005)	(0.0025)	(0.0006)
R^2	0.961	0.683	0.917	0.691
Observations	3060	3060	3060	3060

Notes: This table contains the results from estimating Equation 1 for group-specific means of logarithmic real annual earnings and unemployment separately by gender using the whole FLEED sample. Groups are defined by graduation cohort (year of graduation) and region of residence in the year of graduation. Standard errors clustered by graduation cohort and region of residence in the year of graduation are in parentheses.
Statistical significance: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 5: Effects On Group-Specific Means of Logarithmic Real Annual Earnings and Unemployment Separately for Males and Females: Cohorts 1996–2004.

	Males		Females	
Effect by Years of Pot. Exp. (β_e)	(1) Log Earnings	(2) Unemployment	(3) Log Earnings	(4) Unemployment
1	-0.0306***	-0.0014	-0.0180***	-0.0026
	(0.0100)	(0.0016)	(0.0065)	(0.0018)
2	-0.0237***	-0.0005	-0.0088**	-0.0010
	(0.0072)	(0.0013)	(0.0045)	(0.0012)
3	-0.0204***	-0.0004	-0.0064*	-0.0006
	(0.0063)	(0.0012)	(0.0038)	(0.0009)
4	-0.0201***	-0.0006	-0.0038	-0.0011
	(0.0057)	(0.0012)	(0.0037)	(0.0009)
5	-0.0171***	-0.0010	-0.0027	-0.0008
	(0.0057)	(0.0012)	(0.0041)	(0.0010)
6	-0.0158***	-0.0013	-0.0011	0.0003
	(0.0055)	(0.0012)	(0.0040)	(0.0010)
7	-0.0140***	-0.0013	0.0006	0.0007
	(0.0054)	(0.0012)	(0.0041)	(0.0010)
8	-0.0113**	-0.0016	0.0012	0.0005
	(0.0052)	(0.0012)	(0.0042)	(0.0009)
9	-0.0109**	-0.0016	0.0013	0.0004
	(0.0052)	(0.0012)	(0.0040)	(0.0010)
10	-0.0124**	-0.0014	0.0016	0.0006
	(0.0049)	(0.0012)	(0.0039)	(0.0010)
χ^2_{10}-*value*	24.292	10.525	18.141	19.273
p-value	0.007	0.396	0.053	0.037
R^2	0.965	0.457	0.939	0.557
Observations	1620	1620	1620	1620

Notes: This table contains the results from estimating Equation 1 for group-specific means of logarithmic real annual earnings and unemployment separately by gender using graduation cohorts 1996–2004 of the FLEED sample. Groups are defined by graduation cohort (year of graduation) and region of residence in the year of graduation. Standard errors clustered by graduation cohort and region of residence in the year of graduation are in parentheses.
The χ^2_{10} and p values correspond to the χ^2-test of joint significance $H_0 : \beta_1 = \cdots = \beta_{10} = 0$.
Statistical significance: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

the effects for the average female graduate are smaller and more short-lived. The initial effect is roughly 40% smaller than for the average male graduate and halved already in the following year. Furthermore, the effects on earnings are no longer statistically significant at the 5% level after two years. Finally, similarly to the findings in Column (4) of Table 3, there seem to be little to no effects on unemployment for either gender.[48]

The gender differences in the effects on earnings probably reflect the fact that women are more likely to hold a degree in fields relating to e.g. education and health care, for which the primary employing sector is the public sector. Men, on the other hand, are more likely to work in the private sector, where labor demand and demand for the final product are usually more responsive to business cycle variation. As e.g. Liu et al. (2016) find in their study of Norwegian university graduates, their results on earnings and unemployment are driven largely by graduates working in the private sector. My findings are consistent with this previous evidence. Finally, the small effects on unemployment for both genders among the post-depression cohorts 1996–2004 complements the finding that the 1990s depression is driving the negative effects on unemployment found for the whole FLEED sample.

5.4 Sensitivity and Robustness

Alternative Definitions of Unemployment

As discussed in Subsection 3.1, there are alternatives to my preferred definition of unemployment based on the main type of activity in the last week of the year. To acknowledge this issue, I repeat the main analyses using two alternative definitions: dummy variables taking value one if the individual is unemployed for at least (i) one or (ii) three month(s) during the year. Using grouped panel data of annual *cr*-group means of these outcome variables, I estimate Equation 1 both for the whole sample and for cohorts 1996–2004.

All in all, the results shown in Table A4 in the Appendix indicate that the effects on unemployment are insensitive to how unemployment is defined. As can be seen in Columns (1) and (2), for the whole sample the persistence of the effects is similar to those reported in Table 2. However, the point estimates are larger when using these alternative unemployment variables: the initial effect is roughly three times (twice) as large as the initial effect reported in Table 2 if one (three) month(s) is used as the threshold in the definition of unemployment. After that, for both variable definitions the effects are for the most part twice as large as those reported in Table 2. The effects on unemployment are thus sizable, although many graduates who are unemployed at some point during the year find employment by the end of the year (since the effects in Table 2 are smaller). For cohorts who graduated after the 1990s depression, the effects

[48] For men, the χ^2-test does not reject the null hypothesis that the coefficients for the first ten years are all zeroes. For women, the effects of unemployment are individually statistically insignificant in all years, but the χ^2-test rejects the null hypothesis that all effects on unemployment are jointly zero at the 5% level. Thus while there could be a small and short-lived effect on unemployment for the average female, it is probably not economically significant.

on unemployment using the alternative definitions (Columns (3) and (4)) are quite similar to those obtained using the main definition (cf. Column (4) of Table 3).[49]

Major Regional Specification

As discussed in Subsection 3.1, for the main results I use regions as the geographical units. However, the regional labor market may not in fact constitute the relevant labor market for university graduates. Therefore I check whether using an alternative major regional specification changes the results in any significant way. The specification follows Equation 1, but uses groups defined by graduation cohort and *major region* of residence in the year of graduation, major regional unemployment rate in the year of graduation as the main regressor, and controls for fixed effects with respect to major region of residence in the year of graduation.[50] If the results obtained using the two specifications differ considerably, adverse economic shocks at the major regional level upon graduation could be associated with unobservable changes in the characteristics of graduation cohorts at the regional level.[51]

Unfortunately, the number of possible groups to be used when collapsing the individual-level microdata is much smaller in the major regional specification than in the regional specification: there are at most 68 ($= 4 \times 17$) different "major region $\times$ graduation cohort" groups (since graduates from Åland are excluded). I may thus have too few clusters and therefore overreject null hypotheses when clustering the standard errors at the group level (see Angrist and Pischke 2009, Chapter 8, and Cameron and Miller 2015, Section VI). This "few clusters" problem is further exacerbated by the fact that I use WLS estimation that places different weights to different clusters (see Cameron and Miller 2015, Section VI).

Table A5 in the Appendix presents the estimates of the effects on real annual earnings and unemployment from the major regional specification. Despite the above caveats, columns (1) and (2) show that the results for the whole sample are similar to the main results from the regional specification (cf. Table 2), especially the effects on unemployment. The effects on earnings are somewhat larger, though. When limiting the analysis to cohorts 1996–2004 (columns (3) and (4)), the results again are broadly similar to those obtained with the regional specification (cf. Table 3), even though the earnings losses are smaller after the first year and less persistent.[52] All in all, the similarity of the point estimates from the two specifications shows that my main results

[49] The statistically significant negative unemployment effects at years 8–10 in Column (3) of Table A4 most likely arise because most graduation cohorts (cohorts 1998–2004) experienced the recent recession, which started in 2008, within the first ten years after graduation. Because those who did not experience it within the same time period (cohorts 1996–1997) instead faced more adverse economic conditions upon graduation (see Figures 2 and 4), this produces a positive correlation for outcomes at years 8–10. Since the effects for these years in Column (4) are not significant at the 5% level, this correlation is only short-lived.

[50] Since the mean (and median) and standard deviation of the major regional unemployment rate in the year of graduation are similar in magnitude to those of the regional unemployment rate (cf. Table 1), we can directly compare the point estimates obtained from the regional and major regional specifications.

[51] This issue was highlighted by Oreopoulos et al. (2012, p. 13), although in their study in the context of potential differences between provincial and national level specifications with Canadian data.

[52] Unlike the regional specification, the major regional specification also indicates negative effects on unemployment. However, given that standard errors are estimated using only 36 clusters/groups, the standard errors are likely to be biased downwards and thus the effects are probably not actually statistically significant.

are quite insensitive to using major regions instead of regions when collapsing the microdata.

Selective Timing and Place of Graduation

A possible threat to the validity of the empirical analyses is selective timing of graduation (see Subsection 4.2). Since I do not have information on the duration of education, addressing this issue is challenging. However, if there is clear evidence of strategic delay of graduation, we would expect the regional number of graduates to fall in years of adverse regional economic conditions. To investigate this, I estimate the following model:

$$ln(N_{cr}) \;=\; \alpha_2 \;+\; \beta_1 U_{cr} \;+\; \theta_r \;+\; \chi_c \;+ w_{cr}, \tag{2}$$

where N_{cr} is the number of graduates who belong to regional graduation cohort cr, α_2 is the constant term, w_{cr} is the error term, U_{cr} is the regional unemployment rate facing regional graduation cohort cr in the year of graduation, and θ_r and χ_c denote fixed effects with respect to the region of residence in the year of graduation and graduation cohort, respectively. Standard errors are clustered at the regional level. Strong evidence of strategic delay of graduation would imply a negative correlation between regional unemployment rate and the logarithm of the regional graduation cohort size after controlling for regional and graduation cohort fixed effects, i.e. that the coefficient β_1 in Equation 3 is negative.

As can be seen in column (1) of Table A6 in the Appendix, there does not seem to be a negative correlation between regional unemployment rate and (the logarithm of) the regional graduation cohort size. If a linear or quadratic graduation cohort trend is used instead of graduation cohort fixed effects (Columns (2) and (3)), the conclusion does not change; if anything, there seems to be a small positive correlation. However, given the generally small regional graduation cohort sizes (see Table A2 in the Appendix), the magnitudes of estimates (0.04–0.1) are not substantial.[53] Thus selective timing of graduation seems not to be a large concern.

Another threat to the validity of the main results mentioned in Subsection 4.2 is selection into the region of graduation, i.e. strategic migration in the year of graduation to another region in response to adverse economic shocks. As discussed, this creates a problem because the information on region of residence in the FLEED data refers to the situation in the last day of the year. As an attempt to inspect whether selective place of graduation is an issue, I investigate whether there is a negative correlation between the probability that the region of residence in the year of graduation and in the year *before* the year of graduation are the same and the regional unemployment rate in the year of graduation in the region of residence of the year before graduation.

[53] Repeating the analysis with similar specifications at the major regional and national level (using major regional/national unemployment rates as main regressors) does not change the results.

Specifically, I use individual-level observations of the FLEED sample[54] and estimate the following linear probability model:

$$D_{icr} \;=\; \alpha_1 \;+\; \beta UR_{cr} \;+\; \theta_r \;+\; \chi_c \;+\; v_{icr}, \tag{3}$$

where D_{icr} is a dummy variable taking value one if individual i's region of residence in the year of graduation is the same as the region of residence in the previous year, α_1 is the constant term, v_{icr} is the error term, U_{cr} is the regional unemployment rate in the year of graduation in the region of residence of the year before graduation, and χ_c and θ_r denote fixed effects with respect to graduation cohort and region of residence of the year before graduation, respectively. Standard errors are clustered at the level of graduation cohort and region of residence of the year before graduation. As can be seen in Table A7 in the Appendix, there is no statistically significant correlation (and only a slight significant negative correlation if major regions are used instead). This means that selective region of graduation seems to not be a large concern.[55]

Isolating the Effect of Initial Regional Unemployment Rate

As discussed by Oreopoulos et al. (2012), a graduate who faces adverse economic conditions upon graduation is likely to face adverse economic conditions also after graduation. The main regressor used in the analyses, the regional unemployment rate in the year of graduation, can thus be correlated with regional unemployment rates in further years. Therefore, the results presented so far summarize the *cumulative* effects of the regional unemployment rate upon graduation *and* the subsequent regional unemployment rates. Oreopoulos et al. (2012) note that, if we do not control for the effects of these subsequent unemployment rate shocks, the estimator of the effect of the regional unemployment rate in the year of graduation in potential experience year e, i.e. β_e in Equation 1, has the following omitted variable bias formula:

$$\text{plim}\;\; \hat{\beta}_e \;\;=\;\; \beta_e + \sum_{d=1}^{e} \frac{\text{cov}(U_{cr0}, U_{cr_d d})}{\text{var}(U_{cr0})} \beta_{e,d},$$

where $\beta_{e,d}$ is the effect on the outcome variable in experience year e of the regional unemployment rate in experience year d (where $d < e$) and $U_{cr_d d}$ is the regional unemployment rate an individual belonging to graduation cohort c faces in experience year d in the region of residence in that year, r_d. The estimator $\hat{\beta}_e$ thus captures the effect of the initial unemployment rate in the year of graduation *and* the weighted sum of the effects of subsequent regional unemployment rates, where weights are determined by how large the term $\text{cov}(U_{cr0}, U_{cr_d d})$ is, i.e. how strongly the regional unemployment rate in experience year d is correlated with the regional unemployment

[54] Note that in order to use information on the region of residence in the year before the year of graduation, I have to omit the graduation cohort of 1988 from the analysis since the FLEED data start from 1988. I also drop the individuals for whom the region of residence in the year before graduation was Åland. Nevertheless, 133,710 individuals (roughly 94% of all individuals) from the FLEED sample remain for the analyses. Region of residence in the year of graduation differs from that of the previous year for roughly 18.3% of these individuals.

[55] Using probit/logit specifications do not change the conclusion.

rate in the year of graduation.

Panels (a) and (b) of Figure A2 in the Appendix summarize the autocovariance structures of further regional unemployment rates with the regional unemployment rate in the year of graduation (the figure notes detail how the autocovariances are estimated). Among the whole sample (Panel (a)), the subsequent regional unemployment rates are positively correlated with the initial unemployment rate in first three years and show small negative correlation from the fifth year on. The structure is initially similar also among cohorts 1996–2004 (Panel (b)). However, the correlation turns slightly positive in later years. This is again probably because most graduates among cohorts 1996–2004 faced the recent recession which started in 2008.

While the cumulative effects presented so far indicate the total costs of graduating upon adverse economic conditions, it is also interesting to know to what extent the economic conditions upon graduation alone are responsible for the total cumulative effects. To isolate the effect of the initial regional unemployment rate, net of the effects of any correlated shocks in further years, I follow a method similar to that used by Oreopoulos et al. (2012) and Liu et al. (2016). First, I collapse the individual-level microdata and use grouped panel data where groups are defined by graduation cohort (c), region of residence in the year of graduation (r) and current region of residence (r_e, where $e \in \{1, ..., 10\}$), and where observations are annual group-specific means of the outcome variables ($\bar{y}_{crr_et}$). After that I estimate the following model:

$$\begin{aligned} \bar{y}_{crr_et} \;=\; \alpha \;+\; \sum_{e=1}^{10} \beta_e \, UR_{cr0} \;+\; \sum_{e=1}^{10} \beta_{e,1} \, UR_{cr_11} + \;\ldots\; + \sum_{e=1}^{10} \beta_{e,9} \, UR_{cr_99} \qquad (4) \\ +\; \phi_t \;+\; \theta_r \;+ \theta_{r_e} \;+\; \gamma_e \;+\; \chi_c \;+\; \theta_r \times \gamma_e \;+\; u_{crr_et}, \end{aligned}$$

where θ_{r_e} denotes fixed effects with respect to the current region of residence, $\beta_{e,d}$ is the effect of the unemployment rate in the region of residence in potential experience year d (where $d \in \{1, ..., 9\}$), UR_{cr_dd}, on the outcome variable in experience year e, u_{crr_et} is the error term, and the other terms are as in Equation 1. I impose the restriction $\beta_{e,d} = 0$ when $e \in \{1, ..., d\}$, in other words that the regional unemployment rate in experience year d can only affect the outcomes after that year. In this specification, the coefficient of interest, β_e, captures the net effect in experience year e of the initial regional unemployment rate in the year of graduation, controlling for the effects of the further regional unemployment rates.

According to Columns (1) and (2) of Table A8 in the Appendix, for the whole sample the effects on unemployment and especially earnings are close to those reported in Table 2. The majority of the effects on labor market outcomes are thus indeed caused by the regional economic conditions the graduate faces initially upon graduation. Among cohorts 1996–2004 (Column (3) and (4)), the χ^2-test suggests that there seem to be no effects on unemployment. Furthermore, the initial effect on earnings is close to that reported in Table 3. However, unlike in Table 3, Column (3) of Table A8 also indicates that the initial unemployment rate has persistent effects on earnings even in later years. While this could indeed indicate real earnings losses, it is also possible that the effects in later years again arise because some cohorts faced the recent recession while others

did not, and the inclusion of the effects of later regional economic shocks cannot fully account for this fact. Another possible reason for the persistent earnings effects in Table A8 is that some of the effects of further regional unemployment rates on earnings are actually positive instead of negative (not shown) and thus the net effect of the weighted sum of the opposing effects could be positive. Nevertheless, the veracity of the effects in later years in Table A8 should be treated with caution. In any case, I conclude that the effects reported earlier are indeed caused mostly due to the unemployment rate a graduate faces immediately upon graduation.

Other Sensitivity and Robustness Tests

Finally, I shortly summarize the results of three other sensitivity and robustness tests. Since none of them change the conclusions in any meaningful way, I do not report their results. First, in order to see whether the estimates of the effects on earnings are sensitive to outliers, I drop all observations with real annual earnings greater than 100,000 euros (corresponding roughly to the 98^{th} percentile in the earnings distribution) and repeat the analyses of Subsections 5.2 and 5.3. The point estimates mostly change very little. Second, I exclude all individuals who obtained a graduate degree from the FLEED sample and repeat the main analyses. Again, the point estimates change very little and main results remain.[56] Third, I drop all graduates for whom the region of residence in the year of graduation is Uusimaa and repeat the main analyses to see whether the results are sensitive to omitting by far the largest regional graduation cohorts (see Table A2 in the Appendix). Overall, the effects on unemployment barely change. While there are differences to the main results, nevertheless the main conclusions encouragingly remain.[57]

5.5 Discussion

As the results in Tables 2–5 show, there are sizable and persistent effects on labor market outcomes of graduating under adverse economic conditions in Finland. Since controlling for the effects of regional unemployment rates in further years does not alter the results substantially, the effects are indeed for the most part caused by the economic conditions upon graduation. As such, my findings complement the previous literature and further re-enforce general conclusion that unlucky cohorts can suffer from adverse initial economic conditions regardless of the institutional environment.

[56] I have also studied whether regional economic conditions upon graduation affect the probability of obtaining a graduate degree. Adverse economic conditions at most only have a small effect on the probability of obtaining a graduate degree. Further schooling thus appears not to be a significant way of coping with negative economic shocks. See Chapter 6 of Päällysaho (2017) for details.

[57] For the whole sample, the point estimates of the effects on earnings are roughly 20%–30% smaller. For the depression cohorts of 1988–1995, the effects on earnings are very close to those obtained in Table 3, while for cohorts 1996–2004 the initial effect in the first year is around 28% smaller. For other years the effects are similar. When looking at gender differences, among all cohorts the effects on earnings for the average male graduate are very close to those in Table 4. In contrast, for the average female graduate the effects are less than half of those in Table 4 after the second year since graduation. When looking at cohorts 1996–2004, the earnings effects for the average male graduate can be as much as twice as large after the fourth year than in Table 5. For the average female graduate, the earnings effects are around 40% smaller in the first four years after graduation, but otherwise similar.

All in all, the main results in Subsection 5.2 point to larger and more persistent effects than what have generally been found in the literature. Most notably, the effects on earnings I document for the whole sample in Table 2 are larger than what Liu et al. (2016) find for Norway, arguably the country most comparable to Finland for which a similar analysis has been conducted. Instead, my findings are closer to the evidence from North American (Altonji et al. 2016, Kahn 2010, Oreopoulos et al. 2012) and Belgian (Cockx and Ghirelli 2016) labor markets. In particular, it is rather remarkable that the effects on earnings are statistically highly significant in each of the first ten years after graduation. Given that the initial effect on earnings is only roughly halved by the ninth year (Column (1) of Table 2), the earnings losses could persist even much further into the career. Unfortunately, I cannot confirm this since I have opted to include more graduation cohorts and thus limit myself only to the first ten post-graduation years. For the whole sample, I also find persistent negative effects on unemployment lasting for the first seven years after graduation. This result is similar to that of Liu et al. (2016) for Norway, but in clear contrast to the mostly short-lived effects found in studies using data from the U.S. and Canada, countries with more flexible labor markets.

As I discussed in Section 2, a feature making the Finnish context relevant is the unusually deep 1990s depression. Considering that the countries and time periods which have been studied in the previous literature have not contained a similar economic contraction, studying the 1990s depression is a notable addition to the literature. The smaller earnings losses among graduation cohorts 1988–1995 (Table 3) indicate that the depression hurt the university graduates who faced it shortly after graduation in rather equal ways. Graduating just before the depression started therefore did not really help: the average earnings losses became similar two years after graduation. These particularly unlucky cohorts continue to lag behind their luckier counterparts in terms of earnings even ten years after graduation (Figure 3).

Tables 3 and 5 show that the 1990s depression is driving the negative effects on unemployment that I find for the whole sample. Thus, it seems that highly persistent effects on unemployment can arise even for a population of highly-educated individuals with strong labor market attachment, such as university graduates, in unusually deep economic contractions. Uncovering the underlying heterogeneity and mechanisms at play behind these persistent unemployment effects is a particularly interesting and relevant issue, one that is unfortunately beyond the scope of this paper.

Tables 3 and 5 also show that the 1990s depression is driving the effects on earnings, albeit to a lesser extent. The negative effects on earnings are smaller and relatively short-lived, lasting roughly five years, for the luckier cohorts who did not face the depression. Under more ordinary business cycle variation, the effects on earnings of graduating in adverse economic conditions in Finland are thus closer to those found by e.g Liu et al. (2016) for Norway. Since the earnings losses among these luckier cohorts arise even though there are little to no effects on unemployment, other mechanisms are clearly responsible for these earnings losses. Given that real wages in Finland tend to be more rigid downwards than in other countries that have been studied in the previous literature, and that collective bargains extensively set the wage levels for different

occupations (see Section 2), previous theoretical and empirical literature suggests that these earnings losses may arise through for example an increase in part-time employment, task downgrading and skill mismatch. Unfortunately, distinguishing between the relative importance of the alternative channels is beyond the scope of this paper.

Many of the notable studies in the existing literature have limited their analyses only to male university/college graduates, motivating this choice by the weaker labor market attachment of women (see Oreopoulos et al. 2012, Kahn 2010, and Cockx and Ghirelli 2016). The gender differences I document in this paper thus add to the relatively scarce evidence in the existing literature and are broadly consistent with previous evidence by Kondo (2015) for the U.S.[58] I find that that the effects on earnings found for the post-depression cohorts 1996–2004 are driven largely by males. As already discussed, the smaller earnings losses for female graduates may reflect selection into occupations where public sector is the primary employer. As Liu et al. (2016) argue, working in the public sector, that is more insulated from business cycle variation, may help weathering a more turbulent labor market early on in the career. Since men are more likely to work in the private sector, the larger earnings losses for them may also reflect downwards wage adjustments (that are not caused from task downgrading etc.). Although I unfortunately cannot study this with the FLEED data, this hypothesis would be consistent with the findings of e.g. Sauramo (2012) on the larger role of wage drift in the Finnish private sector.

Finally, the fact that I find smaller and less persistent earnings losses for the post-depression cohorts (1996–2004) than in studies with data from the more flexible North American labor markets calls into question a straightforward link between the rigidity of labor market institutions and the persistence of the effects of facing adverse labor market entry conditions. Indeed, as for example Nickell (1997) points out, individual institutional features of the labor market are not necessarily by themselves associated with distinct labor market outcomes (such as a persistently high unemployment rate). Rather, institutional features of labor markets have complementarities, and it is the combination of these features that together are more indicative of labor market outcomes. Assessing more explicitly the links between institutional features and the career effects of facing adverse economic conditions at labor market entry is essential, not only for improving the external validity of the results in this literature but also for making the results from the studies more policy-relevant.

6 Conclusion

Using Finnish register-based panel data on university graduates who obtained a Master's degree in 1988–2004, I show in this paper that facing a high regional unemployment rate in the year

[58] Kondo (2015) studies the effects of labor market entry conditions across gender (and race) with U.S. survey data from the National Longitudinal Survey of Youth 1979 (NLSY79). She finds smaller effects of facing a recession at labor market entry for women. However, in contrast to my results, in her sample white females seem to be unaffected by labor market entry conditions: she finds no statistically significant effects on real wage rates or employment. She notes that the weaker effects for females may reflect that women have a weaker labor market attachment due to e.g. maternity leaves.

of graduation has sizable and persistent negative effects on labor market outcomes. An average graduate who faces a 6 percentage points (or one standard deviation) higher regional unemployment rate upon graduation has 12.6% lower real annual earnings one year after graduation. For the whole sample, this initial effect is halved only after 9–10 years. There are also persistent effects on unemployment lasting up to seven years after graduation. However, these effects are driven entirely by the cohorts who faced the deep 1990s Finnish economic depression: for the cohorts who graduated after the depression, I find little to no effects on unemployment.

The effects on earnings are also driven to a lesser extent by the cohorts who faced the depression: among cohorts who graduated after the depression, earnings losses from facing a high regional unemployment rate upon graduation are limited to the first five years after graduation. Because these earnings losses arise while there are no effects on unemployment, previous empirical and theoretical literature suggests they can result from e.g. an increase in part-time employment, task downgrading and skill mismatch in employment.

All in all, this paper shows that initial economic conditions upon labor market entry do matter in Finland. However, I emphasize that my results only look at *average* effects. For policy recommendations, more detailed heterogeneity analyses on more and less advantaged graduates with respect to e.g. ability and field of study are warranted. Nevertheless, the fact that I find smaller earnings losses for the average female graduate shows how differences in e.g. fields of study, employing sector, and labor market attachment matter in how adverse initial economic conditions affect a graduate's career. Naturally, focusing only on highly-educated workers like university graduates would be naïve: research focusing on less-educated workers is also needed in order to form a more complete understanding of how economic conditions early on in the labor market affect long-term outcomes.

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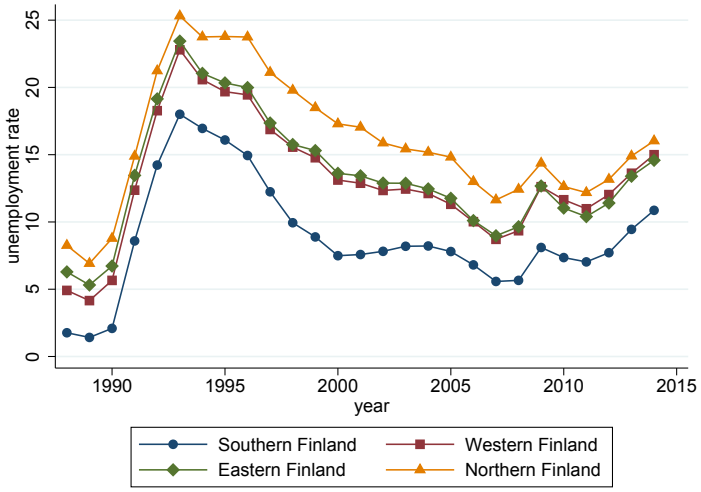
Appendix A Additional Figures and Tables

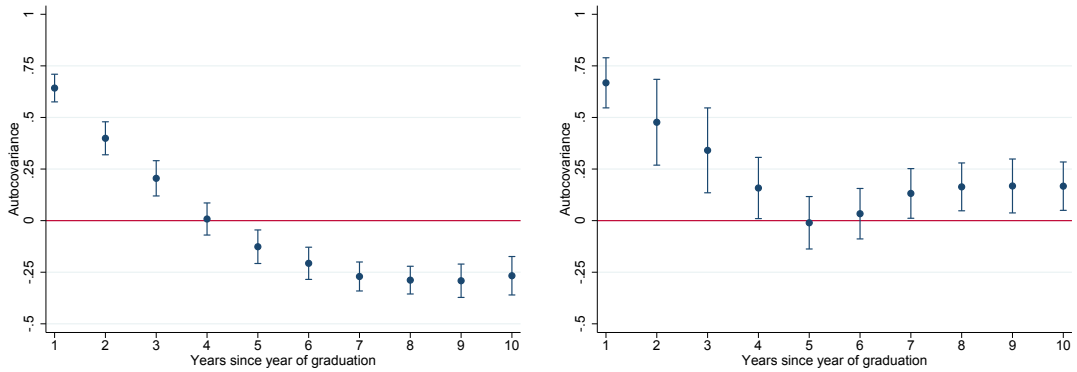
Figure A1: Major Regional Unemployment Rates, 1988–2014.



Notes: This figure contains the time series of unemployment rates for the time period 1988–2014 for all Finnish major regions (excluding Åland). The unemployment rates are computed using FLEED. See Subsection 3.1 for information on how these rates are computed.

Figure A2: Autocovariance Structure of Regional Unemployment Rates

(a) All Cohorts (1988–2004) **(b)** Cohorts 1996–2004



Notes: This figure shows the autocovariance structure (along with 95% confidence intervals) between the regional unemployment rate in the year of graduation and the regional unemployment rates in subsequent years. The autocovariances are estimated using grouped panel data with annual observations on groups defined by graduation cohort (c), region of residence in the year of graduation (r) and current region of residence (r_e). The estimates are obtained by estimating the following regression model separately for each experience year $e \in \{1, ..., 10\}$:

$$U_{cr_e e} = \alpha + \pi_e U_{cr0} + \phi_t + \theta_r + \theta_{r_e} + \chi_c + u_{crt}, \tag{A1}$$

where α is the constant term, U_{cr0} is the regional unemployment rate in the year of graduation, $U_{cr_e e}$ is the regional unemployment in experience year e, u_{crt} is the error term, and ϕ_t, θ_r, θ_{r_e}, χ_c denote fixed effects with respect to calendar year, region of residence in the year of graduation and current region of residence, respectively. Standard errors are clustered at the level of graduation cohort and region of residence in the year of graduation. The coefficient of interest in Equation A1, π_e, is the autocovariance between the regional unemployment in the year of graduation and the regional unemployment rate in experience year e. See also Supplementary Appendix B of Oreopoulos et al. (2012) and Figure A4 of Liu et al. (2016).

Table A1: Descriptive Statistics for the FLEED Sample by Years since Graduation

Years since graduation	Statistic/ Obs.	Unemployed	Real annual earnings (in 2012 euros)	Receives unemployment benefits
1	Mean	0.055	29413	0.219
	Std. Dev.	0.228	14412	0.413
	Obs.	141774	140541	141774
2	Mean	0.0451	32651	0.156
	Std. Dev.	0.208	15342	0.363
	Obs.	141774	140450	141774
3	Mean	0.0407	34888	0.131
	Std. Dev.	0.198	17421	0.337
	Obs.	141774	140285	141774
4	Mean	0.0382	36760	0.116
	Std. Dev.	0.192	18337	0.321
	Obs.	141774	140292	141774
5	Mean	0.0354	38707	0.108
	Std. Dev.	0.185	22660	0.31
	Obs.	141774	140219	141774
6	Mean	0.0322	40707	0.0995
	Std. Dev.	0.177	22900	0.299
	Obs.	141774	140219	141774
7	Mean	0.0291	42894	0.0899
	Std. Dev.	0.168	28168	0.286
	Obs.	141774	140274	141774
8	Mean	0.0283	45143	0.0856
	Std. Dev.	0.166	32834	0.28
	Obs.	141774	140371	141774
9	Mean	0.0279	47068	0.085
	Std. Dev.	0.165	30882	0.279
	Obs.	141774	140432	141774
10	Mean	0.029	49166	0.0869
	Std. Dev.	0.168	35028	0.282
	Obs.	141774	140526	141774
Total	Mean	0.0361	39740	0.118
	Std. Dev.	0.187	25586	0.322
	Obs.	1417740	1403609	1417740

Notes: This table gives more detailed descriptive statistics of the main outcome variables by years since graduation for the individuals of the main FLEED sample used in the analyses. See Subsection 3.1 for information on how the outcome variables are defined and Subsection 3.2 for detailed information on how the sample is formed.

Table A2: Regional Graduation Cohort Sizes in the FLEED Sample.

Year of Graduation	Uusimaa	Varsinais-Suomi	Satakunta	Kanta-Häme	Pirkanmaa	Päijät-Häme	Kymenlaakso	South Karelia	Etelä-Savo	Pohjois-Savo	North Karelia	Central Finland	South Ostrobothnia	Ostrobothnia	Central Ostrobothnia	North Ostrobothnia	Kainuu	Lapland	**Total**
1988	3088	552	183	150	612	147	159	105	139	273	184	359	161	167	56	488	103	219	7145
1989	2802	593	201	137	613	150	159	106	133	264	155	373	137	185	64	453	88	185	6798
1990	3027	647	200	143	695	152	158	115	132	271	204	336	140	172	62	436	98	171	7159
1991	2936	734	219	162	637	181	162	142	166	259	209	379	147	206	61	556	92	202	7450
1992	2947	720	222	150	670	182	169	131	155	305	223	316	176	215	99	571	98	212	7561
1993	3015	800	221	172	737	164	182	152	147	316	226	433	201	275	71	618	103	237	8070
1994	3048	696	221	152	734	150	157	132	135	298	252	360	200	274	61	581	85	188	7724
1995	3232	789	212	160	732	152	145	148	148	283	210	383	161	258	65	564	87	202	7931
1996	3422	800	214	148	864	156	144	136	153	310	232	386	155	262	73	572	78	202	8307
1997	3660	816	209	163	840	126	134	165	141	291	241	441	160	261	63	606	75	193	8585
1998	3934	827	187	147	917	149	139	144	130	309	204	454	164	251	60	681	85	175	8957
1999	4329	899	198	132	980	127	122	138	111	267	206	486	151	209	71	698	71	152	9347
2000	4090	874	197	128	923	136	129	146	118	278	181	438	123	207	46	778	65	178	9035
2001	4014	854	188	125	954	130	114	149	127	290	238	519	126	224	52	745	70	151	9070
2002	3966	916	208	129	1013	136	130	188	110	300	215	506	122	282	51	762	63	176	9273
2003	4017	976	217	142	1128	162	143	179	138	288	231	547	163	281	55	756	74	180	9677
2004	3886	946	194	163	1100	170	133	183	118	339	246	603	170	276	58	837	79	184	9685
Total	59413	13439	3491	2503	14149	2570	2479	2459	2301	4941	3657	7319	2657	4005	1068	10702	1414	3207	141774

Table A3: Major Regional Graduation Cohort Sizes in the FLEED Sample.

Year of Graduation	Southern Finland	Western Finland	Eastern Finland	Northern Finland	**Total**
1988	3088	1113	1482	1462	7145
1989	2802	1145	1509	1342	6798
1990	3027	1215	1543	1374	7159
1991	2936	1381	1588	1545	7450
1992	2947	1352	1599	1663	7561
1993	3015	1470	1867	1718	8070
1994	3048	1287	1789	1600	7724
1995	3232	1394	1746	1559	7931
1996	3422	1384	1881	1620	8307
1997	3660	1404	1911	1610	8585
1998	3934	1406	1973	1644	8957
1999	4329	1418	2024	1576	9347
2000	4090	1413	1888	1644	9035
2001	4014	1372	2011	1673	9070
2002	3966	1499	2131	1677	9273
2003	4017	1602	2336	1722	9677
2004	3886	1595	2343	1861	9685
Total	59413	23450	31621	27290	141774

Table A4: Effects on Group-Specific Means of Unemployment Using Alternative Definitions of Unemployment: All Cohorts vs. Cohorts 1996–2004.

	Cohorts 1988–2004		Cohorts 1996–2004	
	(1)	(2)	(3)	(4)
Effect by Years of Potential Exp. (β_e)	Fraction unemployed $\geq$ 1 month	Fraction unemployed $\geq$ 3 months	Fraction unemployed $\geq$ 1 month	Fraction unemployed $\geq$ 3 months
1	0.0110***	0.0078***	0.0020	-0.0016
	(0.0011)	(0.0008)	(0.0030)	(0.0022)
2	0.0067***	0.0051***	0.0001	-0.0016
	(0.0010)	(0.0007)	(0.0020)	(0.0014)
3	0.0056***	0.0045***	0.0002	-0.0011
	(0.0009)	(0.0007)	(0.0015)	(0.0011)
4	0.0053***	0.0045***	-0.0005	-0.0004
	(0.0009)	(0.0007)	(0.0014)	(0.0011)
5	0.0047***	0.0041***	-0.0012	-0.0007
	(0.0009)	(0.0007)	(0.0014)	(0.0011)
6	0.0038***	0.0031***	-0.0021	-0.0015
	(0.0009)	(0.0007)	(0.0015)	(0.0011)
7	0.0027***	0.0023***	-0.0027*	-0.0015
	(0.0009)	(0.0007)	(0.0014)	(0.0011)
8	0.0017*	0.0015**	-0.0036**	-0.0019*
	(0.0009)	(0.0007)	(0.0014)	(0.0010)
9	0.0010	0.0010	-0.0033**	-0.0012
	(0.0009)	(0.0006)	(0.0013)	(0.0010)
10	0.0004	0.0006	-0.0034**	-0.0016
	(0.0009)	(0.0007)	(0.0013)	(0.0010)
χ^2_{10}-*value*	401.925	244.416	20.290	17.799
p-value	0.000	0.000	0.027	0.058
R^2	0.933	0.888	0.920	0.823
Observations	3060	3060	1620	1620

Notes: This table contains the results from estimating Equation 1 using two alternative outcome variables for unemployment: the group-specific fraction of those having been unemployed for at least (i) one, or (ii) three month(s) during the year. The estimates in Columns (1) and (2) use the whole FLEED sample while the estimates in Columns (3) and (4) only use cohorts 1996–2004. Groups are defined by graduation cohort (year of graduation) and region of residence in the year of graduation. Standard errors clustered by graduation cohort and region of residence in the year of graduation are in parentheses. See Subsection 5.4 for more discussion.
The χ^2_{10} and p values correspond to the χ^2-test of joint significance $H_0 : \beta_1 = \cdots = \beta_{10} = 0$.
Statistical significance: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table A5: Effects on Group-Specific Means of Logarithmic Real Annual Earnings and Unemployment Using the Major Region Specification: All Cohorts vs. Cohorts 1996–2004.

Effect by	Cohorts 1988–2004		Cohorts 1996–2004	
Yrs. of Pot.	(1)	(2)	(3)	(4)
Exp. (β_e)	Log Earnings	Unemployment	Log Earnings	Unemployment
1	-0.0254***	0.0038***	-0.0233***	-0.0032***
	(0.0035)	(0.0006)	(0.0081)	(0.0010)
2	-0.0222***	0.0029***	-0.0129*	-0.0018**
	(0.0035)	(0.0006)	(0.0065)	(0.0007)
3	-0.0208***	0.0030***	-0.0090	-0.0014*
	(0.0035)	(0.0006)	(0.0058)	(0.0007)
4	-0.0195***	0.0029***	-0.0064	-0.0018**
	(0.0035)	(0.0006)	(0.0054)	(0.0008)
5	-0.0193***	0.0026***	-0.0040	-0.0017*
	(0.0036)	(0.0006)	(0.0054)	(0.0009)
6	-0.0185***	0.0023***	-0.0023	-0.0013
	(0.0036)	(0.0006)	(0.0050)	(0.0008)
7	-0.0170***	0.0018***	-0.0005	-0.0011
	(0.0036)	(0.0006)	(0.0047)	(0.0008)
8	-0.0160***	0.0013**	0.0013	-0.0014
	(0.0036)	(0.0006)	(0.0045)	(0.0009)
9	-0.0150***	0.0010*	0.0016	-0.0014
	(0.0035)	(0.0006)	(0.0044)	(0.0009)
10	-0.0144***	0.0010*	0.0011	-0.0011
	(0.0035)	(0.0006)	(0.0041)	(0.0008)
χ^2_{10}-*value*	136.213	211.573	49.656	29.244
p-value	0.000	0.000	0.000	0.001
R^2	0.988	0.924	0.992	0.857
Observations	680	680	360	360

Notes: This table contains the results from estimating a modified version of Equation 1 with major regional data for group-specific means of logarithmic real annual earnings and unemployment using the FLEED sample. More specifically, the main regressor is the unemployment rate of the major region of residence in the year of graduation, and fixed effects for major region of residence in the year of graduation are used instead of region of residence. The estimates in Columns (1) and (2) use the whole FLEED sample while the estimates in Columns (3) and (4) only use cohorts 1996–2004. Groups are defined by graduation cohort (year of graduation) and major region of residence in the year of graduation. Standard errors clustered by graduation cohort and major region of residence in the year of graduation are in parentheses. See Subsection 5.4 for more discussion.
The χ^2_{10} and p values correspond to the χ^2-test of joint significance $H_0 : \beta_1 = \cdots = \beta_{10} = 0$.
Statistical significance: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table A6: Correlation of Regional Unemployment Rate with Regional Graduation Cohort Size.

	(1) Log Cohort Size	(2) Log Cohort Size	(3) Log Cohort Size
Effect of Reg. UR (β_1)	0.0042	0.0055***	0.0105**
	(0.0106)	(0.0019)	(0.0037)
Grad. Cohort Control	Fixed Effect	Linear Trend	Quadratic Trend
R^2	0.981	0.980	0.980
Observations	306	306	306

Notes: This table provides the results of Equation 2 using the whole FLEED sample. Column (1) fits exactly Equation 2, while the specifications of columns (2) and (3) use a linear/quadratic trend of the graduation cohort (year of graduation) instead of graduation cohort fixed effects. Standard errors clustered by region of residence in the year of graduation are in parentheses. See Subsection 5.4 for more discussion.
Statistical significance: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table A7: Selective Region of Graduation

	Outcome Variable: (Major) Region of Residence in Year of Graduation Same as in Previous Year (D_{icr})	
	(1)	(2)
Effect of Regional UR (β)	-0.0013	
	(0.0010)	
Effect of Major Regional UR		-0.0035***
		(0.0013)
R^2	0.088	0.037
Observations	133710	133724

Notes: This table provides the results of estimating Equation 3 using the FLEED sample (cohorts 1989–2004). The specification of Column (1) is exactly Equation 3, while column (2) uses the alternative major regional specification. The specification in Column (2) uses the major regional unemployment rate in the year of graduation in the major region of residence of the year before graduation as the main regressor and controls for fixed effects of the major region of residence of the year before graduation. Standard errors clustered by (1) graduation cohort and region of residence of the year before graduation, (2) graduation cohort and major region of residence of the year before graduation are in parentheses. See Subsection 5.4 for more discussion.
Statistical significance: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table A8: Isolated Effect of the Regional Unemployment Rate in the Year of Graduation on Group-Specific Means of Logarithmic Real Annual Earnings and Unemployment: All Cohorts vs. Cohorts 1996–2004.

Effect by	Cohorts 1988–2004		Cohorts 1996–2004	
Yrs. of Pot.	(1)	(2)	(3)	(4)
Exp. (β_e)	Log Earnings	Unemployment	Log Earnings	Unemployment
1	-0.0277***	0.0048***	-0.0244***	-0.0020*
	(0.0025)	(0.0005)	(0.0053)	(0.0011)
2	-0.0146***	0.0025***	-0.0062	-0.0022***
	(0.0023)	(0.0006)	(0.0043)	(0.0008)
3	-0.0140***	0.0028***	-0.0062	-0.0003
	(0.0026)	(0.0006)	(0.0042)	(0.0008)
4	-0.0130***	0.0018***	-0.0088**	-0.0011
	(0.0026)	(0.0005)	(0.0043)	(0.0008)
5	-0.0117***	0.0009	-0.0092**	-0.0011
	(0.0027)	(0.0007)	(0.0045)	(0.0008)
6	-0.0122***	0.0017***	-0.0088**	-0.0001
	(0.0028)	(0.0006)	(0.0044)	(0.0009)
7	-0.0128***	0.0014**	-0.0097**	-0.0005
	(0.0027)	(0.0006)	(0.0045)	(0.0008)
8	-0.0123***	0.0013**	-0.0097**	-0.0006
	(0.0027)	(0.0005)	(0.0046)	(0.0008)
9	-0.0108***	0.0007	-0.0107**	-0.0006
	(0.0026)	(0.0006)	(0.0044)	(0.0008)
10	-0.0097***	0.0008	-0.0128**	0.0007
	(0.0027)	(0.0006)	(0.0051)	(0.0009)
χ^2-*value*	191.064	150.632	73.623	15.437
p-value	0.000	0.000	0.000	0.117
R^2	0.705	0.224	0.691	0.105
Observations	44025	44117	23067	23115

Notes: This table contains the results from estimating Equation 4 for group-specific means of logarithmic real annual earnings and unemployment using the FLEED sample. The estimates in Columns (1) and (2) use the whole FLEED sample while the estimates in Columns (3) and (4) only use cohorts 1996–2004. Groups are defined by graduation cohort (year of graduation), region of residence in the year of graduation, and current region of residence. Standard errors clustered by graduation cohort and region of residence in the year of graduation are in parentheses. See Subsection 5.4 for more discussion.
The χ^2_{10} and p values correspond to the χ^2-test of joint significance $H_0 : \beta_1 = \cdots = \beta_{10} = 0$.
Statistical significance: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$