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Entry conditions and the transition from tertiary education to employment

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Contents

Abstract

This paper uses monthly data on tertiary education graduates in 17 European countries covering 2004-2017 to assess the short-run effects of entry conditions on the transition into employment. Using an instrumental variables approach, an increase in the graduation unemployment rate of one percentage point is found to reduce the hazard rate of transitioning from unemployment into employment by 3.6 percent. This effect is stronger for females than males although the difference disappears when analysing transitions from inactivity into employment. A longer duration of initial unemployment may therefore help to explain long-run negative effects of unfavourable entry conditions found in earlier studies.

Zusammenfassung

Anhand von Daten zu Hochschulabsolventinnen und -absolventen aus 17 europäischen Ländern und den Jahren 2004-2017 untersuchen wir die kurzfristigen Auswirkungen, die die Bedingungen zum Zeitpunkt des Eintritts in den Arbeitsmarkt auf den Übergang in Beschäftigung haben. Mit einem Instrumentvariablenansatz schätzen wir, dass ein Anstieg in der Arbeitslosenquote zum Zeitpunkt des Abschlusses um einen Prozentpunkt die Hazardrate eines erfolgreichen Übergangs in Beschäftigung um 3,6 Prozent reduziert. Dieser Effekt fällt für Frauen stärker aus als für Männer. Berücksichtigt man jedoch Übergänge aus Inaktivität in Beschäftigung, stellt sich dieser Unterschied nicht ein. Eine längere Arbeitslosigkeit nach Eintritt in den Arbeitsmarkt könnte einen Grund für die aus anderen Studien bekannten langfristigen folgen ungünstiger Eintrittsbedingungen darstellen.

JEL classification

J64, J11, J23

Keywords

Cox proportional hazards model, entry conditions, graduates, residual inclusion, transition to employment

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1 Introduction

The effect of macroeconomic shocks on individual labour market trajectories has taken on additional relevance since the onset of the COVID-19 pandemic. Between March and September 2020 the Euro Area unemployment rate increased from 7.1 percent to 8.6 percent (Eurostat 2021). Graduates who entered the labour market at that time therefore faced unfavourable entry conditions and, as a result, the prospect of persistent scarring (Fiaschi/Tealdi 2022). Moreover, the war in Ukraine has led to a sharp reduction in the growth prospects of European economies (International Monetary Fund 2022), suggesting that labour market entrants in the near future may also face difficult entry conditions.

While previous literature (for example Kahn 2010; Oreopoulos/von Wachter/Heisz 2012) has investigated the long-term consequences of entry conditions, we provide evidence on short-term effects. We do this by analysing the impact of the unemployment rate at the time of graduation on the initial duration of unemployment using monthly data covering the period 2004-17 and 17 European countries. The availability of monthly data is important because the use of annual data, as is standard in earlier work on long-term effects, is too crude to provide detailed insights into the effects of entry conditions on early unemployment experiences. As well as being of intrinsic interest, initial unemployment duration may also be relevant for the longer-term consequences of unfavourable entry conditions if, as previous work suggests, there are 'scarring' effects of youth unemployment (for example Ghirelli 2015; Schmillen/Umkehrer 2017). While possible mechanisms have been suggested for the longer-term consequences of unfavourable entry conditions, how these mechanisms are related to initial unemployment remains unclear. We also assess whether the effects of the graduation unemployment rate differ between males and females. Finally, we discuss the relevance of a longer duration of initial unemployment to the various mechanisms which have been proposed for the persistence of negative effects associated with unfavourable entry conditions (for example Kahn 2010; Liu/Salvanes/Sørensen 2016; Oreopoulos/von Wachter/Heisz 2012).

Compared to the literature on entry conditions, the principal difference here is our focus on short-term rather than long-term effects. Short-term effects on the duration of initial unemployment have only been analysed in very few papers (Gartell 2012; Speer 2016). Compared to those, we provide three main improvements. Firstly, we analyse a more recent period (that includes the Great Recession) and a much broader range of countries. Secondly, we provide tests of the effect of entry conditions for graduates from tertiary education rather than the low-skilled. This is potentially relevant as the extant literature has shown that the long-run effects of entry conditions are not the same for both groups (Hershbein 2012; Cockx/Ghirelli 2016; Fernández-Kranz/Rodríguez-Planas 2018; Schwandt/von Wachter 2019). Thirdly, we address both the potential endogeneity of entry conditions and the nature of the data through the application of an instrumental variable approach within the context of a Cox proportional hazards model.

We show that an increase in the unemployment rate at the time of graduation leads to a reduction in the hazard of finding employment of 3.6 percent. These results are robust to using a range of alternative specifications. Moreover, we find that the reduction in the hazard rate is more pronounced for female than male graduates. We also present descriptive evidence that is

consistent with longer durations of unemployment leading to a lower probability of finding employment in high-quality occupations, which earlier literature has identified as a mechanism for longer-term scarring effects (Kahn 2010; Huckfeldt 2022).

The next section reviews the relevant literature. Section 3 describes the data and the process used to identify graduates from tertiary education. Section 4 outlines the empirical methodology. Section 5 sets out the results. The final section concludes.

2 Literature review

Recent literature from North America has analysed the nature and persistence of effects on college graduates of labour market entry during a recession (Kahn 2010; Oreopoulos/von Wachter/Heisz 2012; Altonji/Kahn/Speer 2016; Schwandt/von Wachter 2019; Kawaguchi/Kondo 2020; Rothstein 2021). Altonji et al. (2016) show that an increase in the unemployment rate at the time of graduation leads to a reduction in earnings up to three years after labour market entry among US college graduates. This is the result of lower wages and a smaller probability of working full time but little evidence is obtained of a significant effect on the probability of being employed. Comparable results are provided by Schwandt and von Wachter (2019): they find effects on earnings for individuals with 16 or more years of schooling up to five years after labour market entry, primarily due to lower wages, but no significant effect on hours worked. Rothstein (2021) also finds that the effect of entry conditions on the wages of college graduates is transitory but that the effect on employment lasts until at least the age of 40.[1] Evidence from other countries confirms that unfavourable entry conditions can have persistent negative effects on the labour market biographies of the high skilled. Genda et al. (2010) and Choi et al. (2020) show that the subsequent labour earnings of male college graduates from Japan and South Korea, respectively, are significantly lower if they entered the labour market at a time of higher unemployment. Cockx and Ghirelli (2016), in their analysis of Belgian data, and Fernández-Kranz and Rodríguez-Planas (2018), using Spanish data, also identify a persistent earnings penalty from graduating during a recession. The former find that this is the result of lower wages while the latter ascribe it to being stuck in less attractive jobs.

While most of this literature has focussed on analysing the impact that the graduation unemployment rate has on subsequent outcomes for men, a number of papers have addressed the question of whether the impact differs between males and females. One reason why the effects of entry conditions might differ is that men and women have been shown to differ in the extent to which their decision to participate in the labour market responds to cyclical variation (Killingsworth/Heckman 1986). Schwandt and von Wachter (2019) find comparable patterns for both groups but Hershbein (2012), using data on US high school graduates, and Kondo (2015), based on the National Longitudinal Survey of Youth, find that wage losses are less pronounced for women. Hershbein (2012) provides evidence that women who enter the labour market during unfavourable conditions have a higher probability of being outside the workforce and spend

[1] The difference in results is attributable to the adoption by Rothstein (2021) of an empirical specification that controls for the possibility that younger works are more sensitive to contemporary economic conditions than older workers.

more time in home production in the first years after graduation. Evidence from Choi et al. (2020) also suggests that entry conditions affect male and female graduates in different ways. For example, they find that women who entered the labour market when the unemployment rate is high tend to have more children than women that enter at a time of low unemployment, while no comparable effects are found for men.

Whereas the potential existence of long-run effects has received a lot of attention in the literature, less is known about how unfavourable entry conditions affect short-run outcomes, such as the initial spell of unemployment before a job is found. Typically, contributions to the entry conditions literature assess how they affect labour market outcomes in calendar years following graduation. While this is suitable for investigating long-run effects, such an approach precludes thorough analysis of the initial transition into employment since graduations generally occur in the middle of the year and, as we show below, most unemployment spells are shorter than a year. Consequently, some of the studies discussed above may fail to find effects on employment outcomes because they are obscured by the use of annual data. Moreover, previous research has found evidence of quantitatively large 'scarring' effects on employment biographies of even short periods of unemployment at the start of one's career. For example, Ghirelli (2015) provides evidence that a one percentage point increase in the amount of time spent not working in the two and a half years after graduation reduces earnings and hours worked by 10 percent and 7 percent, respectively, six years after graduation using data from Belgium. For Germany, Schmillen and Umkehrer (2017) find that an additional day of unemployment in the first eight years of an individual's career leads to an extra half day of unemployment over the next 16 years of their career. Using administrative data from the UK, the benchmark model of De Fraja et al. (2021) shows that an additional week of unemployment between the ages of 18 and 20 reduces earnings until the age of 40 for males and females by between 0.2 percent and 0.6 percent. The corresponding effects for unemployment between the ages of 21 and 23 on earnings are smaller but remain significant in the age range of 31 to 38 for men (0.1 percent-0.15 percent) and 29 to 40 for women (0.12 percent-0.21 percent). The long-term effects of unemployment between the ages of 24 and 26 are much weaker, suggesting that unemployment at the beginning of an individual's career is more harmful than in later periods using administrative data from the UK. These studies therefore suggest that use of annual data is too crude to capture short spells of unemployment that have potentially lasting effects on an individual's career.

Very few papers have analysed the short-term effects of graduating during a recession. One exception is Gartell (2012) who shows that the risk of exiting unemployment varies considerably across the business cycle for graduates of two Swedish universities who entered the labour market during the 1990s. However, the absence of a variable measuring the state of the economy prevents a direct test of whether adverse entry conditions lead to longer unemployment durations. To the best of our knowledge, the only paper that provides such a test is Speer (2016). Using weekly data on low-skilled men who completed school between 1978 and 1987 in the US, Speer (2016) finds that a one percentage point increase in the entry unemployment rate increases the time taken to find the first job by 2.3 weeks and the amount of time registered as unemployed by 0.8 weeks. This extended search period accounts for a substantial part of the reduction in hours worked resulting from unfavourable entry conditions.

3 Data

The analysis is based on the European Union Statistics on Income and Living Conditions (EU-SILC) dataset, which contains nationally representative individual-level data from various countries and has been used for research in different fields of labour economics (for example Andreoli/Fusco 2019; Michael/Christofides 2020). To increase the coverage of the dataset we combine different longitudinal releases of EU-SILC. This process of combining different releases and the necessary adjustments to the weights are described in the Supplementary Material. While the EU-SILC dataset covers a larger number of countries, some cannot be used in the empirical analysis. For example, the ages of individuals in Iceland, Finland and Slovenia are randomly perturbed to prevent disclosure and a large share of individuals in Denmark, Netherlands and Sweden do not provide monthly data on economic activity. Since accurate information on age and economic activity is necessary for the empirical analysis, individuals from these countries are removed from the dataset. Other countries are omitted because the process outlined in the next paragraph identified insufficient numbers of graduates. This is the result of these countries either entering EU-SILC late (Switzerland, Germany and Serbia) or having small populations (Luxembourg and Malta). The dataset that is used for the empirical analysis covers the years 2004 to 2017 and contains data from the following countries: Austria (2004-17), Belgium (2004-17), Bulgaria (2006-17), Cyprus (2005-17), Czech Republic (2005-17), Estonia (2004-17), Greece (2004-17), Spain (2004-17), France (2004-16), Croatia (2010-17), Hungary (2005-17), Italy (2004-17), Lithuania (2005-17), Latvia (2005-17), Poland (2005-17), Portugal (2004-16) and Slovakia (2005-15). This period covers expansions as well as contractions, including the Great Recession, and therefore provides a suitable basis to identify the effect of the unemployment rate at the time of graduation on the transition into employment. Data on the monthly unemployment rate at the national level are taken from Eurostat.

In addition to information on individual characteristics, EU-SILC provides details about a person's main economic activity for each month of the calendar year preceding the interview. This information allows us to identify an individual's month of graduation and economic activity in subsequent months. We identify graduates as individuals aged between 21 and 28 whose main monthly activity changes after a spell of at least six consecutive months in which they report themselves to be in education to some other activity and who are not observed to return to education thereafter. Moreover, we require graduates to report their highest education level to be at least tertiary education in the year following the transition from education.

Given the crucial role of accurate information on monthly economic activity in the analysis, we only include individuals for whom this information is consistent with the economic activity reported at the time of the interview. Since the time of the interview is given as the year and quarter of the interview, consistency is assessed by comparing the economic activity at the time of the interview with the monthly economic activity reported in the relevant three months.

If the monthly economic activity does not match the economic activity at the time of the interview in at least one month, the individual is removed from the sample.[2]

This process yields 4,955 graduates between 2004 and 2017, 75.4 percent of which are subsequently observed to find employment. The remaining are treated as censored in the analysis below and comprise 422 graduates that transitioned into inactivity (either immediately after graduation or after a period of unemployment) and 799 graduates who are not observed to leave unemployment. Descriptive statistics on the variables used in the analysis are provided in Table A 2 and the Kaplan-Meier survivor function is shown in Figure A 1of the Supplementary Material.

Table 1: Unemployment duration by country for all individuals and individuals in 1st and 4th quartiles of graduation unemployment rate

	All			1st Quartile			4th Quartile		
	Percentiles								
Country	25th	50th	75th	25th	50th	75th	25th	50th	75th
Austria	1	1	3	1	1	2	1	1	2
Belgium	1	1	4	1	1	4	1	1	3
Bulgaria	1	1	14	1	1	*	1	1	5
Cyprus	1	4	12	1	3	9	3	8	17
Czech Republic	1	1	3	1	1	2	1	1	4
Estonia	1	1	2	1	1	1	1	1	3
Greece	1	18	*	1	3	*	1	*	*
Spain	1	1	5	1	1	2	1	4	12
France	1	1	6	1	1	3	1	3	10
Croatia	2	6	13	3	10	17	1	3	9
Hungary	1	1	7	1	1	5	1	2	9
Italy	1	3	10	1	5	13	1	3	16
Lithuania	1	1	5	1	1	1	1	1	12
Latvia	1	1	5	1	1	2	1	3	11
Poland	1	1	7	1	1	12	1	1	7
Portugal	1	2	10	1	1	4	1	4	18
Slovakia	1	3	7	1	1	4	1	3	12
Total	1	1	7	1	1	5	1	1	9

Note: Sampling weights are used in the estimation. * denotes censored

Source: © IAB

The left-hand-side of Table 1 presents the 25th, 50th and 75th percentiles of unemployment durations by country. One of the most noticeable features of the table is that the 25th percentile for all countries (except Croatia) and the 50th percentile of the unemployment duration for a

[2] This check means that the first year of monthly observations cannot be used in the analysis. For example, an individual that is interviewed in 2011-2014 will provide their activity at the time of the interview for 2011-2014 and their monthly activity for 2010-2013. As such, it is only possible to check that the monthly activity status is consistent with the activity status at the time of the interview for 2011-2013. No such check is possible for 2010 and the information from that year is therefore excluded from the analysis.

majority of countries is one month. This demonstrates that a high proportion of individuals are observed to find employment the month after leaving tertiary education across all countries. An obvious outlier is Greece where the median unemployment duration is 18 months. Further variation is evident at the 75th percentile, which exceeds nine months in Bulgaria, Cyprus, Greece, Croatia, Italy and Portugal but is three months or less in Austria, Czech Republic and Estonia. Within our sample, there is therefore a clear pattern of longer unemployment durations in southern European countries. In anticipation of the empirical analysis, which will rely on variation in unemployment durations within countries, Table 1 also presents the 25th, 50th and 75th percentiles for individuals graduating at times of low unemployment (the 1st quartile of the country-specific graduation unemployment rate) and at times of high unemployment (the 4th quartile of the country-specific graduation unemployment rate). One concern for an empirical analysis based on data from different countries is that a positive association between the graduation unemployment rate and the duration of initial unemployment might be spurious. Specifically, it may simply reflect graduates taking longer to find employment in countries in which the unemployment rate tends to be higher rather than a causal relationship between entry conditions and unemployment durations. However, the evidence in columns 4-6 and 7-9 in Table 1 shows that for most countries the distribution of the unemployment duration shifts to the right during times of higher (columns 7-9) as opposed to lower graduation unemployment rates (columns 4-6). This finding provides descriptive evidence consistent with unfavourable entry conditions leading to a longer duration of initial unemployment.

Table 2 shows the equivalent information disaggregated by year. Increases in the median and 75th percentile of unemployment durations are evident for individuals that graduated in 2009 and 2012, two years in which GDP in the European Union fell. Unemployment durations, particularly in later years, are generally higher in countries where unemployment rates are high.

Table 2: Unemployment duration by year for all individuals and individuals in 1st and 4th quartiles of graduation unemployment rate

	All			1st Quartile			4th Quartile		
	Percentiles								
Year of graduation	25th	50th	75th	25th	50th	75th	25th	50th	75th
2004	1	1	3	1	1	3	1	1	1
2005	1	1	8	1	1	9	1	1	6
2006	1	1	6	1	1	6	1	1	4
2007	1	1	3	1	1	4	1	1	3
2008	1	1	5	1	1	5	1	1	4
2009	1	2	9	1	3	10	1	4	13
2010	1	1	6	1	1	5	1	1	17
2011	1	1	7	1	1	5	1	2	12
2012	1	2	10	1	1	4	1	5	21
2013	1	3	9	1	1	6	1	6	*
2014	1	1	9	1	1	3	1	1	12
2015	1	1	5	1	1	3	1	1	6
2016	1	1	12	1	1	9	1	1	10
2017	1	1	7	1	1	7	1	3	*
Total	1	1	7	1	1	5	1	1	9

Note: Sampling weights are used in the estimation. * denotes censored

Source: © IAB

4 Empirical methodology

We estimate the effect of the graduation unemployment rate on the transition into employment using a Cox proportional hazards model.[3] The principal advantage of this method is that, unlike fully parametric approaches, it does not require the specification of a functional form for the baseline hazard. This is desirable since the incorrect specification of the baseline hazard would lead to inconsistent coefficient estimates (Cameron/Trivedi 2005). Equation 1 shows the specified hazard rate:

Equation 1: Specified hazard rate

$$h_{icsp}\left(t\middle|UR_{csp}, \boldsymbol{X_{icsp}}, \eta_c, \varphi_s, \psi_p\right) = h_0(t)exp\left(\beta UR_{csp} + \boldsymbol{\gamma X_{icsp}} + \eta_c + \varphi_s + \psi_p\right)$$

[3] Speer (2016) estimates a model in which the dependent variable is the length of unemployment using two-stage least squares. This approach is problematic for two main reasons. Firstly, it leads to the loss of censored observations that are not observed to find employment (unless an assumption is made concerning the length of unemployment). Secondly, such an approach allows for negative predicted values. Implementing this method using our dataset also provides positive effects, although the estimates are somewhat smaller than those in Speer (2016). The results are provided in Table A 3. One potential explanation for this difference is that our analysis is based on high-skilled individuals who are less affected by cyclical variation in entry conditions (Huckfeldt 2022).

The hazard rate represents the probability that individual i, who completed tertiary education in country c in calendar month s of year p, finds employment t months after graduation, given that the individual has not found employment until that month. $h_0(t)$ is the baseline hazard rate common to all individuals. The main explanatory variable is the unemployment rate in country c at the time of graduation, UR_{csp}, while vector $\boldsymbol{X_{icsp}}$ controls for an individual's sex and age. η_c represent country dummies, which control for cross-country differences in transitions from education into employment arising from country-specific factors such as labour market institutions. Year-of-graduation dummies, ψ_p, account for macroeconomic shocks common to all countries. As the opportunities to find employment may vary within years, we also include calendar month-of-graduation dummies, φ_s. Standard errors are clustered at the level of the graduation month-year-country combination to account for the fact that the unemployment rate is constant within these cells. As the data are compiled using non-random sampling, regressions are weighted using the corresponding sampling weights.

If individuals have discretion over the timing of graduation, they may delay entry into the labour market until entry conditions become more favourable. Empirical evidence in favour of this proposition is provided by Brunello and Winter-Ebmer (2003) and Aina et al. (2011). The unemployment rate at the time of graduation is therefore potentially endogenous. To address this concern, we follow Kahn (2010) and use the unemployment rate in the month that an individual would graduate if they did not delay their graduation as an instrumental variable. In our preferred specification, this variable refers to the unemployment rate in June when an individual is aged 22. We also experiment with using the unemployment rate when the individual is at the most frequently observed age of graduation in their country. This is likely to be a stronger predictor of the graduation unemployment rate but is potentially endogenous since the most frequently observed age of graduation is the result of decisions on when to graduate.

We employ a two-stage residual inclusion approach (2SRI) which allows the use of an instrumental variables estimator in a nonlinear model (Terza/Basu/Rathouz 2008; Wooldridge 2015). This involves estimating a first-stage model in which the graduation unemployment rate is regressed on the unemployment rate in the predicted month of graduation as well as the control variables. The first stage is therefore the same as in linear two-stage least squares models, which are widely used in economics to identify causal effects (see Angrist/Krueger 2001 for some early applications). In the second stage, rather than replacing the endogenous variable with the predicted values from the first-stage model as in standard two-stage least squares, the residuals are included as an additional regressor in the second-stage model.[4] In the context of a linear model, 2SRI gives identical coefficient estimates as two-stage least squares but the latter does not generally give consistent estimates when the model is nonlinear (for example Terza/Basu/Rathouz 2008).

[4] We also used the approach proposed by Martínez-Camblor et al. (2019), which involves augmenting the 2SRI model with an individual frailty term to address potential collider bias, but found that this made no substantive difference to the estimated coefficients.

5 Results

5.1 Average effects of the graduation unemployment rate

The complete results from estimation of Equation (1) for all individuals are presented in Table A 4 of the Supplementary Material. Consistent with the descriptive statistics shown in Table 1, the probability of finding employment after t months, having remained unemployed until period t, is significantly lower in Bulgaria, Cyprus, Greece, Croatia, Italy and Portugal than the baseline country, Austria, in the standard model (column 1), having controlled for other variables. The hazard rate is significantly lower for individuals that graduated in 2009, 2012, 2013 and 2016 relative to 2004. This is broadly consistent with the figures presented in Table 2. Ceteris paribus, we do not find any evidence that the duration of the transition into employment differs between males and females. Age and the month-of-graduation dummies are also not statistically significant.

The results in Table 3 show that entering the labour market under less favourable conditions is associated with a statistically significant reduction in the probability of transitioning into employment, having failed to find employment until that period, and thus a longer period of initial unemployment. According to the standard Cox model (column 1), an increase in the graduation unemployment rate by one percentage point reduces the hazard rate of finding employment by 1.8 percent, ceteris paribus. When we use 2SRI and instrument the graduation unemployment rate with the unemployment rate at the predicted time of graduation (column 2), the estimated coefficient on the first-stage residuals is positive and statistically significant which confirms our intuition that the graduation unemployment is endogenous. Moreover, the estimated coefficient on the graduation unemployment rate is twice as large as when it is treated as exogenous, implying a reduction in the probability of finding employment of 3.6 percent, having not found employment until that point, if the graduation unemployment rate increases by one percentage point. Since it is reasonable to think that individuals that have discretion over the timing of their graduation choose to graduate at a time of lower unemployment, this increase in the estimated coefficient is consistent with expectations. The F-statistic associated with the instrument in the first-stage regression is far greater than the threshold value of 10 proposed by Stock and Yogo (2005) which indicates that the instrument is not weak. Compared to the results that are obtained from using our preferred instrumental variable in column 2, the use of the alternative instrument in column 3 has very little effect on the estimated coefficient of the graduation unemployment rate.

Table 3: Cox model regression results for the hazard rate of finding employment

	(1)	(2)	(3)
	Standard	**2SRI (preferred instrument)**	**2SRI (alternative instrument)**
Graduation unemployment rate	-0.018***	-0.036***	-0.036***
	(0.007)	(0.011)	(0.011)
First-stage residuals	-	0.032**	0.031**
		(0.014)	(0.014)
Months at risk	17,433	17,433	17,433
Individuals	4,955	4,955	4,955
Failures	3,734	3,734	3,734
First-stage F-statistic	-	285.2	289.6

Notes: ***/**/* indicate statistical significance at the 0.01/0.05/0.1 level. Standard errors are clustered at the level of month-year-country of graduation. Column 1 shows results from a standard Cox model. Columns 2 and 3 show results from a 2SRI approach using the unemployment rate at the predicted time of graduation (column 2) and the unemployment rate in the individual's country of residence in June of the year that the individual is at the most frequently observed age of graduation in their country (column 3) as instrumental variables. Models include the following control variables: an individual's sex and age, country dummies, year-of-graduation dummies and calendar month-of-graduation dummies. Months at risk refers to the total number of months in which individuals may potentially find employment. Failures refer to the number of number of individuals that find employment. Sampling weights are used in the estimation. The Breslow method is used to handle individuals observed to find employment in the same month. Complete results are in Table A 4 in the Supplementary Material

Source: © IAB

The finding that graduates who enter the labour market at a time of higher unemployment, on average, take longer to find employment is robust to alternative ways of identifying graduates and defining transitions out of unemployment. Firstly, we extend the period for which an individual must be observed in education to be considered a graduate from six to 12 months. This will increase the likelihood that individuals in the sample are university graduates. Across all individuals, this restriction causes a small reduction in the sample size but the effect of the graduation unemployment rate in the 2SRI model based on our preferred instrumental variable remains almost unchanged, as shown in column 1 of Table 4.

Secondly, in an attempt to identify transitions to 'stable' employment rather than into temporary jobs, we only consider transitions as such when the subsequent employment spell lasts at least six months (transitions into shorter periods of employment are treated as censored). Compared to our baseline results in column 2 of Table 3, the estimated effect of the graduation unemployment rate on the hazard rate of finding employment is slightly smaller in magnitude. As an alternative measure of stable employment, we only consider transitions if they lead to full-time employment (treating spells of part-time employment as censored) in column 3 of Table 4. The graduation unemployment rate continues to have a negative and significant effect on the hazard rate of finding employment, which is very similar in magnitude to the results from columns 1 and 2.

Table 4: Cox model regression results for the hazard rate of finding employment (alternative definitions of transitions)

	(1)	(2)	(3)
	Transitions from at least 12 months of education	Transitions to at least 6 months of employment	Transitions to full-time employment
Graduation unemployment rate	-0.037***	-0.034**	-0.036***
	(0.012)	(0.014)	(0.013)
First-stage residuals	0.033**	0.023	0.028*
	(0.014)	(0.017)	(0.015)
Months at risk	17,034	17,433	17,433
Individuals	4,821	4,955	4955
Failures	3,630	2,824	3271
First-stage F-statistic	287.6	285.2	285.2

Notes: ***/**/* indicate statistical significance at the 0.01/0.05/0.1 level. Standard errors are clustered at the level of month-year-country of graduation. Panel 1 excludes individuals that are observed to be in education for less than 12 months. Panel 2 treats spells of employment that are observed to be less than six months as censored. Panel 3 treats periods of inactivity as unemployment. All models include the following control variables: an individual's sex and age, country dummies, year-of-graduation dummies and calendar month-of-graduation dummies. Months at risk refers to the total number of months in which individuals may potentially find employment. Failures refer to the number of number of individuals that find employment. Sampling weights are used in the estimation. The Breslow method is used to handle individuals observed to find employment in the same month. Estimation is done by 2SRI using the unemployment rate at the predicted time of graduation as an instrumental variable.

Source: © IAB

5.2 Sex-specific effects of the graduation unemployment rate

According to results by Hershbein (2012), Kondo (2015) and Choi et al. (2020), the impact of unfavourable entry conditions on subsequent labour market biographies differs between males and females. We assess the existence of a differential effect of the graduation unemployment rate on the transition into employment by estimating Equation 1 separately for male and female graduates. The first panel of Table 5 shows the results from 2SRI estimation using our preferred instrumental variable (results from a standard Cox model as well as from a 2SRI model based on the alternative instrumental variable are given in Table A 5). The first column replicates the results for all graduates from column 2 in Table 3. While a higher graduation unemployment rate reduces the hazard rate of finding employment for males and females, the effect is larger for the latter. As shown in Table A 6, the finding that the graduation unemployment rate has a greater effect on the hazard rate for females is robust to changes in the way that graduates are identified or transitions into employment are defined. This result is consistent with the finding of Hershbein (2012) that unfavourable entry conditions have a larger impact on the employment probability of women during the first years of the career in the US but differs from that of Choi et al. (2020), which only finds persistent negative effects on the employment probability of men in South Korea.

Table 5: Cox model regression results for the hazard rate of different labour market transitions, by sex

	(1)	(2)	(3)
	All	Males	Females
	Transitions from unemployment to employment		
Graduation unemployment rate	-0.036***	-0.029*	-0.039***
	(0.011)	(0.017)	(0.015)
First-stage residuals	0.032**	0.030	0.029
Graduation unemployment rate	-0.036***	-0.029*	-0.039***
Months at risk	17,433	7,386	10,047
Individuals	4,955	2,009	2,946
Failures	3,734	1,511	2,223
First-stage F-statistic	285.2	165.7	289.0
	Transitions from unemployment into inactivity		
Graduation unemployment rate	0.058	-0.075	0.122**
	(0.043)	(0.065)	(0.055)
First-stage residuals	-0.081	-0.002	-0.110
	(0.056)	(0.084)	(0.069)
Months at risk	17,433	7,386	10,047
Individuals	4,955	2,009	2,946
Failures	422	166	256
First-stage F-statistic	285.2	165.7	289.0
	Transitions from not working (inactivity or unemployment) to employment		
Graduation unemployment rate	-0.032***	-0.032*	-0.030**
	(0.011)	(0.017)	(0.014)
First-stage residuals	0.030**	0.036*	0.022
	(0.014)	(0.020)	(0.020)
Months at risk	19,412	8,087	11,325
Individuals	4,955	2,009	2,946
Failures	3,976	1,589	2,387
First-stage F-statistic	285.2	165.7	289.0

Notes: ***/**/* indicate statistical significance at the 0.01/0.05/0.1 level. Standard errors are clustered at the level of month-year-country of graduation. Panel 1 treats transitions into inactivity as failure. Panel 2 excludes individuals that are observed to be in education for less than 12 months. Panel 2 treats periods of inactivity as unemployment. Panel 3 excludes individuals who are never observed to become inactive. Models include the following control variables: an individual's sex (column 1 only) and age, country dummies, year-of-graduation dummies and calendar month-of-graduation dummies. Months at risk refers to the total number of months in which individuals may potentially find employment. Failures refer to the number of number of individuals that find employment. Sampling weights are used in the estimation. The Breslow method is used to handle individuals observed to find employment in the same month. Estimation is done by 2SRI using the unemployment rate at the predicted time of graduation as an instrumental variable.

Source: © IAB

Hershbein (2012) also finds that unfavourable entry conditions significantly increase the probability for females to exit the labour market up to four years after graduation. We evaluate the relationship between the graduation unemployment rate and the hazard of leaving the labour market based on Equation 1 by redefining the hazard as the probability of becoming

inactive, having remained unemployed up to *t* months after graduation (i. e. treating transitions from unemployment into inactivity as failure and transitions into all other states as censoring events). The results are shown in the second panel of Table 5. According to our findings, a higher unemployment rate at graduation, overall, has no significant effect on the hazard rate of exiting the labour market. However, the effect is positive and highly statistically significant for females, whereas the corresponding effect for males is negative and statistically insignificant. Consistent with Hershbein's (2012) findings for the US, our results suggest that female graduates' labour market attachment is more responsive to entry conditions and, presumably, the availability of employment opportunities than is the case for male graduates.

To evaluate whether a transition into inactivity – induced by a higher graduation unemployment rate – can be considered a permanent exit from the labour market, we re-estimate Equation 1, but no longer distinguish between unemployment and inactivity (transitions into inactivity, therefore, no longer lead to censoring). As shown in the third panel of Table 5, we no longer detect any meaningful difference in the effect of the graduation unemployment rate on the hazard of finding employment between males and females using this approach. This suggests that the greater responsiveness of the hazard rate of finding employment among female graduates to unfavourable entry conditions, as shown in panel 1 of Table 5, results from ignoring successful transitions into employment among female graduates after a period of inactivity. While unfavourable entry conditions therefore make it more likely that females withdraw from the labour market, for some females this response is only temporary.

One explanation for this phenomenon is that many graduates (of either sex) that classify themselves as inactive would still like to work, even if they are not actively searching. They therefore fall into the category of the 'marginally attached' who have higher probabilities of transitioning into employment than workers that do not wish to work (Barnichon/Figura 2016; Jones/Riddell 2019). However, females are more likely to engage in 'home production' when not working and therefore to classify themselves as inactive. By contrast, because males suffer a greater loss of 'identity' from engaging in home production (Akerlof/Kranton 2000), they tend to report themselves as unemployed.[5]

5.3 Initial unemployment duration and the long-run effects of unfavourable entry conditions

Various studies have provided evidence concerning the mechanisms by which unfavourable entry conditions lead to persistent costs on the labour market. These include a lower match quality (Liu/Salvanes/Sørensen 2016) as well as selection into lower-quality jobs (Oreopoulos/von Wachter/Heisz 2012; Brunner/Kuhn 2014) or occupations (Kahn 2010; Huckfeldt 2022). Having found above that the graduation unemployment rate leads to an increase in the initial unemployment duration, we propose that these mechanisms may themselves be influenced by the effect that the graduation unemployment rate has on the time taken to find

[5] Our data provides some support for this explanation since 16.2 percent of females move into inactivity, either directly after graduating or after a period of unemployment, because they report that they are 'fulfilling domestic tasks and care responsibilities' compared to only 6.7 percent of males. However, the more detailed disaggregation of economic activity necessary to compute these figures is only available from the 2011 release of EU-SILC onwards so the resulting sample sizes limit the scope for further investigation.

employment. More specifically, we suggest that the longer unemployment durations resulting from adverse entry conditions may in part account for the lower probability of finding employment in a high-quality occupation. Possible reasons for this are that employers view longer durations of initial unemployment as a negative signal about a graduate's quality or that graduates choose to search for a job in a lower-quality occupation as their unemployment duration increases because they become more pessimistic about their chances of finding employment in a high-quality occupation.

While we cannot provide a rigorous evaluation of these hypotheses with the data at our disposal, we provide descriptive evidence that is consistent with them. As EU-SILC contains information about an employee's occupation at the 1-digit level of the International Standard Classification of Occupations (ISCO), we focus on selection into occupations as the mechanism for persistent effects of unfavourable entry conditions. We define high-quality occupations as those belonging to the first two ISCO categories: *managers* and *professionals*. Based on our sample of graduates, we compute the share of graduates who report that they work in high-quality occupations at the time of the interview in the year after they graduate. To assess how occupational quality of the first job varies with entry conditions and the duration of initial unemployment, we also calculate this share for the first and fourth quartiles of the graduation unemployment rate and the duration until the first job. To account for differences in graduation unemployment rates and subsequent unemployment durations between countries, the quartiles are defined using country-specific distributions.

Table 6: Proportion of graduates in high-quality occupations

		Graduation Unemployment Rate		
		1st quartile	4th quartile	All quartiles
Unemployment duration	1st quartile	0.478	0.480	0.477
	4th quartile	0.402	0.341	0.347
	All quartiles	0.456	0.449	0.448

Notes: The table shows the proportion of graduates employed in high-quality occupations, defined as *managers* or *professionals*, in the year after graduation. Quartiles are defined using country-specific distributions. Sampling weights are used.

Source: © IAB

Table 6 summarises the descriptive evidence. According to the bottom cell in the final column, around 45 percent of graduates work in a high-quality occupation in the year after graduation. The bottom row of the table shows that the corresponding share is 44.9 percent when the entry unemployment rate is in the fourth quartile of the country-specific distribution and 45.6 percent when it falls into the first quartile. When the unemployment duration is relatively short (i. e. when it falls into the first quartile of the country-specific distribution), the share of graduates employed in high-quality occupations is very similar across the 1st and 4th quartiles of the graduation unemployment rate (first row). However, there is a much larger difference for longer durations of initial unemployment (i. e. when the unemployment duration is in the fourth quartile of the country-specific distribution). As shown in the middle row of the table, the share of graduates in high-quality occupations is 40.2 percent during favourable entry conditions and 34.1 percent

during adverse entry conditions. The difference in the probability of finding employment as a manager or professional across the 1st and 4th quartiles of the graduation unemployment rate is therefore six percentage points larger during unfavourable entry times than during favourable times.

The descriptive analysis shows that a higher graduation unemployment rate is associated with a lower probability of finding employment in high-quality occupations which in turn may give rise to a persistent negative effect on graduates' labour market trajectories. The role of the graduation unemployment rate for selection into occupations appears to be much more pronounced, however, when the initial search duration is long. This is therefore in line with the argument that the lower occupational quality that has been suggested as a mechanism for long-lasting effects of adverse entry conditions is partly the result of longer unemployment durations. However, we acknowledge that the evidence presented here is far from conclusive and may also reflect heterogenous effects of entry conditions that lead some individuals to have both longer unemployment durations and lower-quality jobs.

6 Conclusion

Using monthly data covering 17 European countries, we estimate the effect of the state of the economy at the time of graduation on the transition into employment. Employing a Cox proportional hazards model and addressing the potential endogeneity of the graduation unemployment rate using a 2SRI approach, we find that unfavourable entry conditions significantly increase the period of unemployment following graduation from tertiary education. Specifically, results from our baseline model show that a one percentage point increase in the unemployment rate at the time of graduation reduces the hazard of finding employment by 3.6 percent. The estimated effect is half as large if no attempt is made to address endogeneity. The results are robust to using different definitions of graduates and a different instrumental variable. We also find that entering the labour market when conditions are less favourable leads to a longer period of initial unemployment for females than for males. One reason for this difference is that, when faced with a higher entry unemployment rate, females are more likely to become inactive which is in line with other findings in the literature. However, our evidence also suggests that the withdrawal of some female graduates in response to adverse entry conditions into inactivity is only temporary. Finally, we provide tentative evidence that the short-run effects of a higher graduation unemployment rate are relevant for the mechanisms that lead to negative effects in the long run. Specifically, we propose that a longer period of unemployment following graduation reduces the probability of finding employment in a higher-quality occupation which has been found to be one explanation for the lasting effects of unfavourable conditions at the time of entry into the labour market. Future research should further assess the role of initial unemployment for the long-run effects of adverse entry conditions.

The finding that graduates that enter the labour market during recessions tend to take more time to find employment and may face lasting scars suggests that governments should consider the counter-cyclical application of active labour market policies targeted at recent entrants to the labour market. Such policies were widely adopted in response to the Great Recession

(International Labour Organization/World Bank 2012) and are supported by evidence from meta-analyses of active labour market polices which have found that the effects of active labour market policies are strongest during recessions (Kluve 2010; Card/Kluve/Weber 2018). Job search assistance represents an attractive option since it has been found to be a relatively effective form of policy (for example Caliendo/Schmidl 2016; Card/Kluve/Weber 2018) and should have direct effects on the initial periods of unemployment. However, policy should also support graduates to move to higher-quality jobs or occupations.

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Appendix

Data and sample

Combining different longitudinal releases of EU-SILC. In its longitudinal form, EU-SILC is a multi-country individual-level panel dataset. For each country, observations are organised in rotational groups. EU-SILC is a rolling panel as the individuals in each rotational group are followed for at most four years before dropping out of the sample and being replaced by a new rotational group. If rotational group A is initially sampled in year t, its members will be observed up to year t+3. Further rotational groups will be added to the dataset during that period: rotational group B will be added in year t+1 and observed until year t+4, while rotational groups C and D are first included in years t+2 and t+3 and are retained until years t+5 and t+6, respectively. After dropping out of the sample at the end of year t+3, rotational group A will be replaced by rotational group E, which in turn will be part of the dataset from year t+4 until year t+7. There are exceptions from this structure. For example, data from France is based on nine rotational groups. Further information on the structure of EU-SILC can be found in Berger and Schaffner (2015) and Moffat and Roth (2016).

While every rotational group can in principle be observed for four years and every four-year period consists of data from four separate rotational groups, a typical longitudinal release only contains information on three rotational groups, which are available for four, three and two years, respectively. Through combining data from different longitudinal releases we are able to increase the sample size for two reasons. Firstly, we include data from all rotational groups that are available within a four-year period. Secondly, for each rotational group, we include data for all available years. We do this by retaining only that rotational group from each release that is available for the full four-year period and combining these groups in a single dataset. The most recent release in our analysis also contains data from two rotational groups that are only available for two and three years. Likewise, there are rotational groups in the first releases which are only followed for two and three years. We also include these rotational groups in the final dataset. Table A 1 illustrates the structure of the combined dataset for the case of Austria (which uses the typical system of rotational groups that are followed for four years). The columns refer to a specific rotational group (labelled by letters) and show the longitudinal release from which the data are taken, while the rows refer to the sample year.

Sampling weights. After combining the data from the different longitudinal releases, we make an adjustment to the sampling weights to ensure that they provide an accurate estimate of the size of the target population for each combination of country and year. By construction, the weights provided in EU-SILC are designed in a way that their sum over all observations in a given rotational group, country and year should provide an accurate estimate of the number of people in that country and year who are aged 16 years and older.

In a first step, we assess how well the sampling weights match the target population by comparing the sum of the weights within a rotational group, country and year with the official population size of those aged 16 years and older. If the implied size of a rotational group is either too large or too small compared to the official population figure, we discard it from the dataset. Specifically, if a rotational group is either more than 25 percent larger or 25 percent smaller than

the corresponding Eurostat figure in at least one year, we remove the observations from that rotational group from the sample for all years in which it is observed. The number of rotational groups and observations that are dropped as a result of this requirement is relatively small. From the 17 countries included in the empirical analysis, only six are affected and at most two rotational groups are dropped per country. In total, eight rotational groups are removed and, in six cases, this applies to the country's first rotational group which is available only for the years 2004 and 2005. In the case of Austria one rotational group (out of a total 16) including 3,252 observations is excluded (which amounts to 2.04 percent of the total number of observations from Austria). For the other affected countries, the number of observations that are excluded amounts to, 1.59 percent (France), 1.99 percent (Spain), 3.95 percent (Italy), 4.07 percent (Greece) and 7.85 percent (Belgium).

In a second step, we construct a new weighting variable to ensure that the weighted sum of observations within a given country and year provides an accurate estimate of the size of the target population. This is done by dividing the sampling weights by the number of rotational groups in a given country and year. Doing so ensures that an observation's weight compared to an observation from a different country or year does not depend on the number of rotational groups in the sample.

Table A 1: Data structure after combining several longitudinal releases (Austria)

Release		2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2018	2018
Rotational group		A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**	**P**
Year	2004	X	X	X													
	2005	X	X	X	X												
	2006		X	X	X	X											
	2007			X	X	X	X										
	2008				X	X	X	X									
	2009					X	X	X	X								
	2010						X	X	X	X							
	2011							X	X	X	X						
	2012								X	X	X	X					
	2013									X	X	X	X				
	2014										X	X	X	X			
	2015											X	X	X	X		
	2016												X	X	X	X	
	2017													X	X	X	X
	2018														X	X	X

Source: © IAB

Table A 2: Weighted Means and Standard Deviations

	All		Males		Females	
	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
Graduation unemployment rate	10.350	4.483	10.420	4.616	10.297	4.380
Predicted graduation unemployment rate	10.391	4.446	10.459	4.505	10.340	4.400
Female	0.569	0.495	0.000	0.000	1.000	0.000
Age	23.896	1.694	24.105	1.723	23.738	1.654
Country						
Austria	0.021	0.143	0.021	0.142	0.021	0.144
Belgium	0.067	0.249	0.073	0.260	0.062	0.241
Bulgaria	0.017	0.131	0.017	0.130	0.018	0.131
Cyprus	0.012	0.111	0.012	0.111	0.012	0.111
Czech Republic	0.058	0.233	0.061	0.239	0.055	0.229
Estonia	0.007	0.084	0.006	0.075	0.008	0.090
Greece	0.023	0.150	0.018	0.135	0.027	0.161
Spain	0.127	0.333	0.143	0.350	0.115	0.319
France	0.262	0.440	0.298	0.457	0.234	0.423
Croatia	0.010	0.102	0.009	0.095	0.011	0.106
Hungary	0.042	0.202	0.037	0.189	0.047	0.211
Italy	0.069	0.254	0.044	0.206	0.088	0.283
Lithuania	0.021	0.143	0.019	0.138	0.022	0.147
Latvia	0.005	0.069	0.005	0.068	0.005	0.069
Poland	0.165	0.372	0.155	0.362	0.174	0.379
Portugal	0.043	0.202	0.031	0.173	0.051	0.221
Slovakia	0.051	0.220	0.052	0.222	0.051	0.219
Year of graduation						
2004	0.059	0.236	0.048	0.213	0.068	0.251
2005	0.079	0.269	0.075	0.263	0.082	0.274
2006	0.080	0.272	0.077	0.267	0.082	0.275
2007	0.083	0.276	0.097	0.296	0.073	0.259
2008	0.064	0.244	0.072	0.258	0.057	0.233
2009	0.075	0.263	0.074	0.261	0.075	0.264
2010	0.079	0.269	0.076	0.265	0.080	0.272
2011	0.097	0.296	0.107	0.310	0.090	0.286
2012	0.071	0.257	0.074	0.262	0.068	0.253
2013	0.062	0.240	0.054	0.227	0.067	0.250
2014	0.082	0.275	0.082	0.274	0.083	0.275
2015	0.085	0.279	0.076	0.265	0.092	0.288
2016	0.049	0.216	0.058	0.233	0.042	0.201
2017	0.037	0.188	0.031	0.173	0.041	0.199

Note: Sampling weights are used in the estimation.

Source: © IAB

Table A 3: Regression results for the duration of unemployment

	(1)	(2)	(3)
	All	Males	Females
	OLS - Baseline Specification		
Graduation unemployment rate	0.046	0.057	0.055
	(0.029)	(0.048)	(0.036)
Individuals	3,734	1,511	2,223
	2SLS – Baseline Specification		
Graduation unemployment rate	0.092**	0.149**	0.090
	(0.044)	(0.068)	(0.060)
Individuals	3,734	1,511	2,223
First-stage F-statistic	634.1	195.5	554.1
	2SLS - Transitions from 12 months of education		
Graduation unemployment rate	0.095**	0.144**	0.094
	(0.046)	(0.070)	(0.062)
Individuals	3,630	1,476	2,154
First-stage F-statistic	598.5	186.4	533.3
	2SLS - Transitions to full-time employment		
Graduation unemployment rate	0.117**	0.172**	0.118
	(0.051)	(0.074)	(0.074)
Individuals	3,271	1,374	1,897
First-stage F-statistic	516.7	176.1	453.2
	2SLS - Transitions to stable (at least 6 months) employment		
Graduation unemployment rate	0.021	0.077	0.014
	(0.042)	(0.062)	(0.057)
Individuals	2,824	1,161	1,663
First-stage F-statistic	470	139.3	428.9
	2SLS - Transitions from not working (inactivity or unemployment)		
Graduation unemployment rate	0.095**	0.136**	0.104*
	(0.042)	(0.067)	(0.057)
Individuals	3,976	1,589	2,387
First-stage F-statistic	667.7	205.4	584.2

Notes: ***/**/* indicate statistical significance at the 0.01/0.05/0.1 level. Standard errors are clustered at the level of month-year-country of graduation. Models include the following control variables: an individual's sex (column 1 only) and age, country dummies, year-of-graduation dummies and calendar month-of-graduation dummies. Sampling weights are used in the estimation. The instrument is the unemployment rate in the individual's country of residence in June of the year that the individual is aged 22.

Source: © IAB

Table A 4: Cox model regression results for the hazard rate of finding employment

	(1)	(2)	(3)	(4)	(5)	(6)
	Standard			2SRI		
	All	Males	Females	All	Males	Females
Graduation unemployment rate	-0.018***	-0.011	-0.023**	-0.036***	-0.029*	-0.039***
	(0.007)	(0.009)	(0.009)	(0.011)	(0.017)	(0.015)
Female	0.027			0.025		
	(0.035)			(0.035)		
Age	-0.008	-0.022	0.000	-0.009	-0.024	-0.001
	(0.012)	(0.018)	(0.017)	(0.012)	(0.018)	(0.017)
Country						
Belgium	-0.061	-0.274**	0.141	-0.008	-0.225	0.190
	(0.103)	(0.139)	(0.141)	(0.105)	(0.143)	(0.147)
Bulgaria	-0.435***	-0.962***	-0.036	-0.357**	-0.884***	0.035
	(0.163)	(0.252)	(0.192)	(0.167)	(0.260)	(0.198)
Cyprus	-0.450***	-0.595***	-0.330**	-0.373***	-0.522***	-0.257*
	(0.094)	(0.122)	(0.140)	(0.103)	(0.138)	(0.151)
Czech Republic	0.069	0.048	0.130	0.078	0.055	0.141
	(0.085)	(0.099)	(0.139)	(0.085)	(0.098)	(0.140)
Estonia	0.091	0.004	0.181	0.157	0.059	0.250
	(0.102)	(0.136)	(0.145)	(0.110)	(0.148)	(0.153)
Greece	-0.997***	-1.685***	-0.720***	-0.835***	-1.495***	-0.587**
	(0.233)	(0.529)	(0.268)	(0.243)	(0.547)	(0.278)
Spain	0.066	-0.031	0.170	0.287**	0.188	0.369*
	(0.107)	(0.139)	(0.165)	(0.146)	(0.218)	(0.211)
France	-0.146	-0.369***	0.073	-0.067	-0.292**	0.146
	(0.097)	(0.124)	(0.140)	(0.104)	(0.139)	(0.149)
Croatia	-0.479***	-0.650***	-0.349*	-0.318**	-0.486**	-0.205
	(0.135)	(0.179)	(0.204)	(0.159)	(0.225)	(0.229)
Hungary	-0.133	-0.328**	0.046	-0.075	-0.272*	0.101
	(0.103)	(0.146)	(0.146)	(0.108)	(0.154)	(0.152)
Italy	-0.433***	-0.302*	-0.421***	-0.362***	-0.234	-0.355**
	(0.113)	(0.172)	(0.163)	(0.118)	(0.180)	(0.169)
Lithuania	-0.020	-0.386**	0.248*	0.067	-0.302*	0.332**
	(0.104)	(0.157)	(0.147)	(0.112)	(0.169)	(0.158)
Latvia	-0.055	-0.181	0.072	0.044	-0.090	0.165
	(0.125)	(0.179)	(0.184)	(0.136)	(0.192)	(0.200)
Poland	-0.102	-0.199	-0.014	-0.028	-0.124	0.054
	(0.094)	(0.128)	(0.141)	(0.101)	(0.139)	(0.148)
Portugal	-0.294**	-0.430***	-0.170	-0.185	-0.319*	-0.071
	(0.116)	(0.157)	(0.167)	(0.128)	(0.179)	(0.183)
Slovakia	-0.077	-0.250*	0.072	0.058	-0.114	0.195
	(0.107)	(0.138)	(0.156)	(0.130)	(0.178)	(0.184)
Year-of-graduation dummies						
2005	-0.133	-0.328**	0.004	-0.122	-0.316**	0.012
	(0.121)	(0.151)	(0.169)	(0.121)	(0.151)	(0.169)
2006	-0.079	-0.153	-0.052	-0.080	-0.162	-0.047
	(0.115)	(0.141)	(0.173)	(0.115)	(0.140)	(0.173)
2007	-0.004	-0.132	0.060	-0.025	-0.146	0.034
	(0.118)	(0.157)	(0.164)	(0.117)	(0.154)	(0.164)
2008	-0.131	-0.176	-0.131	-0.158	-0.200	-0.156
	(0.120)	(0.137)	(0.177)	(0.121)	(0.136)	(0.178)
2009	-0.296**	-0.366**	-0.290	-0.280*	-0.353**	-0.275

	(1)	(2)	(3)	(4)	(5)	(6)
	Standard			2SRI		
	All	Males	Females	All	Males	Females
	(0.145)	(0.176)	(0.200)	(0.147)	(0.177)	(0.202)
2010	-0.168	-0.229	-0.151	-0.128	-0.191	-0.114
	(0.132)	(0.165)	(0.176)	(0.132)	(0.167)	(0.176)
2011	-0.182	-0.348**	-0.078	-0.140	-0.306**	-0.039
	(0.125)	(0.150)	(0.186)	(0.125)	(0.153)	(0.186)
2012	-0.287**	-0.277*	-0.344*	-0.224	-0.207	-0.295
	(0.141)	(0.162)	(0.201)	(0.142)	(0.174)	(0.201)
2013	-0.266*	-0.393**	-0.141	-0.182	-0.309*	-0.067
	(0.140)	(0.181)	(0.185)	(0.145)	(0.185)	(0.193)
2014	-0.187	-0.317**	-0.109	-0.120	-0.244	-0.052
	(0.130)	(0.154)	(0.181)	(0.134)	(0.166)	(0.185)
2015	-0.140	-0.160	-0.107	-0.106	-0.119	-0.081
	(0.120)	(0.147)	(0.172)	(0.122)	(0.150)	(0.173)
2016	-0.271**	-0.525***	-0.073	-0.252**	-0.498***	-0.063
	(0.127)	(0.168)	(0.179)	(0.127)	(0.168)	(0.180)
2017	-0.248	-0.242	-0.233	-0.260	-0.251	-0.244
	(0.169)	(0.258)	(0.250)	(0.169)	(0.259)	(0.249)
Calendar month-of-graduation dummies						
February	-0.032	-0.469	0.397*	-0.042	-0.465	0.373*
	(0.223)	(0.339)	(0.219)	(0.221)	(0.336)	(0.218)
March	-0.130	0.012	-0.165	-0.144	0.012	-0.183
	(0.238)	(0.292)	(0.304)	(0.239)	(0.293)	(0.303)
April	0.048	-0.014	0.187	0.044	-0.002	0.174
	(0.194)	(0.225)	(0.259)	(0.192)	(0.222)	(0.257)
May	-0.025	-0.118	0.100	-0.035	-0.119	0.086
	(0.171)	(0.196)	(0.228)	(0.169)	(0.193)	(0.227)
June	-0.108	-0.162	-0.071	-0.118	-0.159	-0.089
	(0.157)	(0.182)	(0.205)	(0.156)	(0.180)	(0.204)
July	-0.106	-0.137	-0.070	-0.124	-0.135	-0.096
	(0.168)	(0.195)	(0.217)	(0.166)	(0.193)	(0.216)
August	0.228	0.199	0.282	0.216	0.204	0.260
	(0.160)	(0.185)	(0.212)	(0.159)	(0.183)	(0.211)
September	0.105	0.057	0.156	0.093	0.053	0.141
	(0.161)	(0.186)	(0.211)	(0.160)	(0.185)	(0.209)
October	0.157	0.174	0.210	0.147	0.174	0.195
	(0.167)	(0.193)	(0.222)	(0.166)	(0.190)	(0.221)
November	0.208	0.037	0.331	0.199	0.035	0.314
	(0.176)	(0.238)	(0.227)	(0.174)	(0.235)	(0.225)
December	-0.045	-0.268	0.151	-0.051	-0.255	0.133
	(0.172)	(0.207)	(0.222)	(0.171)	(0.204)	(0.220)
First-stage residuals				0.032**	0.030	0.029
				(0.014)	(0.021)	(0.020)
Months at risk	17,433	7,386	10,047	17,433	7,386	10,047
Individuals	4,955	2,009	2,946	4,955	2,009	2,946
Failures	3,734	1,511	2,223	3,734	1,511	2,223
First-stage F-statistic				285.2	165.7	289.0

Notes: ***/**/* indicate statistical significance at the 0.01/0.05/0.1 level. Standard errors are clustered at the level of month-year-country of graduation. Months at risk refers to the total number of months in which individuals may potentially find employment. Failures refer to the number of number of individuals that find employment. Sampling weights are used in the estimation. The Breslow method is used to handle individuals observed to find employment in the same month.

Source: © IAB

Table A 5: Alternative Cox model regression results for the hazard rate of finding employment (by sex)

	(1)	(2)	(3)
	All	Males	Females
Standard			
Graduation unemployment rate	-0.018***	-0.011	-0.023**
	(0.007)	(0.009)	(0.009)
Months at risk	17,433	7,386	10,047
Individuals	4,955	2,009	2,946
Failures	3,734	1,511	2,223
2SRI (alternative instrument)			
Graduation unemployment rate	-0.036***	-0.031*	-0.038***
	(0.011)	(0.017)	(0.015)
First-stage residuals	0.031**	0.034	0.028
	(0.014)	(0.020)	(0.019)
Months at risk	17,433	7,386	10,047
Individuals	4,955	2,009	2,946
Failures	3,734	1,511	2,223
First-stage F-statistic	289.6	170.7	290.3

Notes: ***/**/* indicate statistical significance at the 0.01/0.05/0.1 level. Standard errors are clustered at the level of month-year-country of graduation. Panel 1 shows results from a standard Cox model. Panel 2 shows the results from 2SRI estimation using the unemployment rate in the individual's country of residence in June of the year that the individual is at the most frequently observed age of graduation in their country as an instrumental variable. Models include the following control variables: an individual's sex (column 1 only) and age, country dummies, year-of-graduation dummies and calendar month-of-graduation dummies. Months at risk refers to the total number of months in which individuals may potentially find employment. Failures refer to the number of number of individuals that find employment. Sampling weights are used in the estimation. The Breslow method is used to handle individuals observed to find employment in the same month.

Source: © IAB

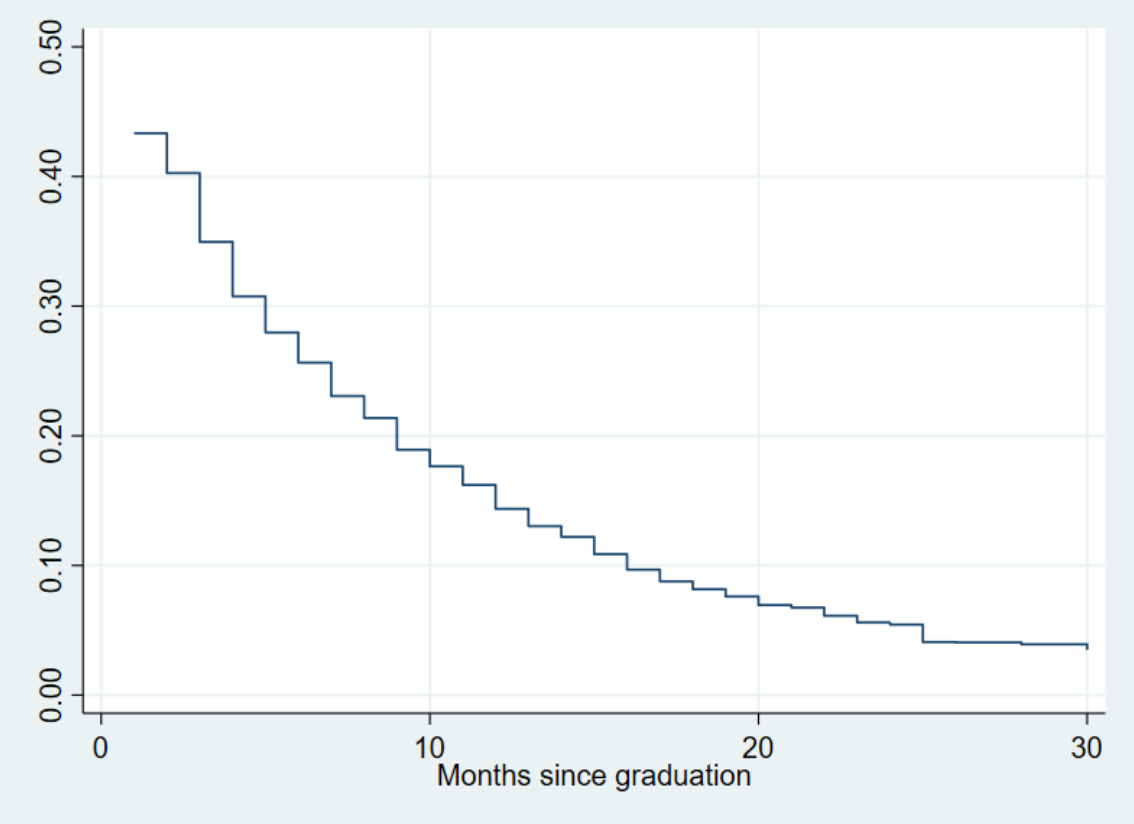
Table A 6: Cox model regression results for the hazard rate of finding employment (alternative definitions of transitions, by sex)

	(1)	(2)	(3)
	All	Males	Females
12 months of education			
Graduation unemployment rate	-0.037***	-0.029	-0.042***
	(0.012)	(0.018)	(0.015)
First-stage residuals	0.033**	0.029	0.034
	(0.014)	(0.021)	(0.021)
Controls	Yes	Yes	Yes
Months at risk	17,034	7,247	9,787
Individuals	4,821	1,962	2,859
Failures	3,630	1,476	2,154
First-stage F-statistic	287.6	154.0	303.1
At least 6 months of employment			
Graduation unemployment rate	-0.034**	-0.021	-0.043**
	(0.014)	(0.020)	(0.019)
First-stage residuals	0.023	0.026	0.020
	(0.017)	(0.024)	(0.025)
Controls	Yes	Yes	Yes
Months at risk	17,433	7,386	10,047
Individuals	4,955	2,009	2,946
Failures	2,824	1,161	1,663
First-stage F-statistic	285.2	165.7	289.0
Full-time employment			
Graduation unemployment rate	-0.036***	-0.029	-0.041**
	(0.013)	(0.018)	(0.016)
First-stage residuals	0.028*	0.030	0.023
	(0.015)	(0.023)	(0.021)
Controls	Yes	Yes	Yes
Months at risk	17,433	7,386	10,047
Individuals	4955	2009	2946
Failures	3271	1374	1897
First-stage F-statistic	285.2	165.7	289.0

Notes: ***/**/* indicate statistical significance at the 0.01/0.05/0.1 level. Standard errors are clustered at the level of month-year-country of graduation. Panel 1 excludes individuals that are observed to be in education for less than 12 months. Panel 2 treats spells of employment that are observed to last for less than six months as censored. Panel 3 only treats transitions into full-time employment as failures (while part-time employment leads to censoring). Models include the following control variables: an individual's sex and age, country dummies, year-of-graduation dummies and calendar month-of-graduation dummies. Months at risk refers to the total number of months in which individuals may potentially find employment. Failures refer to the number of number of individuals that find employment. Sampling weights are used in the estimation. The Breslow method is used to handle individuals observed to find employment in the same month. Estimation is done by 2SRI using the unemployment rate at the predicted time of graduation as an instrumental variable.

Source: © IAB

Figure A 1: Estimated Survivor Function



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References (Appendix)

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Tables

Appendix Tables/Figures

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