Mapineq

Cross-national analysis of the short- and longer-term effects of economic conditions at labor market entry

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Executive summary

This report uses data from the European Union Labour Force Survey (EU-LFS) to examine whether poor macro-economic conditions at labor market entry increase the risk of labor market exclusion (non-employment) and insecurity (temporary contracts and low-skilled jobs) 5 to 10 years after entry, and whether this differs by entrants' gender and education. The analyses are based on young adults who entered the labor market in Europe between 1994 and 2011, so that labor market outcomes are examined between 1999 and 2021. The analyses focus on the effects of unemployment rates at entry at the regional level, defined by the European regions (NUTS1 = regions with populations between 3 and 7 million inhabitants), which are closer to individuals' actual labor markets than the national level. The report also investigates the role of labor market institutions (employment protection legislation (EPL) for permanent employment and for temporary employment, and public spending on active and passive labor market policies (ALMP, PLMP)), that is, whether they increase or decrease the risk of labor market exclusion and insecurity due to poor economic conditions at entry.

The main findings are:

1. Poor labor market conditions at entry increase
   - the risk of temporary employment 5 to 7 years later for both less-educated men and women,
   - the risk of non-employment for women with lower secondary and, to a lesser extent, with upper secondary education,
   - the risk of low-skilled employment, which tends to diminish over time.
2. The adverse long-term effects of regional unemployment at labor market entry on career outcomes are larger for individuals with only lower secondary education than for those with upper secondary education. There is no evidence of negative long-term effects on labor market outcomes for young adults with tertiary education who entered the labor market during periods of high regional unemployment.
3. Labor market institutions moderate the extent of the consequences of poor economic conditions at entry:
   - Higher levels of EPL for permanent contracts increase the risks of temporary employment when unemployment at entry is high, especially for tertiary-educated workers.
   - EPL for temporary contracts increases the risks of later non-employment due to higher unemployment rates at entry, especially for less-educated young adults.
   - The risk of long-term low-skilled employment is higher in regions with higher public expenditure on PLMP, especially for less-educated young adults.

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Abbreviations

ALMP Active labor market policies
AME Average marginal effects
EPL Employment protection legislation
EU-LFS EU-Labour Force Survey
GDP Gross domestic product
ISCED International Standard Classification of Education
ISEI International Socio-Economic Index
NUTS Nomenclature of Territorial Units for Statistics
PLMP Passive labor market policies
PP Percentage points
SD Standard deviation
STWT School-to-work transitions
VET Vocational education and training

ISO codes of countries included

Austria – AT – AUT
Belgium – BE – BEL
Bulgaria – BG – BGR
Croatia – HR – HRV
Cyprus – CY – CYP
Czech Republic – CZ – CZE
Denmark – DK – DNK
Estonia – EE – EST
Finland – FI – FIN
France – FR – FRA
Germany – DE – DEU
Greece – GR – GRC
Hungary – HU – HUN
Iceland – IS – ISL
Ireland – IE – IRL
Italy – IT – ITA
Latvia – LV – LVA
Lithuania – LT – LTU
Luxembourg – LU – LUX
Malta – MT – MLT
Netherlands – NL – NLD
Norway – NO – NOR
Poland – PL – POL
Portugal – PT – PRT
Romania – RO – ROU
Slovakia – SK – SVK
Spain – ES – ESP
Sweden – SE – SWE
Switzerland – CH – CHE
United Kingdom – GB – GBR

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Cross-national analysis of the short- and longer-term effects of economic conditions at labor market entry

This report uses European Union Labour Force Survey (EU-LFS) survey data to examine the longer-term impact of regional economic conditions at labor market entry on labor market exclusion (non-employment) and insecurity (temporary contracts and low-skilled jobs). The analyses are based on young adults who entered the labor market in Europe between 1994 and 2011. The focus is on whether poor economic conditions at entry increase the risk of scarring effects for these entry cohorts. To identify the effect of economic conditions at labor market entry, we exploit year-to-year variation in unemployment rates in European regions (NUTS1) and examine labor market outcomes 5 to 10 years later (i.e., between 1999 and 2021). We explore effect heterogeneity by gender and level of education and examine potential moderating effects of various labor market policies.

Higher risks of temporary employment when unemployment rates are higher at entry, especially for less-educated young adults.

Higher risk of long-term low-skilled employment in regions with higher public expenditure on PLMP, especially for less-educated young adults.

No evidence of adverse labor market effects of entering the labor market in poor economic conditions for tertiary-educated young adults.

1. Introduction

The first years after entering the labor market are typically a very important period for young adults' career progression, characterized by wage increases and frequent transitions to better-paying jobs (Schwandt/von Wachter 2019). Business cycles have clear and immediate consequences for labor market entrants: Loose labor market conditions, defined by a lack of labor demand and an oversupply of job seekers, increase young adults' risks of unemployment, low quality of first job placements, and skill mismatches (Altonji et al. 2016; Kahn 2010; Kwon et al. 2010; Liu et al. 2016; Van Dijk et al. 2020; Verick 2009). In addition to immediate negative effects, entering the labor during economic downturns might hurt the longer-term career outcomes of young workers

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(Duval et al. 2011). Possible explanations for such "scarring effects" (Arulampalam et al. 2001; Gangl 2006) include reduced opportunities for skill maintenance and enhancement, negative productivity signals, and/or structural labor market inequalities.

Empirical evidence on whether poor economic conditions at labor market entry lead to long-term scarring is mixed. Looking at a cohort that entered the labor market during the Great Recession (2010), Unt and Täht (2020) find no negative effects of early career unemployment on *poverty risk* and *income* five years later in Estonia. Wolbers (2016) reaches similar conclusions for the Netherlands: high unemployment rates at labor market entry did not have lasting effects on employment chances and occupational status attained. In contrast, papers by Kahn (2010), Oreopoulos et al. (2012), and Altonji et al. (2016) for the United States (US) and Canada show that *male college graduates* who entered the labor market during recessions suffered persistently larger *earnings* losses lasting up to 10 years. This finding is also supported by a Norwegian study of college graduates (Liu et al. 2016) and an Austrian study of men (Brunner/Kuhn 2014). The study by Genda et al. (2010), which compares Japan and the US and also looks at differences by educational attainment, finds stronger long-term effects of high unemployment at labor market entry for less-educated men in Japan but not in the US (the effects for other educational groups are similar between the two countries).

Opposing findings on the extent and persistence of adverse labor market effects across country contexts might be due to differences in empirical approaches, follow-up periods, or outcome measures. However, they might also result from differences in macro-level labor market institutions. Different types of labor market institutions and policies have been shown to facilitate or hinder school-to-work transitions (STWTs) and may play a particularly important role for young adults' labor market outcomes during economic downturns. Previous work has examined the role of employment protection legislation (EPL), active and passive labor market policies (ALMP/PLMP), as well as minimum wages, trade unions, and collective bargaining (for a review, see Ortiz-Gervasi/Gebel 2025).

Most existing research has examined the impact of economic conditions at the country level, despite the large variation in economic conditions within countries. Moreover, heterogeneous effects across education levels and gender are often ignored. For example, economic downturns are associated with more conservative gender roles (Berniell et al. 2024), which in turn, along with occupational sex segregation, may push women into part-time, lower status or care-related jobs with fewer opportunities for upward mobility. Thus, entering the labor market during periods of high unemployment may exacerbate these disadvantages, as women are more likely than men to accept jobs that conform to societal expectations but offer limited career prospects (Charles/Grusky 2004; England 2010). In addition, career instability at labor market entry has been shown to influence family formation behavior differently for men and women (e.g., in Australia, see Bolano/Vignoli 2021), which in turn may affect immediate and long-term labor market outcomes (e.g., unemployment or nonemployment) differently for men and women. Furthermore, labor market institutions (such as employment protection legislation (EPL) for permanent and temporary jobs, or active/passive labor market policies) may moderate for which group the adverse labor market effects of entering the labor market during economic recessions are persistent.

Finally, most existing research focuses on regional or national unemployment rates at the time of labor market entry but ignores macro-economic trajectories thereafter, including several years later when measuring its consequences. A causal interpretation of such estimates as scarring effects requires that the economic conditions at labor market entry are uncorrelated with other determinants of the respective outcomes, including regional and national unemployment rates in the year outcomes are measured. This assumption seems highly unrealistic, as business cycles generally exhibit a strong temporal autocorrelation from one year to the next. Importantly, resulting bias is hard to predict and can go both ways, depending on whether economic conditions at labor market entry are positively or negatively related to conditions later on.

To address these shortcomings, we examine the short- and long-term effects of macro-economic conditions at labor market entry in terms of labor market exclusion (non-employment) and insecurity (temporary contracts and low-skilled jobs) (Gebel/Giesecke 2016). We consider young adults who entered the labor market in Europe between 1994 and 2011. To identify the effect of economic conditions at labor market entry, we exploit the year-to-year variation in unemployment rates in European regions (NUTS1) at labor market entry and examine labor market outcomes 5 to 10 years later (i.e., between 1999 and 2021). Thus, our identifying variation lies at the cohort (region by entry year) level. This means that, although labor market outcomes are observed at the individual level, the focus of this study is not on individual (within-cohort) scarring effects, but on whether poor economic conditions at entry increase the risk of scarring effects for these entry cohorts. We explore effect heterogeneity by gender and level of education and examine potential moderating effects of various labor market policies.

2. Theoretical background

2.1. Scarring effects of entering the labor market in poor economic conditions

Theories of human capital development, labor market signaling, and structural inequalities all suggest that entering the labor market during recessions can have lasting “scarring” effects on labor market outcomes. According to human capital theory (Becker 1964), skills and knowledge acquired through education and training require continuous application to maintain their value. Prolonged periods of unemployment or underemployment at labor market entry can lead to the loss or depreciation of skills as well as foregone on the job learning, making individuals permanently less competitive than their more fortunate counterparts (Pissarides 1992). Entering the labor market during economic downturns may also put these cohorts at higher risk of educational mismatch (below their formal qualifications or occupational skills), channeling them into lower quality jobs, which would also lead to a lower extent and quality of skill acquisition than those with matching jobs (Becker 1967; Kahn 2010).

In addition, Spence’s (1973) signaling model emphasizes the role of observable characteristics, such as employment history, in conveying beliefs about an individual’s productivity to employers. Employers therefore also use temporary contracts for young

people as a "screening device" to minimize the risks of poor job-worker matches (Bills 2003; Korpi/Levin 2001; Scherer 2004). Thus, periods of unemployment or lower quality jobs due to poor initial conditions can create negative productivity signals driven by external conditions. If employers do not or only partly factor difficult structural conditions at entry into their interpretation of individual career signals, the latter may have long-lasting effects on labor market success. Following a similar logic, Devereux (2002) presents a stigma model to explain cohort effects – arguing that if employers take workers' current wages as a signal of ability, then being exogenously forced to accept lower wages may have long-lasting effects. Worse, these exogenous negative productivity signals may act as self-fulfilling prophecies: if employers consistently interpret employment gaps or lower-quality jobs as signals of lower productivity, individuals may begin to internalize these signals, which in turn could permanently affect their confidence and job search behavior. On the other hand, if employers acknowledge external difficulties (such as entry during a crisis), the long-term disadvantages may be less severe, but still depend on the extent of skill loss and foregone skill development due to unemployment or mismatches.

Search theory provides a contradictory theoretical account (e.g., Topel/Ward 1992), arguing that "job shopping" is beneficial for labor market outcomes, especially to wage growth. If job changes are common and beneficial, exogenous shocks to the job-matching process can be overcome once the economy picks up. However, in highly segmented and in occupational labor markets, entry into the secondary jobs or jobs that do not match certified skills due to limited opportunities in a recession may still limit these cohorts' "job shopping" and later upward mobility (Gangl 2003; Reich et al. 1973; Scherer 2004).

However, the extent of the scarring effects can be influenced by the question of whether, and to what extent, young people choose the alternative to un- and underemployment, i.e. to remain in the education system or to re-enter it (depending on the cost of education). If they do so, this would, on the one hand, increase the competitiveness of the then "better" educated young people later on. On the other hand, it would increase the educational selectivity of young people who actually enter the labor market in bad times compared to good times. This type of reasoning applies the "discouraged worker" thesis to young people for whom participation in (post-)secondary education is a "shelter" from being un- or underemployed (Shanahan et al. 1997). This strategy would respond to several potential scarring factors: "signaling", skill acquisition (rather than skill loss), and keeping self-esteem high (by being productive rather than unemployed or frustrated in low-skilled jobs) (see, for example, Mroz/Savage 2006). The study by Witteveen (2021) finds support for higher prolongation or re-enrollment in education for Germany, Sweden and the UK, but not for the US. The latter is also found by Schwandt/von Wachter (2019). In the US, young people leave education earlier in response to adverse economic conditions, supporting the so-called "encouraged worker" thesis (see also Salazar et al. 2020) – perhaps due to high tuition fees (Witteveen 2021).

2.2. Heterogeneous impacts of poor economic conditions: Labor queue and gender queue

Previous research has shown that job mismatch is higher during economic downturns due to greater job competition (Borgna et al. 2019). According to Thurow's (1979) model of job

competition model, labor market outcomes are determined by an individual's rank position in the labor queue and the length of the queue of job vacancies. Less-educated applicants often find themselves at the lower ranks of the labor queue, if they are not even sorted out (Solga 2002), and thus have difficulty finding jobs, while stronger candidates (those with more education) are at the higher rank positions. Intuitively, the labor queue will be particularly consequential for young adults' labor market outcomes in times of poor labor market conditions, when labor supply clearly exceeds labor demand and job opportunities become scarce, i.e., when youth unemployment rates are high. Thus, economic downturns are likely to exacerbate existing educational inequalities not only at labor market entry but also in the long run.

Importantly, this is also likely to apply to other social groups that have been shown to be disadvantaged in the hiring process, such as female job seekers (Barron et al. 2025; Kübler et al. 2018; Valdés/Solga 2024). According to Spence (1973), labor queues are sorted not only by qualification but also by other labor market "indices" that employers believe to signal lower productivity (see also Reskin/Roos 1990). Thus, not only do labor queues rank the more educated ahead of the less educated, but they also rank men ahead of equally educated women. When poor economic conditions shorten the job queues (i.e., the queues of job vacancies), the cutoff point for the last applicant in the labor queue to get a job moves up. This is likely to increase inequalities (heterogeneous effects) to the detriment of social groups that already face barriers in accessing (higher quality) employment even under good economic conditions – such as the less educated and women. Relatedly, it is fruitful to adopt an intersectional lens when examining heterogeneity in labor market scarring effects, as some social groups may experience compounding disadvantages (Gebel/Giesecke 2016).

Finally, union formation/marriage and childbearing may also be strategies to reduce uncertainty and serve as role alternatives (such as being "a mother" instead of being unemployed) in times of economic uncertainty. For women in particular, they may serve as a strategy to respond to unfavorable employment prospects by choosing the "alternative career" of being a housewife (Bolano/Vignoli 2021). The extent to which the relationship between labor market entry and family formation processes depends on economic labor market conditions is the subject of Mapineq Deliverable 4.3 (König et al. 2025).

2.3. The moderating role of labor market institutions

Labor market institutions have been shown to influence STWT processes (see review in Ortiz-Gervasi/Gebel 2025). When it comes to effects on employment, the factor that has probably received the most attention is **employment protection legislation** (EPL). It is important to distinguish between EPL for permanent jobs (including, e.g., severance pay, dismissal options, and length of notice period) and for temporary contracts (restrictions on their use), as they have been shown to affect labor market entry outcomes differently (Baranowska/Gebel 2010; Gebel/Giesecke 2016; Noelke 2016), which may also affect subsequent employment opportunities.

It has been argued that high levels of **EPL for permanent contracts** may hamper hiring and increase the risk of unemployment, especially of labor market entrants, as employers fear the high costs of dismissal and may therefore be encouraged to hire them on temporary

contracts (Gebel/Giesecke 2016; Polavieja 2003). As the latter can be "traps" (Scherer 2004), young people in countries with weaker **EPL of temporary contracts** may be particularly affected by greater instability in their subsequent employment trajectories, including higher risks of unemployment and non-employment and persistent low-status employment. Moreover, as less-educated youth are more likely to experience unstable employment upon entering the labor market (Gebel 2010; Gebel/Giesecke 2016), they may also face more longer-term scarring effects, especially in countries with strong EPL for permanent contracts and particularly weak EPL for temporary contracts (Barbieri/Cutuli 2016; Bentolila et al. 2012; Breen 2005; Van Dijk et al. 2020).

Finally, many European countries have responded to poor economic conditions by deregulating EPL, especially fixed-term contracts, often targeting labor market entrants (Barbieri 2009), which may also have long-lasting effects if not undone in good times, and this not only in regions with poor labor market conditions but nationwide (as temporary contracts are also used for screening, see above).

Active labor market policies (ALMPs) are another labor market policy area that has received attention as an instrument to support young job seekers in times of economic downturn (Ortiz-Gervasi/Gebel 2025). These policies include, for example, job search assistance, employment subsidies, public employment services, training measures, as well as subsidies to employers to incentivize them to create jobs – all aimed at promoting the labor market activity of workers who have become inactive or whose employability is low. Thus, ALMP may help to counteract a decrease in jobs and to support educational matches for labor market entrants during economic downturns. However, empirical research suggests that ALMPs targeting youth employment have not been particularly effective (Caliendo/Schmidl 2016; Card et al. 2010) – thus ALPMs may not prevent scarring effects.

Finally, **passive labor market policies** (PLMPs) refer to policies aimed at providing replacement income during periods of unemployment or job search. PLMPs correspond to social transfers that are not conditional on participation in a training or work program (although they usually include job search provisions). Typical PLMPs include unemployment benefits and assistance as well as early retirement schemes. Regarding the role of PLMPs for youth labor market integration, more generous PLMP – often measured in terms of the replacement rate associated with them, the duration of the unemployment benefits, or workers' eligibility to them (Ortiz-Gervasi/Gebel 2025) – are often seen as work disincentives, leading to higher (long-term) unemployment and longer job searches (Rebollo-Sanz/Rodríguez-Planas 2020). However, unemployment subsidies may also be regarded as job search subsidies: more generous unemployment benefits could allow for longer job searches, which may result in better job matches (Gangl 2004). In his analysis for Europe and the US, Biegert (2017) explicitly compares these opposite effects and finds that the role of generous PLMPs as a job search subsidy outweighs their disincentive effects, provided that there is a larger pool of quality job opportunities for jobseekers. Thus, PLMPs may reduce potential scarring effects of difficult conditions at labor market entry.

3. Data and Methods

3.1. European Union Labour Force Survey (EU-LFS) 1994–2021 and sample construction

Our analysis uses cross-sectional individual-level data from the EU-LFS. The EU-LFS provides rich annual information on individuals' working lives for up to 31 European countries over a long period of time starting in 1983. Importantly, the EU-LFS provides information on respondents' regional location at the NUTS1 level (i.e., regions with populations between 3 and 7 million inhabitants). This allows us to capture variation in macro-economic conditions at a level closer to individuals' actual labor markets than the national level.

Macroeconomic conditions at labor market entry are assigned using a question about the year when the respondent obtained their highest level of education. Since we are interested in the longer-term effects on labor market outcomes 5 to 10 years after entry, the analytic sample constructed from a given EU-LFS survey year t includes everyone who reported completing their highest level of education between t-10 and t-5. Because we do not observe respondents' regional location at labor market entry, we have to rely on individuals' current regional location to assign initial regional macroeconomic conditions. Consequently, one important limitation of our approach, and one faced by many studies (e.g., Schwandt/von Wachter 2019), is endogenous migration: if people respond to poor labor market conditions at entry by migrating into other regions that are less affected by unemployment, we erroneously assign them the better labor market conditions in their new regions of residence. The implied mismeasurement of initial labor market conditions would lead to attenuation bias. Moreover, an increasing empirical literature suggests that higher skilled young workers are more likely to move between regions in response to adverse labor market conditions (Wozniak 2010). If there is selection in who tends to leave in response to adverse labor market conditions, the bias could go either way (depending on whether those with particularly small or large treatment effects have a higher tendency to migrate).

We exclude all observations that indicate that they were in formal education at the time of the interview (when we measure the outcome) and who indicate that they have never worked before. This is to reduce the risk of including individuals who are still in the process of attaining their highest level of education five or more years later. This still leaves us vulnerable to including individuals who entered the labor market, worked for a bit, and later returned to education. Both these issues point to another important caveat also linked to the "discouraged worker" thesis: If young adults prolong their educational attainment or return to education to avoid unfavorable labor market conditions at entry, timing of entry is no longer exogenous. Endogenous timing of labor market entry, if uniformly distributed among labor market entrants, would attenuate our estimates of scarring effects toward zero (see Schwandt/von Wachter 2019). If the timing of entry is selective with respect to labor market prospects, the introduced bias may go either way. In the more likely scenario that those at higher risk of being negatively affected by poor

labor market conditions are more likely to prolong their education, we would underestimate the scarring effects of labor market conditions at entry.[1]

We further restrict the sample to individuals who were no younger than 14 and no older than 30 at the time they reached their highest level of education. 1992 is the first year the EU-LFS collects information on education.

We further restrict our analytical sample to entry cohorts for which we can observe labor market outcomes 5, 6, 7, 8, 9, and 10 years later. Given these restrictions, outcomes for the 1992 and 1993 labor market entry cohorts are observed only for very few individuals and countries. We therefore use micro-level data for 1994–2021. We first measure outcomes in 1999, 5 years after entry for the 1994 entry cohort, but need to use the data from 1994 onwards because we also use them to calculate the regional (NUTS 1) unemployment rate, as further described below.

For some countries in the EU-LFS, important macro-level indicators such as regional unemployment rates or labor market segments are missing. These countries are therefore excluded from the analysis. Five countries –Bulgaria, Croatia, Cyprus, Malta, and Romania – are included in the general analyses of the effects of macro-economic conditions at labor market entry but have to be omitted from the analyses exploring the moderating role of labor market institutions due to incomplete data on the latter.

3.2. Variables

We use three dependent variables. Our first main outcome of interest is **non-employment**. Non-employment is coded 0 for individuals who were employed during the interview week and 1 for those who were not employed, i.e. unemployed or economically inactive (ILO 1998). We use two variables to analyze effects on employment quality. These analyses are restricted to employed individuals. Our second dependent variable measures **temporary employment**. Those in temporary employment (i.e., with a fixed-term contract) are coded 1, while those with permanent contracts are coded 0. Our third dependent variable is **low occupational skill level** (being employed in low-skilled jobs). We construct a dummy variable based on the skill level of the ISCO codes, where workers in occupations with the lowest skill level (i.e., ISCO-08=9, representing "Elementary occupations") are coded 1 and all other employed persons are coded 0.

We operationalize regional economic conditions at labor market entry through the regional (NUTS1) unemployment rate. We generate this measure from our individual-level data by calculating the number of unemployed working age (15-64) individuals as a share of the labor force.

We use additional variables at the individual, regional, and national level. At the individual level, we also measure respondents' gender (male/female), age, and educational attainment (three levels based on ISCED-97: low (ISCED-97 0-2), medium (ISCED-97 3-4), and high (ISCED-97 5-6). Individuals' regional location is defined by NUTS1 regions. Where NUTS1 information is not available (the Netherlands, Romania) or for smaller countries

[1] We consider our estimates to be conservative with regard to endogenous timing of entry. We will look into this issue in more detail in future analyses by comparing the likelihood of entering the labor market in times of low/high regional unemployment among young adults who are about to complete a formal educational qualification.

(Croatia, Cyprus, Czech Republic, Denmark, Estonia, Iceland, Ireland, Latvia, Lithuania, Luxembourg, Malta, Norway, Slovakia, and Switzerland) consisting of only one NUTS1 region, we use the country as the regional location. We use the EU-LFS microdata to construct further regional-level variables to capture industry structures. Following Carroll and Mayer (1986; see also, Heisig et al. 2019), we use occupational information from employed respondents to calculate the regional employment share of six different labor market segments: (1) traditional primary, (2) large-scale engineering, (3) competitive, (4) small competitive, (5) bureaucratic, and (6) professional jobs.

We measure all labor market institutions at the national level, as regional-level measures are generally unavailable (in some cases, because the relevant policies are set at the national level). Specifically, we use the OECD's EPL indices (version 1) for permanent and for temporary contracts to model employment protection legislation. The indices measure the strictness of legal protection for permanent and for temporary employees on a scale from 0 to 6. To measure a country's commitment to activating workers, we use the OECD measure of public spending on ALMPs (as the percentage of GDP). Since spending also depends on the number of eligible persons, we standardize ALMP spending by dividing it by the national unemployment rate in a given year. To measure a country's transfer payments to non-working individuals, we use the OECD measure of public spending on PLMPs, again adjusted for the unemployment rate.

All regional variables (regional unemployment rate, labor market segments) and national-level variables (EPL permanent contracts, EPL temporary contracts, ALMP, PLMP) are measured at the time when individuals reached their highest level of education. To adjust for regional labor market trajectories and subsequent changes in labor market institutions after labor market entry, some specifications include additional measures of regional unemployment as well as EPL, ALMP, and PLMP at the time when labor market outcomes are measured.

3.3. Descriptive statistics of the analytical sample

Our analytical sample consists of 3,669,621 individuals from 103 NUTS1 regions and 30 countries who have entered the labor market between 1994 and 2011 and whose labor market outcomes are observed between 1999 and 2021 (see Table 1). The large sample size, even after implementing the sample restrictions outlined above, is a key advantage of the EU-LFS. Pooling across European regions and years, 22% of the sample are non-employed 5 to 10 years after entering the labor market, 17% are employed on a temporary contract, and 6% work in low-skilled jobs. Average age at the time of outcome measurement is 28 years, ranging from 19 to 40 years. The average age of obtaining the highest level of education is around 21 years (not shown in Table 1). In terms of educational attainment, 13% of our sample have only lower secondary education, 51% have upper secondary education, and 37% have obtained a tertiary degree.

The **average regional unemployment rate at labor market entry**, our treatment of interest, is 9% and, more importantly, shows considerable variation ranging from 0% to 31%. Average values of the four labor market institution indices are comparatively less meaningful. Nevertheless, Table 1 shows that there is considerable variation in labor market institutions (see also Appendix, Figures A3 and A4). For the multivariate analyses,

we z-standardized (with a mean of 0 and a SD 0f 1) the four labor market institution variables based on pooled observations (across countries and years).

Table 1: Descriptive statistics of the analytical sample

	N	Mean	SD	[Min,Max]
Individual level (LM outcome year)				
Non-employed (binary)	3,669,621	0.22	0.41	[0, 1]
Temporary employed (binary)	2,561,265	0.17	0.38	[0, 1]
Low-skilled employment (binary)	2,843,404	0.06	0.24	[0, 1]
Age	3,669,621	28.13	4.24	[19, 40]
Female (binary)	3,669,621	0.50	0.50	[0, 1]
Highest education level				
Lower secondary	3,669,621	0.13	0.33	[0, 1]
Upper secondary	3,669,621	0.51	0.50	[0, 1]
Tertiary	3,669,621	0.37	0.48	[0, 1]
Regional/NUTS1 level (labor market entry year)				
Unemployment rate	3,669,621	0.09	0.05	[0, 0.31]
Labor market segments				
Traditional primary	3,669,621	0.07	0.08	[0, 0.47]
Large-scale engineering	3,669,621	0.27	0.07	[0, 0.42]
Competitive	3,669,621	0.14	0.04	[0, 0.29]
Small competitive	3,669,621	0.23	0.05	[0, 0.45]
Bureaucratic	3,669,621	0.10	0.03	[0, 0.3]
Professional	3,669,621	0.18	0.07	[0, 0.41]
Country level (LM entry year)				
EPL permanent	3,300,620	2.52	0.68	[1.1, 4.58]
EPL temporary	3,300,620	1.86	1.15	[0.12, 4.75]
ALMP spending (divided by share unemployed)	2,951,465	10.87	8.40	[0.57, 60.83]
PLMP spending (divided by share unemployed)	3,360,245	14.73	10.73	[1.02, 65.98]

3.4. Analytical strategy

Our analysis has two main parts: In a first step, we examine the labor market scarring effects of regional labor market conditions (i.e., regional unemployment rates) at labor market entry among young adults over the short to long run (5 to 10 years) – without considering the role of labor market institutions. In a second step, we examine whether possible scarring effects of regional unemployment at labor market entry are moderated by national-level labor market institutions.

3.4.1. Labor market effects

To examine the effects of regional labor market conditions at labor market entry, we estimate a series of multivariate OLS regressions, regressing our labor market outcomes (non-employment, temporary employment, low-skilled employment) on a set of independent variables that are decomposed into their between- and within-country components prior to the analyses (see below).

For each outcome, we estimate separate OLS regressions according to time since labor market entry (5, 6, 7, 8, 9, and 10 years) to examine the existence and persistence of negative consequences of entering the labor market during poorer economic conditions. We control for potential regional-level confounders by including regional employment shares in different labor market segments and the level of regional unemployment at the

time when the outcome is measured. Previous research on the long-term consequences of a recession at labor market entry has often abstained from controlling for macroeconomic trajectories following the initial shock, conceptualizing the effect of the initial unemployment rate as consisting of its own direct effect plus the weighted effect of subsequent unemployment rates correlated with it (Oreopoulos et al. 2012; Schwandt/von Wachter 2019). The resulting coefficient estimates are supposed to capture the effect of graduating in a recession, given "the regular subsequent evolution of the local labor market conditions" (Schwandt/von Wachter 2019, p. 168). However, since we are interested in genuine scarring effects, it is important to also adjust for the regional unemployment rates at the time of outcome measurement, as this ensures that we isolate the effect of regional labor market conditions *at entry*. As shown in Figure 1, unemployment rates in Europe vary considerably over a period of 5 to 10 years. Even if labor market shocks were followed by a regular aftermath (i.e., typical business cycle dynamics), not adjusting for current unemployment would be problematic in the context of our study, as it could lead to both an over- and underestimation of scarring effects, depending on how initial unemployment typically correlates with unemployment rates 5 to 10 years later. When examining the effects of high regional unemployment at entry for the full sample below, we estimate models with and without adjusting for the current regional unemployment rate.

At the individual level, we control for age, gender, and educational attainment. It is important to note that, due to the retrospective approach (required by the use of the EU-LFS for our research questions), we cannot observe any individual-level characteristics at the time of labor market entry. However, gender can be assumed to be time-invariant, changes in educational attainment are limited due to our definition of labor market entry (see Section 3.1), and age at labor market entry can be defined with certainty.

To examine the overall magnitude and persistence of the scarring effects of poor initial labor market conditions, we estimate analyses using data pooled across social groups, and to identify heterogeneous effects, we estimate the same specification (without controls for gender and education) separately for men and women, as well as stratified by highest educational attainment.

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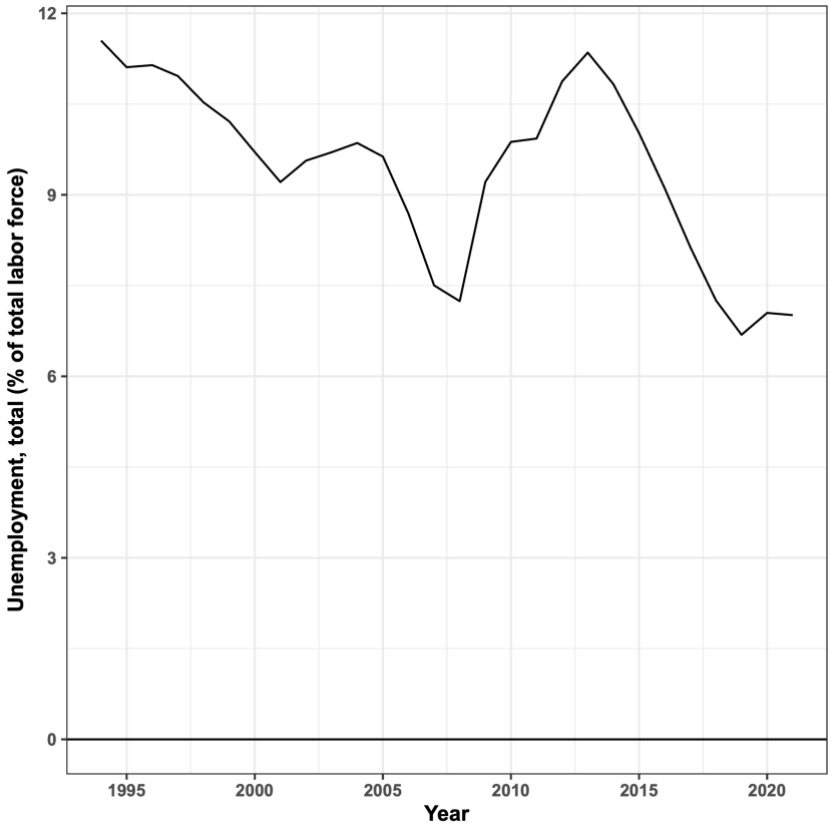
Figure 1: Unemployment rate as EU-27 average, 1994–2021



Data source: Unemployment data from the International Labour Organization (ILO), extracted from the World Bank database.

We decompose all right-hand-side variables into three distinct components as follows:

$$x_{r,t} = x_{.t} + x_{r.} + \tilde{x}_{r,t} \qquad (1)$$

where the index r denotes regions and t denotes years. The annual mean component $x_{.t} = \bar{x}_t - \bar{x}$ captures Europe-wide annual trends (i.e., annual deviation from the grand mean). The *regional mean component* $x_{r.}$ simply equals the NUTS1 averages over time ($x_{r.} = \bar{x}_r$), while the *within-region component*, calculated as the difference between the variable's original value minus the two aforementioned components ($\tilde{x}_{r,t} = x_{r,t} - (\bar{x}_t - \bar{x}) - \bar{x}_r$), captures year-to-year within-region variation net of Europe-wide trends. Individual-level covariates (i.e., age, gender, education) are decomposed in the same way as regional-level covariates, the only difference being that they are decomposed into four instead of only three distinct components since they, unlike the regional variables, vary even within NUTS1 years.

The resulting regression equation (in matrix form) looks as follows:

$$Y = \alpha + X_{.t}\beta + X_{r.}\gamma + \tilde{X}_{rt}\theta + \varepsilon, \qquad (2)$$

where Y is the n x 1 labor market outcome vector and $X_{.t}, X_{r.}$, and $\tilde{X}_{rt}$ are n x k dimensional matrices of the independent variables' annual mean, regional mean, and within-region components, respectively. Finally, β, γ, and θ are the corresponding k x 1 vectors of

regression parameters, and ε is the error term. The standard errors are clustered at the country level.

Regarding the regression coefficient estimates for the within-region unemployment component $\tilde{X}_{rt}$, our decomposition approach closely resembles an OLS regression including region (NUTS1) and year fixed effects in that the focal component is also limited to within-region variation and thus accounts for unobserved, time-invariant confounding at the regional and/or national level as well as aggregate time trends. However, unlike with fixed effects, our approach allows us to also estimate between-effects and is more flexible regarding the introduction of interaction terms (see analyses of labor market institutions below).

3.4.2. Moderating role of labor market institutions

In the second step of the analysis, we repeat the analyses outlined above, this time including interaction terms between the within-region component of the unemployment rate and country-level labor market institutions, measured at the time of labor market entry (EPL permanent contracts, EPL temporary contracts, ALMP, and PLMP). As with the unemployment rate, measures of labor market institutions are included in the models not only through interactions with the unemployment components, but also by controlling for changes in labor market institutions that occur between labor market entry and the year of the survey.

Our decomposition approach allows us to separately estimate models that include within-between interactions, where within-region variation in the unemployment rate at entry is interacted with (z-standardized) measures of labor market institutions at labor market entry (presented in the main text), and within-within interactions, where within-region variation in the unemployment rate at entry is interacted with within-country deviations in labor market institutions from the long-term average (results are presented in the Appendix).

On the one hand, the latter – within-within interactions – are advantageous because they focus specifically on changes in labor market institutions that occur within countries. This approach minimizes concerns about confounding due to unobserved between-country differences correlated with the level of labor market institutions (Giesselmann/Schmidt-Catran 2020). On the other hand, this approach requires sufficient within-country variation in labor market institutions over time and does not capture potentially important level differences. Figures A3 and A4 (in the Appendix) show country-specific trends in labor market institutions between 1994 and 2011 (the labor market entry years in our analyses). As they indicate that some countries show little or no change in some labor market institutions, within-within interactions have the problem that these cases do not contribute to the estimates of (within-within) interaction effects with labor market institutions.

Thus, to be more consistent with the country sample of the scarring effect analyses (first step) and to examine whether the effects of an increase in regional unemployment differ between countries by level of labor market institutions, we focus on the results derived from models that include *within-between interactions*. We present the results of the same

set of models including *within-within* interactions in the Appendix (see Figures A5–A8) and discuss relevant results in the main text (Section 4.3).

4. Results

The results are presented as follows: First, we provide a brief overview of the level and fluctuations of the regional unemployment rate (our treatment variable of interest) for the period considered in this study. We then present the results of the analyses regarding the scarring effects of macroeconomic conditions at labor market entry, pooled across social groups and by gender and education. Finally, we turn to the potential moderating role of labor market institutions, again pooled across social groups and by educational attainment.

4.1. Differences in economic conditions at labor market entry

Young adults in our sample entered the labor market between 1994 and 2011, which includes early-1990s recessions in many EU countries as well as the onset of the financial crisis starting in 2008. Figure 1 above shows the high average unemployment rate in the European Union in the mid-1990s, its subsequent decline until 2008, and its sharp increase between 2009 and 2013. In the present study, we are not interested in the role of labor market conditions faced by labor market entrants at the European or country level, but at the more disaggregated regional level, which plausibly represents a more relevant and immediate spatial context for young adults. Previous research has discussed and investigated the heterogeneous impacts of economic downturns on unemployment rates at the country level (e.g., Cazes et al. 2013; Hartung et al. 2018), while the number of studies on the effect of *regional* unemployment differences is more limited.

Figure 2 maps regional unemployment rates across Europe in 2008 and 2013, illustrating variation in regional unemployment for a year with low (2008) and one with high (2013) unemployment. The right-hand panel of Figure 2 displays how unemployment changed within each region between 2008 and 2013. The three panels of Figure 2 show that, while regional unemployment rates were relatively low in most regions in 2008, the sharp increase in the aggregate unemployment rate between 2009 and 2013 was not uniformly distributed across European regions. Certain regions in Spain, Portugal, Italy, and Greece were particularly affected by increases in unemployment, while many regions in other countries experienced only small increases in unemployment, and in some cases even decreases (e.g., Eastern Germany).

Figure 4, displaying unemployment trends in European regions grouped by country over the period of 1994–2011, further illustrates the fact that unemployment rates do not only vary *between* countries. Regions *within* countries exhibit substantial variation in the level and sometimes even the trend of unemployment: There are countries (e.g. Italy) where NUTS1 regions show substantial differences in both the level and the trend of unemployment rates. Moreover, for a number of countries in our study, NUTS1 regions follow similar trends but at different levels (e.g. Poland, Spain, Germany), while only a few countries show little within-country variation in the level and trend of regional

unemployment (e.g. Austria, Great Britain). These differences suggest that it is worth examining the role of unemployment at the subnational level.

Due to the scope of the data and sample restrictions discussed above, the analyses focus on entry cohorts between 1994 and 2011, which means that we cannot explicitly examine the consequences for young adults who entered the labor market during the *COVID-19 pandemic*. What we can say is that unemployment rates increased at the onset of the pandemic in 2020 (see Figure 1 above). However, compared to previous economic downturns, the increase in unemployment was rather small. Figure 3 further illustrates this point by comparing regional unemployment rates at the height of the Eurozone crisis in 2013 with those at the onset of the COVID-19 pandemic in 2020. As is evident from the right panel of Figure 3, unemployment levels were significantly lower in most European regions in 2020. It is important to note that the COVID-19 pandemic and its societal consequences may have affected labor markets and those trying to enter them in significant ways that are *not* reflected in unemployment rates, for example, through a shift to remote work, a lack of personal contact with supervisors and mentors, and colleagues, reduced opportunities to develop certain types of skills, and so on. Unfortunately, due to data limitation, it is beyond this report to examine the medium- and long-term consequences for labor market entrants during the COVID-19 pandemic. What we can say, however, is that Hornberg et al. (2024), besides analyses of unemployment, conducted analyses with regard to NEET risk, occupational attainment, and income in/security (disposable income and poverty risk of young adults) and well-being at labor market entry for 2021 (COVID-19 pandemic period) and 2018 (pre-pandemic period). The results are very similar for both time periods.

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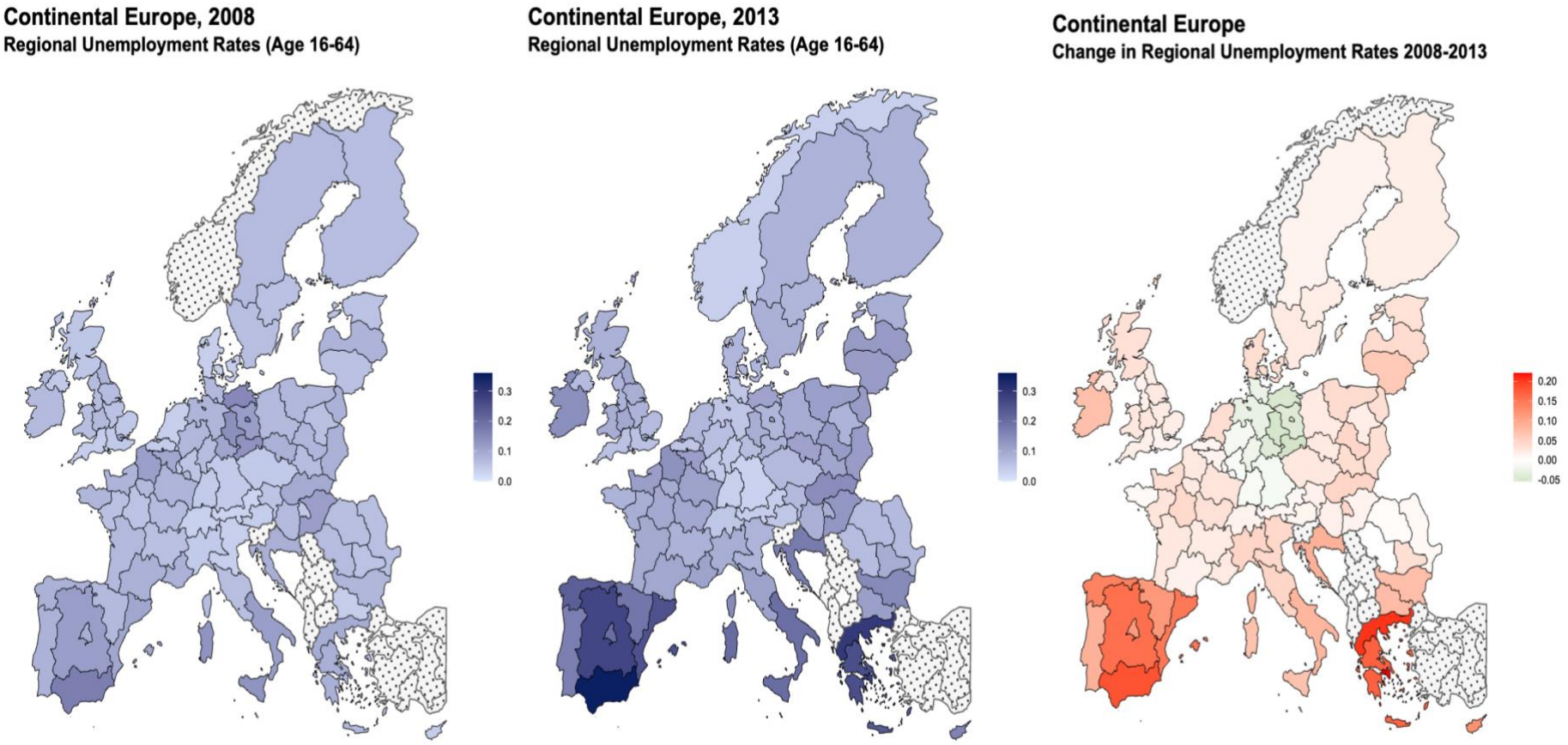
Figure 2: Regional (NUTS1) unemployment rates in continental Europe in times of low unemployment (2008, left panel) and high unemployment (2013, central panel) as well as differences in regional unemployment rates between 2008 and 2013 (right panel)



Source: EU-LFS, authors' calculations.

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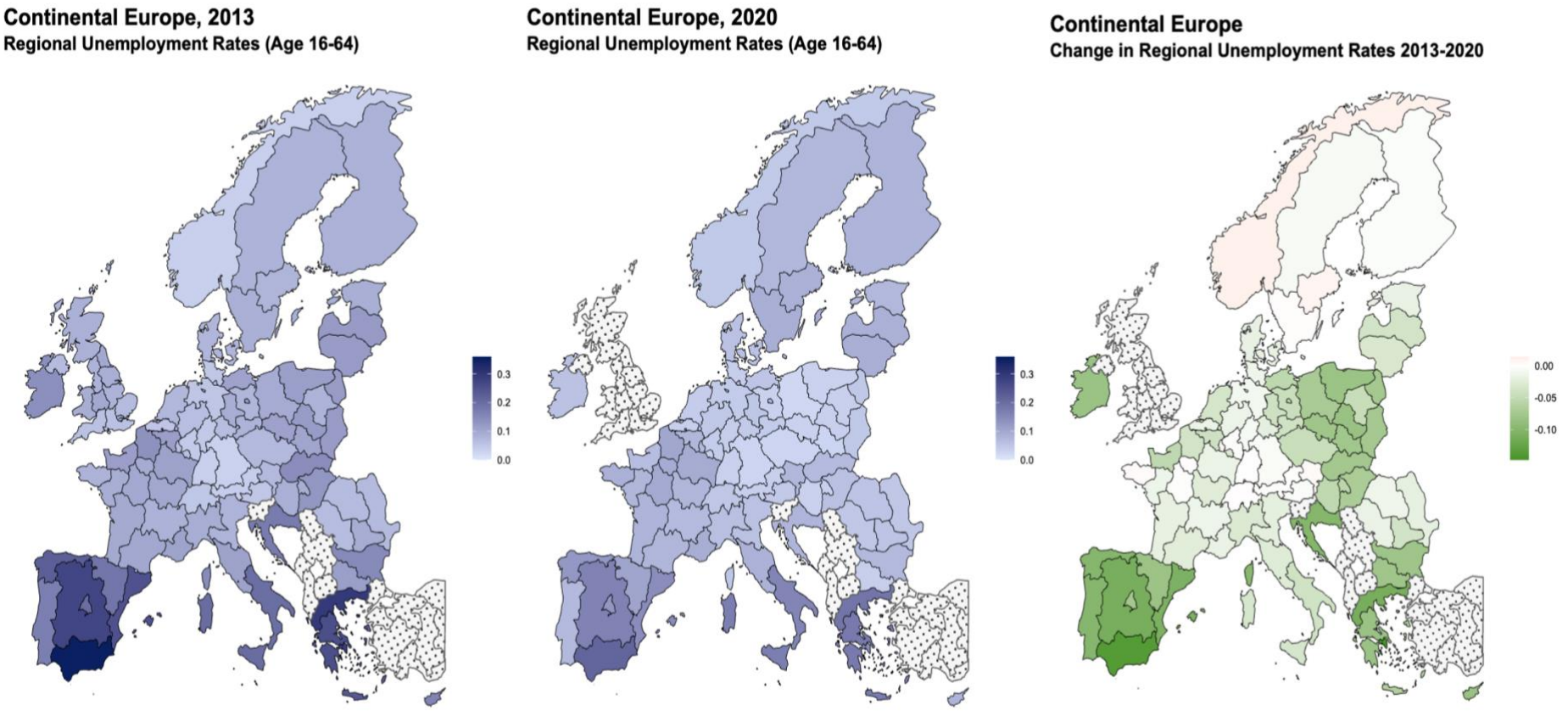
Figure 3: Regional (NUTS1) unemployment rates in continental Europe in times of high unemployment (2013, left panel), during the COVID-19 pandemic (2020, central panel), as well as differences in regional unemployment rates between 2013 and 2020 (right panel)



Source: EU-LFS, authors' calculations.

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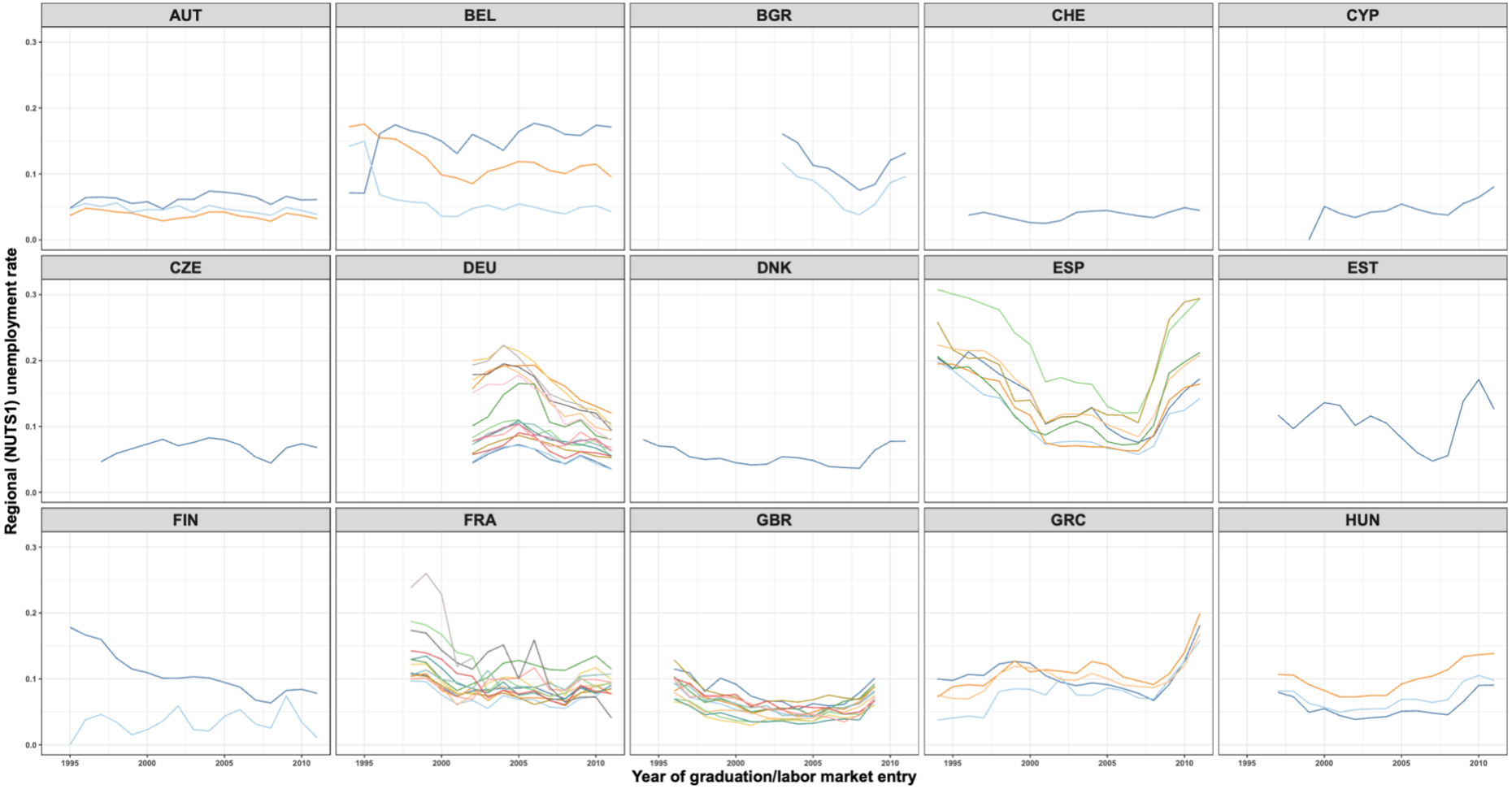
Figure 4: Regional (NUTS1) unemployment rates between 1994 and 2011 by country



Source: EU-LFS, authors' calculations.

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Figure 4: Regional (NUTS1) unemployment rates between 1994 and 2011 by country (continued)

Source: EU-LFS, authors' calculations.

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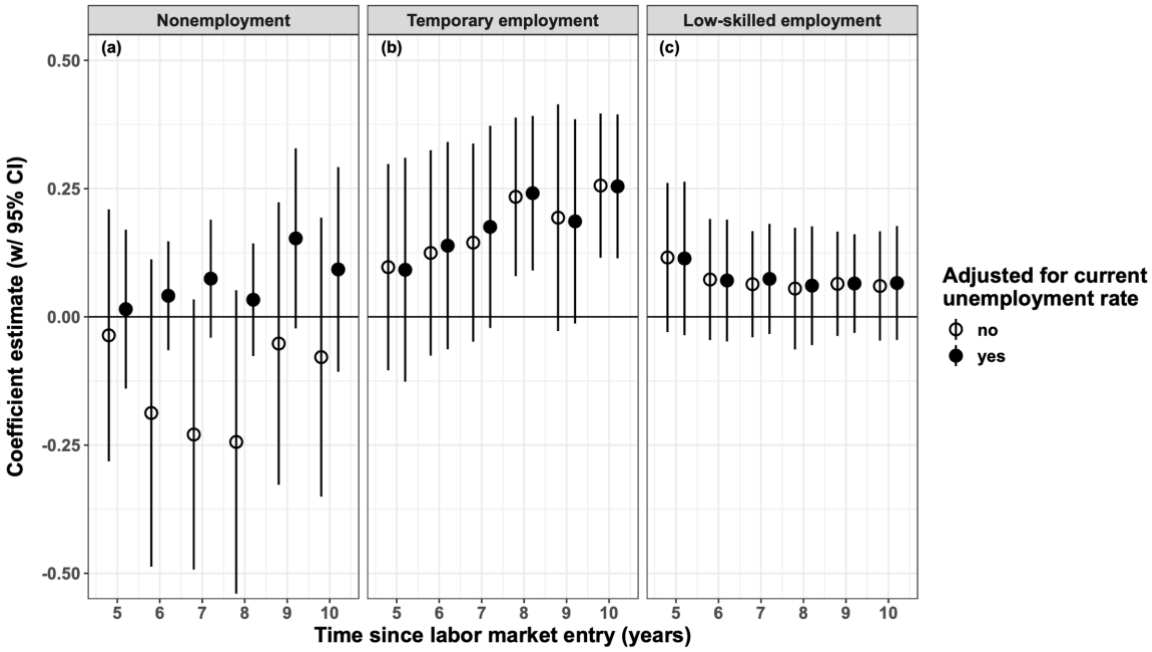
4.2. Effects of economic conditions at labor market entry on labor market outcomes 5 to 10 years later

Figure 5 shows the estimated effects of an increase in the regional unemployment rate at labor market entry on the risk of being non-employed (left panel) and, conditional on being employed, of working on a temporary contract (middle panel) or in a low-skilled job (right panel). The regional unemployment rate at entry ("treatment") – or, more precisely, its deviation from the regional long-term average, net of European-wide trends – ranges between 0 and 1 by construction. The three dichotomous individual-level outcome variables take values of 0 or 1. This means that a coefficient estimate of 1 would imply that a 1 percentage points increase in the within-region unemployment rate at labor market entry increases the risk of being non-employed 5 to 10 years later by 1 percentage point (pp). For reference, the standard deviation of the within-region component of the regional unemployment rate equals 2.4 pp.

Figure 5 presents coefficient estimates based on two sets of models: unadjusted models that do not account for the regional unemployment in the year when treatment and outcomes are measured, and adjusted models that do.

Figure 5: Effect of within-region variation in unemployment rate at labor market entry on labor market outcomes 5 to 10 years later (pooled across groups)



Notes: Effect of regional labor market conditions at entry on labor market outcomes 5 to 10 years later with and without adjusting for current (i.e. measured at outcome) regional unemployment rates. All models control for respondents age, gender, and educational attainment and regional shifts in labor market composition (economic activities, NACE).

Source: EU-LFS, authors' calculations.

Our models, based on data pooled across regions and different groups of young adults, provide some evidence of scarring effects due to poor initial labor market conditions. All coefficient estimates of the effect of a deviation from the long-term regional

unemployment rate on the extent of later **non-employment** are positive and substantial in size, suggesting that a 1 pp increase in regional unemployment at labor market entry increases the risk of being non-employed 5 to 10 years later by around 0.1 pp ($\beta = .01$ five years later; $\beta = .15$ nine years later). However, none of these estimates is statistically significant (smallest p-value = 0.087, nine years after entering the labor market).

We do find stronger evidence of a rather persistent scarring effect of poor initial labor market conditions on the risk of being in **temporary employment**: the corresponding coefficient estimates range from 0.19 pp (5 years later) to 0.25 pp (10 years later). The latter implies that a one SD increase in within-region unemployment at entry is linked to an increase in the risk of being in temporary employment by 0.6 pp, which corresponds to an increase of 3.5% relative to the mean.[2]

Two of the estimates are statistically significant at the 5% level and two others at the 10% level (7 and 9 years after labor market entry, with p-values of 0.08 and 0.07, respectively). Although not all of the estimates reach statistical significance, the clear pattern of the estimates suggests that high regional unemployment at labor market entry does indeed have negative effects on subsequent career success in terms of the risk of being in temporary employment. Importantly, our results do not suggest that these adverse effects fade over time. If anything, they tend to become more pronounced towards the end of the follow-up period.

The coefficient estimates for **low-skilled employment** are consistently positive 5 to 10 years after graduation, with β ranging from 0.06 to 0.11, implying that a one SD increase in the within-region unemployment rate at entry is associated with an increase in the risk of low-skilled employment by 2.4% to 4.4% relative to the mean[3]. Although none of the coefficient estimates reaches statistical significance at the 5% level, the consistent pattern does suggest a moderate scarring effect on the risk of employment in low-skilled jobs that tends to diminish over time.

4.2.1. Differential effects of economic conditions at labor market entry by gender and education

Figure 6 explores effect heterogeneity by presenting the results of adjusted models (controlling for changes in unemployment after labor market entry) for six gender/education subsamples (i.e., separately for female and male respondents with lower secondary, upper secondary, and tertiary degrees). These analyses provide several important insights: First, the scarring effects of entering the labor market during poor economic conditions are **more severe for individuals with only lower secondary education** than for those with higher levels of education.

Second, the **non-employment effects** of labor market entry in times of high regional unemployment appear to be largely concentrated among **women with lower secondary and**, to a lesser extent, **with upper secondary education**, while non-employment effects are less clear for men. For women with lower secondary education, we find that a 1 pp increase in the regional unemployment rate at entry increases the risk of being non-employed 5 to

[2] $(0.25 * 2.4)/17 = 0.035$.
[3] $(0.06 * 2.4)/6 = 0.024$ and $(0.11 * 2.4)/6 = 0.044$.

9 years later by 0.5 (t+6) to 1.2 (t+9) pp (the effect for t+10 is smaller and no longer statistically significant). For those with upper secondary education, the estimates of the non-employment effects are substantially smaller (positive only for women). Third, we find that unemployment at entry increases the risk of **being in temporary employment** 5 to 7 years after entering the labor market for **both less-educated men and women**, while the positive estimates for men and women with upper secondary education are rarely statistically significant and moderate in size. Fourth, we find **no evidence of persistent scarring effects among those with tertiary education**: the majority of estimates is close to zero and insignificant. Finally, we find no very clear patterns of effects of poorer economic conditions at entry on the risk of low-skilled employment. If anything, it is men with lower secondary and upper secondary education that face an increased risk of low-skilled employment.

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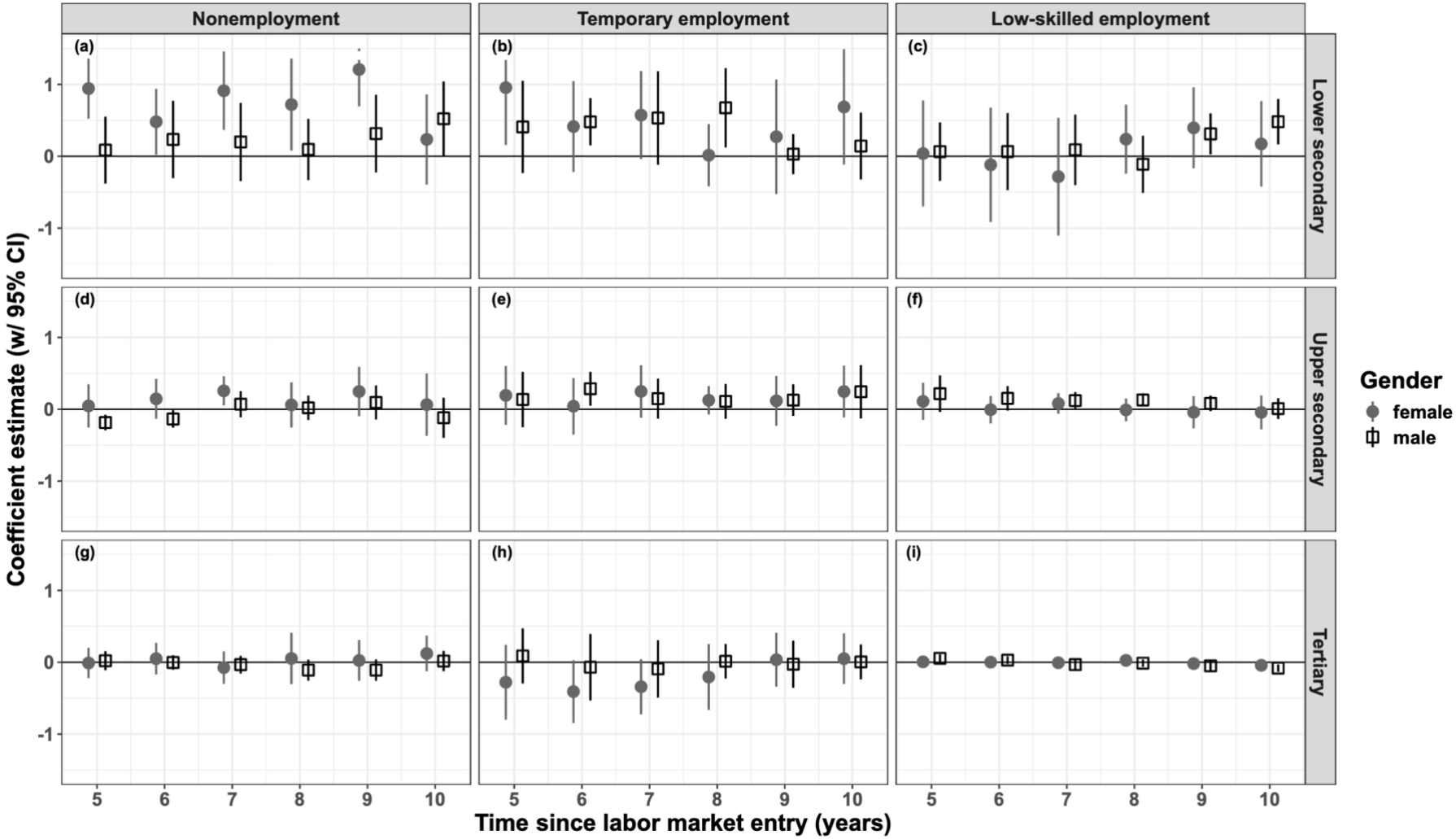
Figure 6: *Effect of within-region variation in unemployment rate at entry on later labor market outcomes for men and women by education*



Notes: Effect of labor market conditions at entry on labor market outcomes 5 to 10 years later adjusting for current regional unemployment rates. All subsample analyses control for respondents age and regional shifts in labor market composition (economic activities, NACE). Source: EU-LFS, authors' calculations.

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4.3. Moderation by labor market institutions

To examine the moderating role of four important labor market institutions (EPL for permanent and temporary employment, and public spending on ALMP and PLMP), we estimate a series of models that include (within-between) interactions between the decomposed components of regional unemployment at labor market entry (our "treatment") and the level of these labor market institutions at labor market entry. Estimates of corresponding 'within-within' interaction models are presented in the Appendix.

Based on the models with interaction terms, we present the results on the role of labor market institutions in terms of conditional marginal effects, i.e., the marginal effect of a one unit (percentage point) increase in the regional unemployment at entry on non-employment/temporary employment/low-skilled employment conditional on the level of the respective labor market institution being one standard deviation (SD) below or above the grand mean (pooled across countries and years). Consequently, the point estimates and 95% confidence intervals in the Figures 7–9 (as well as the corresponding 'within-within' Figures A5–A7 in the Appendix) can be interpreted as subgroup marginal effects. Whether they are significantly different from each other is indicated by solid (difference is significant) and hollow (difference is not significant) point estimates.

The results displayed in Figure 7 are based on the full sample of young adults (i.e., pooled across social groups). We highlight three interesting results: First, the adverse effects of high initial unemployment on the risk of later **temporary employment** seem to be substantially moderated by a country's general level of EPL. As evident from panel b in Figure 7, we find large and statistically significant effects of unemployment rates at entry on the cohorts' risk of being in temporary employment 5 to 7 years later in NUTS1 regions characterized by comparatively **high levels of EPL for permanent contracts**. The corresponding average marginal effects range from 0.81 pp (after 5 years) to 0.47 pp (after 7 years). However, in regions characterized by relatively low levels of EPL of permanent employment, the estimated average marginal effects are small and not statistically significant.

Second, we find some evidence that high levels of **EPL for temporary contracts** tend to increase the risk of **non-employment** 5 years after entering the labor market (Figure 7, panel d). This implies that young adults who entered the labor market during poorer economic conditions in regions with high EPL for temporary contracts face a higher risk of being non-employed 5 years later (likely due to employers' reluctance in loose labor markets to hire young workers with high dismissal costs). This interpretation is also supported by corresponding results based on 'within-within' interactions. Panel d in Figure A5 (in the Appendix) shows significantly larger non-employment effects 6 to 8 years after labor market entry in times of higher unemployment in regions with high EPL for temporary contracts compared to regions where EPL for temporary employment is below the long-term average.

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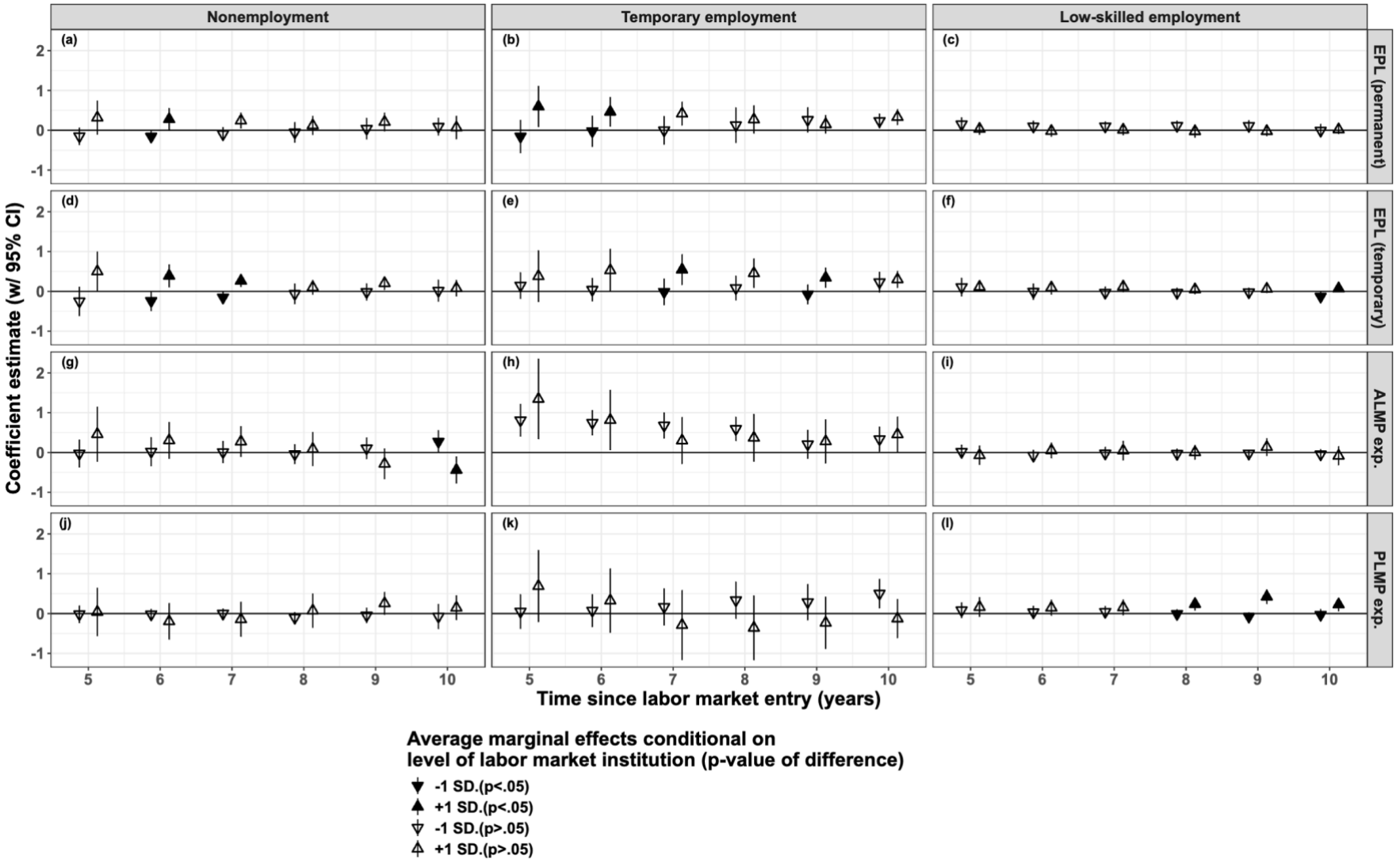
Figure 7: Conditional average marginal effects of within-region variation in unemployment at entry, by levels of labor market institution



Source: EU-LFS, authors' calculations.

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Third, we find that entering a weak regional labor market is associated with a moderate increase in the later risk of **low-skilled employment** in countries with high levels of **PLMP spending** (Figure 7, panel l). The estimated increase in the risk of low-skilled employment after 8 to 10 years associated with a 1 pp increase in unemployment rate at entry in regions with high (1 SD above mean) PLMP spending ranges from 0.21 pp (t+10) to 0.41 pp (t+9). The corresponding estimates for regions with low PLMP (1 SD below mean) are practically zero (and statistically significantly different from those for high-PLMP regions). This finding is again supported by our analyses of 'within-within' interactions (Appendix Figure A5, panel l).

4.3.1. Differences in effect moderation by education group

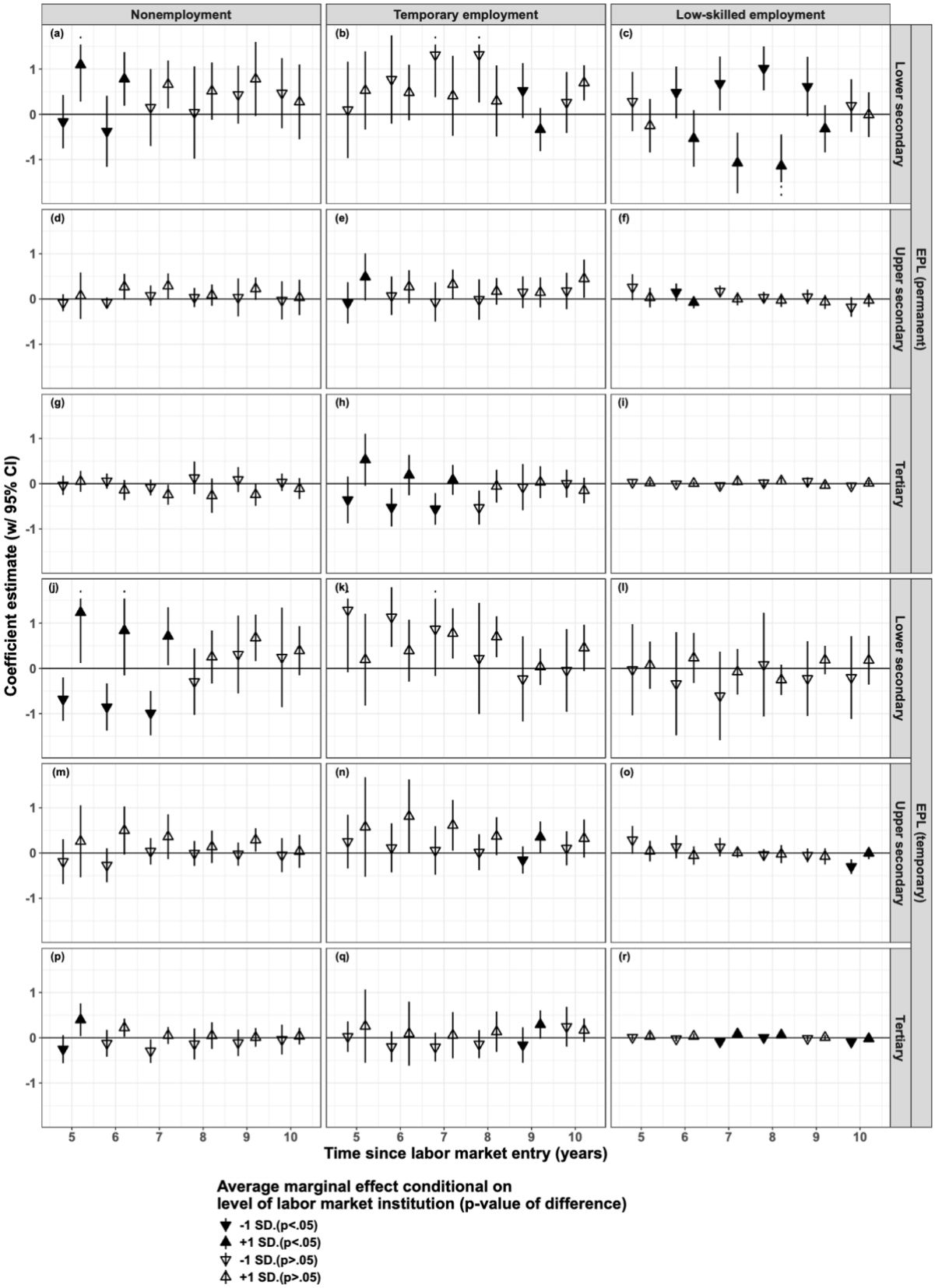
To examine whether these labor market institutions affect entrants with different levels of education in similar or different ways, we estimate the models for the subsamples defined by education group: lower secondary, upper secondary, tertiary education (see Figures 8 and 9).

Regarding the three findings on the interaction effects based on pooled data – i.e., (i) the moderation of temporary employment effect by EPL for permanent contracts, (ii) the amplification of non-employment effects by EPL for temporary contracts, and (iii) the emergence of low-skilled employment effects in regions with high spending on PLMP – we find interesting differences across education groups.

Ad (i): The adverse temporary employment effects of high unemployment rates at entry, mostly found in contexts with high EPL for permanent contracts, seem to be partly driven by individuals with tertiary education. As is evident from panel n in Figure 8, an increase in regional unemployment rate at entry is associated with an **increase in temporary employment among tertiary-educated workers** 5 to 8 years later **in high EPL regions**, while it is associated with a substantial and significant **decrease in temporary employment among tertiary-educated workers in low EPL contexts**. This pattern is less pronounced for those with upper secondary education (see Figure 8, panel h).

Ad (ii): Regarding the **non-employment effects** of unemployment rates at entry conditional on **low/high EPL for temporary contracts**, we find that effect sizes as well as differences between conditional effects are **largest for those with only lower secondary education**, with significant differences 5 and 7 years after labor market entry (see Figure 8, panel d; within-between interaction models). The pattern that **nonemployment effects** of poor initial conditions tend to be more pronounced in contexts of **strict EPL for temporary contracts** can also be observed for **those with upper secondary and tertiary education**, especially 5 to 6 years after labor market entry (Figure 8, panels j and p). Models with 'within-within' interaction terms support this finding by clearly showing that high regional unemployment at entry combined with rather strict EPL for temporary contracts relative to the region-specific mean leads to significantly higher rates of non-employment among those with upper secondary and tertiary education that persist up to 9 years after labor market entry (see Appendix, Figure A6).

Figure 8: Average marginal effects of within-region variation in unemployment at entry conditional on EPL permanent and temporary contracts, by entrants' education



Source: EU-LFS, authors' calculations.

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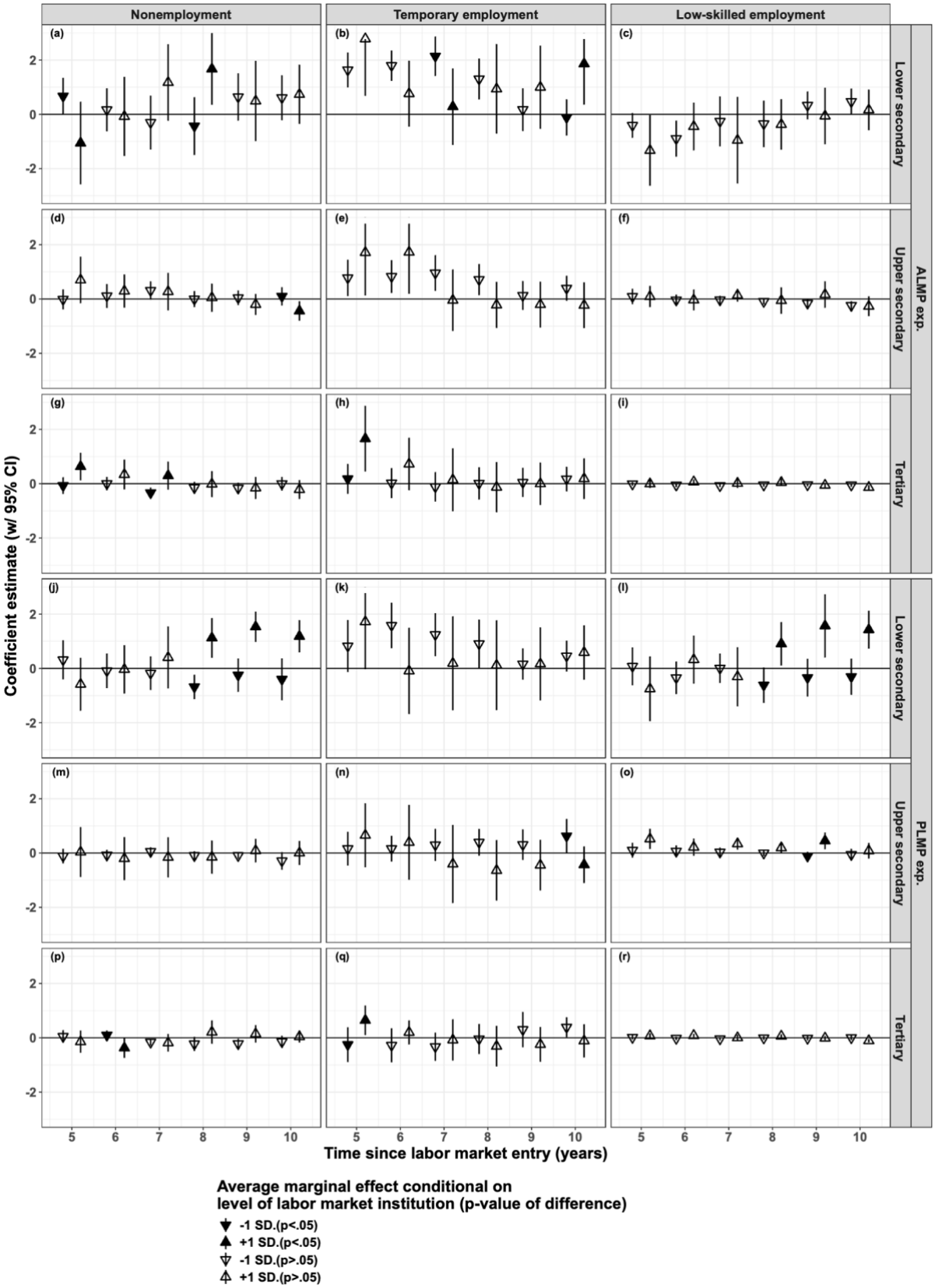
Figure 9: Average marginal effects of within-region variation in unemployment at entry conditional on ALMP and PLMP spending, by entrants' education



Source: EU-LFS, authors' calculations.

Ad (iii): Figure 9, panel f shows that differences in the long-term **effects of unemployment rates at entry by PLMP spending** are mostly **driven by less-educated workers**. Entering the labor market in times of high unemployment leads to an increased risk of **low-skilled employment** 8 to 10 years later for less-educated workers when PLMP spending at labor market entry was high, but has no effect when PLMP spending was low.

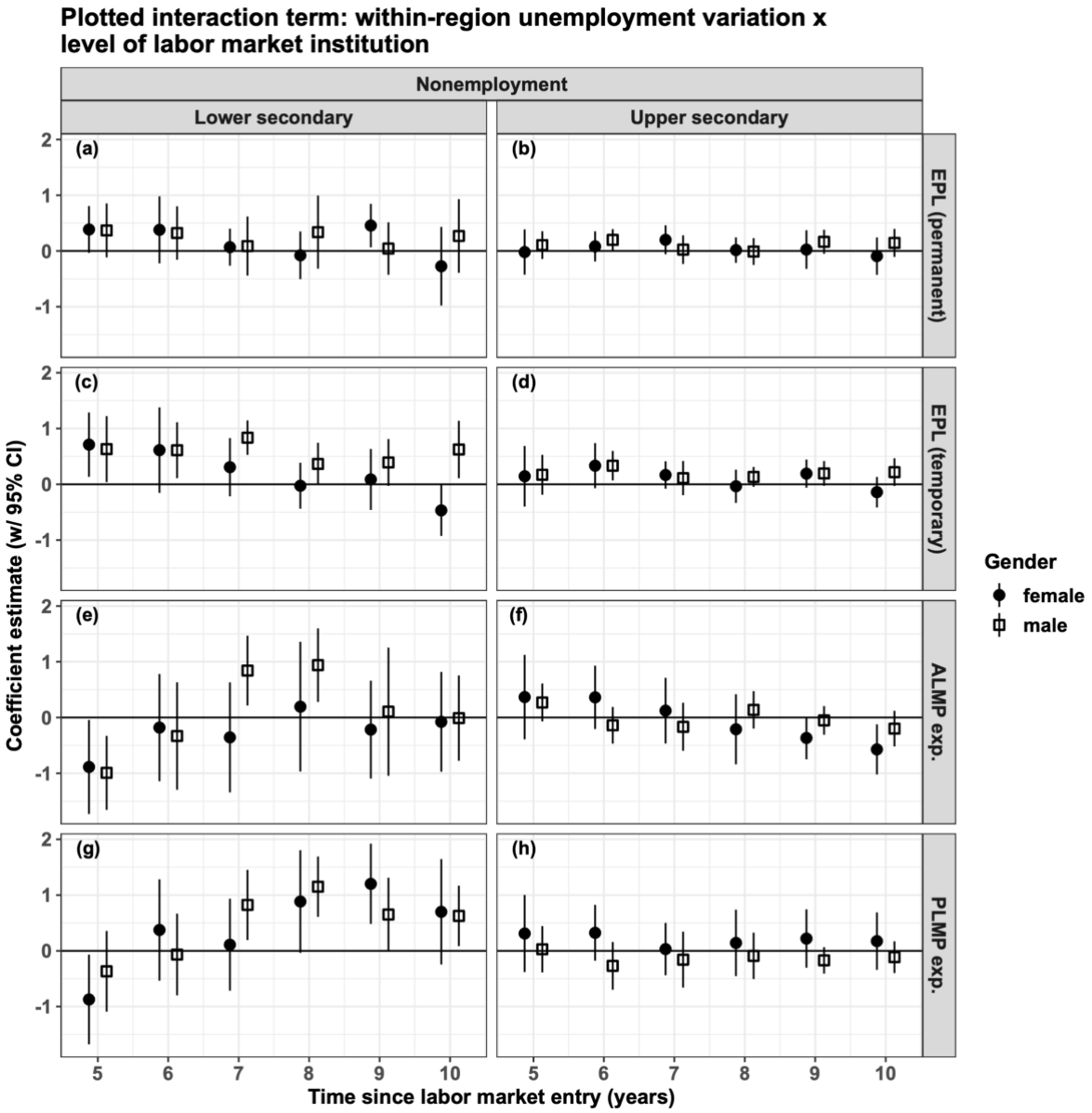
The subgroup-specific results shown in Figure 8 reveal an additional insight: For less-educated entrants, higher regional unemployment rates at entry also appear to have significant adverse effects in terms of low-skilled employment – especially 6 to 9 years after entry – conditional on entering the labor market in a context of high EPL (see Figure 8, panel c). Based on data pooled across education groups, we found no interaction effect on low-skilled employment (Figure 7, panel c) – likely due to the fact that there is virtually no interaction effect between initial unemployment and EPL on the risk of low-skilled employment for individuals with upper secondary and tertiary education. Moreover, the results of both our 'within-between' and 'within-within' analyses show that obtaining tertiary education clearly protects individuals against the long-term risks of low-skilled employment stemming from adverse labor market entry conditions (for results of "within-within' analyses, see Appendix, Figures A6 and A7).

4.3.2. Gender differences in moderating role of labor market institutions for non-employment

Finally, we examine whether the moderation of scarring effects of poor entry conditions by labor market institutions differs for men and women. Note that the set of scarring effect results by gender and education (without considering moderation by labor market institutions, shown in Figure 6 above) have shown only some gender differences in the non-employment effects of entering the labor market in times of high regional unemployment for individuals with lower and upper secondary education (Figure 6, panels a and d).

To test whether the level of labor market institutions at labor market entry can potentially explain the heterogeneous non-employment effects between men and women with lower and upper secondary education, Figure 10 shows the corresponding interaction term coefficient estimates for men and women. Comparing the interaction effects between regional unemployment rate at entry and the level of different labor market institutions on the risk of later non-employment, we find no significant differences by gender (similar results are found for 'within-within' interaction models; see Appendix, Figure A8). This suggests that gender differences in non-employment effects are likely due to family formation processes (which are considered in König et al. 2025) rather than gender-typical impacts of EPL, ALMP and PLMP spending.

Figure 10: Estimated interaction effects (within-region unemployment x level of labor market institution) on nonemployment by entrants' gender and education



Source: EU-LFS, authors' calculations.

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5. Discussion and conclusion

The results of our analyses support the notion that poor labor market conditions at labor market entry have lasting negative "scarring" effects on the labor market outcomes of young adults: Based on data pooled across groups, we find relatively clear effects on the risk of temporary employment in line with the scarring effect hypothesis – cohorts that are exposed to poorer labor market conditions at entry have a significantly higher risk of being temporarily employed 5 to 10 years later. The corresponding results for non-employment and low-skilled employment point in the same direction, but should be interpreted more cautiously due to the lower significance level.

The more disaggregated analyses by gender and education reveal effect heterogeneities that are in line with the theoretical arguments of the labor queue: It is primarily the less-educated who are disproportionately affected by the negative consequences of unfavorable labor market conditions at entry. As for the negative effects on labor market exclusion (non-employment risk), we show that women (especially those with low levels of education) are more severely affected. Importantly, these gender differences in the non-employment effects cannot be explained by labor market institutions affecting men and women differently.

Regarding the role of labor market institutions as effect moderators we did not find any evidence that expenditure on ALMP cushions the longer-term impacts of adverse macroeconomic conditions at entry. EPL, by contrast, seems to play a crucial role in several complex ways. For the tertiary educated, a stricter EPL leads to an increased risk of temporary employment in the medium to long term due to poor economic conditions and vice versa. Less-educated individuals, on the other hand, seem to benefit from stricter EPL in that it prevents that poor labor market conditions lead to higher rates of low-skilled employment among them. We also show that the level of EPL for temporary employment moderates how poor conditions at entry affect labor market exclusion later on. Unfavorable non-employment effects of labor market conditions at entry presumably only come into effect if EPL for temporary contracts is relatively strict.

The results of our analyses highlight that labor market and social policies aiming to buffer detrimental effects for cohorts of young adults entering the labor market in times of high unemployment need to account for considerable effect heterogeneities by educational attainment. While prolonged education and training represents a threat to the identification of scarring effects (from a methodological viewpoint), encouraging continued education especially among those facing the largest risk of scarring effects (i.e., less-educated individuals) may mitigate the negative short- to long-term effects. If a considerable share of a cohort that would otherwise enter the labor market stays in education in response to poor labor market conditions, this may also have aggregate labor supply effects which, in turn, improve labor market prospects for those who do enter the labor market nonetheless. Our finding that non-employment effects are particularly pronounced for women with only lower secondary education shows that policymakers should further acknowledge intersectionalities between education and gender. The fact that these gender-typical non-employment effects of poor labor market entry conditions do

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neither vary by the level of EPL nor by public spending on ALMP or PLMP indicates that other potential explanations need to be considered, such as spill-over effects of labor market conditions on processes of family formation and the role of family policies or prevailing gender norms (König et al. 2025). Finally, our finding that labor market entry cohorts in European regions with comparatively strict EPL for temporary contracts are at higher risk of non-employment in subsequent years could be interpreted as tentative evidence for the effectiveness of deregulation of EPL for temporary contracts. Since this is not necessarily in line with previous research (e.g., Gebel/Giesecke 2016), we believe this issue to require further investigation.

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Appendix

Figure A. 1. Comparison of effect estimates based on between-within decomposition approach (only component capturing within-region variation displayed) with corresponding estimates based on OLS regressions including region and graduation year fixed effects.

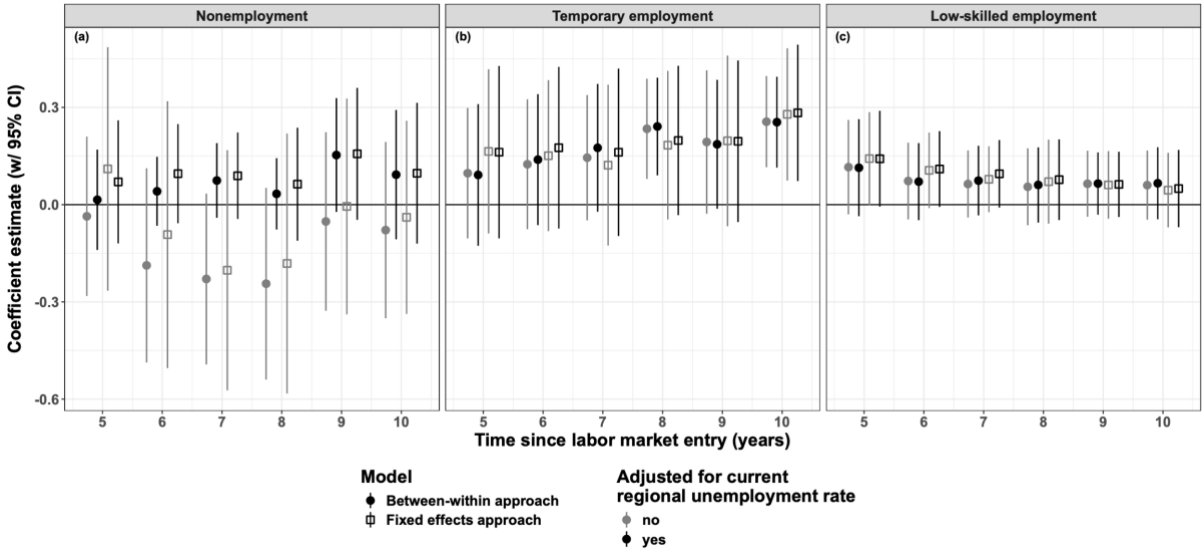

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Figure A. 2. Coefficient estimates for the annual and regional mean components of the decomposed unemployment variable.

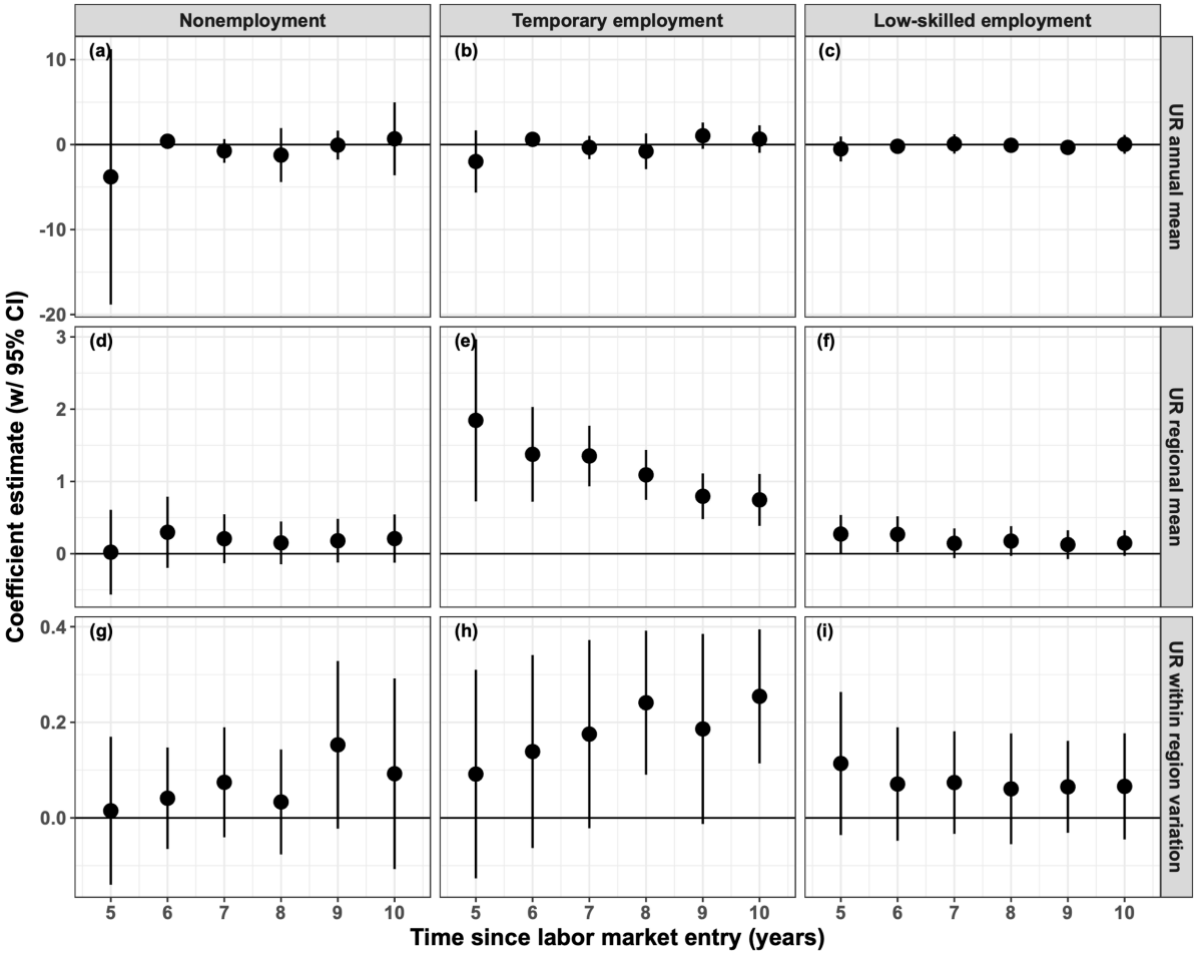

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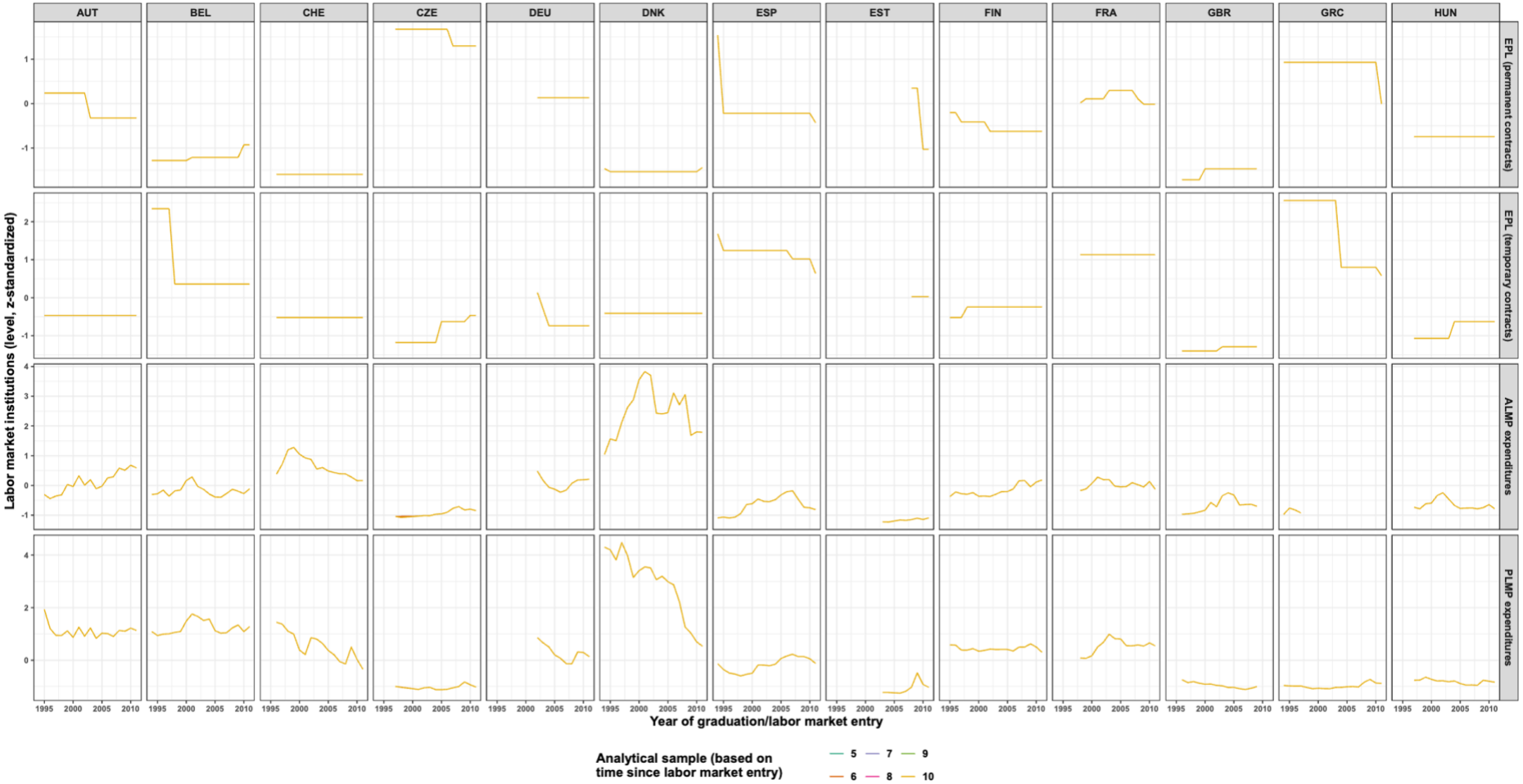
Figure A. 3. Levels of selected labor market institutions (LMIs) between 1994 and 2011.



Countries: Austria, Belgium, Switzerland, Czech Republic, Germany, Denmark, Spain, Estonia, Finland, France, Great Britain, Greece, Hungary.

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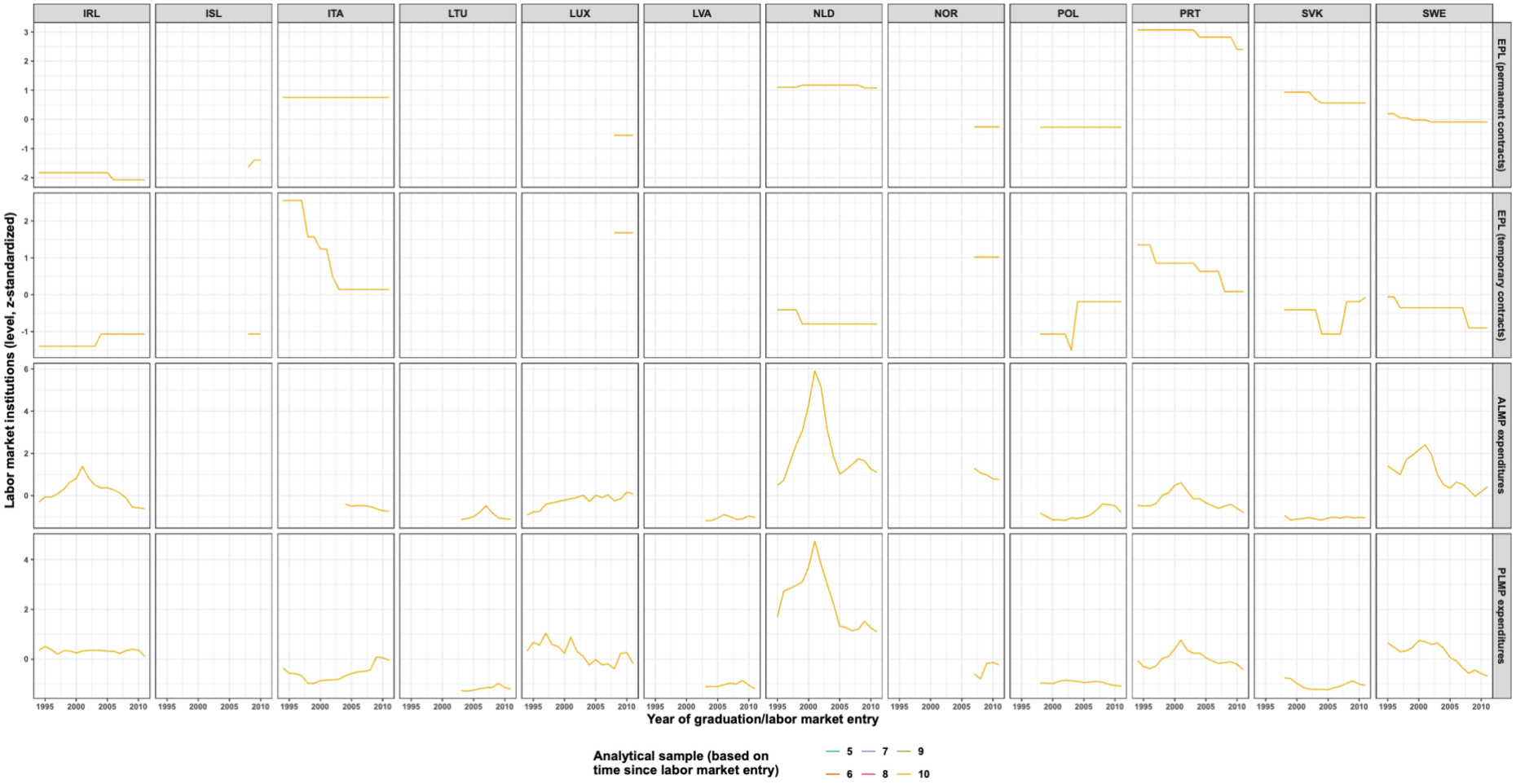
Figure A. 4. Levels of selected labor market institutions (LMIs) between 1994 and 2011.



Countries: Ireland, Iceland, Italy, Lithuania, Luxembourg, Latvia, the Netherlands, Norway, Poland, Portugal, Slovakia, Sweden.

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Figure A. 5. Conditional average marginal effects of within-region variation in unemployment at entry, by within-region labor market institutions.

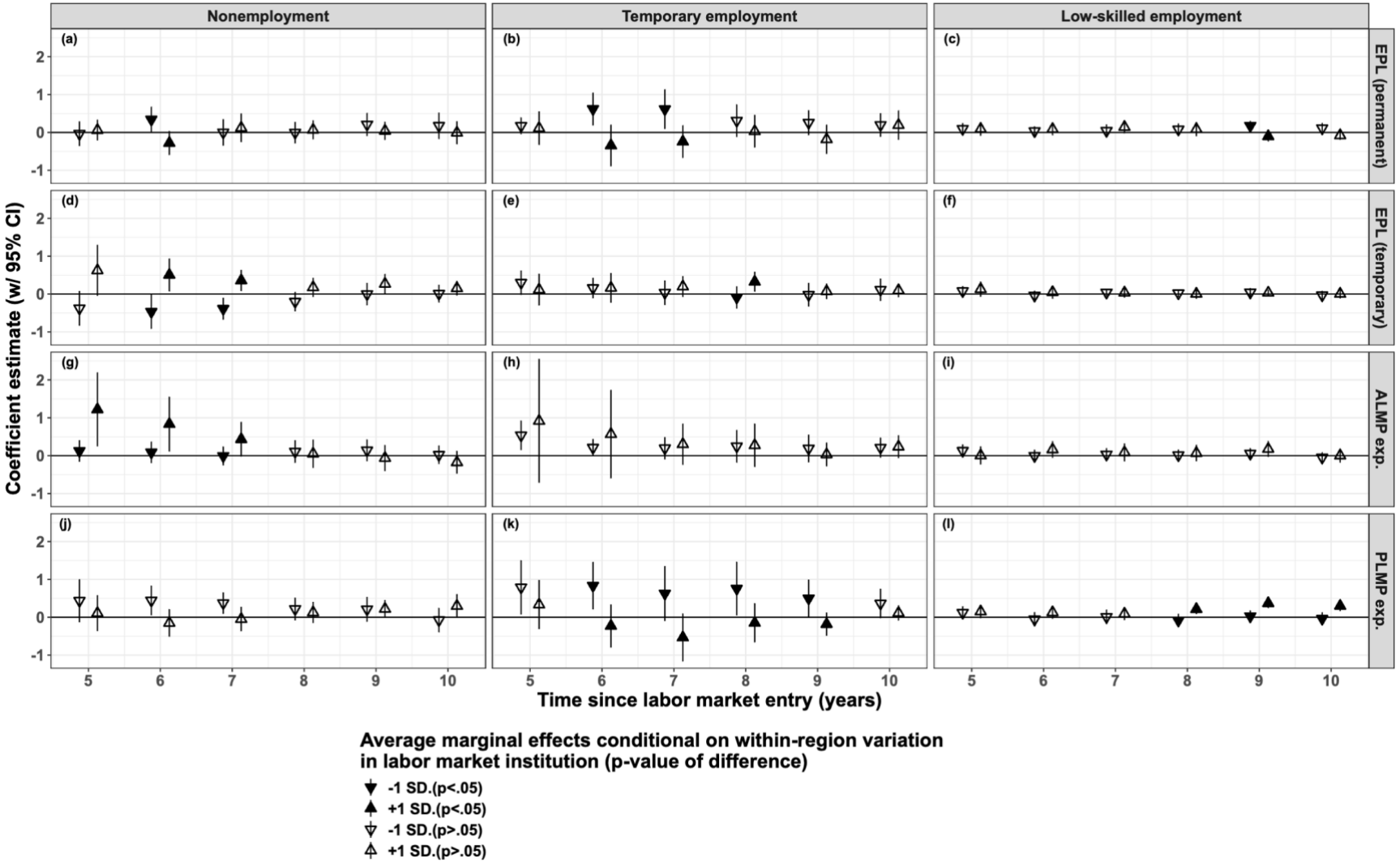

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Figure A. 6. Average marginal effects of within-region variation in unemployment at entry conditional on within-region variation in EPL (permanent and temporary contracts), by education groups.

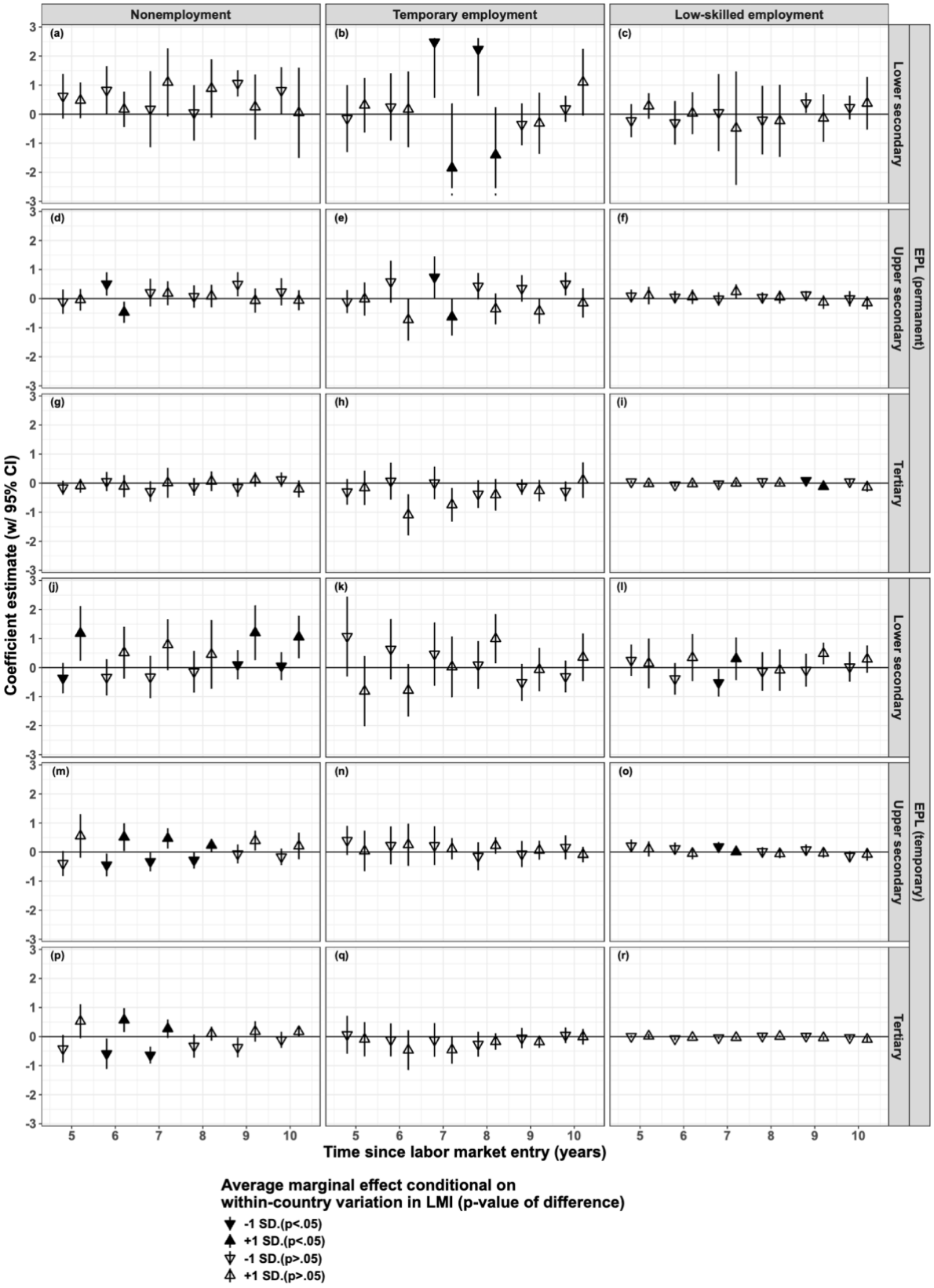

Figure A. 7. Average marginal effects of within-region variation in unemployment at entry conditional on within-region variation in ALMP and PLMP spending, by education groups.

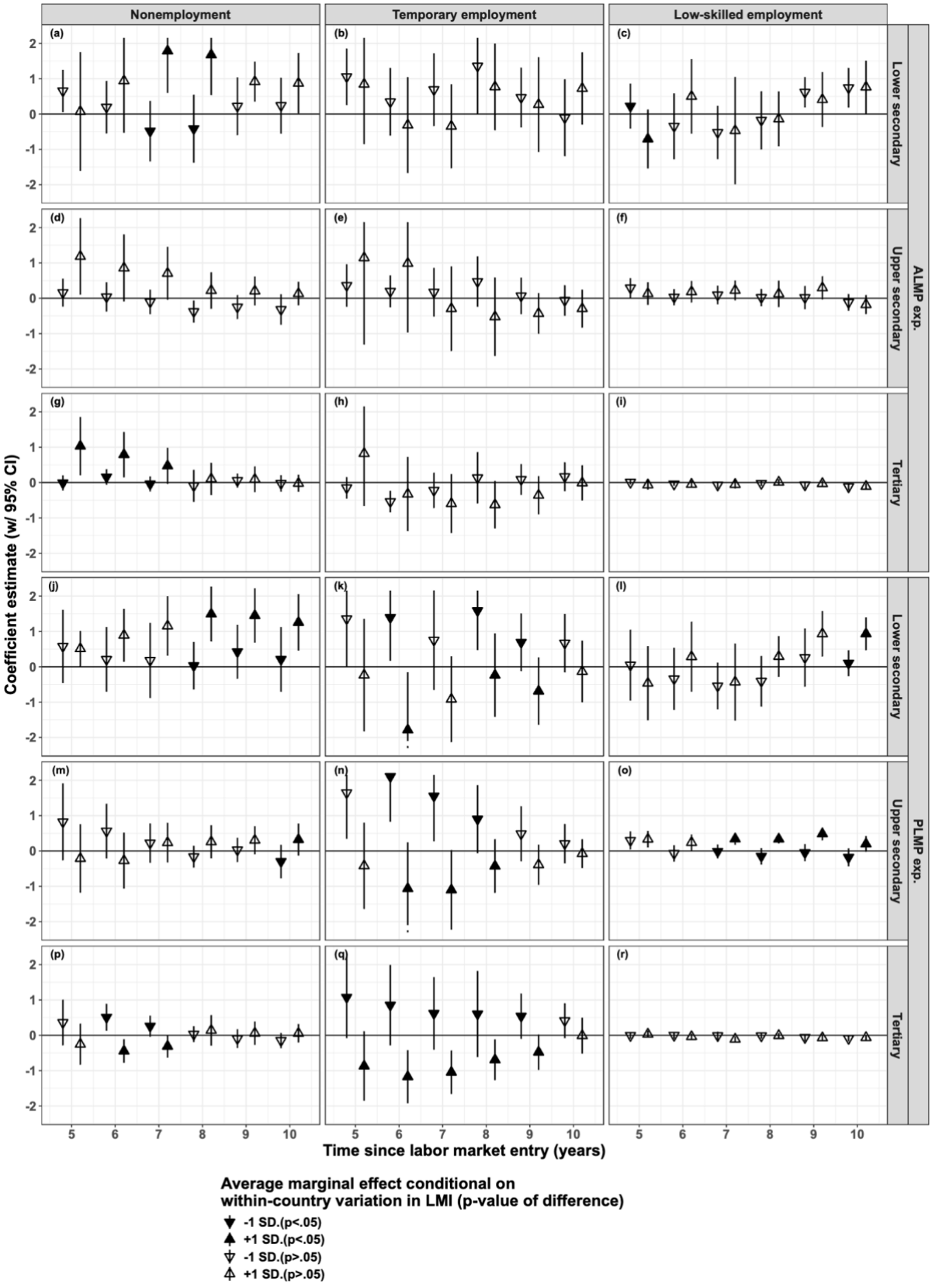

Figure A. 8. Estimated interaction effects (within-region unemployment x within-region labor market institutions) on nonemployment by gender and education.

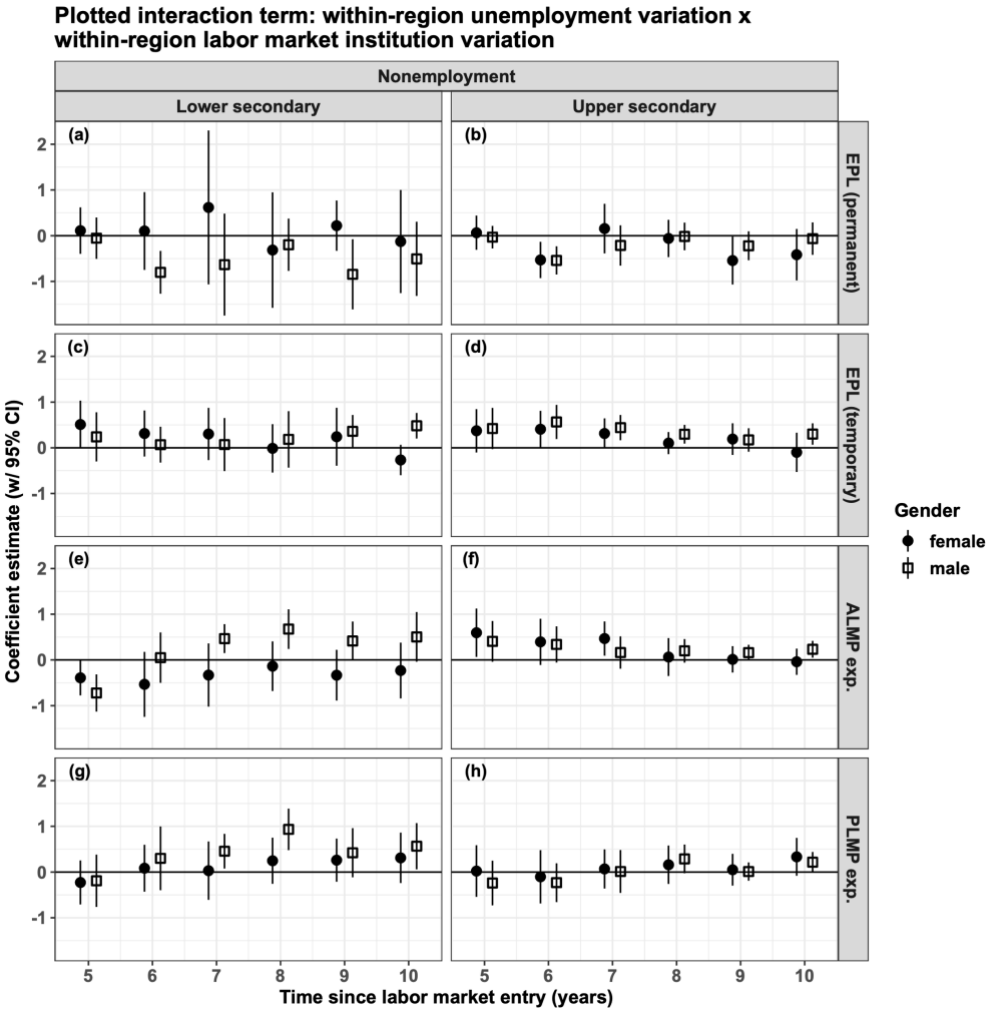

Table A. 1. Correlation matrix for different labor market institutions.

	EPL (permanent)	EPL (temporary)	ALMP exp.	PLMP exp.	Income maintenance/ support exp.	Unemployment assistance exp.
EPL (permanent)	1.00	0.21	- 0.04	- 0.12	- 0.01	0.03
EPL (temporary)		1.00	- 0.29	0.19	0.19	- 0.13
ALMP exp.			1.00	0.43	0.50	0.24
PLMP exp.				1.00	0.92	0.44
Income maintenance/ support exp.					1.00	0.60
Unemployment assistance exp.						1.00

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