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Occupational regulation and labour market fluidity in ten European Countries

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ABSTRACT
This paper examines the impact of occupational regulation, a labour market institution affecting many workers, on labour market fluidity in Europe. Using data from 10 European countries, we estimate the effect of occupational regulation on occupational mobility (transition to another occupation) and job loss (transition from employment to unemployment). By leveraging the variation in regulation across countries within an occupation, we identify the regulation effect using a two-way fixed effects approach. We also compare the effects of more and less stringent forms of regulation. The results show that occupational regulation substantially decreases occupational mobility, while its effect on job loss is ambiguous. More stringent regulation (occupational licensing) has a more substantial effect than weaker requirements.

JEL codes: C01, J08, J44, J62
Keywords: occupational regulation, occupation licensing, occupation mobility, labour market fluidity, labour market flexibility

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Foglalkozási szabályozás és munkaerőpiaci fluiditás tíz európai országban

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ÖSSZEFOGLALÓ

Ez a tanulmány egy sok munkavállalót érintő munkaerő-piaci intézménynek, a foglalkozási szabályozásnak a munkaerő-piaci rugalmasságra gyakorolt hatását vizsgálja Európában. Tíz európai ország adatai alapján megbecsüljük a foglalkozási szabályozás hatását a foglalkozási mobilitásra (foglalkozások közötti átmenet) és a munkahely elvesztésére (foglalkoztatásból a munkanélküliségbe való átmenet). Kihasználva azt, hogy a foglalkozási szabályozás eltér foglalkozások szerint az egyes országokban, a szabályozás hatását több fix hatásos [two-way fixed effects] modell segítségével vizsgáljuk. Összehasonlítjuk a szabályozás szigorúbb és kevésbé szigorú formáinak hatásait is. Az eredmények azt mutatják, hogy a foglalkozási szabályozás jelentősen csökkenti a foglalkozási mobilitást, míg a munkahelyek elvesztésére gyakorolt hatása nem egyértelmű. A szigorúbb szabályozás (foglalkozási engedélyezés) jelentősebb hatást fejt ki, mint a gyengébb követelmények.

JEL: C01, J08, J44, J62

Kulcsszavak: foglalkozási szabályozás, foglalkozások engedélyhez kötése, foglalkozási mobilitás, munkaerőpiaci fluiditás, munkaerőpiaci flexibilitás

1 Introduction

Using data from 10 European countries, this study examines the impact of occupational regulation on labour market fluidity. Occupational regulation, which imposes minimum standards, often educational requirements, for entry and working in a given occupation, is an important labour market institution. Occupational regulation affects at least one-fifth of the workforce in the European Union (Koumenta-Pagliero, 2019) and one-quarter in the United States (Kleiner, 2017). Over time, more occupations have become regulated, and the share of workers working in regulated occupations has steadily increased. In the US, the increase was from around 5 per cent of the workforce in the early 1960s to more than 25 per cent since 2000 (Kleiner-Krueger, 2013; Cunningham, 2019). There are no comparable data for Europe over such a long period. Studies available for the UK (Shackleton, 2017) and Italy (Mocetti et al., 2021) also report a considerable increase in the number of regulated occupations and the proportion of workers working in such professions. A part of the increase reflects the changing composition of employment by sector and occupation and the changing skill requirements of professions. It is also worth mentioning that in recent years, there has been a decline in the number of regulated occupations in some European countries (Runst, 2018; Białowolski – Masior, 2022), especially in countries where an above-average number of professions were previously regulated and where, sometimes even after the changes, more than the average number of occupations remained regulated.

Whether or not an occupation is regulated varies greatly between EU countries (and also between US member states). While some professions (doctor, dentist, etc.) are regulated everywhere, for many other professions, the same profession is regulated in one country (member state) but not in another. This study does not examine why that regulation is much more prevalent in some countries than others. A few studies have addressed this question. Some studies explain the differences by the impact of historically evolved institutions. For example, the long-term effect of occupational regulation dates back to craft guilds and state involvement in the economy (Kleiner, 2015). Carollo et al. (2023) document that occupations with larger interest groups are more likely to become regulated in the US, and professional associations significantly increase the probability of regulation.

Supporters of occupational regulation argue that regulation reduces the effects of asymmetric information and limits the harm to consumers from poor-quality service. Consumers cannot access information on workers' professionalism; they cannot assess the quality of the products or services they provide. Occupational regulation can help alleviate this information gap by setting minimum quality standards. These considerations are even more valid where the quality of the service provided may impact the wider community or society through the positive or negative externalities of the service. The other argument often made favouring regulation is that regulation creates a greater incentive for individuals to invest in more occupation-specific human capital.

On the other hand, although stricter entry restrictions for workers in regulated professions mean greater job security, this may limit the supply of skilled professionals as regulation increases the cost of entering the occupation. Reduced labour supply in

regulated professions is likely to lead to higher prices. This process will also generate higher wages for workers in licensed occupations. Another disadvantage is that it may disrupt labour market fluidity and create an inflexible labour market. Entry into regulated professions is time-consuming and costly, so individuals are reluctant to switch from one profession to another, and employers are reluctant to lay off workers in regulated professions, as replacing the dismissed worker is costlier and may take longer due to reduced labour supply.

In our paper, we examine the last issue. This study examines the impact of occupational regulation in 10 European countries between 2012 and 2020 on labour market fluidity measured by job loss probability and probability of job and occupational mobility. In addition, we examine whether the strictness of occupational regulation has had different effects on the labour market outcomes under study. While extensive literature has long studied the multiple effects of occupational regulation in the United States, relatively little work has dealt with the impact of occupational regulation in Europe.

Our study's contribution to the literature is threefold. First, we present new results for several European countries on the effect of occupational regulation. Second, we use a two-way (country and occupation) fixed-effects estimation method. Leveraging the variation of regulation across countries within the same occupation, we can control for the effects of unobserved occupation characteristics on mobility. Third, we also explore the impact of the stringency of regulation.

We find that occupational regulation significantly negatively affects labour market fluidity, defined as the probability of cross-occupation mobility. Heterogeneity analysis shows that this effect is present in the case of both white-collar and blue-collar occupations. We also document that occupational licencing has a more pronounced negative effect on occupation mobility than weaker forms of regulation (proof of competence requirement). Distinguishing between occupation mobility within the firm where the worker is employed and occupation mobility accompanied by moving to another firm, we find that both types of occupation mobility are decreased by regulation. Finally, we find no unambiguous effect on job loss.

The rest of the paper is structured as follows: in Section 2, we provide an overview of the related literature; in Section 3, we sum up how we put together the database and how the variables were defined; in Section 4, we provide some descriptive statistics; in Section 5 we present the estimation results on the impact of employment regulation on the probability of job loss and job and occupation change and in Section 6 we draw some concluding remarks.

2 Literature review

In the US, many studies have examined the impacts of occupational regulation, while few studies are available in Europe. The studies have examined the impact of occupational licensing on wages (e.g. Krueger-Summers, 1988; Belman- Heywood, 1989; Timmons- Thornton 2007, 2013; Venti - Smith, 2008; Kleiner- Krueger, 2013; Gittleman et al., 2015; Kleiner-Vorotnikov, 2017), the impact on labour supply and employment (DePasquale - Stange, 2016; Blair and Chung, 2019 Kleiner - Soltas, 2019) and also the welfare impact of occupational regulation.

There is also extensive literature on the impact of occupational regulation on labour market flexibility. Different studies have shown that occupational licensing greatly reduces interstate migration (Kugler Sauer, 2005; Johnson & Kleiner, 2017), which

may be related to the broader decline in labour market turnover observed in the latest decades in the US.

Kleiner and Xu (2020) show that occupational licensing significantly negatively impacts labour market flexibility. They documented that licensed workers are less likely to change occupations and less likely to become unemployed (Kleiner & Xu, 2020). This phenomenon can be attributed to the significant investment of time and resources required to obtain a license, which may discourage workers from changing occupations or seeking new job opportunities (Kleiner & Krueger, 2013). Hermanssen (2019) also documented that more extensive and stringent licensing is associated with lower job mobility in the United States. This is also true for mobility between jobs and transitions to and from non-employment. Blair and Chung (2024) found that licensed workers experience less job loss during recessions than their unlicensed peers. This could be observed during both the Great Recession and during COVID-19.

Little work in Europe examines the impact of occupational regulation using cross-country data. Using the 2012 EU Labour Force Survey data matched with the EU Single Market Regulated Professions Database, Koumenta et al. (2014) estimate upper and lower bounds on the prevalence of occupational regulation in the EU countries.

Based on an EU Survey of Regulated Occupations in 2015, Koumenta and Pagliero (2019) presented the first EU-level study, which examined the prevalence and impact of occupational regulation on earnings in the EU. The survey was based on telephone interviews with an average of 940 respondents per country from the then 28 EU Member States, with a total sample of 26 640 respondents. Data on whether an individual worked in a regulated occupation was thus based on self-reporting. Their results showed that workers in a regulated occupation earn a 4 per cent return for working in a regulated occupation. Koumenta and Paglio (2016) also documented that the proportion of foreign workers is about one-third lower among licensed workers than among unregulated workers. They find that this effect is more substantial amongst lower-skilled occupations, suggesting that licensing such occupations disproportionately disadvantages foreign-born workers. To our knowledge, no other work has included all EU countries in its analysis.

The other European studies focused on a single country over a longer period or on a single profession. Using data over several decades, Williams and Koumenta (2020) documented that occupational regulation resulted in such jobs having higher pay and lower job insecurity in Britain. Using German reunification as a natural experiment Prant and Spitz-Oener (2009) found that entry regulation reduces entry into self-employment and also reduces occupational mobility. Damelang et al. (2018) documented in Germany that transitioning into a new occupation becomes less likely the more an occupation is regulated.

Mocetti et al. (2021) examined the impact of occupational regulation on occupational mobility and wages in Italy from 2004-2018. They matched the Italian Labour Force Survey data with the EU Single Market Regulated Professions Database. They showed that occupational mobility is considerably lower in regulated occupations than in non-regulated occupations in both job-to-job mobility and non-employment-to-job mobility. Their results also show that regulation mainly affects job-to-job mobility and, to a lesser extent, entry from (exit to) a non-employment status. They also examine the effect of the intensity of regulation and show that the stricter the regulation in an occupation, the smaller the likelihood of entering it.

3. Data and variables

For the analysis, we matched two datasets: (1) The EU Single Market Regulated Professions Database (RPD) maintained by the European Commission and (2) the

2012-2020 waves of the quarterly anonymised European Labour Force Survey (EU-LFS) microdata for Scientific purposes of Eurostat (2022 January release).
The RPD database records occupational regulation restrictions across the countries of the European Union. The RPD database is not designed for statistical or research purposes but to facilitate labour mobility within the European Union, inform potential workers whether an occupation is regulated in a country, and, if so, what conditions must be met for entry and working there. Each country is responsible for updating information on its regulated professions in the RPD database. The database contains the names of the regulated occupations in the language of the country where the profession is regulated (often, the English translation of the profession's name is also listed). The levels of requirements or qualifications required for entry and practice in the professions are also specified.
Since the database does not contain the International Classification of Occupations (ISCO) codes to identify occupations, we have assigned the ISCO occupational code to each occupation using the following method. For each country in our analysis for every occupation listed as regulated, we have looked up the occupation's name in its original language on the list of occupation names and ISCO codes provided by the country's statistical office. The lists can be found on the website of the statistical office of all individual EU countries, as this is the basis on which each country assigns ISCO codes to the occupation of individuals in the EU LFS database. The code list has been standardised within Eurostat. Therefore, the classifications can be considered the most comparable across European countries. The European Commission manages the translation of ISCO labels into the official languages of the European Union. There is a Commission recommendation for the different language versions, which we have used to check the correctness of our classification.
EU-LFS collects comparable information on the labour market. The data provide information on the demographic characteristics of the individuals: their employment status, their workplace, their occupation, etc. The EU-LFS survey is a rotational panel; the same person is interviewed several times in consecutive quarters. Countries use different rotation schemes (see Annex Table 1). The number of panels (waves) ranges from two to eight. All panels include an overlap between one quarter and the successive one. All panel designs with a quarter-to-quarter overlap result in an overlap of 50% or more (Eurostat, 2020). This design makes it possible to derive variables describing labour market transitions between quarters at the individual level. Due to the anonymisation method of the Eurostat, we were able to identify the same individuals between waves only for ten countries (Austria, Croatia, France, Greece, Hungary, Ireland, Latvia, Lithuania, Slovakia, and Sweden) and only within the same year even if the given country follows individuals for more than four quarters. For the same reason, we could not observe labour market status and job or occupational changes between Q4 and Q1. We suppose that the changes in the labour market status, jobs, or occupations are roughly evenly distributed and that the value of occupational changes between quarters Q4 and Q1 are not outliers in either direction; this does not bias our results.
The two databases were merged using the ISCO codes. In the RPD data, 4-digit ISCO codes (unit groups) can be assigned to the names of regulated occupations. In the EU-LFS microdata, only 3-digit ISCO codes (minor groups) were provided for us for anonymisation reasons. So, merging the two datasets could be made using the 3-digit ISCO codes. The ISCO classification has a hierarchical structure from the top down. Each minor group is comprised of one or more unit groups with high skill levels and similarities in specialisation. In one part of the ISCO3 groups, all 4-digit ISCO codes are regulated occupations; in another part of the minor groups, none of the unit groups

are regulated. There are also minor groups where one part of ISCO's 4-digit occupations (unit groups) is regulated, and another is not. For example, from the seven-unit groups of the minor group 'Building Finishers and Related Trades Workers' (ISCO3 712) in Austria five are regulated (ISCO 4-digit codes 7121 (Roofers); 7122 (Floor Layers and Tile Setters); 7123 (Plasterers); 7124 Insulation Workers and 7126 Plumbers and Pipe Fitters) are regulated occupations while two (ISCO 4-digit codes 7125 Glaziers and 7127 Air Conditioning and Refrigeration Mechanic) are not.

In the case of occupations with regulated and unregulated unit groups, first, we assumed that if there was even one 4-digit code in the 3-digit level minor group that indicated a regulated occupation, all workers were assumed to be regulated. To put it differently, in the merged data set, we classified each 3-digit occupation as regulated if the corresponding occupational code is included in the RPD database. This method overestimates the number of people working in regulated occupations. So, to test the robustness of our results, we repeated our estimates using the share of regulated unit groups (i.e. regulated occupations at the 4-digit level) within the 3-digit ISCO occupation as an alternative measure of regulation[1].

It is worth mentioning that many European studies on the effects of occupational regulation report the same classification problem (Koumenta et al., 2014; Koumenta—Pagliero, 2019), even if all data were available at the ISCO 4-level (Mocetti et al., 2021). The authors have taken a similar approach to classifying occupations as regulated as we have in this study.

Forms of occupational regulation can be categorised according to several criteria (Forth et al., 2011). One of them is how strict the regulation is. From this perspective, the following groups are usually identified: (i) licensing, when it is unlawful to work in a specific occupation without meeting certain criteria (e.g. qualifications, work experience, etc.); (ii) registration, when it is a legal requirement to register with a relevant regulatory body in order to be allowed to practice the occupation (e.g. chamber of physicians, chamber of lawyers etc.), (iii) certification, when working in the profession is subject to a specific qualification, (iiii) accreditation or attestation of competence when to work in the profession, individuals need to have their skills recognised by a professional body, industry association or other organisation (e.g. professional experience, aptitude test etc.) The most restrictive and costly form of regulation for the individual is licensing, the least one is the attestation of competence. In this paper, we use occupational regulation as the umbrella term for these four forms of regulation. Occupations that are not regulated in this way are referred to as unregulated. We also separately examine the impact of the first three more stringent forms (using the term 'licensed, certificated') and the last, less stringent form (attestation of competence or proof of competence). Occupations which are not regulated in any of these ways are termed unregulated.

For the analysis, we restricted our sample to those aged 25-64 who were employed or self-employed in quarters 1, 2 or 3 of the year and their 3-digit ISCO occupation code is observed, and they were observed as employed or unemployed in a subsequent quarter within the same year. The models were estimated for the 2012-2019 period. The analysis sample contains 2,416,112 observations for 1,399,237 individuals. Number of observations by country and year is shown in Table A1 of the Appendix.

As sample size varies widely across countries, we used senate weighting to ensure that the sum of weights is equal in each country. The individual weights in the Eurostat

[1] Note that ideally these shares should be calculated with weighting the 4-digit ISCO occupations by their employment shares within the 3-digit ISCO group. As employment data at the 4-digit level is not available, we use the unweighted share of regulated occupations.

databases ensure the representativeness of the samples within the country. The sum of the weights in each country is adjusted to be proportional to the country size, i.e. the total sample is representative of the EU population. This means that larger countries in the pooled data may have a greater impact on the estimation results. That's why, in our analysis, we used senate weights instead of those provided by Eurostat data. The senate weights are simply a rescaling of the country-level weights in order to obtain the same constant value within each country. In this way, all countries contribute equally to the analysis.
Table 1 provides descriptive statistics for the two outcome variables, occupational mobility and job loss, occupational regulation and the individual characteristics used as control variables.

4 Methods

To explore the effects of occupational regulation, we start with estimating pooled cross-section linear probability regression models with country fixed effects:

$$Y_{ic,t+1} = \alpha + \beta R_{ijct} + X_{ijct}\Gamma + \lambda_c + \varepsilon_{ijct} \qquad (1)$$

where R is an indicator variable denoting that worker i in country c and time t had worked in an occupation j that was *regulated* in that particular country. Occupation j at the 3 digit ISCO level is considered regulated here if any 4-digit occupation of the 3-digit occupation is regulated. Y is the outcome variable measured in the following time period (usually in the next quarter) within the same year. It shows whether or not the worker's status has changed relative to the previous period. Our first outcome variable is occupational mobility; in this case, Y indicates whether worker i is employed in a different occupation in time $t+1$ than in time t (1) or remained in the same occupation (0), conditional on having a job in both periods. The second outcome is job loss; here Y shows whether the worker moved from employment in time t to unemployment in time $t+1$ (1) or remained employed (0). Control variables include combinations of gender, education attainment and age categories, an indicator for part-time jobs, industry fixed effects at 1-digit NACE level, quarter-of-the-year dummies and the time gap between observations measured in quarters of a year[2]. Additional controls are tenure, linear and squared term and an indicator for supervising the work of other workers. These can be argued to be bad controls, but estimating the models without these turns out to provide qualitatively identical results. Finally, we include country-year fixed effects to capture overall differences across countries in the level of occupational mobility and job loss and the effects of country-specific shocks on these levels.
Equation (1) builds on the variation in regulation across occupations within countries. In other words, we compare workers with similar individual characteristics in the same industry and country working in different occupations, regulated and unregulated.
However, the level of occupational mobility and job loss may differ by occupation due to regulation, but for other reasons, as well. For example, suppose some occupations

[2] In the vast majority of cases t is the first, second or third quarter and $t+1$ is the next quarter of the year. However, in some cases workers are observed only in quarter 1 and then quarter 3 or 4, or in quarter 2 and 4. We control for the time gap as longer time may increase the probability of a change in worker's status.

require more specific human capital investments. In that case, this may generate a wage premium and result in lower occupational mobility in the absence of occupational regulation. In order to identify the effect of regulation, we estimate a two-way fixed effect model:

$$Y_{ic,t+1} = \alpha + \beta R_{ijct} + X_{ijct}\Gamma + \lambda_c + \phi_j + \varepsilon_{ijct} \quad (2)$$

where ϕ stands for occupation fixed effects, in this model, β estimates the effects of regulation within the occupation, leveraging the variation in regulation across countries. Put it differently, we compare workers with similar characteristics working in the same occupation, which is regulated in some countries but not regulated in others, also taking into account the overall differences in the outcome level across countries, captured by the country-year fixed effects. Note that the country-year fixed effects are identified from workers in occupations either regulated or not regulated uniformly in all countries.

We also estimate equations (1) and (2) using different regulation measures. First, we distinguish between regulations requiring some specific formal qualification or license and weaker regulations, attestation of competence. To estimate the effects of these forms separately, we define three types of regulated occupations at the 3-digit ISCO level. In *licensed* occupations, there is at least one 4-digit occupation with a formal qualification requirement, and there is no occupation with attestation of competence requirement. In *attestation of competence* occupations there is at least one 4-digit occupation with attestation of competence required, and there is no 4-digit occupation with a formal qualification requirement. In *mixed regulated* occupations, both formal qualification and attestation of competence requirements occur at the 4-digit ISCO level. Then the models are estimated with these three indicators replacing the single regulated occupation variable.

Second, we estimate the models using the share of regulated occupations at the 4-digit level within the 3-digit ISCO group as an alternative measure of regulation. This is a measure of the extent of regulation in the 3-digit ISCO occupation, mitigating the bias due to the overestimation of regulation by the binary indicator. Unfortunately, the share of regulated occupations measure is also prone to measurement error, as it is an unweighted share, disregarding any differences in employment shares of 4-digit occupations.

Finally, we estimate the models with the share of 4-digit licensed occupations and the share of occupations with attestation of competence requirement separately, instead of the single regulated occupation share.

All models are estimated with standard errors clustered at the individual level. As individuals can be identified within years only, we can observe workers in quarters 1, 2 or 3 with an observed outcome in the following period. This way, we have a maximum of three observations per worker.

5 Results

5.1 Incidence of occupational regulation

Figure 1 displays the incidence of occupational regulation by country. As panel A shows, the share of workers in regulated occupations varies widely across countries, from 17% in Latvia to 57% in Slovakia. The overall share in regulated occupations in the ten countries is 42%. Note that these shares are upper bound estimates, as each 3-digit ISCO occupation is classified as regulated if any regulated 4-digit occupation belongs to that group. In contrast, other 4-digit occupations might be non-regulated.

Panel B shows the extent of regulation based on the share of regulated unit groups (4-digit occupations) within 3-digit occupations. The figure displays the mean of this measure across all workers, including those in non-regulated occupations, as well, with a zero value. The mean shares estimate the share of workers in regulated 4-digit occupations under the assumption that the employment distribution of 4-digit occupations within 3-digit occupations is uniform. These estimates are scattered in the range of 9% (Latvia) and 32% (Hungary), with an overall mean of 22%.
Panels C and D of Figure 1 present similar estimates for the more detailed classification of licensed and proof of competence types of regulation. The overall patterns are similar, though some countries rely more on the weaker form of regulation (e.g., Slovakia), while in others, this form is hardly used at all (e.g., Latvia, Austria).
Figure 2 displays the variation in regulation across the ten countries within 3-digit occupations. Only a handful of occupations are regulated in each country, while the number of occupations not regulated in any country is also small. At the same time, regulation is more widespread in high-skill occupations, displayed in the left part of the figure, than in blue-collar jobs.
Figures A1 and A2 of the Appendix display the variation in regulation across the ten countries based on the share of regulated and licensed unit groups by occupation. Similar to Figure 2, we see a substantial variation across countries within occupations in the extent of regulation and licensing.

5.2 Main results

Table 2 displays the estimated effects on occupational mobility. Columns 1-4 present estimates based on equation (1), including no occupation fixed effects, while columns 5-8 show the results of the two-way fixed effects specification of equation (2). Columns 1-2 and 5-6 use binary measures of regulated occupations, while the remaining columns show estimates for the prevalence of regulation (share of regulated unit groups) within 3-digit occupations. Finally, columns 1, 3, 5 and 7 estimate the effect of regulation in general, while in the remaining columns, we distinguish between stronger and weaker forms of regulation: licensing and proof of competence requirements[3].
The results show that working in a licensed occupation significantly decreases the probability of occupational mobility. The magnitude of the coefficients drops to about half in the two-way fixed effects models, suggesting that the simple comparison of workers in regulated and non-regulated occupations is likely to overestimate the effect of regulation.
However, the two-way fixed effects model's estimated effect size is still substantial. Working in a regulated occupation is associated with a 0.19 percentage point decrease in the probability of moving to a different occupation (column 5), which amounts to a 7.5 per cent effect based on the 2.5 percentage point baseline probability. Comparing 3-digit occupations with no regulation at all with the ones in which all 4-digit occupations are regulated, we estimate an effect of 0.46 percentage points (column 7), which is 18 per cent of the baseline value.

[3] When classifying occupations with respect to the type of regulation we define three categories. „Licensed occupation" refers to occupations where at least some of the 4-digit occupations require a licence, while there is no unit group with a proof of competence requirement. „Proof of competence" occupations contain some unit groups with a proof of competence requirement, while no 4-digit occupation is licensed. In „mixed regulated" occupations there are both licensed and proof of competence unit groups.
In few cases a 4-digit occupation is registered as regulated, but the type of regulation (licensed or proof of competence) is not observed in the data. These occupation-by-country cases are excluded from the sample in columns 2, 4, 6 and 8, see the smaller number of observations in the Table.

The results also show that licensing has a stronger and more pronounced effect on mobility. Comparing occupations with all the 4-digit occupations licensed and occupations with no licensed unit groups, the differences in occupational mobility amount to 20% of the baseline value (column 8). The effect of weaker regulation (proof of competence) is weaker and somewhat ambiguous. In the preferred two-way fixed effects model, the binary indicator is insignificant. At the same time, the share of unit groups with proof of competence requirement is significant only at the 10 per cent level. At the same time, the size of the coefficient of the share of unit groups with proof of competence is meaningful (above 10 per cent of the baseline value).

To further explore the mobility effect of regulation, we re-estimate the models of Table 2 separately for two types of occupation mobility: changing occupation within the firm and occupation mobility accompanied by moving to another firm simultaneously (occupation mobility between firms). Table 3 presents two-way fixed effects estimates for these two outcomes (see Table A2 of the Appendix for baseline estimates with no occupation fixed effects).

The results show a marked negative regulation effect on occupation mobility within firms, while the estimates on mobility between firms are noisier. The estimated effects of the regulated occupation dummy and the share of regulated unit groups are significant at the 5 per cent level. In contrast, the coefficients of licensed occupations are hardly statistically significant. At the same time, the size of the coefficients relative to the baseline values are non-negligible even in these cases. Moreover, these marginally significant coefficients mask a considerable heterogeneity between white-collar and blue-collar occupations (see the next section).

Overall, the effect sizes are similar for the two types of occupation mobility. The estimated regulation effects amount to about 10 per cent of the baseline values both regarding within and between firm occupation mobility.

Besides occupation mobility within and between firms, we also look at the effect of regulation on job mobility between firms while they remain in the same occupation. Results in Table A3 of the Appendix show that workers in regulated occupations are somewhat more likely to move from one job to another occupation than similar workers in non-regulated occupations. At the same time, in our preferred two-way fixed effects specifications, the regulation does not affect job change.

Finally, we explore whether regulation is related to job loss, i.e. the probability of transition from employment to unemployment. The results are shown in Table A4 of the Appendix. Here, the models excluding and including occupation fixed effects provide rather different results. In columns 1-4, regulations seem to be associated with a lower probability of job loss, at least in the case of licensed occupations. At the same time, the preferred two-way fixed effects models show either insignificant or significant positive effects. Overall, regulation has no clear effect on job loss in our data.

Altogether, we find that regulation clearly decreases occupation mobility. Licensing has a more robust and more unambiguous effect than proof of competence requirements. The regulation effect is present both regarding within-firm and between-firm occupation mobility. Unlike mobility, the probability of job loss is unrelated to occupation regulation in our data.

5.3 Heterogeneity of regulation effects

After estimating the overall effects of regulation on occupation mobility, we explore differences in the effects between white and blue-collar occupations, defined as 1-digit ISCO codes up to 4 and 5 or higher. This kind of heterogeneity is interesting for two reasons. First, regulation is more widespread in the group of white-collar occupations (see section 5.1). Second, white-collar occupations require more human capital

investment in general, and a large part of this investment is field or occupation-specific. It is an open question whether regulation and licensing, in particular, require relatively more additional occupation-specific investment in the case of white-collar or blue-collar occupations.

Table 4 provides the effects on occupational mobility estimated separately for white-collar and blue-collar occupations, using the two-way fixed effects specification[4]. The coefficients of the binary indicators are almost identical for the two groups, implying similar effect sizes as the baseline probabilities are very similar in the two groups. At the same time, the share of regulated unit groups has a stronger effect on workers in white-collar occupations. These two results together suggest that in white-collar occupations, the regulation effect depends more on the share of regulated unit groups of occupations and probably the share of workers in regulated unit groups than in blue-collar occupations. In contrast, the regulation effect in blue-collar occupations seems to carry over to workers in non-regulated unit groups within the regulated occupation to a larger extent. In other words, the presence of some regulated unit groups has a stronger effect on workers in non-regulated 4-digit occupations within the same 3-digit occupation.

Next, we look at the white collar - blue collar differences in case of regulation effects on within and between firm occupation mobility. Results are shown in Tables 5 and 6. Regarding within-firm occupation mobility, the regulation effects are similar in white-collar and blue-collar occupations, though the effect sizes are somewhat smaller in the latter group.

There are more marked differences in case of between firm occupation mobility. In white-collar occupations, regulation has no detectable effect on the probability of transitioning into another occupation and another firm simultaneously. On the contrary, regulation in blue-collar occupations significantly decreases occupation mobility between firms. The effect size is considerable, above 10 per cent of the baseline probability. The coefficients of licensing are significant only at the 10 per cent level, though effect sizes are large. However, the overall regulation effect is driven by licensing, as proof of competence regulation has no significant effect on between firm occupation mobility.

Altogether, regulation decreases occupation mobility in general and within firms in white-collar and blue-collar occupations. At the same time, occupation mobility accompanied by moving to another firm is related to regulation only in blue-collar occupations.

6 Robustness

In the estimates so far, tenure (2nd order polynomial) and the dummy indicating supervision of other workers were included among the control variables. These variables can be argued to be bad controls, as occupational regulation might affect the probability of a supervisory position, while tenure might be affected through job mobility. Table A5 of the Appendix reproduces the main results while excluding these bad controls. The results are basically identical to those of Table 2.

Another concern is that we observe regulation at the end of the period analysed (the year of reference is 2019). Therefore, we have to rely on the assumption that no major changes in regulation have occurred over time. In order to test the sensitivity of our results to that assumption, we re-estimated the main models for a limited time period,

[4] In case of heterogeneity analysis, we provide the results of the preferred two-way fixed effects specification only. Results of the baseline model excluding occupation fixed effects are available from the authors upon request.

from 2016 to 2019. Restricting the sample to years close to the year when regulation status is observed shows qualitatively similar results to those of Table 2 (Table A6 of the Appendix).

7 Conclusion

Analysing the impact of occupational regulation on labour market flexibility in a sample of 10 European countries, we have found that regulation significantly negatively impacts occupational mobility. We found a much larger effect for more stringent regulation than for less stringent regulation, which can be obtained less costly for individuals. These results are in line with previous results for the US and with the results of studies on the impact of regulation on some specific European countries or occupations and also meet our presumptions. If an occupation is regulated, individuals must invest money and time to obtain a license or meet the requirements of the attestation of competence. Since the license is tied to the occupation, it is not worth it for the individual to leave the occupation because he or she loses the wage premium from having a limited number of workers allowed to enter the occupation. Employers are also less likely to dismiss a worker in a regulated occupation because it is harder to find another licensed worker. The more stringent the regulatory requirements, the higher the cost of obtaining a licence, which explains the different impacts for the two groups.

Nevertheless, if we distinguished between occupational changes within the firm and occupational changes moving to another firm simultaneously, we found that in the first case, occupational regulation decreased occupational mobility for the entire sample as well as for the subsamples of white-collar and blue-collar workers; in the second case, the effect was only seen in the subsample of blue-collar workers. This result is a novelty, and it will be worth examining other countries or periods to see if similar differences between these groups can be detected. If so, it would also be worth exploring what might explain these differences, whether the difference between white and blue-collar workers is due to different levels of human capital investment or whether other reasons might explain it.

Our results for mobility between firms where the worker who changes jobs stays in the same occupation were inconclusive. Nevertheless, it is difficult to predict how occupational regulation might affect this type of mobility, as two opposing aspirations may influence the final impact. On the one hand, the employer might want to keep the worker in the regulated occupation; on the other hand, the worker might want to get a pay rise by staying in the same regulated occupation (and thus not losing the wage premium) and still earning higher wages by changing jobs. Unfortunately, we cannot test this condition as earnings data are not available, but the relevant literature shows that changing jobs can lead to higher earnings.

Our results confirmed previous research findings that occupational regulation reduces the labour market fluidity and flexibility. Therefore, if the aim is to increase labour market fluidity and flexibility, it may be worthwhile to consider easing the strictness or extent of occupational regulations.

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Tables and Figures

Table 1 Descriptive statistics

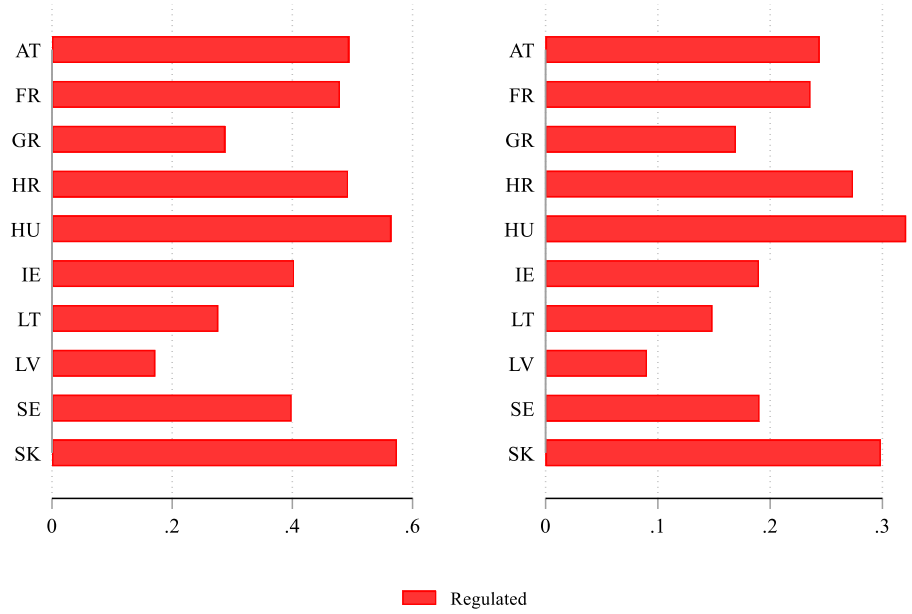
	Total	Workers in non-regulated occupations	Workers in regulated occupations
N	2,320,000 (100.0%)	1,341,168 (57.8%)	978,832 (42.2%)
Occupational mobility			
no	0.975	0.972	0.980
yes	0.025	0.028	0.020
Job loss (moving from employment to unemployment)			
no	0.989	0.987	0.992
yes	0.011	0.013	0.008
Gender			
male	0.529	0.519	0.543
female	0.471	0.481	0.457
Age group			
25-34	0.253	0.25	0.257
35-44	0.296	0.292	0.302
45-54	0.286	0.289	0.281
55-64	0.166	0.17	0.161
Education attainment			
lower-secondary or below	0.114	0.149	0.066
upper-secondary education	0.522	0.567	0.461
tertiary	0.363	0.283	0.473
Part-time worker			
no	0.878	0.863	0.899
yes	0.122	0.137	0.101
Tenure	10.573 (9.632)	10.267 (9.578)	10.992 (9.691)
Supervising other workers			
no	0.806	0.813	0.797
yes	0.194	0.187	0.203

Notes: The table provides the mean (SD) for tenure and proportions for the other variables.

Figure 1 Incidence of occupational regulation by country

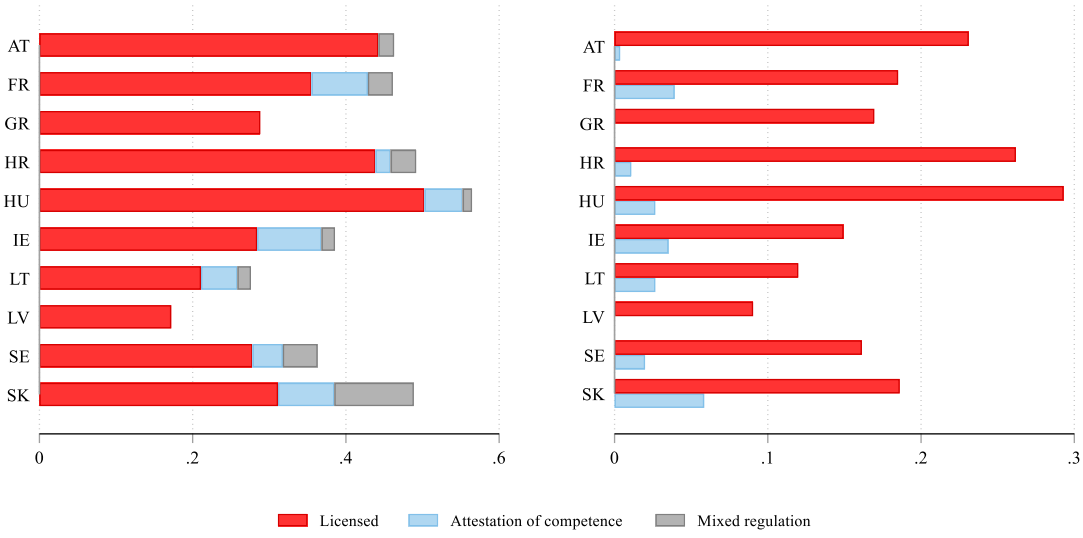
A Share of workers in regulated occupations (based on the regulated/non-regulated classification)

B Share of workers in regulated occupations (based on the share of regulated unit groups in occupations)



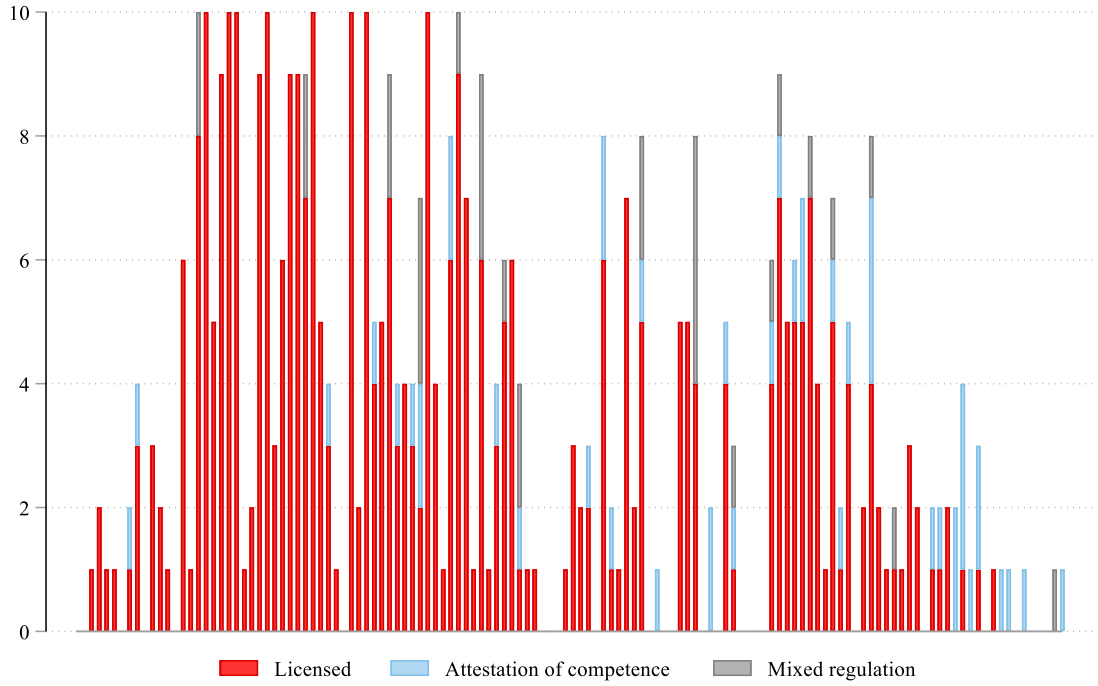
C Share of workers in the types of regulated occupations (based on the regulated/non-regulated classification)

D Share of workers in the types of regulated occupations (based on the share of regulated unit groups in occupations)



Note: Panel B (D) displays the mean value of the share of regulated (licensed and proof of competence) unit groups (4-digit occupations) in minor groups of occupations (3-digit occupations) in each country.

Figure 2 Number of countries employing different forms of regulations in 3-digit ISCO occupations



Note: The occupations with the lowest to highest 3-digit ISCO codes are listed from left to right.

Table 2 Effects of occupational regulation on occupational mobility

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Regulated occupation	-0.00437***				-0.00189***			
	(0.00041)				(0.00059)			
Licensed occupation		-0.00457***				-0.00232***		
		(0.00047)				(0.00072)		
Proof of competence occupation		-0.00284***				0.00022		
		(0.00082)				(0.00091)		
Mixed regulated occupation		-0.00570***				-0.00688***		
		(0.00071)				(0.00126)		
Share of regulated unit groups			-0.00991***				-0.00462***	
			(0.00059)				(0.00096)	
Share of licensed unit groups				-0.00992***				-0.00514***
				(0.00067)				(0.00113)
Share of proof of competence unit groups				-0.00972***				-0.00310*
				(0.00145)				(0.00167)
Observations	2,390,962	2,288,836	2,390,962	2,288,836	2,390,962	2,288,836	2,390,962	2,288,836
R-squared	0.02209	0.02201	0.02224	0.02214	0.02416	0.02414	0.02418	0.02413
occupation FE	NO	NO	NO	NO	YES	YES	YES	YES
Baseline probability	0.02539	0.02568						

Robust standard errors clustered at the individual level in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 3 Effects of occupational regulation on occupational mobility within and between firms

	Occupational mobility within firms				Occupational mobility between firms			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Regulated occupation	-0.00118**				-0.00070**			
	(0.00052)				(0.00030)			
Licensed occupation			-0.00169***				-0.00063*	
			(0.00063)				(0.00035)	
Proof of competence occupation			0.00059				-0.00037	
			(0.00073)				(0.00054)	
Mixed regulated occupation			-0.00495***				-0.00193***	
			(0.00107)				(0.00068)	
Share of regulated unit groups		-0.00349***				-0.00113**		
		(0.00085)				(0.00047)		
Share of licensed unit groups				-0.00439***				-0.00075
				(0.00101)				(0.00051)
Share of proof of competence unit groups				-0.00107				-0.00203*
				(0.00129)				(0.00106)
Observations	2,390,962	2,390,962	2,288,836	2,288,836	2,390,962	2,390,962	2,288,836	2,288,836
R-squared	0.01910	0.01911	0.01895	0.01895	0.01129	0.01129	0.01147	0.01147
occupation FE	YES	YES	YES	YES	YES	YES	YES	YES
Baseline probability	0.01731		0.01753		0.00807		0.00815	

Robust standard errors clustered at the individual level in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 4 Effects of occupational regulation on occupational mobility by occupation groups

	White collar occupations (ISCO first digit: 1-4)				Blue collar occupations (ISCO first digit: 5-9)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Regulated occupation	-0.00261***				-0.00219***			
	(0.00088)				(0.00079)			
Licensed occupation		-0.00280***				-0.00324***		
		(0.00096)				(0.00107)		
Proof of competence occupation		0.00014				-0.00016		
		(0.00191)				(0.00104)		
Mixed regulated occupation		-0.00724***				-0.00675***		
		(0.00207)				(0.00157)		
Share of regulated unit groups			-0.00720***				-0.00307**	
			(0.00155)				(0.00120)	
Share of licensed unit groups				-0.00687***				-0.00418***
				(0.00160)				(0.00158)
Share of proof of competence unit groups				-0.01042**				-0.00225
				(0.00525)				(0.00178)
Observations	1,168,680	1,107,313	1,168,680	1,107,313	1,209,614	1,168,855	1,209,614	1,168,855
R-squared	0.02484	0.02498	0.02488	0.02499	0.02587	0.02576	0.02587	0.02573
occupation FE	YES	YES	YES	YES	YES	YES	YES	YES
Baseline probability	0.02592	0.02612			0.02500	0.02539		

Robust standard errors clustered at the individual level in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 5 Effects of occupational regulation on occupational mobility within and between firms: white-collar occupations (ISCO first digit: 1-4)

	Occupational mobility within firms				Occupational mobility between firms			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Regulated occupation	-0.00248***				-0.00013			
	(0.00079)				(0.00038)			
Licensed occupation			-0.00269***				-0.00010	
			(0.00087)				(0.00041)	
Proof of competence occupation			0.00013				0.00001	
			(0.00163)				(0.00103)	
Mixed regulated occupation			-0.00710***				-0.00013	
			(0.00190)				(0.00086)	
Share of regulated unit groups		-0.00696***				-0.00024		
		(0.00145)				(0.00056)		
Share of licensed unit groups				-0.00680***				-0.00006
				(0.00150)				(0.00057)
Share of proof of competence unit groups				-0.00975**				-0.00067
				(0.00463)				(0.00255)
Observations	1,168,680	1,168,680	1,107,313	1,107,313	1,168,680	1,168,680	1,107,313	1,107,313
R-squared	0.02114	0.02119	0.02122	0.02124	0.00961	0.00961	0.00975	0.00975
occupation FE	YES	YES	YES	YES	YES	YES	YES	YES
Baseline probability	0.01855		0.01875		0.00737		0.00737	

Robust standard errors clustered at the individual level in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 6 Effects of occupational regulation on occupational mobility within and between firms: blue-collar occupations (ISCO first digit: 5-9)

	Occupational mobility within firms				Occupational mobility between firms			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Regulated occupation	-0.00118*				-0.00100**			
	(0.00066)				(0.00046)			
Licensed occupation			-0.00219**				-0.00106*	
			(0.00090)				(0.00059)	
Proof of competence occupation			0.00017				-0.00033	
			(0.00082)				(0.00064)	
Mixed regulated occupation			-0.00376***				-0.00299***	
			(0.00120)				(0.00104)	
Share of regulated unit groups		-0.00123				-0.00184**		
		(0.00096)				(0.00074)		
Share of licensed unit groups				-0.00247*				-0.00171*
				(0.00131)				(0.00091)
Share of proof of competence unit groups				-0.00042				-0.00184
				(0.00135)				(0.00117)
Observations	1,209,614	1,209,614	1,168,855	1,168,855	1,209,614	1,209,614	1,168,855	1,168,855
R-squared	0.01936	0.01935	0.01903	0.01901	0.01335	0.01336	0.01357	0.01356
occupation FE	YES	YES	YES	YES	YES	YES	YES	YES
Baseline probability	0.01620		0.01645		0.00880		0.00894	

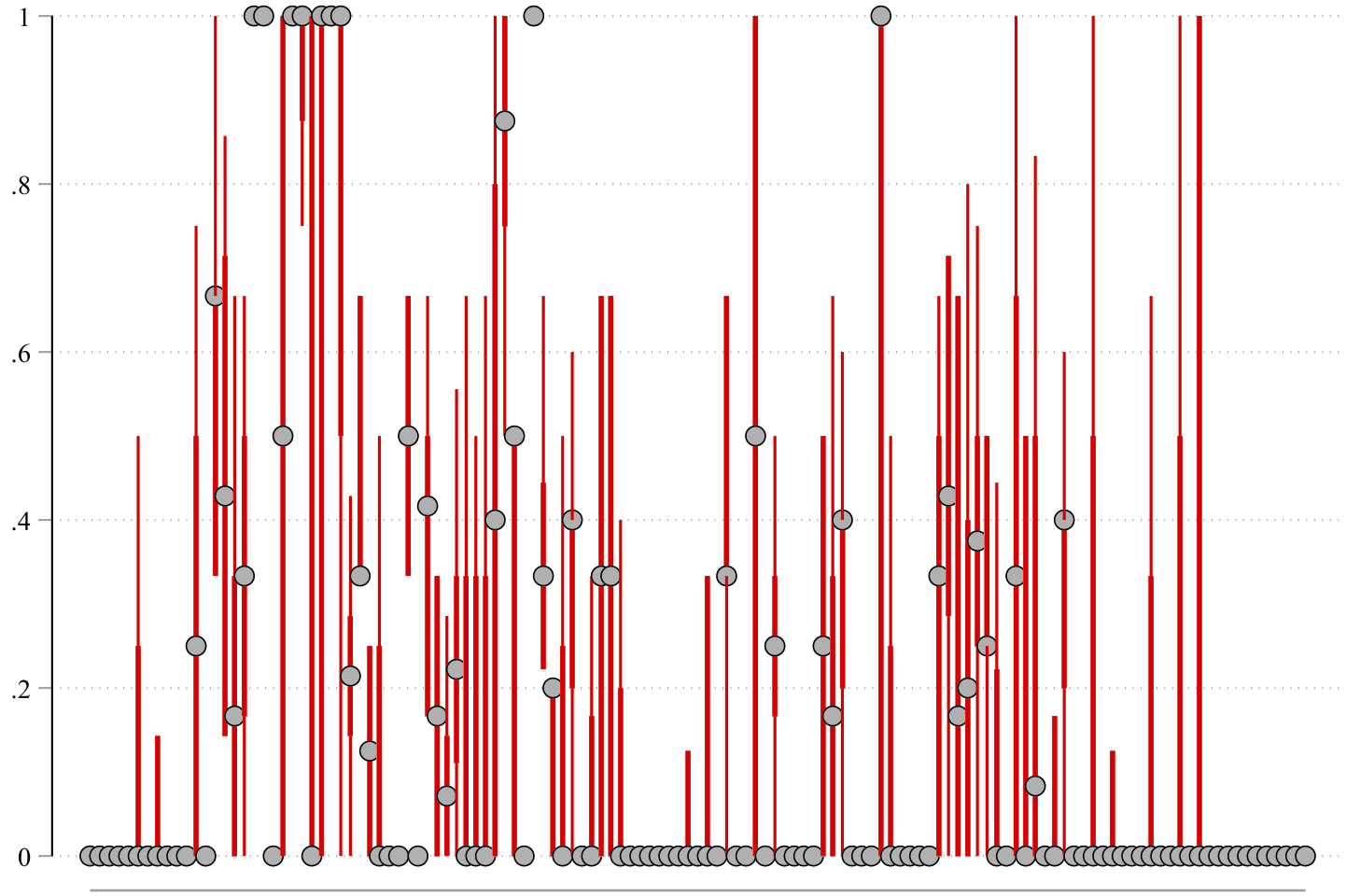
Robust standard errors clustered at the individual level in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Appendix

Table A1 Number of observations in the analysis sample by country and year

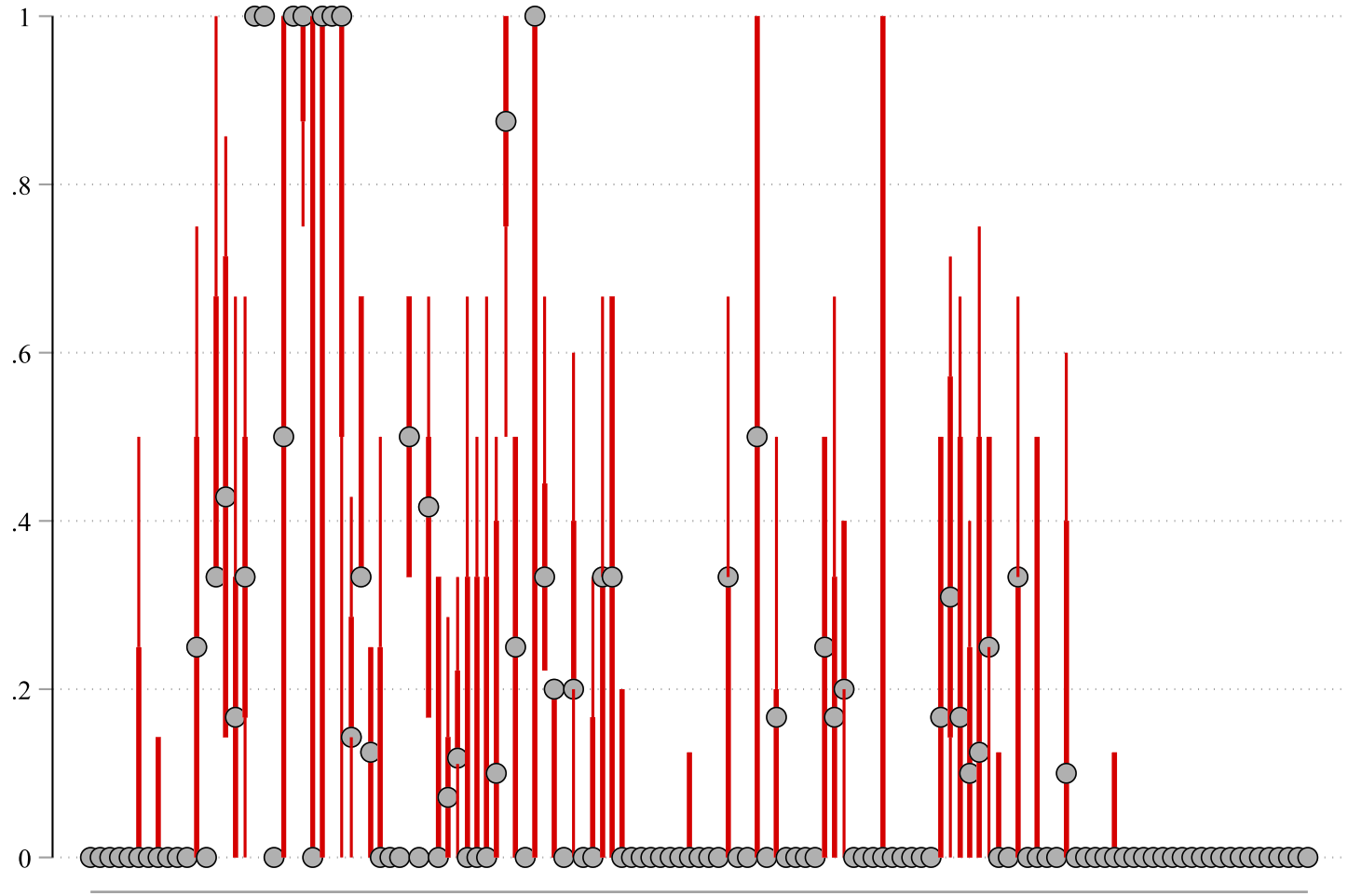
Country	Year 2012	2013	2014	2015	2016	2017	2018	2019	Total
AT	43,115	43,376	42,450	42,018	43,563	44,810	43,512	43,748	346,592
FR	21,204	19,146	20,649	20,784	21,326	19,782	20,305	19,270	162,466
GR	43,080	42,635	41,347	40,887	46,317	45,491	45,626	42,826	348,209
HR	4,988	4,503	4,997	5,242	3,683	3,867	4,567	4,411	36,258
HU	53,187	49,684	52,606	52,408	51,319	50,706	47,438	45,129	402,477
IE	40,837	37,420	39,706	35,820	30,878	16,398	21,706	23,012	245,777
LT	10,847	10,679	10,845	10,105	10,377	10,960	11,513	10,997	86,323
LV	4,595	5,377	6,154	5,704	5,879	879	764	0	29,352
SE	93,298	90,043	84,563	80,161	77,297	79,402	49,644	36,825	591,233
SK	22,364	22,131	21,493	20,687	20,932	19,886	20,095	19,837	167,425
Total	337,515	324,994	324,810	313,816	311,571	292,181	265,170	246,055	2,416,112

Figure A1 Box plots of share of regulated unit groups in countries, by occupation



Note: From the left to the right occupations with lowest to highest 3-digit ISCO codes. Grey dots indicate values of the median country.

Figure A2 Box plots of share of licensed unit groups in countries, by occupation



Notes: From the left to the right occupations with lowest to highest 3-digit ISCO codes. Grey dots indicate values of the median country.

Table A2 Effects of occupational regulation on occupational mobility within and between firms: baseline specification with no occupation FEs

	Occupational mobility within firms				Occupational mobility between firms			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Regulated occupation	-0.00271***				-0.00166***			
	(0.00035)				(0.00022)			
Licensed occupation			-0.00277***				-0.00180***	
			(0.00041)				(0.00024)	
Proof of competence occupation			-0.00197***				-0.00088*	
			(0.00065)				(0.00050)	
Mixed regulated occupation			-0.00371***				-0.00199***	
			(0.00056)				(0.00044)	
Share of regulated unit groups		-0.00686***				-0.00305***		
		(0.00051)				(0.00031)		
Share of licensed unit groups				-0.00686***				-0.00306***
				(0.00059)				(0.00033)
Share of proof of competence unit groups				-0.00678***				-0.00295***
				(0.00110)				(0.00094)
Observations	2,390,962	2,390,962	2,288,836	2,288,836	2,390,962	2,390,962	2,288,836	2,288,836
R-squared	0.01707	0.01719	0.01687	0.01699	0.01055	0.01057	0.01070	0.01071
occupation FE	NO	NO	NO	NO	NO	NO	NO	NO
Baseline probability	0.01731		0.01753		0.00807		0.00815	

Robust standard errors clustered at the individual level in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table A3 Effects of occupational regulation on job change within the same occupation

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Regulated occupation	0.00082***				0.00000			
	(0.00021)				(0.00032)			
Licensed occupation			0.00032				-0.00057	
			(0.00023)				(0.00036)	
Proof of competence occupation			0.00371***				0.00186***	
			(0.00060)				(0.00065)	
Mixed regulated occupation			0.00184***				0.00119	
			(0.00056)				(0.00074)	
Share of regulated unit groups		0.00262***				0.00095		
		(0.00037)				(0.00058)		
Share of licensed unit groups				0.00164***				-0.00032
				(0.00038)				(0.00059)
Share of proof of competence unit groups				0.01148***				0.00786***
				(0.00149)				(0.00159)
Observations	2,390,962	2,390,962	2,288,836	2,288,836	2,390,962	2,390,962	2,288,836	2,288,836
R-squared	0.01308	0.01313	0.01324	0.01333	0.01451	0.01452	0.01472	0.01475
occupation FE	NO	NO	NO	NO	YES	YES	YES	YES
Baseline probability	0.00951		0.00947					

Robust standard errors clustered at the individual level in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table A4 Effects of occupational regulation on job loss (transition from employment to unemployment)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Regulated occupation	-0.00122***				0.00042			
	(0.00025)				(0.00036)			
Licensed occupation			-0.00168***				0.00026	
			(0.00028)				(0.00042)	
Proof of competence occupation			0.00021				0.00111*	
			(0.00059)				(0.00065)	
Mixed regulated occupation			0.00224**				0.00286**	
			(0.00092)				(0.00119)	
Share of regulated unit groups		-0.00107**				0.00169**		
		(0.00043)				(0.00067)		
Share of licensed unit groups				-0.00128***				0.00150**
				(0.00046)				(0.00072)
Share of proof of competence unit groups				0.00349**				0.00528***
				(0.00153)				(0.00167)
Observations	2,416,110	2,416,110	2,313,312	2,313,312	2,416,110	2,416,110	2,313,312	2,313,312
R-squared	0.01599	0.01597	0.01625	0.01621	0.01830	0.01831	0.01858	0.01859
occupation FE	NO	NO	NO	NO	YES	YES	YES	YES
Baseline probability	0.01015		0.01032					

Robust standard errors clustered at the individual level in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table A5 Effects of occupational regulation on occupational mobility: estimates with a limited set of controls

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Regulated occupation	-0.00477***				-0.00177***			
	(0.00041)				(0.00059)			
Licensed occupation			-0.00515***				-0.00217***	
			(0.00047)				(0.00072)	
Proof of competence occupation			-0.00271***				0.00020	
			(0.00082)				(0.00091)	
Mixed regulated occupation			-0.00553***				-0.00632***	
			(0.00071)				(0.00126)	
Share of regulated unit groups		-0.01076***				-0.00450***		
		(0.00060)				(0.00097)		
Share of licensed unit groups				-0.01106***				-0.00505***
				(0.00067)				(0.00113)
Share of proof of competence unit groups				-0.00888***				-0.00272
				(0.00145)				(0.00167)
Observations	2,390,962	2,390,962	2,288,836	2,288,836	2,390,962	2,390,962	2,288,836	2,288,836
R-squared	0.01953	0.01971	0.01940	0.01956	0.02180	0.02182	0.02172	0.02172
occupation FE	NO	NO	NO	NO	YES	YES	YES	YES
Baseline probability	0.02539		0.02568					

Robust standard errors clustered at the individual level in parentheses. *** p<0.01, ** p<0.05, * p<0.1
Control variables not included in these models: tenure, tenure squared and supervising other workers.

Table A6 Effects of occupational regulation on occupational mobility: estimates for 2016-2019

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Regulated occupation	-0.00468***				-0.00154*			
	(0.00058)				(0.00089)			
Licensed occupation			-0.00530***				-0.00242**	
			(0.00067)				(0.00109)	
Proof of competence occupation			-0.00204				0.00124	
			(0.00127)				(0.00139)	
Mixed regulated occupation			-0.00557***				-0.00694***	
			(0.00113)				(0.00189)	
Share of regulated unit groups		-0.01066***				-0.00324**		
		(0.00085)				(0.00144)		
Share of licensed unit groups				-0.01129***				-0.00440**
				(0.00096)				(0.00173)
Share of proof of competence unit groups				-0.00823***				-0.00144
				(0.00215)				(0.00244)
Observations	1,104,869	1,104,869	1,057,693	1,057,693	1,104,869	1,104,869	1,057,693	1,057,693
R-squared	0.02646	0.02663	0.02633	0.02649	0.02890	0.02890	0.02885	0.02883
occupation FE	NO	NO	NO	NO	YES	YES	YES	YES
Baseline probability	0.02803		0.02832					

Robust standard errors clustered at the individual level in parentheses. *** p<0.01, ** p<0.05, * p<0.1