Measuring Prevalence and Labour Market Impacts of Occupational Regulation in the EU

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Executive Summary

The European Commission wishes to commission research to examine the prevalence and labour market impact of occupational regulation in the EU using the recent European Survey on Regulated Occupations with an aim to inform the evidence base on the economic costs and benefits of this labour market institution. Dr. Mario Pagliero and Dr. Maria Koumenta are pleased to present the findings from the analysis of the survey and in particular:

1. Estimates of the prevalence of occupational regulation by type of regulation, by the characteristics of workers subject to regulation and by broad economic sector.
2. Estimates of the aggregate wage effects of licensing and certification as well as analyses of differential wage effects by occupational groups and by broad economic sector.
3. Assessment of the contribution of licensing to wage inequality through an examination of its effect on the wage structure.
4. Using the variation in stringency of licensing requirements at occupation and country level, an examination of the effect that licensing has on employment.
5. Estimates of the effect of licensing and certification on labour mobility and an examination of how this effect varies between occupations subject to automatic recognition arrangements versus their general system counterparts as well as differential effects by broad occupational group.
6. Estimates of the effect of licensing and certification on educational and training attainment as well as comparisons of returns on investment in education by different types of regulation.
7. Assessment on whether the incidence of occupational licensing is associated with the presence of information asymmetries within the occupation.

We have addressed these themes in five distinctive empirical sections. While drawing on the same data source, each section is free-standing and aims at contributing to advancing our knowledge on this labour market institution in the EU. In doing so, we provide the first estimates of the prevalence of occupational regulation in the EU and an analysis of its impact on key labour market outcomes, namely wages and wage inequality, employment, training and labour mobility. The final section explores whether the incidence of licensing is

justified on asymmetric information grounds, a common justification by policy-makers for its adoption.

The results of this study can be summarised as follows:

1. Occupational licensing affects about 22 percent of workers in the EU. However, its prevalence varies across Europe with higher incidence in central Europe. It is also more widespread amongst certain occupational groups such as professionals (26%) and plant and machine operators (35%), but only covers 11% of workers in elementary occupations and 13% of managers[1].
2. Occupational licensing is associated with an aggregate wage premium of about 4%, but considerable variations by occupation are found. We also show that licensing contributes to wage inequality in the European labour market.
3. Measuring the impact of licensing on employment with one-off (cross-sectional) data is difficult[2]. However, our estimates suggest that licensing can be associated with a substantial loss in employment (up to 705,000 jobs in the EU). Depending on the occupation, there could be between 3 and 9% more people working in a given profession should access requirements be made less stringent.
4. Licensing is associated with about one third less foreign-born workers in the occupation, while no significant difference is found between unregulated and certified workers. We find that the automatic recognition arrangements currently present in the EU are effective in facilitating entry into foreign markets and mobility across countries. Finally, the incidence of licensed foreign-born workers varies by occupation. Licensed foreign-born workers are under represented, relative to unregulated workers, in elementary occupations, craft and related trades, and skilled agricultural occupations.
5. Certified workers seem to be able to invest more in training than licensed workers without any obligation to do so, thus indicating that licensing is not the only way to induce workers to invest in training. The upskilling effect of licensing seems to kick in only when educational requirements are set above upper secondary education level.

[1] Occupational categories have been defined according to ISCO
[2] For a detailed explanation, please refer to Chapter 4 of this report.

Further, licensing distorts the returns to education in that it flattens the returns to education for those with low educational attainment while it increases the returns to having a university degree.

6. Finally, we examine the correlation between perceived asymmetric information and licensing. Our findings, albeit with some caveats, lead us to reject the asymmetric information argument as the main explanation for the incidence of licensing in our survey.

Structure of the report

Chapter 1 discusses the nature of occupational regulation, the rationale for its adoption and its characteristics in the EU labour market context.

Chapter 2 describes the EU Survey of Regulated Occupations.

Chapter 3 analyses the prevalence of occupational regulation across the EU and presents the estimates on its impact on wages and wage inequality.

Chapter 4 examines the impact of occupational regulation on employment.

Chapter 5 examines the impact of occupational regulation on mobility.

Chapter 6 examines the impact of occupational regulation on skills and training.

Chapter 7 assesses whether the incidence of occupational regulation is associated with the incidence of information asymmetries within occupations.

Chapter 8 brings together all the findings and provides recommendations for policy and future research.

Introduction

Occupational regulation is a labour market institution that has attracted considerable debate within academic and policy cycles[3]. The current policy interest derives from its potential to serve as a strong incentive for employers and workers to invest more heavily in skills and as a means to safeguard consumer interests. Economists on the other hand, have commonly described it as a rent-seeking activity by powerful occupational groups and have warned against its deleterious labour market effects (e.g. Friedman 1962[4]; Maurizi 1974[5]; Graddy 1991[6]; Shapiro 1986[7]; Johnson and Kleiner 2015[8]; Kleiner 2016[9]). While there is now a well-developed empirical literature in the US assessing the labour market outcomes of occupational regulation, the paucity of such evidence in the European context is striking. This is a surprising omission given that, as we shall show below, entry to a significant proportion of EU jobs is restricted through licensing[10]. As such, the importance of this labour market institution extends beyond academic curiosity and deserves more attention than it currently receives.

On the other hand, this gap in the literature is not entirely unjustifiable. Until recently, in Europe researchers have been lacking comprehensive data that clearly identifies regulated

[3] The term «occupational regulation» is used in the US and the EU literature on the subject to describe regulation governing access to and exercise of professions.

[4] Friedman, Milton 1962. Capitalism and Freedom. Chicago: University of Chicago Press.

[5] Maurizi, A. (1974). Occupational licensing and the public interest. The Journal of Political Economy, 399-413.

[6] Graddy, E. (1991). Interest groups or the public interest—why do we regulate health occupations? Journal of Health Politics, Policy and Law, 16(1), 25-49.

[7] Shapiro, Carl. (1986). "Investment, Moral Hazard, and Occupational Licensing." Review of Economic Studies 53(5) (October): 843–862.

[8] Johnson, J., & Kleiner, M. M. (2015). Does Occupational Licensing Reduce Interstate Migration?. *WE Upjohn Institute for Employment Research, July*,*30*.

[9] Kleiner, M. M. (2016). Labor Markets with Occupational Licensing: Their Economic Effects Battling Over Jobs: Occupational Licensing in Health Care.*The American Economic Review*, *106*(5), 165-170.

[10] The precise terminology employed by the EU Commission refers to a licensed profession as 'regulated profession' and defines it as a "professional activity or group of professional activities, access to which, the pursuit of which, or one of the modes of pursuit of which is subject, directly or indirectly, by virtue of legislative, regulatory or administrative provisions to the possession of specific professional qualifications" (Directive 2005/36 Article 3.1 a).

individuals, the characteristics of the regulatory regime they are subject to and documents their individual and labour market attributes. The EU Survey of Occupational Regulation commissioned by the EU Commission and conducted by TNS Opinion between March and April 2015 represents a significant step towards bridging this knowledge gap. The survey covers the labour force within each EU member state and asks detailed questions about regulation.

This report is the first output from the analysis of the survey and the first study to provide (a) a thorough analysis of the incidence and prevalence of occupational regulation in the EU, (b) estimates of the wage premium associated with licensing and certification, (c) an assessment of the impact of licensing on different parts of the income distribution. In doing so, it introduces new methods of analysis, improves considerably on previous estimates and facilitates comparisons with the US labour market context.

1. Occupational Regulation: Background and Rationale

Chapter Summary

- Occupational regulation refers to legally defined requirements or rules that govern entry into occupations and subsequent conduct within them.
- In the EU labour market we can distinguish between three broad types of regulation: licensing (reserved activities), certification (protected title) and accreditation (voluntary). Occupations for which no restrictions to entry exist are termed unregulated.
- Currently, there is no consistent pattern in the regulation of occupations amongst Member states (which occupations are regulated) as well as considerable heterogeneity in the characteristics of the regulatory regimes (how these occupations are regulated).
- While the knowledge base on occupational licensing in the US is advanced, there is a lack of evidence on the operation of this labour market institution in the EU. The limited existing knowledge of professional regulation in the Member states points towards a great degree of complexity and lack of consistency in their regimes.
- Occupational regulation is used as a means to reduce information asymmetries between providers and consumers and standardise skill requirements. However, licensing (the most restrictive form of occupational regulation) is expected to have some broader, often negative effects in the labour and product markets.

1.1 The EU Typology of Occupational Regulation

Occupational regulation refers to legally defined requirements or rules that govern entry into occupations and subsequent conduct within them. Entry is commonly determined by the attainment of certain minimum qualifications, but can also include satisfying certain

work experience and continuous professional development requirements, as well as passing competence tests, criminal record checks and medical assessments. At its most simple form, occupational regulation can be understood as a dichotomy between occupations that legally force practitioners to meet these requirements (known as licensed occupations or reserved activities) and occupations that do not.

Table 1.1 EU Typology of Occupational Regulation

		Requirement to demonstrate a minimum degree of competence?	
		No	*Yes*
Any legal regulation by the government (directly or through an appointed agency)?	*No*	**Unregulated** The occupation may be subject to conventions, whereby employers will typically cite minimum entry criteria, but these are not co-ordinated, nor do they have any legal basis. *Example: retail assistant, bank clerks, priests (in some member states)*	**Non-governmental accreditation schemes** Practitioners may apply to be accredited as competent by an accrediting body, which is usually a professional body or industry association. May permit the accredited person to use a specific title or acronym but confers no legal protection of title, nor any legal protection of function. *Example: Accountants, hairdressers (in some member states)*
	Yes, but confers no rights to practice	**Empty cell**	**Certification schemes** There is no legal restriction as to who may carry out the tasks covered by the occupation, but practitioners may apply to be certified as competent by the state (or an appointed agent). This certification may sometimes (but not always) confer legal protection of title. *Example: taxi drivers (in some member states), fitness instructors (in some member states), electrical engineers (in some member states)*
	Yes, and confers rights to practice	**Empty cell**	**Licensing schemes** Only those who can demonstrate the specified level of competence may obtain a licence permitting them to undertake the tasks covered by the regulation, also called "reserves of activities" or "reserved activities". *Example:* veterinary surgeons, pharmacists, dentists

Source: Adopted from Forth et al. (2012) and adjusted by the authors to the EU context.

However, within the latter category, we can distinguish between occupations for which certain standards of competency exist, but incumbents are not legally forced to meet them (known as certification and accreditation/protection of title) and between occupations for which no formally established requirements exist although employers might expect candidates to meet certain criteria (known as unregulated)[11]. And while certification is granted by the state or an appointed agent such as a regulatory body or competent authority, accreditation is provided by a professional body or an industry association. Table 1.1 provides a summary of the EU typology of occupational regulation and the sections that follow further elaborate on this typology[12].

1.2 The Characteristics of the EU Regime of Occupational Regulation

The EU Regulated Professions Database[13] (maintained by the EU Commission) includes information on the regulated professions covered by the Mutual Recognition of Professional Qualifications (MRPQ) Directive 2005/36/EC and shows that some 600 different occupations are affected by occupational regulation. Taking into consideration professions regulated in every Member States, the total number of regulated professions in the EU exceeds 5,400[14].

A detailed examination of the database reveals a number of interesting features. Notable is the lack of a consistent regulatory pattern resulting to some occupations being regulated in some Member states but not in others (e.g. lawyers, physicians, and nurses are reported to be licensed in all countries while tour guides are only licensed in 9 member states). Such institutional diversity is also evident when looking at other common features of regulation. For example, at the occupation level, there is diversity with regards to the regulatory

[11] For example a bank might require bank clerks to have a university degree or some basic training in accounting, but these are not uniform across all banks nor do they have a legal basis.

[12] In addition to licensing, accreditation and certification, the academic literature on occupational regulation also considers registration. Registration entails practitioners registering their details with a government body in order to practice the occupation. We consider this type of regulation to be out of scope in this study, since it does not place any skill requirements on practitioners and it has not been measured in the survey.

[13] http://ec.europa.eu/internal_market/qualifications/regprof/index.cfm?action=homepage.

[14] Professions are regrouped under "generic professions" in the database. For each generic profession there are usually many more professions corresponding to the national terminology because under a generic professions there are several sub-professions. The number of regulated professions reported in the EU database is not in itself an indicator of regulatory intensity (the type of regulation is) but it does illustrate the diversity and multitude of activities covered or reserved to different professions, access to which is conditional upon recognition of the professional qualification by the relevant Member State.

framework (Table 1.1), the level at which regulation takes place (e.g. state or sector enforced), and the requirements placed on individuals wishing to practice the occupation (e.g. educational, work experience, moral character, residency and other conduct restrictions).

Nevertheless, the database provides a snapshot of the various forms that occupational regulation takes in the EU. As such, the current regime, albeit very diverse, can be broadly understood as an amalgam of *state-enforced* regulation (typically associated with more stringent forms such as licensing) and '*state sanctioned self–regulation'* (meaning certification and accreditation by professional bodies usually endorsed by the state apparatus*)*. Licensing is the strictest form of regulation: it is associated with legal barriers to entry, usually but not exclusively related to the attainment of minimum skills standards[15]. The state appointed regulator (known as Competent Authority) is responsible for overseeing the licensing of occupations, and while their responsibilities are confined to the jurisdiction of their corresponding Member states, there are some scant examples of cross-European collaboration towards standardising entry requirements.

A recent voluntary initiative for example, largely motivated by concerns about regulation impeding labour mobility in the EU, has been the enactment of *Common Training Frameworks* aiming at establishing training and entry principles that would apply across member states[16]. Certification and accreditation also feature in the EU typology of regulation. These are associated with voluntary requirements for entry to occupations, and being largely based on the tradition of craft guilds, they are self-regulated practitioner-led bodies organised on occupational bases[17]. In some cases, such bodies have come together to create professional representation at European level (e.g. European Tourism Association), as well as introduce initiatives aiming in harmonising training requirements across Europe

[15] The precise terminology employed by the EU Commission refers to a licensed profession as 'regulated profession' and defines it as a "professional activity or group of professional activities, access to which, the pursuit of which, or one of the modes of pursuit of which is subject, directly or indirectly, by virtue of legislative, regulatory or administrative provisions to the possession of specific professional qualifications" (Directive 2005/36 Article 3.1 a).

[16] Directive 2005/36 Article 49.a

[17] Certification and accreditation are captured by the EU Commission using the following definition "the use of a professional title limited by legislative, regulatory or administrative provisions to holders of a given professional qualification shall constitute a mode of pursuit".

(e.g. Common Content Project in Accountancy), but by and large their activities are confined to specific member states.

The heterogeneity of the EU regulatory regime complicates the measurement of incidence and prevalence. A recent study by Koumenta *et al*. (2014) attempts to provide some preliminary estimates. The authors draw on the information provided in the EU Commission's database and match the reported regulation status of the occupation to the occupation's ISCO-code (at 4-digit level). This information is subsequently matched to the European Labour Force Survey thus enabling them to produce estimates of the range in the proportion of the workforce affected by occupational regulation. However, due to the difficulties in matching different datasets, this study is only able to provide very imprecise upper and lower bound estimates[18]. Moreover, the classification of jobs, rather than workers, makes their estimates prone to measurement error. The main problem is the lack of individual level data on workers with a more precise measure of occupational regulation.

This knowledge gap has not been filled by academic work elsewhere. Although we have seen a surge in studies on occupational regulation in the European context, these have been based on a small number of occupations in specific countries, thus not enabling us to assess this labour market institution on a wider scale.

1.3 The Economic Rationale for Occupational Regulation

From a public policy perspective, occupational regulation in general, and licensing in particular is aimed at ensuring that consumers are protected from incompetent and unscrupulous practitioners. The common assumption is that, due to lack of expert knowledge and the intangible nature of services, consumers cannot assess the quality of the product or service they receive, so occupational regulation provides these guarantees through the standardising the skills of providers. Therefore, through setting minimum skills standards for entry to occupations, occupational licensing is expected to raise average skills levels in the occupation, since low-quality providers cannot meet the new skill standard and

[18] In particular, the authors estimate that between 9 and 24 per cent of all EU workers are subject to occupational regulation, which is between 19 and 51 million individuals.

are driven out of the occupation (Pagliero 2013)[19]. As a result consumers are likely to receive a more homogeneous and high quality product.

Such considerations are even greater where the quality of the service provided can affect the wider community or society through positive or negative externalities that its consumption might entail. For example, it is not only to the best interest of those consuming health care that practitioners are competent, but also important for the welfare of society at large. Therefore, the impetus for regulation is likely to be greater, the greater the cost and risk posed to society from these externalities (Humphris, Kleiner and Koumenta 2011[20]). Evidence from the US, for example, shows that the passage of licensing laws during the 20th century followed advances in scientific knowledge within professions and accelerated urbanisation rates (i.e. movement away from local product markets where it was easier to use reputation as a signal of quality, Law and Kim 2005[21]).

A second important effect of regulation is that the resulting higher investments in training have the potential to enhance the skills base in the economy (Shapiro 1986[22]). Such an effect is likely to be stronger in the case of licensing, where the requirement is legally enforced, rather than in the cases of certification and accreditation where the requirements are voluntary in nature. As such, policy-makers could in principle use licensing as a policy lever to increase skills (or address possible market failures in the provision of skills). The extent to which licensing will have such an effect is likely to depend on the difference between the existing average skill levels prior to regulation, as well as the degree to which practitioners comply with the new requirements (i.e. success in enforcement).

Two key issues emerge from the above discussion. First, since 'potential harm to the public' (and the magnitude of this harm) and 'information asymmetries' are the key considerations in deciding which occupations to regulate and the degree of stringency attached to these regulations, we would expect to find a consistent pattern of regulation regardless of the

[19] Pagliero, M. (2013) 'The Impact of Potential Labour Supply on Licensing Exam Difficulty', Labour Economics, 25, 141-152.
[20] Humphris, A., Kleiner, M. and Koumenta, M. (2011) 'How Does Government Regulate Occupations in the United Kingdom and the United States? Issues and Policy Implications', in Marsden, D. (ed.) Employment in the Lean Years: Policy and Prospects for the Next Decade, Oxford: Oxford University Press.
[21] Law, M. T., & Kim, S. (2005). Specialization and regulation: The rise of professionals and the emergence of occupational licensing regulation. *The Journal of Economic History*, *65*(03), 723-756.
[22] Shapiro, C. (1986) 'Investment, Moral Hazard and Occupational Licensing', Review of Economic Studies, 53, 843-62.

labour market context (or Member state). After all, whether occupational malpractice can pose risks to the public is not expected to vary significantly across Member states and labour market contexts. Yet, as discussed earlier, this is not the case in the EU in that the same occupation might be licensed in one Member state, but not in another. It is also not the case in the US context, where we observe considerable variation in the incidence and nature of licensing between states. This alludes to the idea that other considerations, beyond the economic and public policy rationale are at play. Economists have commonly attributed such discrepancies to the ability of professional bodies to influence government policy in favour of regulation through lobbying, as well as the government's taste for regulation. Indeed, regulation can also serve the interests of the government in the form of an 'insurance policy' against professional malpractice cases and high profile scandals (especially when the public sector is the provider of the services).

The second issue relates to the up-skilling potential of licensing and its link to productivity. A key distinction in the economic literature on skills is that of 'inputs' versus 'outputs' and the link between the two. Licensing can lead to higher productivity if inputs in the form of higher skills requirements are translated into more output, or else better quality products and services. Such a link however should not be taken for granted, as it depends on a number of unobserved factors, such as ability, resources, and economic incentives. For example, licensing doctors can only go as far as guaranteeing a minimum skill level. Whether this translates to better medical services depends on the context within which these skills are enacted. As such, while licensing can lead to up-skilling (provided that regulations are set at appropriate levels), caution must be exercised when linking licensing to productivity and product quality.

Occupational regulation, however, is expected to have some broader economic effects. In this section, we provide a brief overview of such effects before we discuss them in more detail in the empirical sections that follow. Licensing, the most restrictive form of regulation, has the potential to create distortions in the operation of the labour and product markets. First, we would expect to see an employment effect, meaning that tighter entry restrictions can limit the supply of qualified practitioners in the labour market, since only those with the right competencies (and often the financial resources to pay for the training) will have access to the occupation. A reduction in the pool of qualified practitioners is likely to lead to

an increase in their cost, meaning that consumers will now be faced with higher prices, while low income consumers are being priced out of the market. The result therefore is a dual market where some consumers either receive high quality services or none at all, thus overall consumer welfare is declining (Friedman 1962[23]; Shapiro 1986[24]). This process generates economic rents and further leads to higher wages for incumbents in licensed occupations, while putting a downward pressure on the wages of individuals in non-licensed occupations due to the increased supply of labour from those that cannot meet the licensing requirements (displacement effect).

The higher the entry criteria, the higher the rents to be captured by practitioners. This may lead to an inefficient allocation of economic resources if time and money used to acquire the required credentials could have been better invested elsewhere[25]. A further disadvantage is that of creating inflexible labour markets. Since licensing requires large time and financial commitments from individuals, we would expect highly regulated labour markets to find it harder to adjust to structural changes in the economy as individuals will not be readily willing to shift from one occupation to the other (Mortensen and Pissarides 1994[26]).

Finally, licensing is expected to increase the cost of geographical mobility. Under licensing, the individual is making location specific investments relating to qualifications, exams and continuous training. In the absence of any harmonization or reciprocity between entry requirements in the country of practice and those of the destination country, licensing is likely to act as a deterrent. Contrary to the US however, in the EU occupations are covered by the Mutual Recognition of Professional Qualifications Directive (MRPQ). This provides a mechanism by which a professional can have their qualifications recognised or undertake compensatory measures to qualify in another Member State. Such initiatives, when effectively implemented are likely to facilitate labour movement. Further, the incentive to move to a country where the occupation is not regulated is likely to be lower the higher the wage premium associated with licensing in the current country of practice (Pashigan 1979[27]). The sections that follow explore these themes in more detail.

[23] Friedman, M. (1962) Capitalism and Freedom, University of Chicago Press, Chicago.
[24] Shapiro, C. (1986) 'Investment, Moral Hazard and Occupational Licensing', Review of Economic Studies, 53, 843-62
[25] This is relevant to the concept of 'opportunity cost' in economics.
[26] Mortensen, D. and Pissarides, C. (1994) 'Job Creation and Job Destruction in the Theory of Unemployment', Review of Economic Studies, 61, 397-415.
[27] Pashigian, P. B. (1979) 'Occupational Licensing and the Interstate Mobility of Professionals,' Journal of Law and Economics. 22(1), pp. 1-25.

2. The EU Survey of Regulated Occupations

Chapter Summary

- The EU Survey of Regulated Occupations is the first ever survey capturing the extent of occupational regulation in the EU.
- A total of 26,640 individuals were interviewed providing a wealth of data on the regulation status of their occupation, the characteristics of the regulation regime (e.g. entry and renewal requirements) as well as on a variety of individual characteristics relating to employment and labour market profile.
- The survey is cross-sectional in nature, meaning that it provides a snapshot of the state of regulation in the EU at a specific point in time and the unit of analysis is the individual.

The data used for this study is based on the EU Survey of Regulated Occupations, the first ever survey dedicated to capturing the extent of occupational regulation in the EU. The survey was carried out in the period between 31st March and 14th April 2015. It covers the EU labour force (28 member states). The survey was carried out by means of telephone interviews (Computer Assisted Telephone Interviews) using a multi-stage random probability sample design. The questionnaire items are derived from questions tested in the US-based Westat survey of regulated occupations, and further developed by the authors to specifically address the aims of this study.

A pilot study was carried out which suggested some revisions to the questionnaire, including shortening its length and some minor changes to the wording of the items. Survey weights are developed to compensate for variation in selection probabilities and non-response

bias[28]. Population weights that take into consideration the respective national populations are also applied. A total of 26,640 individuals were interviewed providing data on their regulation status, the characteristics of the regulation regime (e.g. entry and renewal requirements) as well as on a variety of individual characteristics relating to employment and labour market profile. A copy of the survey questionnaire can be found in Appendix 1.

[28] Selection probability bias occurs when certain respondents have higher chances of being selected to participate than others. Non-response bias in surveys occurs when those that agree to participate differ from those that do not agree to participate in ways that can bias the results.

3. Wage Effects of Regulation

Chapter Summary

- Licensing is expected to restrict the supply of practitioners and result in higher wages for incumbents, a phenomenon known as 'the wage premium' of licensing. Licensing can affect the entire distribution of wages.
- We provide estimates of the wage premium and impact on wage inequality.
- The prevalence of occupational licensing is about 22 percent of workers in the EU. However, there is significant variability across member states and occupations. Licensing ranges from 14 percent in Denmark to 33 percent in Germany, with higher prevalence in central Europe. Only 11 percent of workers in elementary occupations are licensed, 13 percent of managers, but 26 percent of professionals and 35 percent of plant and machine operators.
- After controlling for individual characteristics, occupational licensing is associated with an aggregate wage premium of about 4 percent. However, it varies considerably by occupation. Licensing contributes to wage inequality in the European labour market.

3.1 Theoretical Background

Economic models of occupational regulation focus on how entry requirements associated with licensing regulate the supply of labour in the market. This is achieved in two ways. First, regulators restrict entry to those practitioners whose skills or character are above the minimum requirements. Second, regulators may revoke the license if performance of incumbents is deemed to fall short of meeting the professional standards. Such supply-driven processes can create monopoly rents within the licensed occupation, which can then translate to higher incomes for existing practitioners (the licensing 'wage premium'). The stricter the entry requirements, the higher the wage premium associated with licensing. The

wage premium is a result of the artificial restriction in the supply of practitioners in the occupation, rather than the normal return that individuals receive in the labour market due to their characteristics and skills.[29]

In principle, the wage premium could also be explained by the higher quality of the products and services provided by licensed workers. This is obviously an important issue for the empirical analysis that follows, which will take into account as much as possible the heterogeneity in skills across workers[30]. However, with a few exceptions, empirical research has not established that licensing actually improves the quality of products and services received by consumers.[31].

Research on these issues has a relatively long tradition, but improvements in measurement have led researchers to focus on two key themes: (a) better estimations of the wage premium associated with licensing (b) detection of potential differential effects of licensing on wage determination by occupation. These are explained in detail below.

3.2 Empirical Evidence

A number of papers investigate the prevalence of occupational regulation and attempt to measure its effect on wages. Kleiner and Krueger (2013)[32] find that licensing is associated with 18% higher wages in the US, while other studies show that restrictions on interstate mobility further add to such an effect (e.g. Tenn 2001[33]). Overall, early studies from the US have commonly shown the wage premium to range between 15% to 25%, while in the UK Humphris *et al*.'s estimates based on the UK Labour Force Survey show that licensing is

[29] In economics, 'rents' are defined as the payment made to an individual in the labour market that exceeds the actual payment needed to induce this individual to work or keep him in its current occupation. It therefore represents an inefficiency in the operation of the labour market.
[30] This is achieved through the use of controls for human capital such as education and work experience.
[31] The effect on overall quality of provision is even more negative if broader measures of quality are taken into account, such as exclusion of low income consumers from consumption due to the higher cost of licensed products and services.
[32] Kleiner, M. and Krueger A. (2013) 'Analysing the Extent and Influence of Occupational Licensing on the Labor Market, Journal of Labor Economics, 31, 2.
[33] Tenn, S. (2001) 'Occupational Licensing: An Effective Barrier to Entry?', Unpublished Dissertation, The University of Chicago.

associated with a 13 per cent higher hourly pay (2011[34]). More recently, using longitudinal data[35], Gittleman and Kleiner (2016[36]) find wage effects of about 7.5%, admittedly considerably lower than previous estimates. One potential explanation for this drop in magnitude is the better quality data used by researchers as well as the wider set of labour market controls they are able to employ. This is the result of the US recently introducing occupational regulation related questions into large-scale national surveys. Unfortunately, no question on occupational licensing is currently asked in any labour force survey in the EU.

Most studies present licensing as having a homogeneous wage effect, without distinguishing between different types of occupational classifications and licensing regimes. A further development in recent research is the detection of some degree of heterogeneity in the effect of licensing on the wage premium, controlling for other human capital variables. For example, Timmons and Thornton use a cross-state U.S. survey of licensed and non-licensed radiologic technologists and calculate a 12 per cent wage premium, an 11 per cent premium in similar comparisons of barbers, and a 16 per cent effect for massage therapists (Timmons and Thornton 2010[37]).

In his comparison of average incomes across licensed and non-licensed occupations, Kleiner (2000[38]) calculates the licensing premium among dentists, lawyers, barbers, and cosmetologists vis-à-vis other comparable occupations. Although he finds a licensing premium of 30 percent for dentists, the premium is 10 percent for lawyers despite some broad similarities in the educational and training requirements amongst these two groups. In the case of cosmetologists and barbers—both low-wage and low-skill occupations—the impact of regulation appears to be small. Some differential effects by occupation are also

[34] Humphris, A., Kleiner, M. and Koumenta, M. (2011) 'How Does Government Regulate Occupations in the United Kingdom and the United States?' Issues and Policy Implications, in Marsden, D. (ed.) Employment in the Lean Years: Policy and Prospects for the Next Decade, Oxford: Oxford University Press.

[35] Longitudinal or panel data track the same sample at different points in time.

[36] Gittleman, M., & Kleiner, M. M. (2016). Wage Effects of Unionization and Occupational Licensing Coverage in the United States, Industrial and Labour Relations Review, DOI: 10.1177/0019793915601632

[37] Timmons, Edward and Robert Thornton. "The Licensing of Barbers in the US," British Journal of Industrial Relations. 48(4), 2010.

[38] Kleiner, M. M. (2000). Occupational licensing. *The Journal of Economic Perspectives*, 189-202.

found by Forth *et al.* (2012[39]) and Koumenta *et al.* (2014[40]), but due to data limitations, the authors refrain from making definitive conclusions. Although these studies allude to potential heterogeneity in the effect of licensing on wages, they nevertheless are confined to a small set of occupations with limited ability to generalise amongst wider occupational groups.

A less well-developed line of enquiry is the impact of licensing on different parts of the income distribution. Licensing can result in the creation of rents through large initial investments in education not necessarily followed by improvements in worker skill or product/service quality. Any such economic rents can exacerbate income inequality if they are unequally distributed amongst income groups (e.g. those at the top of the income distribution fare better than those at the bottom).

Such an analysis of the impact of licensing parallels that used to study the effect of unions on wage dispersion. For example, in his classic work on the effects of unions, Freeman and Medoff (1984)[41] find that despite the inequality-increasing effect of unions on the difference between union members and non-members, the overall effect of unions on income inequality is negative, because of the larger negative effect on the variance of wages of union members. Licensing can exacerbate inequality by shifting resources to those within licensed jobs and away from those in unregulated jobs. This is further exacerbated through lobbying for preferential regulation by some professional groups and the imposition of barriers to entry (often in the form of expensive upfront investments in education that lower income groups cannot afford).

Both the creation and the unequal distribution of rents do not only increase inequality but also reduce efficiency. Does licensing have such an effect on wage dispersion? Kleiner and Krueger (2013)[42] and Gittleman and Kleiner (2016)[43] find that licensing does not reduce wage dispersion in the US, but whether this is the case in the EU is an empirical question. In

[39] Forth, J., Bryson, A., Humphris, A., Kleiner, M. and Koumenta, M. (2011) A Review of Occupational Regulation and its Impact, UK Commission for Employment and Skills, London
[40] Koumenta, M., Humphris, A., Kleiner, M. and Pagliero, M. (2014) Occupational Regulation in the UK and EU: Prevalence and Labour Market Impact, Department for Business, Innovation and Skills, London
[41] Medoff, J. L., & Freeman, R. (1984). What do unions do? *New York*.
[42] ibid
[43] ibid

particular, to the extent that licensing is associated with a wage premium, it would be informative to establish its effect on the variance of wages.

3.3 Methodology

In this section, we expand upon each of the elements of our approach in more detail.

Estimating the Prevalence of Occupational Regulation

We use the European Survey of Occupational Regulation to produce estimates of the incidence of occupational regulation at EU and national level. Given that the survey provides individual level data on occupational regulation, we expect our estimates to be much more accurate than existing estimates (e.g. correct for no compliance on the part of the employee or when lack of detailed occupational codes produces measurement error) based on classifications of professional groups.

The licensing wage premium

We start from the classic approach to estimating the wage premium associated with occupational licensing. We estimate cross sectional wage regressions of the general form

$$Y_i = b_0 + b_1\, Licensed_i + X_i b_2 + u_i \qquad (1)$$

where Y_i denotes the log hourly wage of worker *i*, the matrix X_i includes gender, education, union membership, work experience, working status, occupation, country, and industry fixed effects[44]. The coefficient b_1 measures the impact of the indicator variable *Licensed*, which measures whether worker *i* is subject to occupational licensing. The vector b_2 measures the impact of individual characteristics X_i.

This model is very useful and widely used in empirical research. Still, this approach assumes that the impact of occupational regulation is uniform across occupations, and that regulation cannot affect the return to other individual characteristics[45] (b_2). This assumption is somewhat restrictive, since regulation may affect differently workers in different

[44] The inclusion of fixed effects aims at removing biases in estimation associated with industry and country characteristics that result from omitted variables (i.e. variables that cannot be observed in our data).
[45] Return to individual characteristics refers to any normal pay off one would expect to receive from investment undertaken in training, labour market experience, position in the organisation etc.

occupations[46]. Moreover, it may induce changes in the coefficients of other variables such as education and work experience. Because of these limitations, we also use a more general model that allows for different coefficients b_1 and b_2 for licensed and unlicensed workers.

Assume that individuals in the survey can be partitioned into two exclusive groups denoted by *g=L, N*. Individuals in group *L* are individuals who need a license to do their job, while those in group *N* do not. The coefficients from the group-specific wage regressions

$$Y_{gi} = \beta_{g0} + X_{gi}\beta_{g1} + u_{gi} \tag{2}$$

can be used to decompose the difference in average predicted outcome between group *L* and group *N*,

$$\Delta = \overline{Y}_L - \overline{Y}_N, \tag{3}$$

into the part explained by differences in characteristics *X* across the two groups (Δ_X), the composition effect, and the structural component (Δ_S) that is due to differences in the coefficients β_{g0} and β_{g1} across the two groups,

$$\Delta = \Delta_X + \Delta_S \tag{4}$$

$$\Delta_X = \left(\overline{X}_L - \overline{X}_N\right)\hat{\beta}_{N1}$$

$$\Delta_S = \left(\hat{\beta}_{L0} - \hat{\beta}_{N0}\right) + \overline{X}_L\left(\hat{\beta}_{L1} - \hat{\beta}_{N1}\right).$$

Hence, we can estimate by OLS the wage regressions (2) and then decompose the overall change in wages into what is driven by X, that is Δ_X, and what is driven by the different coefficients across groups, Δ_S (Oaxaca 1973[47] and Blinder 1973[48]). This second component, the wage structure effect, can be interpreted as the counterpart of the simple wage premium obtained by the classic approach.

These two approaches crucially rely on linear regression models that capture the impact of regulation on mean wages. More in general, one can decompose the entire wage

[46] For example, the impact of regulation is likely to be stronger the longer the occupation has been licensed and the higher the entry barriers.

[47] Oaxaca, Ronald (1973), Male-Female Wage Differentials in Urban Labor Markets, International Economic Review, Vol. 14, No. 3, pp. 693-709

[48] Blinder, Alan S. (1973) Wage Discrimination: Reduced Form and Structural Estimates, The Journal of Human Resources, Vol. 8, No. 4, pp. 436-455.

distribution and study the impact of licensing on any quantile of the distribution. Following the semiparametric approach of DiNardo, Fortin and Lemieux (1996[49]), we first describe the entire wage distribution using Kernel density estimation, and then estimate the counterfactual wage distribution that would result if the characteristics of workers were maintained constant, but regulation changed. This generalizes the idea of decomposing the overall wage difference into the composition effect and the wage structure effect. In practice, the method requires using Kernel density estimation and reweighting the data with a reweighting factor that is a function of observable characteristics of workers (DiNardo, Fortin and Lemieux (1996).

Decomposition methods are more flexible than the traditional wage regressions given that they allow us to decompose the wage gap into the part that is due to group differences in the magnitudes of the determinants of wage levels, on the one hand, and group differences in the effects of these determinants, on the other. Still, they all share the important assumption that $E(u|X)=0$. In other words, they cannot account for unobserved characteristics u correlated with X, for example unobserved variables influencing wages and the selection process into licensed occupations. Hence, the results obtained with the two methods can be interpreted as causal only under this fairly strong assumption. In general, sharp identification of the causal impact of licensing on wages is easier to be achieved in studies focusing on specific occupations, perhaps subject to unexpected (exogenous) changes in regulation. On the other hand, these studies cannot provide results on the overall importance of licensing at a wider scale, which is the main objective of our study on the European labour market. Fortunately, our data provides a very rich set of control variables in X, thus we can control for many potential sources of endogeneity[50].

3.4 Prevalence of Occupational Regulation

[49] DiNardo, John, Nicole M. Fortin, and Thomas Lemieux. 1996. "Labor Market Institutions and the Distribution of Wages, 1973-1992: A Semiparametric Approach". Econometrica 64 (5): 1001–44.

[50] Endogeneity occurs when an explanatory variable is correlated with the error term. Endogeneity can arise as a result of measurement error, simultaneity and omitted variables.

This section aims to provide the first conclusive evidence on the incidence of occupational regulation in the EU. The analysis focuses on overall incidence but also presents results by country level. Two questions are used in the EU Survey of Occupational Regulation to classify workers into three groups: 1) licensed, 2) certified (or accredited), and 3) unregulated. (In the following, for simplicity, we will call the second group "certified", even though it also includes accredited workers according to Table 1.1.) The two questions are:

"In addition to this education, do you have a professional certification, licence or did you have to take an exam which is required to practice your occupation?"[51]

1. *Yes*
2. *No – but currently in process of obtaining one*
3. *No*

"Without this professional certification, licence or exam would you be legally allowed to practice your occupation?"[52]

1. *Yes*
2. *No*

A worker is classified as **licensed** if she answers (1) or (2) in the first question and (2) in the second. A worker is classified as **certified** if she answers (1) or (2) in the first question and (1) in the second, unregulated otherwise.

Table 3.1: Proportion of licensed and certified workers in the European Union.

	Proportion (%)	Std. Error
Licensed	22	0.48
Certified	21	0.46

Source: EU Survey of Regulated Occupations.

[51] In addition to specific training, interviewers received the following instructions: *"A professional certification or licence shows you are qualified to perform a specific job and may give you the right to enter a regulated profession or professional association. Only include certifications or licences obtained by the respondent as an individual. Examples include "licensed medical doctor" and "licensed taxi driver* […]".

[52] Instructions to the interviewer*: Refer to the respondent's specific occupation and personal circumstances. Refer to the current laws and regulations affecting the respondent's occupation (current main paid job).*

Using these classifications, we estimate that just under half (43%) of workers is either licensed or certified. In particular, 22% of EU workers are licensed and 21% are certified (Table 3.1).

To explore the basic demographic characteristics of regulated workers, we examine the proportion of licensed, certified and unregulated workers by gender, education, age, occupation, union and employment status (Table 3.2). With regards to educational endowments, we find no stark differences in the distribution of licensed, certified and unregulated workers across the various educational categories. We find no gender differences in the distribution of regulation, and only a slightly higher prevalence in the incidence of union membership amongst licensed workers compared to certified and unregulated.

Licensing is fairly prevalent in the public sector and amongst self-employed licensed workers. This is partly expected as many occupations with high information asymmetries and potential to cause harm to others (e.g. medical occupations, teachers etc.) are found in the public sector. Self-employment is usually correlated with the provision of personal services (e.g. plumbers, lawyers etc.), again areas where information asymmetries between consumer and producer are high, but interestingly neither licensing nor certification are any more prevalent than no regulation at all. Finally, licensing is more prevalent amongst professional groups, followed by technicians and associate professionals and services and sales groups. This is fairly similar to the trend we observe for certified and unregulated occupations.

Table 3.2. Characteristics of unregulated, certified, and licensed workers in the EU.

	Unregulated	Certified	Licensed	Total
Gender				
Male	0.53	0.57	0.55	0.54
Female	0.47	0.43	0.45	0.46
Total	1.00	1.00	1.00	1.00
Education				
Primary education	0.03	0.02	0.01	0.03
Lower secondary	0.12	0.19	0.16	0.14
Upper secondary	0.38	0.36	0.36	0.37
Post-secondary education	0.06	0.07	0.08	0.07
University	0.38	0.35	0.37	0.37
PHD/ adv. research	0.02	0.02	0.02	0.02
Total	1.00	1.00	1.00	1.00
Age				
15-24	0.10	0.07	0.07	0.08
25-39	0.37	0.35	0.32	0.35
40-54	0.38	0.40	0.42	0.40
55+	0.15	0.19	0.18	0.17
Total	1.00	1.00	1.00	1.00
Union status				
Non-Member	0.79	0.75	0.70	0.76
Member	0.21	0.25	0.30	0.24
Total	1.00	1.00	1.00	1.00
Employment status				
Employee in a private firm	0.60	0.54	0.39	0.54
Employee in public/non-profit sector	0.26	0.31	0.46	0.31
Self-employed with employees	0.04	0.04	0.05	0.04
Self-employed without employees	0.10	0.11	0.10	0.10
Total	1.00	1.00	1.00	1.00
Occupation				
Managers	0.12	0.10	0.06	0.10
Professionals	0.25	0.29	0.33	0.27
Technicians and associate professionals	0.14	0.17	0.19	0.16
Clerical support workers	0.12	0.07	0.06	0.10
Service and sales workers	0.14	0.14	0.14	0.14
Skilled agricultural, forestry and fishing	0.02	0.02	0.01	0.02
Craft and related trades workers	0.10	0.13	0.10	0.11
Plant and machine operators and machine workers	0.04	0.04	0.08	0.05
Elementary occupations	0.07	0.04	0.03	0.05
Armed forces occupations	0.00	0.00	0.01	0.01
Total	1.00	1.00	1.00	1.00

Finally, in Table 3.3, we note the active role that the national government or regulatory bodies play in granting licenses (39%), followed by the educational system (24%), while professional associations also seem to play a role (17%) but it is likely that this is complementary to the activities of regulatory bodies.

Table 3.3. Institutions granting occupational licenses in the EU.

	Proportion of Licensed Workers (%)
National governments or Regulatory Bodies	39
Regional governments or Regulatory Bodies	8
Local governments or Regulatory Bodies	5
Professional Associations	*17*
Schools or Universities	24
Other	9

Source: EU Survey of Regulated Occupations
Note: the table reports the proportion of licensed workers having obtained their license by each type of institution. More than one type of institutions may be involved in granting each license, hence the numbers do not sum to one hundred.

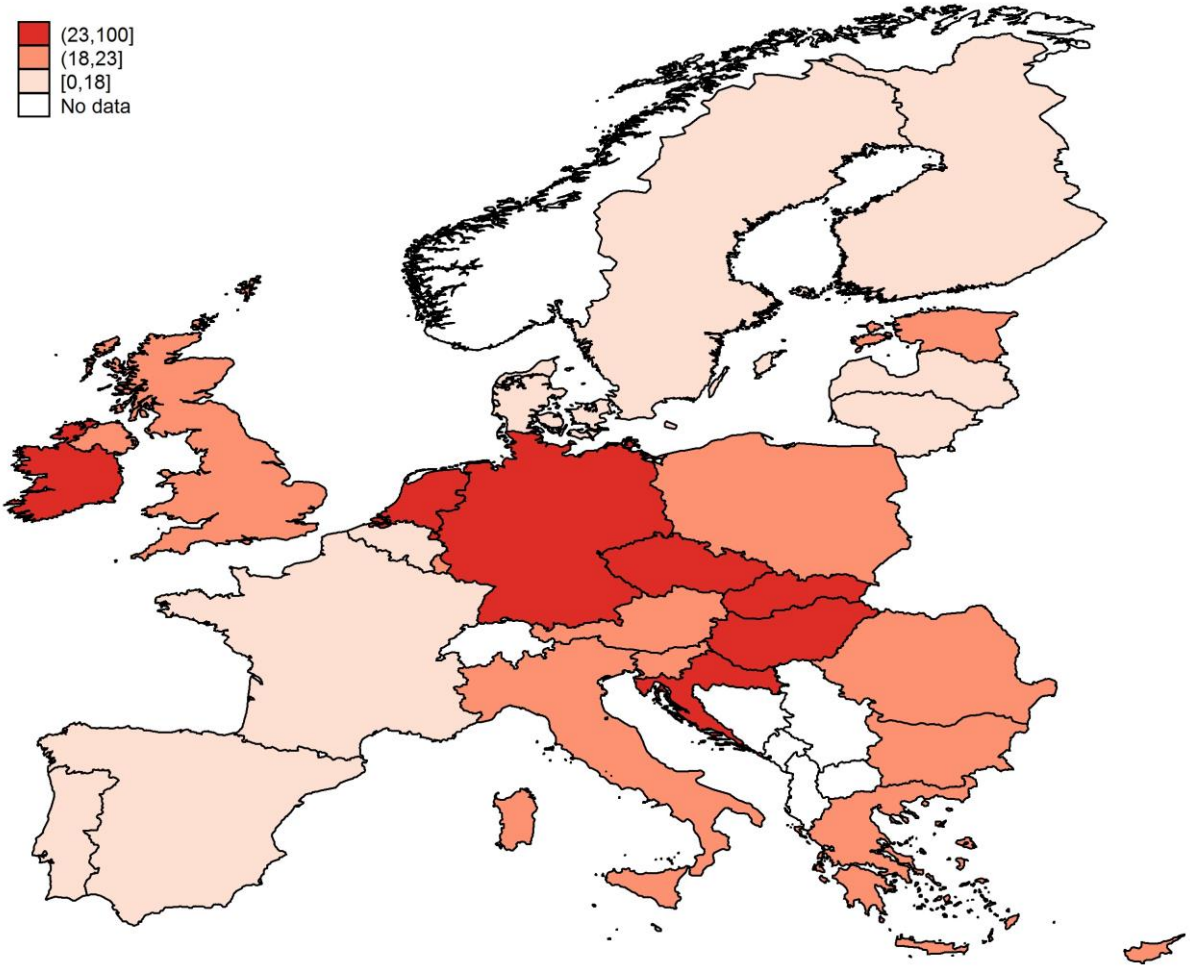
Our data further provides us with information about the distribution of licensed workers across different member states (Table 3.4). Overall, the proportion of licensed workers ranges between 14% and 33%. We find the largest proportion of licensed individuals in Germany (33%), Croatia (31%), and Ireland (29%), the smallest proportion in Sweden (15%), Latvia (15%), and Denmark (14%). Figure 3.1 show the geographical variability of the proportion of licensed workers. Licensing is most prevalent in many Central and Eastern European countries (Figure 3.1). There is no clear difference between North and South. Countries with high proportion of licensing seems to be located along a diagonal from North-West to South-East.

Table 3.4. Prevalence of Licensing by EU Member State (ranked).

Member State	*Proportion Licensed (%)*
Germany	33
Croatia	31
Ireland	29
Slovakia	27
Hungary	26
Czech Republic	25
Netherlands	25
Austria	22
Romania	22
Greece	22
Bulgaria	21
Luxemburg	21
Poland	21
Slovenia	20
United Kingdom	19
Italy	19
Estonia	19
Cyprus	19
Lithuania	18
Spain	17
Malta	17
Portugal	17
Belgium	17
Finland	17
France	17
Sweden	15
Latvia	15
Denmark	14

Source: EU Survey of Regulated Occupations

Figure 3.1. The proportion of licensed workers in the EU.



Turning to certification (Table 3.5), Germany tops the table, with Austria and the Netherlands following closely. Denmark, Sweden, France, Finland, Belgium, and Portugal all rank low in the prevalence of certification (but also licensing) amongst their workforces. Overall, the proportion of certified workers ranges between 9% and 36%, and although differences in the prevalence within countries are found, the actual coverage is not too dissimilar to that of licensing.

Table 3.5. Proportion of certified workers in EU member states (ranked)

Member State	*Proportion Certified (%)*
Germany	36
Romania	26
Lithuania	26
Austria	24
Bulgaria	24
Netherlands	24
Latvia	22
Poland	22
Hungary	22
Luxemburg	21
Ireland	21
Spain	21
United Kingdom	20
Slovakia	20
Malta	20
Estonia	18
Denmark	17
Slovenia	16
Czech Republic	16
Cyprus	15
Belgium	15
France	15
Sweden	14
Croatia	14
Portugal	12
Greece	12
Italy	12
Finland	9

Source: EU Survey of Regulated Occupations

Table 3.6 shows the distribution of licensed individuals within occupations (ISCO 1-digit classifications) in each EU Member State. This table (and the next) should be interpreted with care, as these estimates are based on substantially smaller samples than those in Table 3.1. We find the highest proportion of licensed individuals to belong to the 'Plant and Machine Operators' category[53]. Leaving out some notable outliers such as the UK (14%) and Italy (9%), the proportion has a fairly wide range (from 30% to 64%). Unsurprisingly, the lowest incidence of licensing in almost all Member States is amongst the 'Elementary

[53] Examples from this occupational category include 'Heavy Truck and Lorry Drivers', 'Car, Taxi and Van Drivers', 'Lifting Truck Operators'.

Occupations[54]', although some countries like Poland, the Czech Republic, Slovakia and Slovenia display somewhat higher than average incidence (25%, 18% and 15% respectively).

The remaining categories can be split into two groups. First, we find occupational groups that display fairly even incidence. A typical example here is that of 'Technical and Associated Professionals[55]' whereby with the exception of some outliers such as Denmark (45%) and Croatia (49%), the majority lie within the 20-28% range. On the other hand, we find large discrepancies as to the proportion of individuals affected by licensing in the case of 'Skilled Agricultural[56]' with no incidence at all (e.g. Spain) to incidence as high as 48% in the case of Cyprus. Overall, we observe considerably large variations with regards to which broad occupational groups are deemed by national authorities as necessary to be licensed.

We now turn to the prevalence of licensing by industry within Member States (Table 3.7).[57] We find that 'Health and Social Work' and 'Public Administration' display the highest levels of incidence of licensing with some consistency amongst Member States (possibly due to the high risk they pose to public welfare and information asymmetry considerations). The lowest incidence is found within 'Hotels and Restaurants' and 'Wholesale, Retail Trade and Repairs' and 'Cultural Activities', both with relatively compressed ranges. As before, a key feature of this analysis is the lack of overall consistency in the way in which licensing is adopted within different sectors in each Member State. For example, in the case of 'Cultural Activities' we find that incidence ranges from as low as zero (e.g. Cyprus) to as high as 38% in the case of Croatia. Although this could be partly due to the level of aggregation present in the data, it is certainly indicative of a lack of consistency in the application of licensing across the EU.

[54] Examples from this occupational category include: cleaners, labourers, refuse workers.
[55] Examples from this occupational category include: 'Civil Engineering Technicians', 'Agricultural Technicians', 'Air Traffic Controllers', 'Dispensing Opticians', 'Ambulance Workers'.
[56] Examples from this occupational category include: 'Poultry Producers', 'Gardeners, Horticultural and Nursery Workers', 'Forestry and Related Workers', Deep-sea Fishery Workers'.
[57] Industry is defined as the main activity *of the company or organization* in which the worker is employed according to the NACE codes. It does not refer to the specific tasks carried out by the worker within the firm or organization.

Table 3.6 Prevalence of Licensing by EU Member State and Occupation (ISCO 1-digit).

	Managers	Professionals	Technicians/ associated professionals	Clerical support	Service & sales	Skilled agricultural	Craft & Related trades	Plant & Machine operators	Elementary occupations	Total
BE	0.19	0.17	0.24	0.09	0.13	0.21	0.16	0.34	0.03	0.17
DK	0.12	0.15	0.20	0.07	0.10	0.11	0.12	0.42	0.05	0.14
DE	0.17	0.27	0.45	0.37	0.34	0.40	0.36	0.35	0.12	0.33
EL	0.18	0.29	0.28	0.15	0.14	0.02	0.21	0.45	0.10	0.22
ES	0.10	0.21	0.19	0.13	0.14	0.00	0.07	0.43	0.12	0.17
FI	0.12	0.13	0.17	0.04	0.20	0.06	0.11	0.49	0.14	0.17
FR	0.10	0.21	0.12	0.06	0.23	0.16	0.09	0.46	0.09	0.17
IE	0.17	0.40	0.27	0.07	0.27	0.12	0.35	0.51	0.05	0.29
IT	0.17	0.43	0.22	0.11	0.16	0.00	0.09	0.09	0.05	0.19
LU	0.16	0.31	0.25	0.19	0.18	0.00	0.14	0.27	0.02	0.21
NL	0.14	0.28	0.28	0.13	0.25	0.18	0.30	0.47	0.11	0.25
AT	0.18	0.30	0.20	0.18	0.21	0.10	0.23	0.30	0.10	0.22
PT	0.06	0.28	0.23	0.07	0.13	0.20	0.10	0.25	0.02	0.17
SE	0.08	0.19	0.15	0.07	0.04	0.08	0.14	0.44	0.09	0.15
UK	0.11	0.30	0.18	0.03	0.21	0.12	0.28	0.14	0.10	0.19
BG	0.19	0.26	0.19	0.10	0.22	0.05	0.20	0.39	0.00	0.21
CY	0.07	0.17	0.26	0.05	0.15	0.48	0.38	0.45	0.02	0.19
CZ	0.17	0.27	0.25	0.12	0.24	0.15	0.23	0.56	0.18	0.25
EE	0.09	0.17	0.22	0.13	0.18	0.15	0.14	0.64	0.11	0.19
HU	0.10	0.22	0.30	0.20	0.33	0.30	0.25	0.54	0.15	0.26
LV	0.07	0.18	0.15	0.14	0.15	0.39	0.12	0.24	0.11	0.15
LT	0.13	0.15	0.37	0.11	0.13	0.13	0.18	0.39	0.05	0.18
MT	0.19	0.18	0.21	0.03	0.26	0.00	0.06	0.21	0.11	0.17
PL	0.10	0.25	0.21	0.12	0.18	0.40	0.17	0.40	0.25	0.21
RO	0.08	0.22	0.31	0.19	0.20	0.00	0.20	0.42	0.11	0.22
SK	0.24	0.18	0.32	0.16	0.36	0.27	0.32	0.55	0.15	0.27
SI	0.12	0.24	0.19	0.16	0.15	0.13	0.20	0.30	0.15	0.20
HR	0.18	0.40	0.49	0.20	0.23	0.29	0.19	0.59	0.13	0.31
Total	**0.13**	**0.26**	**0.27**	**0.15**	**0.22**	**0.16**	**0.20**	**0.35**	**0.11**	**0.22**

Table 3.7 Prevalence of Licensing by EU Member State and Industry.

	Agriculture	Manufacturing of products	Construction or Energy	Wholesale or Retail Trade	Hotels And Restaurants	Transportation and Communication	Finance, Real Estate	Public Administration	Education	Health and Social Work	Professional services	Cultural activities (including sport)	Total
BE	0.08	0.06	0.19	0.05	0.10	0.33	0.28	0.20	0.21	0.17	0.20	0.05	0.17
DK	0.08	0.07	0.20	0.08	0.15	0.14	0.14	0.08	0.12	0.29	0.11	0.08	0.14
DE	0.31	0.23	0.26	0.20	0.14	0.27	0.48	0.60	0.33	0.51	0.29	0.27	0.33
EL	0.03	0.16	0.35	0.13	0.00	0.31	0.13	0.31	0.18	0.32	0.33	0.17	0.22
ES	0.09	0.06	0.10	0.03	0.09	0.24	0.15	0.47	0.26	0.24	0.17	0.12	0.17
FI	0.07	0.13	0.14	0.09	0.37	0.44	0.08	0.08	0.07	0.29	0.14	0.06	0.17
FR	0.12	0.04	0.06	0.05	0.06	0.40	0.16	0.26	0.30	0.24	0.10	0.11	0.17
IE	0.11	0.14	0.40	0.13	0.07	0.43	0.27	0.17	0.53	0.49	0.30	0.11	0.29
IT	0.08	0.03	0.14	0.05	0.19	0.13	0.17	0.36	0.36	0.42	0.22	0.18	0.19
LU	0.00	0.00	0.23	0.25	0.00	0.30	0.05	0.40	0.36	0.31	0.14	0.20	0.21
NL	0.32	0.15	0.32	0.13	0.00	0.34	0.39	0.22	0.30	0.41	0.17	0.18	0.25
AT	0.08	0.22	0.22	0.11	0.04	0.13	0.18	0.43	0.30	0.40	0.16	0.18	0.22
PT	0.10	0.03	0.18	0.08	0.00	0.36	0.34	0.27	0.24	0.20	0.24	0.04	0.17
SE	0.16	0.04	0.15	0.04	0.00	0.29	0.16	0.12	0.23	0.29	0.09	0.01	0.15
UK	0.09	0.02	0.25	0.11	0.03	0.09	0.19	0.16	0.29	0.35	0.22	0.10	0.19
BG	0.19	0.15	0.20	0.17	0.16	0.43	0.08	0.28	0.23	0.33	0.23	0.19	0.21
CY	0.41	0.04	0.29	0.11	0.04	0.29	0.18	0.20	0.09	0.46	0.28	0.00	0.19
CZ	0.30	0.19	0.24	0.10	0.12	0.41	0.37	0.34	0.21	0.45	0.22	0.22	0.25
EE	0.27	0.13	0.25	0.09	0.13	0.34	0.10	0.31	0.22	0.29	0.13	0.11	0.19
HU	0.24	0.21	0.28	0.18	0.12	0.38	0.22	0.41	0.17	0.40	0.32	0.14	0.26
LV	0.16	0.06	0.15	0.07	0.00	0.28	0.14	0.19	0.15	0.33	0.16	0.03	0.15
LT	0.17	0.17	0.19	0.19	0.04	0.19	0.06	0.22	0.12	0.46	0.10	0.14	0.18
MT	0.00	0.08	0.14	0.14	0.20	0.14	0.17	0.23	0.19	0.24	0.21	0.19	0.17
PL	0.06	0.20	0.29	0.11	0.23	0.44	0.21	0.37	0.17	0.37	0.13	0.15	0.21
RO	0.19	0.12	0.19	0.15	0.13	0.33	0.07	0.43	0.19	0.42	0.28	0.11	0.22
SK	0.22	0.19	0.37	0.16	0.09	0.36	0.28	0.39	0.17	0.37	0.23	0.29	0.27
SI	0.10	0.12	0.21	0.13	0.03	0.29	0.27	0.21	0.30	0.41	0.16	0.27	0.20
HR	0.35	0.15	0.29	0.04	0.14	0.37	0.13	0.54	0.37	0.63	0.35	0.38	0.31
Total	**0.14**	**0.13**	**0.21**	**0.11**	**0.10**	**0.27**	**0.24**	**0.35**	**0.27**	**0.37**	**0.21**	**0.15**	**0.22**

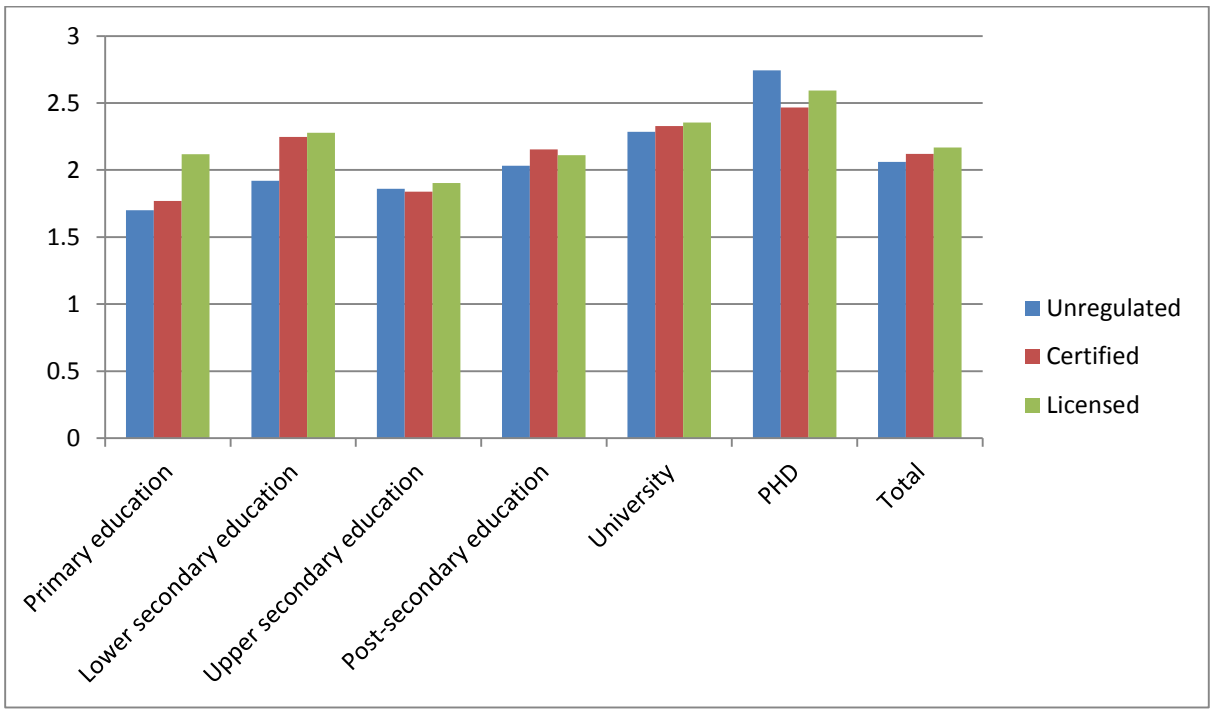
Note: Industry is defined as the main activity of the company or organization in which the worker is employed. It does not refer to the specific tasks carried out by the worker within the firm or organization.

3.5 Wage Effects of Occupational Regulation

Descriptive statistics

In the Survey of Regulated Occupations, workers are asked to report their net earnings from their main job. They are also asked how many hours they typically work in a week. Having this information, we can now compare the average hourly wage of licensed, certified and unregulated workers, possibly differentiating them on the basis of their educational attainment and other characteristics. Hourly wages account for differences in hours worked across individuals and provide a better measure than nominal (weekly or monthly) wages.

Figure 3.2. Log hourly wages in the EU (by education).

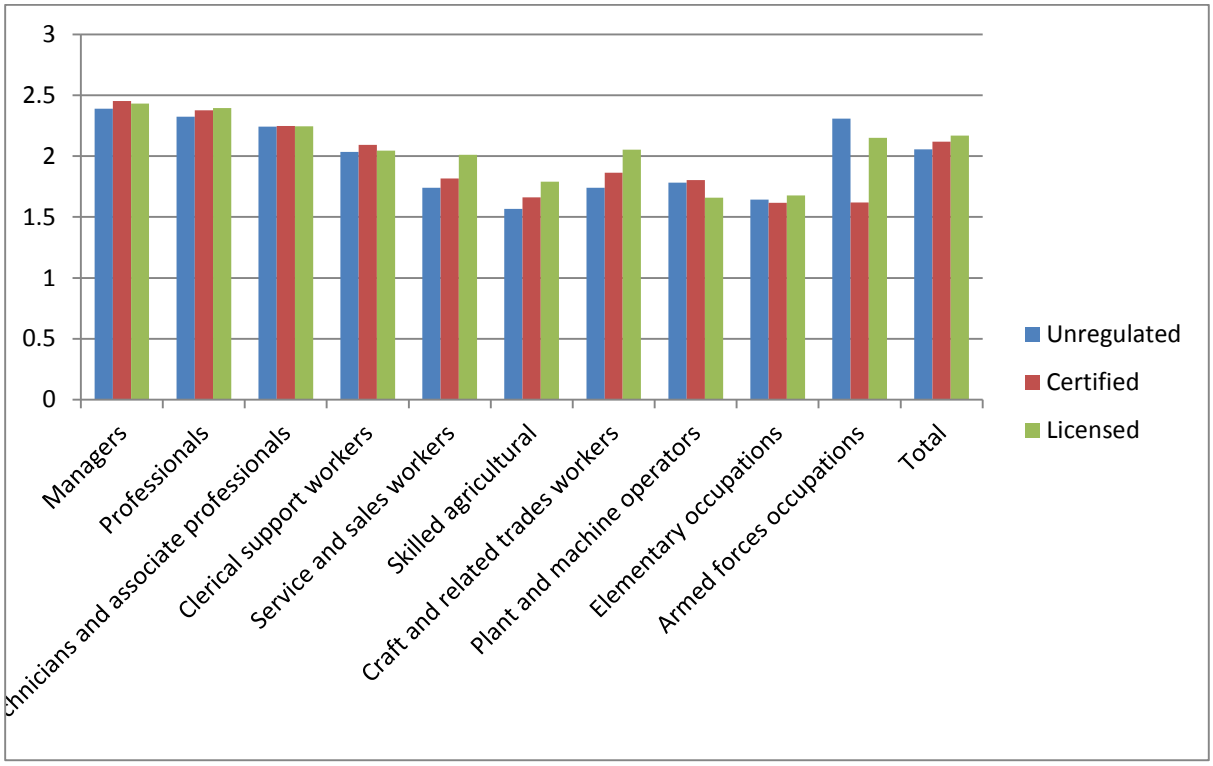


As Figure 3.2 shows, licensing is associated with higher hourly wages on average. This is true also for specific levels of education (with the exception of PhD holders), but the differences are more pronounced for those within the primary and lower secondary education. Wages are reported in logs, hence differences across groups in the histogram can be interpreted as

percentage differences (a difference of 0.01 in log wages corresponds to a 1 percent difference in wages).

Figure 3.3 applies the same analysis by occupational groups. Being licensed is associated with higher pay for 'Professionals', Service and sales', 'Skilled agricultural' and 'Craft and related trades workers' and 'elementary occupations' compared to those individuals who are certified or unregulated. For 'Machine and plant operators', licensing is associated with inferior average pay than certification or being unregulated.

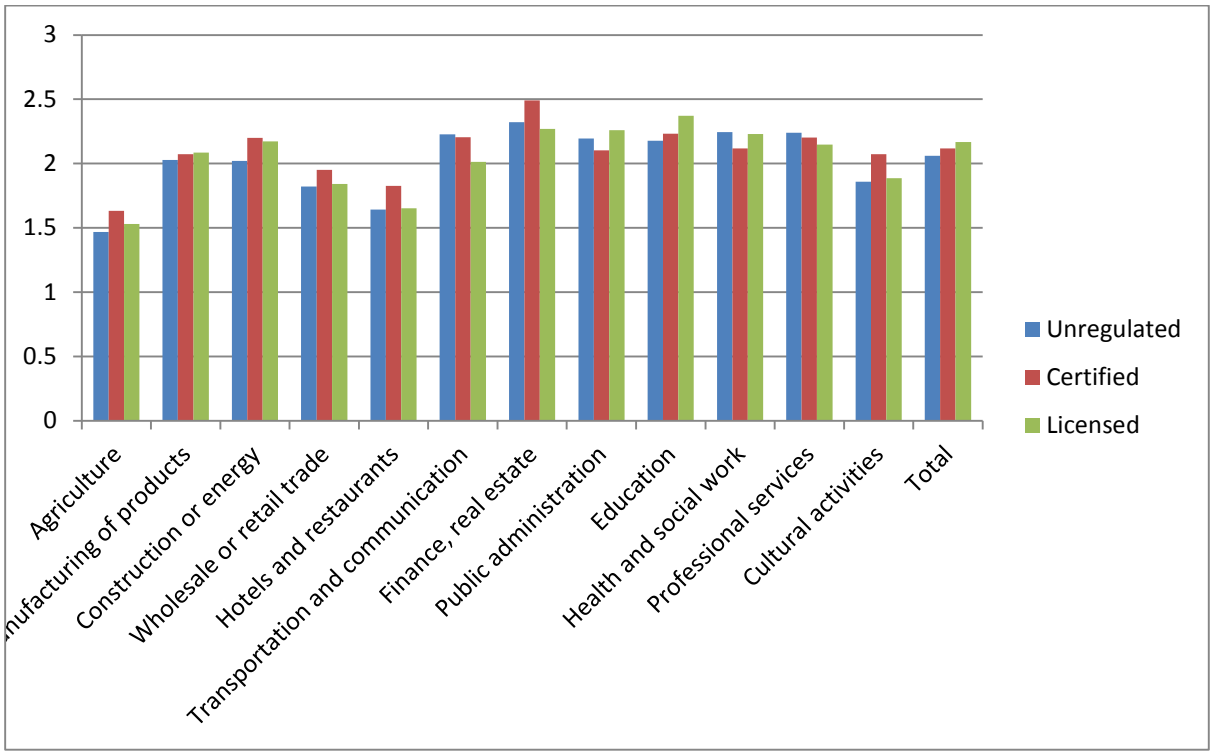
Figure 3.3 Log hourly wages in the EU (by occupation).



Finally, in Figure 3.4 we explore such differences by industry. Licensing is associated with higher wages in the case of public administration and education, but lower compared to certification and being unregulated in many instances such as transport and communication, and finance and real estate. In some industries such as cultural activities and agriculture, certification is associated with a higher average wage than licensing. Overall, Figure 2, 3 and 4 show that licensed workers, on average, enjoy higher wages than

certified or unregulated workers. Still, this ordering does not necessarily hold when looking at specific occupations or industries. Clearly, these differences are the result of differences in characteristics of workers *and* the possible effects of regulation. Disentangling these two effects requires a more sophisticated regression approach. We turn to this in the section that follows.

Figure 3.4 Log hourly wages in the EU (by industry).



Note: Industry is defined as the main activity of the company or organization in which the worker is employed. It does not refer to the specific tasks carried out by the worker within the firm or organization.

Effects of Occupational Regulation on Wage Determination

To examine whether licensing is associated with higher pay, we present estimates of log wage regressions in Table 3.7. The basic specification is described in equation (1). In addition to the standard human capital controls, industry and detailed occupational controls, as well as country fixed effects are included in the models. When no control variable is included (column 1), the coefficient of the "licensed" indicator variable captures the average difference in hourly net wages between licensed and unregulated workers (0.09 log points, about 9 percent).

The coefficient of this variable significantly drops as more controls are progressively included, suggesting that a large portion of the wage gap in column 1 is due to differences in educational endowments and other labour market characteristics, rather than licensing per se. As such, in our more elaborate specifications, we find that having a licence is associated with approximately 4 percent higher hourly wages. Such an effect is considerably lower than the licensing wage premium found in the US (Kleiner and Krueger 2013) and closer to the more recent US estimates of Gittleman and Kleiner (2016).

Table 3.7. Coefficients from log wage regressions.

	(1)	(2)	(3)	(4)	(5)	(6)
licensed	0.0911***	0.0506***	0.0433***	0.0388***	0.0335**	0.0378**
	(0.0223)	(0.0150)	(0.0147)	(0.0146)	(0.0148)	(0.0150)
union		0.0375**	0.00524	0.0150	0.0125	0.0123
		(0.0158)	(0.0157)	(0.0160)	(0.0156)	(0.0156)
male		0.174***	0.173***	0.164***	0.148***	0.149***
		(0.0128)	(0.0128)	(0.0135)	(0.0135)	(0.0138)
age		0.0104***	0.00669***	0.00641***	0.00632***	0.00639***
		(0.000680)	(0.000790)	(0.000761)	(0.000735)	(0.000725)
Lower secondary education (usually age 11-15)		0.141***	0.133***	0.0932**	0.0849*	0.0873**
		(0.0459)	(0.0464)	(0.0430)	(0.0435)	(0.0441)
Upper secondary education (usually age 16-19)		0.249***	0.234***	0.159***	0.151***	0.155***
		(0.0421)	(0.0427)	(0.0403)	(0.0407)	(0.0411)
Post-secondary		0.313***	0.297***	0.183***	0.174***	0.174***

education (not university)						
		(0.0487)	(0.0488)	(0.0468)	(0.0470)	(0.0478)
University (undergraduate and post-graduate)		0.578***	0.569***	0.379***	0.360***	0.356***
		(0.0426)	(0.0432)	(0.0423)	(0.0427)	(0.0430)
PHD/ advanced research qualification		0.799***	0.809***	0.583***	0.578***	0.571***
		(0.0535)	(0.0548)	(0.0542)	(0.0539)	(0.0540)
Experience			0.0180***	0.0151***	0.0145***	0.0140***
			(0.00239)	(0.00233)	(0.00231)	(0.00224)
Experience^2/1,000			-0.316***	-0.270***	-0.260***	-0.252***
			(0.0725)	(0.0709)	(0.0700)	(0.0680)
Employee in public sector or non-profit				-0.000590	0.0243	0.0235
				(0.0136)	(0.0187)	(0.0184)
Self-employed with employees				0.182***	0.194***	0.202***
				(0.0526)	(0.0527)	(0.0528)
Self-employed without employees				-0.0653*	-0.0463	-0.0434
				(0.0393)	(0.0385)	(0.0363)
Country f.e?		yes	yes	yes	yes	yes
Occupation controls?				yes	yes	
Industry controls?					yes	yes
Detailed occupation controls?						yes
	16,156	16,116	16,041	16,041	16,041	15,875
	0.002	0.668	0.675	0.699	0.705	0.710

Note: The dependent variable is the log of hourly wage. Omitted indicator variables: Primary education, Employee in private firm or business. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Our next models also consider certification, as a less restrictive policy alternative to licensing. Table 3.8 provides the results from the wage regressions. We use the same specifications as in Table 3.7 but add an indicator variable for certification status. Interestingly, as with licensing, we find that certification has a positive and significant effect on wages. This is consistent with certification being associated with higher skills and/or having some signalling value in the labour market. However, in general, certification is associated with a smaller premium than licensing.

As we progressively control for more observable characteristics of the workers, the wage premium for both licensing and certification decreases. In addition, the difference between the coefficient of "licensed" and "certified" is reduced when more controls are added. In column 6, this difference is about two percentage points (0.0309, *p<0.05* for certification and 0.0485, *p<0.01* for licensing). The difference between the coefficients of the "licensed" and "certified" dummies captures the impact of the legal requirement to hold a license, which is the crucial difference between certification and licensing. This is an important point. In fact, both licensing and certification provide a signal of the quality of the worker. However, licensing also restricts entry into specific labor markets to licensed workers and it is therefore associated with a higher wage.

Table 3.8. Coefficients from log wage regressions (licensing and certification).

	(1)	(2)	(3)	(4)	(5)	(6)
licensed	0.107***	0.0635***	0.0565***	0.0494***	0.0438***	0.0485***
	(0.0231)	(0.0155)	(0.0153)	(0.0153)	(0.0154)	(0.0155)
certified	0.0586**	0.0421**	0.0434**	0.0327**	0.0313**	0.0309**
	(0.0251)	(0.0172)	(0.0170)	(0.0162)	(0.0159)	(0.0157)
union		0.0359**	0.00347	0.0141	0.0116	0.0115
		(0.0158)	(0.0156)	(0.0160)	(0.0156)	(0.0155)
male		0.173***	0.172***	0.163***	0.147***	0.148***
		(0.0128)	(0.0129)	(0.0136)	(0.0135)	(0.0139)
age		0.0103***	0.00660***	0.00634***	0.00626***	0.00633***
		(0.000671)	(0.000781)	(0.000755)	(0.000729)	(0.000719)
Lower secondary education (usually age 11-15)		0.139***	0.131***	0.0915**	0.0834*	0.0861*
		(0.0459)	(0.0463)	(0.0429)	(0.0435)	(0.0440)
Upper secondary		0.248***	0.233***	0.159***	0.150***	0.155***

education (usually age 16-19)						
		(0.0422)	(0.0427)	(0.0403)	(0.0406)	(0.0411)
Post-secondary education (not university)		0.312***	0.296***	0.183***	0.175***	0.175***
		(0.0487)	(0.0487)	(0.0468)	(0.0470)	(0.0478)
University (undergraduate and post-graduate)		0.577***	0.568***	0.379***	0.361***	0.357***
		(0.0426)	(0.0432)	(0.0423)	(0.0427)	(0.0431)
PHD/ advanced research qualification		0.801***	0.812***	0.587***	0.582***	0.576***
		(0.0537)	(0.0550)	(0.0544)	(0.0540)	(0.0542)
Experience			0.0180***	0.0151***	0.0145***	0.0140***
			(0.00240)	(0.00233)	(0.00231)	(0.00225)
Experience2/1,000			-0.315***	-0.270***	-0.260***	-0.252***
			(0.0728)	(0.0711)	(0.0702)	(0.0682)
Employee in public sector or non-profit				-0.00247	0.0231	0.0224
				(0.0138)	(0.0188)	(0.0185)
Self-employed with employees				0.182***	0.194***	0.203***
				(0.0526)	(0.0527)	(0.0528)
Self-employed without employees				-0.0661*	-0.0467	-0.0436
				(0.0393)	(0.0385)	(0.0363)
Country f.e?		yes	yes	yes	yes	yes
Occupation controls?				yes	yes	
Industry controls?					yes	yes
Detailed occupation controls?						yes
Observations	16,156	16,116	16,041	16,041	16,041	15,875
R-squared	0.003	0.668	0.676	0.699	0.706	0.711

Note: The dependent variable is the log of hourly wage. Omitted indicator variables: Primary education, Employee in private firm or business. Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1.

In the analysis that follows (Table 3.9) we disaggregate the effects of licensing by occupation to explore differences in the wage premium across occupations. In practice, we add in equation (1) the interactions of "Licensed" and an indicator variable for each occupation. Overall, we find that licensing has a differential effect by occupation.

We report the results from three different specifications. The first (columns 1-3) corresponds to the model in Table 3.7, column 5, which includes controls for education, occupation, industry, work status, gender, union indicators, age, experience, and experience squared (the coefficients of the controls are not reported in Table 3.9). The second specification (columns 4-6) includes also the indicator variable for certification, while the third (columns 7-9) includes interactions of "certified" with an indicator variable for each occupation. This allows to simultaneously estimate the differential effect of licensing and certification by occupation.

In column 7, the coefficient of "licensed" is largest for professionals (6.3%), service and sales workers (8.6%), craft and related trades occupations (19.2%), and elementary occupations (10%). The difference between the coefficients of "licensed" and "certified" is very heterogeneous across occupations. This difference is particularly large and statistically significant for craft and related trades workers, elementary occupations, and service and sales workers.

The licensing wage premium is the percentage increase in wage associated with licensing in a given group of occupations. The premium is not per se related to the prevalence of licensing. For example, elementary occupations include sales assistants, bar tenders, waiters, and security guards. The prevalence of licensing in elementary occupations is relatively low (about 11 percent, Table 3.6) and wages are much lower than average (Figure 3.3). Still, the regression results show that the few licensed workers in these occupations have a significantly higher wage (in percentage terms) relative to unregulated workers in the same group.

Table 3.9. Coefficients from log wage regressions (licensing and certification) with interactions.

	(1) Coef.	(2) Std. Err.	(3) t	(4) Coef.	(5) Std. Err.	(6) t	(7) Coef.	(8) Std. Err.	(9) t
certified				0.033	0.016	2.05			
licensed x managers	-0.093	0.068	-1.38	-0.085	0.068	-1.25	-0.078	0.069	-1.13
licensed x professionals	0.047	0.026	1.82	0.057	0.026	2.22	0.063	0.026	2.39
licensed x Technicians and associate professionals	-0.012	0.032	-0.38	0.001	0.032	0.02	0.000	0.035	0
licensed x Clerical support workers	-0.009	0.065	-0.14	0.000	0.065	-0.01	0.001	0.065	0.01
licensed x Service and sales workers	0.078	0.030	2.59	0.090	0.031	2.93	0.086	0.032	2.67
licensed x Skilled agricultural	0.030	0.235	0.13	0.041	0.236	0.17	0.036	0.233	0.16
licensed x Craft and related trades workers	0.172	0.040	4.33	0.185	0.040	4.62	0.192	0.042	4.57
licensed x Plant and machine operators	-0.049	0.054	-0.92	-0.038	0.054	-0.71	-0.059	0.056	-1.06
licensed x Elementary occupations	0.120	0.081	1.49	0.126	0.081	1.57	0.099	0.082	1.2
licensed x Armed forces occupations	-0.085	0.130	-0.65	-0.081	0.130	-0.62	-0.081	0.137	-0.59
certified x managers							0.065	0.055	1.17
certified x professionals							0.050	0.035	1.42
certified x Technicians and associate professionals							0.032	0.035	0.93
certified x Clerical support workers							0.041	0.046	0.89
certified x Service and sales workers							0.025	0.045	0.55
certified x Skilled agricultural							0.020	0.210	0.1
certified x Craft and related trades workers							0.057	0.038	1.5
certified x Plant and machine operators							-0.033	0.043	-0.77
certified x Elementary occupations							-0.121	0.071	-1.7
certified x Armed forces occupations							0.035	0.133	0.26

Difference between licensing and certification:						
Managers	-0.117	0.069	-1.71	-0.143	0.079	-1.8
Professionals	0.024	0.028	0.86	0.012	0.038	0.32
Technicians and associate professionals	-0.032	0.033	-0.97	-0.033	0.037	-0.89
Clerical support workers	-0.033	0.067	-0.5	-0.040	0.076	-0.53
Service and sales workers	0.057	0.032	1.78	0.061	0.045	1.36
Skilled agricultural	0.008	0.237	0.03	0.016	0.301	0.05
Craft and related trades workers	0.152	0.041	3.7	0.135	0.046	2.92
Plant and machine operators	-0.071	0.055	-1.29	-0.026	0.060	-0.43
Elementary occupations	0.094	0.082	1.14	0.219	0.098	2.24
Armed forces occupations	-0.113	0.130	-0.87	-0.116	0.140	-0.83

Note: The dependent variable is the log of hourly wage. The coefficients of education, occupation, industry, work status, gender, union indicators, age, experience, and experience squared are not reported. Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 3.10. Means and regression coefficients from log wage regressions for licensed and non-licensed workers.

	(1)	(2)	(3)	(4)	(5)	(6)
	Licensed Means	Non-licensd Means	Licensed coeff.	s.e.	Non-licensd coeff.	s.e.
licensed	1	0				
union	0.314	0.236	-0.031	0.026	0.026	0.019
age	43.203	41.541	0.004	0.001	0.007	0.001
Experience	12.550	10.887	0.014	0.003	0.015	0.003
Experience^2/1,000	0.270	0.225	-0.158	0.082	-0.295	0.087
male	0.563	0.536	0.122	0.025	0.150	0.015
Education (primary education omitted):						
Lower secondary education (usually age 11-15)	0.152	0.139	-0.038	0.105	0.084	0.047
Upper secondary education (usually age 16-19)	0.354	0.366	0.002	0.099	0.163	0.043
Post-secondary education (not university)	0.075	0.064	0.003	0.118	0.197	0.049
University (undergraduate and post-graduate)	0.383	0.377	0.262	0.104	0.353	0.046
PHD/ advanced research qualification	0.023	0.022	0.452	0.119	0.581	0.060
Occupation (managers omitted):						
Professionals	0.316	0.258	0.070	0.063	-0.058	0.028
Technicians and associate professionals	0.186	0.144	-0.031	0.067	-0.140	0.030
Clerical support workers	0.063	0.108	-0.148	0.085	-0.234	0.030
Service and sales workers	0.148	0.141	-0.145	0.065	-0.338	0.031
Skilled agricultural	0.009	0.014	-0.351	0.222	-0.381	0.085
Craft and related trades workers	0.097	0.110	-0.029	0.074	-0.315	0.032
Plant and machine operators	0.084	0.046	-0.190	0.091	-0.274	0.033
Elementary occupations	0.026	0.062	-0.208	0.095	-0.426	0.041
Armed forces occupations	0.013	0.005	-0.072	0.122	-0.072	0.086
Industry (agriculture omitted):						
Manufacturing of products	0.077	0.147	0.165	0.082	0.277	0.061
Construction or energy	0.082	0.084	0.208	0.087	0.303	0.064
Wholesale or retail trade	0.051	0.137	0.069	0.089	0.193	0.062
Hotels and restaurants	0.015	0.036	-0.053	0.113	0.081	0.076
Transportation and communication	0.068	0.056	0.214	0.089	0.325	0.064
Finance, real estate	0.044	0.040	0.106	0.110	0.335	0.067

Public administration	0.150	0.076	0.161	0.084	0.196	0.062
Education	0.135	0.102	0.082	0.088	0.162	0.067
Health and social work	0.218	0.107	0.064	0.083	0.207	0.063
Professional services (e.g. legal)	0.123	0.141	0.078	0.085	0.269	0.062
Cultural activities (including sport)	0.019	0.042	-0.036	0.106	0.092	0.067
Work status (employee in private firm omitted):						
Employee in public sector or non-profit	0.502	0.298	0.019	0.036	0.029	0.022
Self-employed with employees	0.035	0.032	0.198	0.089	0.205	0.062
Self-employed without employees	0.083	0.081	0.002	0.061	-0.053	0.046
Number of obs (16,041)						

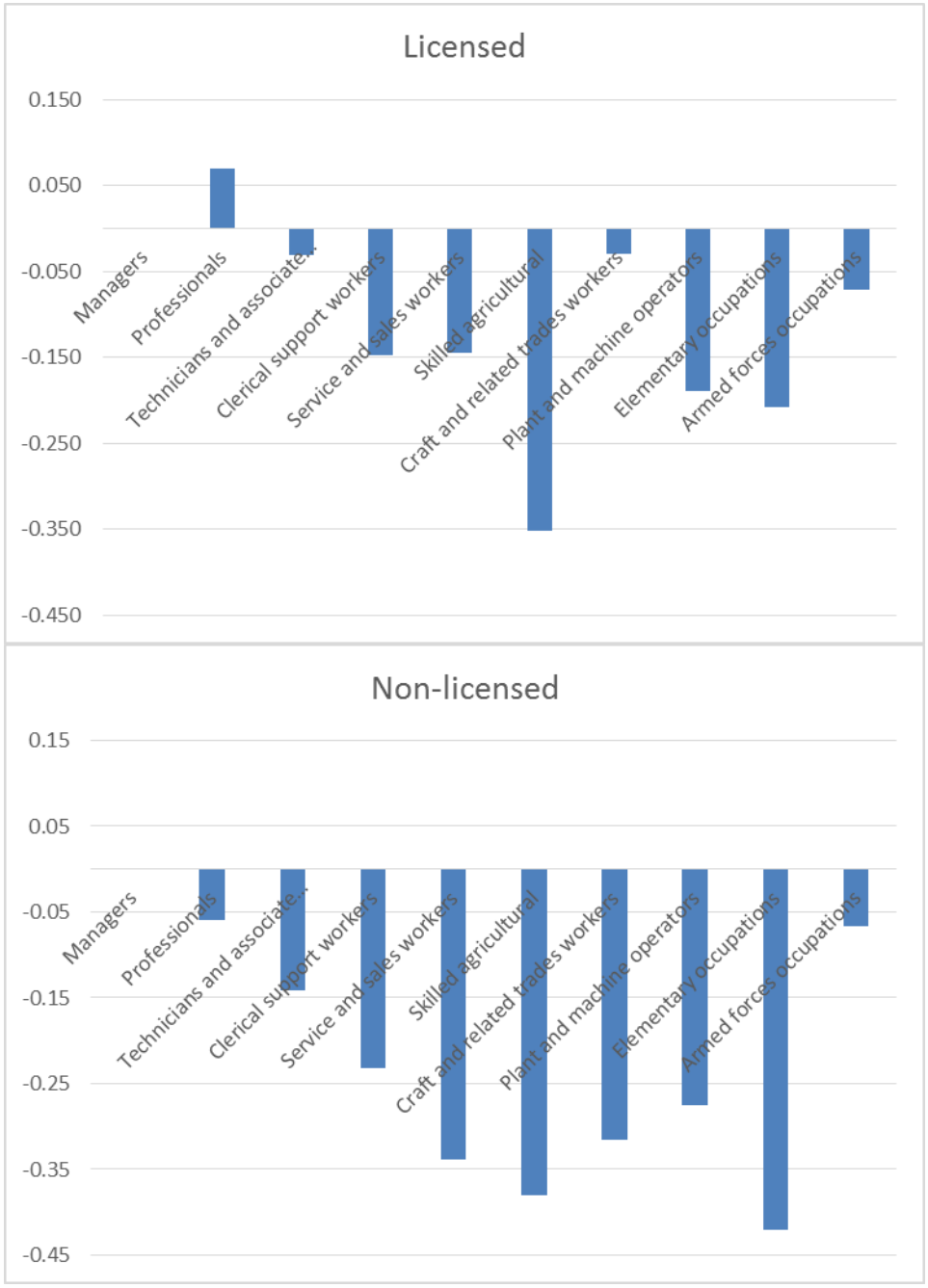
Note: The table reports the mean of the variables for licensed and non-licensed workers in columns 1 and 2. Columns 3 and 4 report the coefficients and standard errors of a wage regression for licensed workers. Columns 5 and 6 report the coefficients and standard errors of a wage regression for non-licensed workers. Country fixed effects are not reported.

The existence of significant heterogeneity in wage premiums across occupations suggests that the linear model (1) is appropriate for measuring the average wage gap and the average differences across occupations, but it may not capture some of the heterogeneous effects of licensing regulations. We then turn to the Oaxaca-Blinder decomposition, which does not constrain the effect of licensing to be constant for all workers (as in Table 8), or even for workers within the same occupation (as in Table 9).

The coefficients from the estimation of model (2) on the two groups are reported in Table 3.10, together with the mean values of each variable. Figure 3.5 plots the coefficients of the occupation dummies from the wage regressions in Table 3.10 (Column 3) to depict how licensing distorts the relative wage of different occupational groups. 'Managers' are the reference category, hence the value of the coefficient for this group is equal to zero by assumption. Figure 3.5 shows, for example, that licensed professionals earn on average 7 percent more than licensed managers, licensed craft workers 3 percent less, and licensed workers in elementary occupations 21 percent less.

Figure 3.5 shows a very different pattern of relative wages for non-licensed workers. Non-licensed professionals earn 6 percent *less* than non-licensed managers, non-licensed craft workers earn 31 percent less, and non-licensed workers in elementary occupations 42 percent less. The occupations with the largest differences between the two figures are 'Professionals', 'Craft and related trades', 'Service and sales workers' and 'Elementary occupations'. These differences are consistent with the idea that licensing confers a wage premium that is particularly large for some occupations.

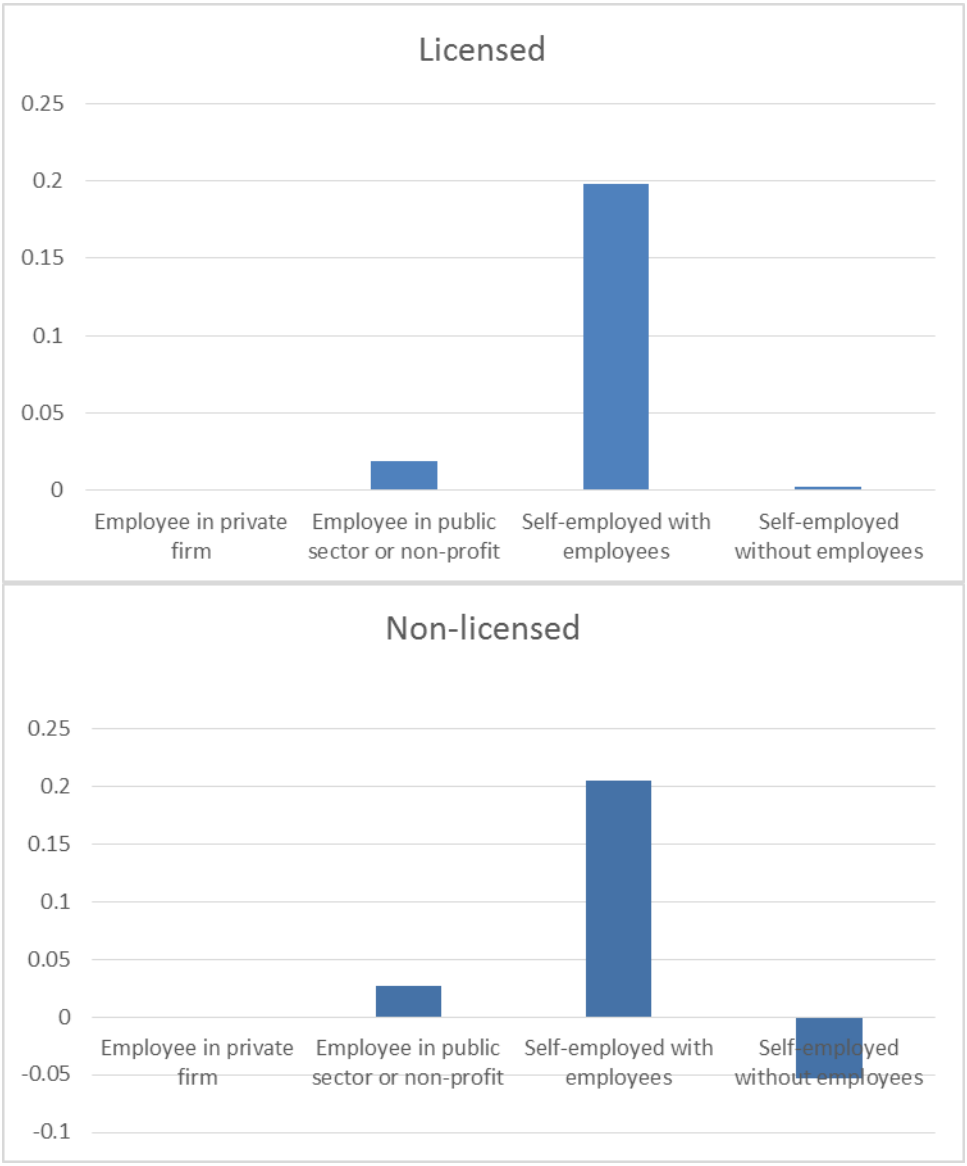
Figure 3.5. Coefficients of occupation dummies from wage regressions.



Notes: The omitted category in the wage regressions is "managers". The figure reports estimated coefficients from Table 3.10.

Figure 3.6 provides a similar comparison for the coefficients of the employment status indicator variables. Licensed self-employed workers (without employees) earn as much as licensed employees in the private sector. However, non-licensed self-employed workers earn 5 percent less than non-licensed employees. This is another instance of significant differences in the relative wages between licensed and non-licensed workers.

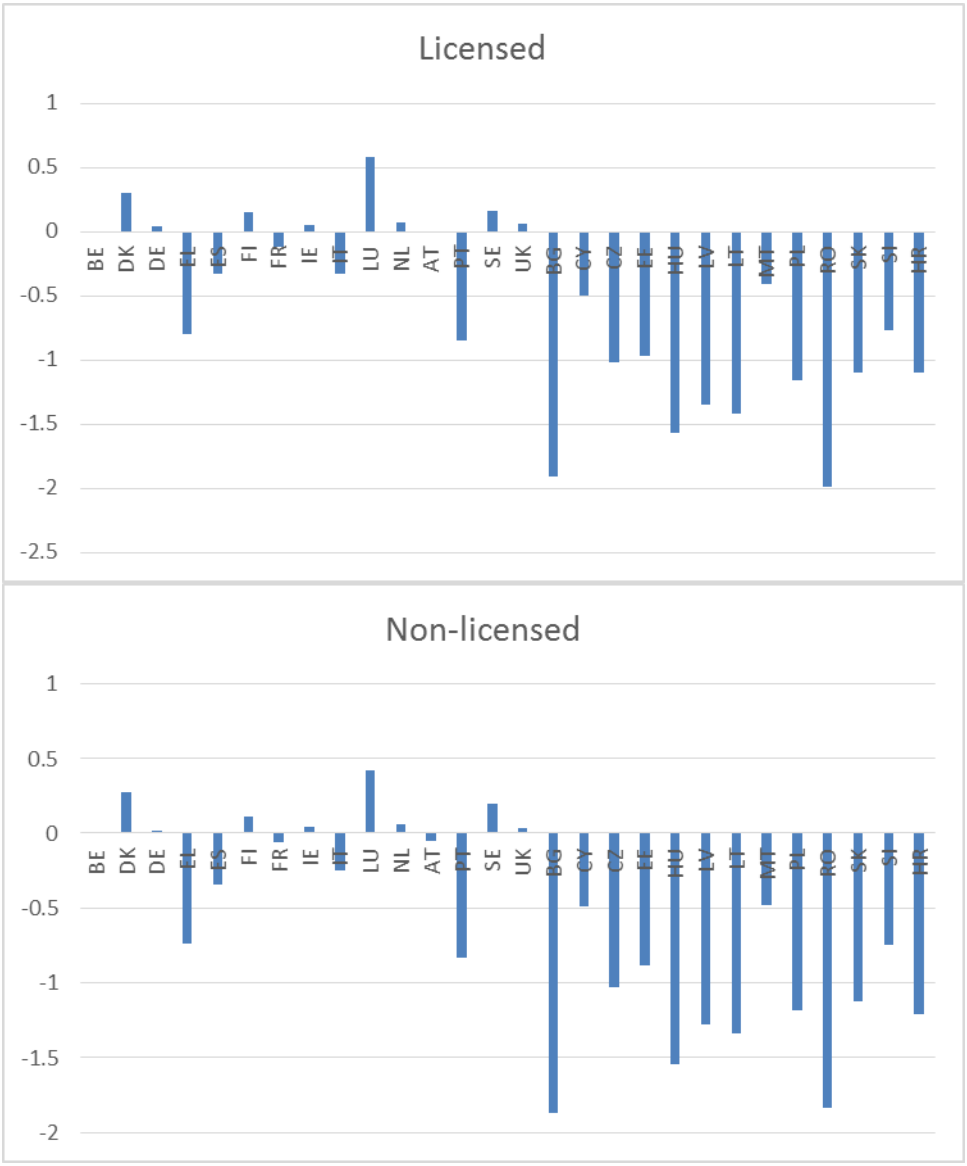
Figure 3.6. Coefficients of employment-status dummies from wage regressions.



Notes: The omitted category in the wage regressions is "employee in private firm". The figure reports estimated coefficients from Table 10.

Finally, we perform a similar comparison for the coefficients of country-specific indicator variables. Differences in nominal wages across EU member states are very large. Hence, differences between the estimated coefficients for licensed and unlicensed workers are very small in relative terms (Figure 3.7).

Figure 3.7. Coefficients of country dummies from wage regressions.



Notes: The omitted category in the wage regressions is "Belgium". The figure reports estimated coefficients from the specification described in Table 10.

Table 3.11 describes the results of the decomposition in equation (4) based on the estimated coefficients in Table 3.10. Table 3.11 shows that the overall difference in log wages between licensed and non-licensed workers is 0.089 log points (about 8.9 percent). The table then describes the how much of this 8.9 percent difference is due to characteristics of the workers (composition effects) and how much is due to differences in regression coefficients (wage structure effect). The wage structure effect can be interpreted as the "effect of licensing" on wages, or a generalized version of the "wage premium"

discussed in previous paragraphs. Columns 1-6 describe the decomposition results without controlling for the effect of certification, columns 7-12 account for this effect.[58]

The composition effect, due to differences in average characteristics, accounts for roughly two thirds of the overall difference. Differences in occupation, age, and work experience are important determinants of the composition effect. *The wage structure effect, due to differences in the estimated coefficients, accounts for about one third of the overall effect.* Differences in the coefficients of union membership, age, education dummies, occupation dummies, and industry dummies are the most important contributors to the wage structure effect. These results are in line with our previous results suggesting that the wage premium associated with licensing is very different across occupations. On average, occupational licensing is estimated to have a *3 percent (wage structure) effect*. This is statistically different from zero at conventional levels, accounting for individual characteristics, occupation, industry, and country fixed effects.

The estimated wage structure effect is also very significant from an economic point of view. The number of employed individuals (age 15-64) in the EU is about 214 million. Using our data, we know that about 47 million need a license do their job. Since our data provides information on the average wage of licensed workers (about €1,752 per month after tax), we estimate the wage premium associated with licensing to be about €37,000 million or 0.27 percent of the EU28 Gross Domestic Product.

[58] For each specification, we provide two different decompositions, which use the mean characteristics of licensed and unlicensed workers as reference. The results are very similar.

Table 3.11. Oaxaca-Blinder decomposition results.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Coef.	Std. Err.		Coef.	Std. Err.		Coef.	Std. Err.		Coef.	Std. Err.	
Predicted log wage licensed	**2.1667**	**0.0193**										
Predicted log wage non-licensed	**2.0778**	**0.0108**										
Difference	**0.0890**	**0.0221**	100.0%									
Composition effects attributable to												
Certified							**-0.0097**	**0.0043**		0.0000	(omitted)	
Union	0.0020	0.0015		-0.0024	0.0020		0.0019	0.0015		-0.0024	0.0020	
Age	**0.0114**	**0.0032**		**0.0067**	**0.0028**		**0.0113**	**0.0031**		**0.0067**	**0.0028**	
Work experience	**0.0113**	**0.0026**		**0.0160**	**0.0040**		**0.0113**	**0.0026**		**0.0160**	**0.0040**	
Gender	0.0040	0.0025		0.0033	0.0021		0.0040	0.0025		0.0033	0.0021	
Education	0.0034	0.0041		0.0011	0.0051		0.0034	0.0042		0.0011	0.0051	
Occupation	**0.0094**	**0.0048**		0.0102	0.0065		**0.0090**	**0.0048**		0.0102	0.0065	
Industry	0.0024	0.0056		0.0071	0.0087		0.0019	0.0056		0.0071	0.0087	
Work status	0.0065	0.0046		0.0045	0.0076		0.0061	0.0046		0.0045	0.0076	
Country	0.0047	0.0156		0.0105	0.0166		0.0034	0.0155		0.0105	0.0166	
Total	**0.0551**	**0.0181**	61.9%	**0.0569**	**0.0203**	64.0%	**0.0426**	**0.0188**	47.9%	**0.0569**	**0.0203**	64.0%
Wage structure effect attributable to												
Certified							0.0000	(omitted)		**-0.0097**	**0.0043**	
Union	**-0.0179**	**0.0100**		**-0.0135**	**0.0075**		**-0.0175**	**0.0100**		**-0.0132**	**0.0075**	
Age	**-0.1227**	**0.0678**		**-0.1179**	**0.0651**		**-0.1193**	**0.0676**		**-0.1147**	**0.0650**	

Work experience	0.0259	0.0280		0.0212	0.0251		0.0258	0.0280		0.0211	0.0251		
Gender	-0.0158	0.0168		-0.0151	0.0160		-0.0153	0.0168		-0.0145	0.0160		
Education	-0.1280	0.1077		-0.1257	0.1057		-0.1283	0.1076		-0.1260	0.1056		
Occupation	**0.1353**	**0.0621**		**0.1344**	**0.0590**		**0.1358**	**0.0621**		**0.1347**	**0.0589**		
Industry	-0.1154	0.0955		-0.1202	0.0935		-0.1168	0.0956		-0.1220	0.0935		
Work status	-0.0009	0.0236		0.0012	0.0155		0.0000	0.0237		0.0017	0.0155		
Country	-0.0092	0.0373		-0.0150	0.0360		-0.0047	0.0373		-0.0118	0.0360		
Constant	0.2826	0.1805		0.2826	0.1805		0.2865	0.1805		0.2865	0.1805		
Total	**0.0339**	**0.0153**	38.1%	**0.0320**	**0.0163**	36.0%	**0.0463**	**0.0161**	52.1%	**0.0320**	**0.0163**	36.0%	

Note: Columns 1-3 and 7-9 use non-licensed workers as reference group, columns 4-6 and 10-12 use licensed workers as reference group. The coefficients (corresponding to decompositions in columns 1-6) and mean values of the variables are reported in Table 3.10. Coefficients statistically different from zero at 10 percent confidence level are reported in bold.

Effects of Occupational Regulation on the Distribution of Wages

Finally, we investigate the effect of licensing on the entire wage distribution using the DiNardo, Fortin and Lemieux (1996) semiparametric decomposition method (DFL). Figure 8 shows the distribution of log hourly wages in the EU for licensed and non-licensed workers.

The difference between these two distributions can be decomposed into the composition effect and the wage structure effect. Figure 3.9 reports the distribution for licensed workers and the estimated counterfactual density that would be obtained if these workers had the same characteristics of non-licensed workers. The difference between the two distributions is the composition effect. Finally, Figure 3.10 reports the wage distribution of non-licensed workers and the same counterfactual density. The difference between these two distributions corresponds to the impact of licensing, holding constant the characteristics of workers. This is the generalization of the wage structure effect introduced in equation (4).

The results of the DFL decomposition can be used to compute statistics from the three distributions. Table 3.12 reports the standard deviation, the variance, and the distances between selected quantiles. Differences in these statistics provide estimates of the composition and wage structure effects. The wage structure effect of licensing implies a significant increase in wage inequality as measured by the standard deviation of log hourly wages (0.0246 log points). Also the distance between the 99^{th} and the 1^{st}, the 95^{th} and the 5^{th}, the 90^{th} and the 10^{th} percentiles are increased by licensing. Columns 6 and 7 show that the wage structure effect leads to an increase in the dispersion of wages in both tails of the distribution. Consistently with previous results on mean wages, we find that the median wage is increased by the wage structure effect (column 8).

Figure 3.8. Log wage distribution for licensed and non-licensed workers.

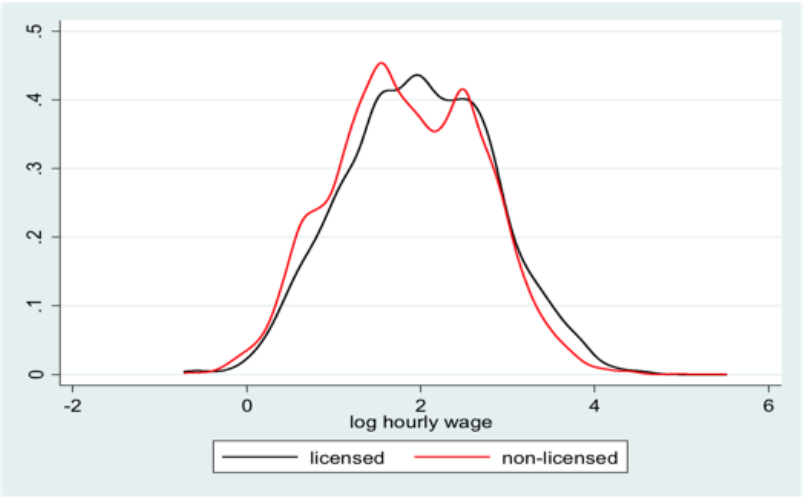


Figure 3.9. The composition effect on the log wage distribution.

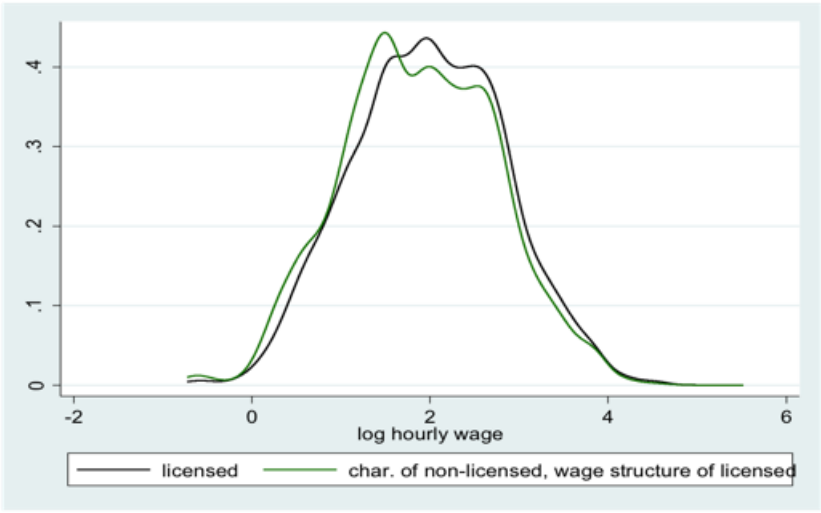


Figure 3.10. The wage structure effect on the log wage distribution.

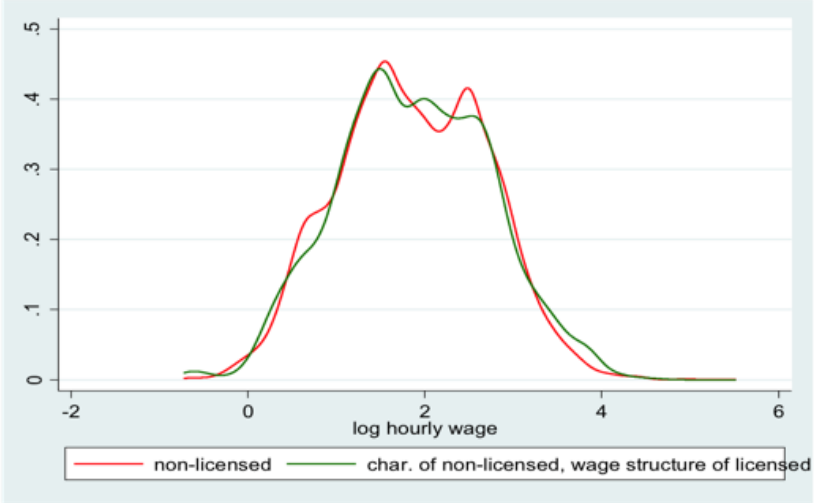


Table 3.12. Licensing and wage inequality: aggregate decomposition results.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	sd	var	p99-p1	p95-p5	p90-p10	p50-p5	p95-p50	Median
Licensed workers	0.8569	0.7343	3.7768	2.8273	2.2264	1.4093	1.4180	1.9841
Non-licensed workers	0.8451	0.7142	3.6706	2.7049	2.2114	1.3481	1.3568	1.8417
Counter factual	0.8698	0.7565	3.8243	2.8685	2.2476	1.4118	1.4568	1.8679
Total effect	0.0118	0.0201	0.1062	0.1224	0.0150	0.0612	0.0612	0.1424
Composition effect	-0.0128	-0.0221	-0.0475	-0.0412	-0.0212	-0.0025	-0.0387	0.1162
Wage structure effect	0.0246	0.0422	0.1537	0.1637	0.0362	0.0637	0.0999	0.0262

Note: DFL decomposition results. The explanatory variables include union, education, occupation, industry, work status, country indicators, age, experience, experience squared.

3.6 Conclusions: Prevalence and Wage Effects

This section examined the prevalence and labour market impact of occupational regulation in the EU using the recent European Survey on Regulated Occupations. We find that the prevalence of occupational licensing is about 22 percent of workers in the EU. However, there is significant variability across member states and occupations. Licensing ranges from 14 percent in Denmark to 33 percent in Germany, with higher prevalence in central Europe. Only 11 percent of workers in elementary occupations are licensed, 13 percent of managers, but 26 percent of professionals and 35 percent of plant and machine operators.

These estimates are based on a representative cross section of workers. They represent the proportion of licensed workers and *not* the proportion of licensed professions. Hence, these results cannot be directly compared with previous estimates based on counting the number of regulated professions. Since the importance of licensing is ultimately based on the number of workers affected by regulation, we argue that the new estimates are a more appropriate measure of the overall importance of occupational regulation.

Occupational licensing is associated with an aggregate wage premium of about 4 percent, after accounting for observable characteristics of the workers, country and occupation fixed effects. Its varies considerably by occupation: for some groups such as crafts it can be as high as 19.2% and it drops to 10% elementary occupations, 8.6 % for service and sales workers and 6.3% for professional groups. This is reflected in significant differences in wages across professional groups and shows that licensing may significantly distort relative wages in the labor market (Figure 3.5). From a policy making perspective, these results are clearly alarming and indicate that, at the very least, governments should consider carefully before wholeheartedly adopt licensing as a policy lever.

We also account for the possible effect of certifications that are not legally required to practice an occupation, but which may signal the existence of labor market skills that are not fully captured by conventional educational qualifications. Our estimates are in line with the most recent findings in the US in that certification is also associated with a wage premium, but not as high as that of licensing. In that sense, certification is perhaps a better policy alternative in that it improves the skills of practitioners, signals the existence of a

minimum standard to consumers while allowing them to choose whether they are willing to pay the premium associated with using a certified practitioner, without pricing low income groups out of the market.

Finally, we find that occupational licensing contributes to wage inequality in the European Union. In particular, we show that licensing benefits those at the top of the income distribution, as it increases the dispersion of wages at the top and the bottom (i.e. the very low and the very high earners). From this point of view, occupational licensing seems to be quite different from unionization, which has been shown to reduce wage dispersion. To the extent that pay inequality in the labour market is a concern for policy makers, then the adoption of licensing requires further consideration.

4. Employment Effects of Regulation

Chapter Summary

- Economic theory would predict that licensing is associated with lower employment levels. However, the magnitude of this effect is expected to be differential by occupation, depending on the stringency of the licensing requirements, the elasticity of demand for the occupation in question and any grandfathering rights granted to existing incumbents. We would also expect the negative effect on employment to be greater for occupations that have been licensed the longer.
- Research evidence from both the US and the EU confirm such assumptions. However, given the sensitivity of the employment effect to the aforementioned factors, some approaches are better than other at detecting this effect. In particular, the existing literature shows that before-after studies of specific occupations, as well as within-occupation comparisons, have been more powerful than cross sectional ones in capturing the negative employment effect of licensing.
- Using established methodologies we estimate that licensing is associated with a loss of about 700,000 jobs in the EU. Depending on the occupation, there could be between 3 and 9 % more people working in a given profession should access requirements be made less stringent.
- In our cross-sectional analysis, we explore the variation in stringency of licensing requirements at occupation and country level to detect any adverse effect on employment. We find no conclusive evidence of a relationship between licensing and employment using three different measures of employment against three different entry requirements (examinations, experience and education).
- Given the cross-sectional nature of the data and the absence of detailed information on the characteristics of each licensing regime (e.g. the stringency of the licensing regime, how long it has been operational, the elasticity of demand for the products and services provided), we cannot provide any exact estimates of the impact of

licensing on employment. Future research should seek to explore this theme by exploiting changes in the regulatory status of occupations from regulated to unregulated and vice versa.

a. Theoretical Background

The enactment of barriers to entry in occupations, usually but not exclusively associated with increases in skills requirements, is thought to lead to a reduction in employment levels, at least in the short term, as low quality workers who cannot meet the new minimum entry standards are not allowed to practice the now licensed occupation (Kleiner 2006)[59]. Employment levels can also decline when consumers reduce their consumption as they are priced out of licensed products and services due to higher prices associated with such licensure. Therefore, licensing may restrict employment opportunities and contribute to unemployment.

The magnitude of this negative effect on employment is likely to depend on various characteristics of the licensing regime and the licensed occupation. First, the stringency of the entry barrier, in that the higher entry standards make entry more costly for workers without the necessary requirements. The effect of the introduction of licensing (or the increase in entry standards) is likely to be larger in the short run, when workers cannot easily adjust their skills. In the long run, workers can more realistically adjust their skills and investments in human capital leading to smaller employment effects.

Second, the elasticity of demand for the services provided by licensed workers plays an important role in determining the employment effect. If labour demand is very elastic, the wage premium generated by licensing through higher entry standards will lead to larger employment losses in the occupation. Finally, if grandfathering rights are granted to incumbents, meaning that current practitioners are exempt from the new requirements, we would expect the employment effect to be of lower magnitude.

[59] Kleiner, M. (2006) Licensing Occupations: Ensuring Quality or Restricting Competition? Michigan: W.E. Upjohn Institute.

4.2 Empirical Evidence

Existing evidence broadly confirms the hypothesized negative effect on employment. Carroll and Gaston's (1981[60]) study of various occupational groups in the US (electricians, dentists, plumbers, real estate agents, optometrists, sanitarians and veterinarians) finds that licensing lowers the total stock of practitioners. Using US Census data, Kleiner (2006[61]) finds a 20 per cent faster growth rate in employment in states in which librarians, respiratory therapists, dieticians and nutritionists are not licensed. He also finds a faster employment growth for dental hygienists when they are not subject to licensing requirements allowing them to work only under the supervision of dentists (Kleiner 2013[62]).

These results are also partly supported by studies of deregulation. Using data from Greece, Athanassiou *et al.* (2014[63]), compare the evolution in total employment between a group of deregulated occupations and a group of non-regulated professions. They conclude that the effects of deregulation on employment appear to be positive in the medical and finance professions, and for car, van, and motorcycle drivers. The effects are also positive, but significantly delayed, for the legal professions, while they are ambiguous for travel attendants, conductors and guides, and negative for business and administration associate professions.

Similarly, Humphris and Koumenta (2015[64]) pick up a strong negative employment effect when nursery workers became subject to licensing in the UK, but no effect on employment was detected in the case of security guards. According to the authors, while for nursery workers the skill requirements were substantial and made a difference in both employment

[60] Carroll, S. L., & Gaston, R. J. (1981). Occupational restrictions and the quality of service received: some evidence. *Southern economic journal*, 959-976.
[61] Ibid.
[62] Kleiner, M. M. (2013). *Stages of Occupational Regulation: Analysis of Case Studies*. WE Upjohn Institute.
[63] Athanassiou, E., Kanellopoulos, N., Karagiannis, R. and Kotsi, A. (2014) The Effects of Liberalization of Professional Requirements in Greece, available at: http://ec.europa.eu/growth/tools-databases/newsroom/cf/itemdetail.cfm?item_id=8525&lang=en
[64] Humphris, A., and Koumenta, M. (2015) The Effects of Occupational Licensing on Employment, Skills and Quality: A Case Study of Two Occupations in the UK, available at: http://ec.europa.eu/growth/tools-databases/newsroom/cf/itemdetail.cfm?item_id=8525&lang=en

and skill levels of practitioners, in the case of security guards the skill requirements were too low to be a binding constraint and thus have an effect on employment. Finally, other studies find licensing having a modest or no effect on employment levels (e.g. Kleiner (2013) on interior designers; White (1980[65]) on nurses; Thornton and Weintraub (1979[66]) on barbers).

These results are not entirely unexpected given the sensitivity of the employment effect to the various factors discussed earlier. Overall, the existing literature shows that before-after studies of specific occupations, as well as within-occupation comparisons, have been more powerful than cross sectional ones in capturing the negative employment effect of licensing. This is because cross-sectional studies (like the one undertaken here) using data in one point of time cannot take advantage of *specific* changes in regulation that take place in *specific* industries and compare employment or employment growth before and after the reform. In the literature, large cross sectional data sets have proved to be very useful in estimating the prevalence and wage effect of licensing, but they have typically not provided conclusive results for employment effects.

With these caveats in mind, we embark in our analysis with great caution as to whether we will be able to detect the employment effect of licensing in our current sample. However, what we can more confidently do is provide some indication of the number of jobs likely to be lost because of licensing based on our estimates of the wage premium and some estimates of the elasticity of labour demand from the literature. The methodological approaches are explored in the section that follows.

4.3 Methodology

In the academic literature, we find the following themes and methodological approaches in the study of employment effects of licensing. Using estimates of the wage premium and labour demand elasticities researchers provide estimates of the potential number of jobs lost to licensing, thus providing an 'overall' picture of the macroeconomic costs of licensing

[65] White, W. D. (1980). Mandatory licensure of registered nurses: Introduction and impact. *Occupational licensure and regulation*, 47-72.
[66] Thornton, R. J., & Weintraub, A. R. (1979). Licensing in the barbering profession. *Industrial and Labor Relations Review*, 242-249.

(e.g. Kleiner and Todd 2009[67]; Kleiner 2015[68]). A second theme is to look at effects at the occupation-level. Here, we primarily find comparisons of occupations that switch from regulated to unregulated (and vice versa) over time, using difference-in-difference methodologies and including standard labour market and industry controls (e.g. Kleiner 2006; Forth *et al*. 2011[69]).

Another common approach is to explore state variation in licensing for specific professions. This generally requires focusing on specific professions and enables researchers to compare occupations that are licensed in some states but not in others, using controls for state characteristics, and estimate differences in the number of professionals in the occupations in question (e.g. Carroll and Gaston 1981[70]; Thornton and Weintraub 1979[71]). These studies further explore state variations in the stringency of licensing requirements, thus shedding some light on the magnitude of the employment effect depending on the height of the entry barriers.

In our analysis, we draw on these approaches. We first estimate the potential number of jobs lost to licensing, followed by estimates of the effect of licensing on employment. With regards to the latter, we estimate a model similar to that of Thornton and Weintraub (1979[72]). We construct a model in an attempt to capture the effect that licensing requirements in different member states have on the number of workers. We take a model that assumes that a demand equation for licensed services in each member state exists, where the demand for licensed workers $N_d$is a linear function of the average wage (W_d), which is as a measure of the price of the services they provide.

Supply of practitioners (N_s) on the other hand is a function of the vector of several licensing restrictions (R_{kic}), such as having to take an exam, minimum years of formal education

[67] Kleiner, M and Todd, R. (2009) Mortgage Broker Regulations That Matter: Analyzing Earnings, Employment and Outcomes for Consumers, Labor Market Intermediation edited by David Autor, MIT, University of Chicago Press.
[68] Kleiner, M. (2015) Reforming Occupational Licensing Policies, Discussion Paper 1, The Hamilton Project.
[69] Forth, J., Bryson, A., Humphris, A., Kleiner, M. and Koumenta, M. (2011) A Review of Occupational Regulation and its Impact, UK Commission for Employment and Skills, London
[70] Ibid.
[71] Ibid.
[72] Thornton, R. J., & Weintraub, A. R. (1979). Licensing in the barbering profession. *Industrial and Labor Relations Review*, 242-249.

necessary, and work experience requirements. Supply also depends on the average wage (W_s). If the labour market for licensed workers are assumed to be in equilibrium with $N_d = N_s \; and \; W_d = W_s$, we can then derive an equation describing the equilibrium number of workers in the market as a function of the licensing restrictions.

Empirically, we can then estimate models of the general form

$$N_{jic} = \beta_0 + \sum_{k=1}^{3} \beta_k \bar{R}_{kic} + \tau_i + \varepsilon_{ic} \qquad (1)$$

where N_{jic} denotes one of three alternative measures of employment, j=1,2,3 in occupation *i* and country *c*. These measures are:

1) *j*=1, number of workers in occupation *i* and country *c* / total number of workers in country *c,*
2) *j*=2, number of licensed workers in occupation *i* and country *c* / total number of workers in country *c,*
3) *j*=3, number of licensed workers in occupation *i* and country *c* / total number of workers in occupation *i* and country *c*

R_{kic} denotes one of three licensing requirements, *k*=1,2,3. These are measured as average licensing requirements for licensed workers in occupation *i* and country *c*. The licensing requirements are:

1) *k*=1 examination requirement (binary variable),
2) *k*=2 educational requirement (measured in years),
3) *k*=3 experience requirement (measured in years).

Finally, τ_i denotes occupation-specific fixed effects. This regression approach exploits differences in regulation requirements for a given profession across member states. If licensing has a negative effect on employment, the higher the stringency of entry requirements, the stronger the effect.

4.4 Employment Effects of Occupational Regulation

Number of jobs lost to licensing

We begin by calculating the number of forgone jobs due to the presence of licensing. The starting point of this approach is that since licensing is associated with a wage premium, it is more costly to hire licensed labour. As a result, the consumption of products and services that licensed practitioners provide are likely to be lower than what it would be the case if licensing was not present. This is because the price of labour is the key determinant of demand for labour. For example, low and medium income consumers will either cut or reduce consumption, and companies are likely to hire less labour, if its price is higher due to licensing. This enables us to calculate what employment would look like if licensing was not making the cost of workers more expensive. Such an approach is common in occupational licensing research (for recent examples see Kleiner 2015 [73] and Humphris *et al.* 2011[74]).

In order to examine the cost of licensing on employment we consider a conservative 3 percent wage premium and further assume that labour supply is perfectly elastic, and the elasticity of labour demand is 0.5 (Hamermesh 1993[75]). This figure for the elasticity of labour demand is based on empirical evidence and is regarded as a realistic value for different markets. It has also been used in a number of previous studies, which contributes to the comparability of the results. Obviously, if more precise estimates (possibly occupation-specific or even occupation-country-specific) were available, these could be used to improve the results. Still, this figure can be used to obtain an estimate of the magnitude of the overall effect.

Currently, there are 214 million employed people in the EU28 (aged 15-64) of which, according to our calculations based on the Survey of Regulated Occupations, 22 percent are licensed. We therefore have approximately a total of 47 million licensed workers in the EU.

[73] Kleiner, M. (2015) Reforming Occupational Licensing Policies, The Hamilton Project , available at: http://www.brookings.edu/research/papers/2015/01/28-reforming-occupational-licensing-policies-kleiner

[74] Humphris, A., Kleiner, M.,and Koumenta, M. (2011). *How Does Government Regulate Occupations in the United Kingdom and the United States? Issues and Policy Implications* (pp. 87-101). New York: Oxford University Press.

[75] Hammermesh, D. (1993) Labor Demand, Princeton, NJ: Princeton University Press.

The calculation is that 47 million licensed workers multiplied by the 0.03 wage premium multiplied by the elasticity of 0.5 results in a loss of about 705,000 jobs.

Using this approach, we can extend our estimates to the occupational groups for which a large wage premium was previously shown. Using the same elasticity of 0.5, in the case of 'Professionals', with a 0.06 wage premium, we would expect licensing to have a 3 per cent impact on employment; for 'Service and Sales Workers' whose wage premium is 0.08 we would expect a 4 per cent impact on employment, while in the case of 'Craft and Related Trades Workers', whose premium is higher at 0.19, the employment effect could be as high as 9.5 per cent.

In other words, depending on the profession, there could be between 3 and 9 % more people working in a given profession should access requirements be made less stringent. While these estimates are clearly based on strong assumptions, they do provide an idea of the magnitude of the possible employment effects and their variability across professions.

Employment Effects of Licensing

We begin by computing N_{ic} and $\bar{R}_{kic}$ for ISCO one- digit occupations. We then plot N_{ic} and $\bar{R}_{kic}$ separately for each different type of entry barrier (k) available in our dataset. If there is a relationship between licensing and employment, we would expect to see the stringency of entry requirements to be negatively associated with employment within licensed occupations. However, the relatively low number of observations limits the extent to which one can test this hypothesis.

Figure 4.1 shows the mean employment (j=1) and prevalence of examination requirement by occupation and country. Each dot represents one occupation (ISCO codes 1 through 9) in one country (EU28 member states excluding Luxembourg, Malta, and Cyprus). We use the first definition of employment, j=1, which is total employment in occupation *i* and country *c* divided by the total employment in country *c*. The examination requirement is measured by the proportion of licensed workers who were required to take an exam to obtain their license. This is a measure of the stringency of requirements to become a licensed worker in

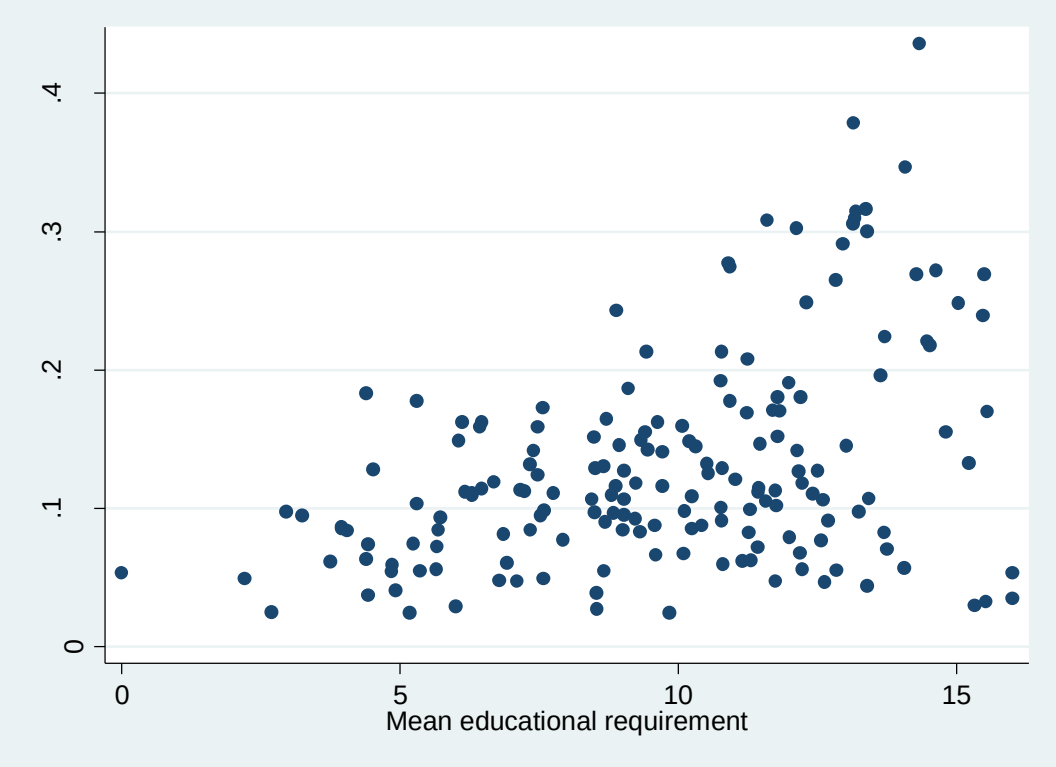
occupation *i.* As the figure shows, there is no correlation between the prevalence of an examination requirement for entry to a licensed occupation and employment.

Figure 4.1 Mean employment (j=1) and prevalence of examination requirement by occupation and country.

Note: Each dot represents one occupation (ISCO codes 1 through 9) in one country (EU28 member states excluding Luxembourg, Malta, and Cyprus). Employment is defined as j=1, number of workers in occupation i and country c / number of workers in country c. The examination requirement is measured by the proportion of licensed workers who were required to take an exam to obtain their license.

Figure 4.2 shows the scatter plot of the same measure of employment and our second entry requirement, which is measured by the average number of years of education required for workers to become licensed in occupation *i* and country c. Similar results are obtained here. We find no correlation between the years of education required to become licensed and employment within the occupations in question.

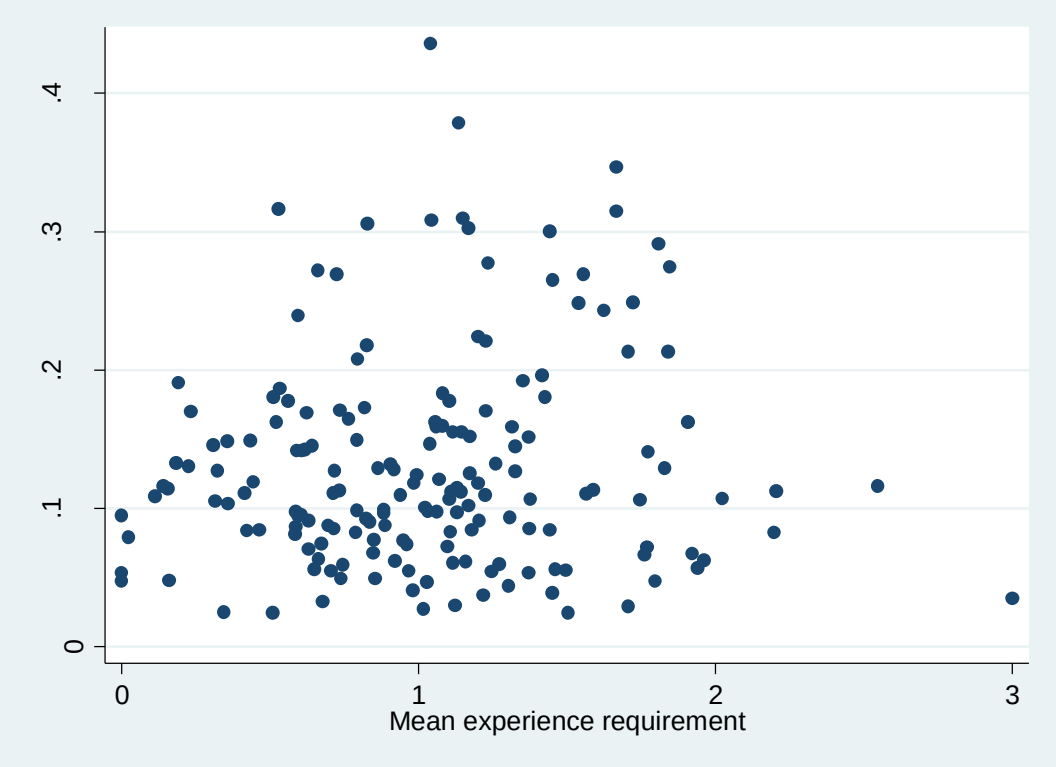
Figure 4.2 Mean employment (j=1) and mean educational requirement by occupation and country.



Note: Each dot represents one occupation (ISCO codes 1 through 9) in one country (EU28 member states excluding Luxembourg, Malta, and Cyprus). Employment is defined as j=1 number of workers in occupation i and country c / number of workers in country c. The educational requirement is measured by the average number of years of education required to licensed workers in occupation i and country c.

We replicate our estimates in Figure 4.3, which shows a similar scatter plot for the third measure of entry restrictions, namely the experience requirement, measured by the average number of years of experience required to obtain a license in occupation i and country c. As before, we find no relationship between this measure of stringency and employment in licensed occupations.

Figure 4.3 Mean employment (j=1) and mean experience requirement by occupation and country.



Note: Each dot represents one occupation (ISCO codes 1 through 9) in one country (EU28 member states excluding Luxembourg, Malta, and Cyprus). Employment is defined as j=1 number of workers in occupation i and country c / number of workers in country c. The experience requirement is measured by the average number of years of experience required to obtain a license in occupation i and country c.

Overall, the three figures show a large dispersion in the occupation-country data and no clear correlation between entry requirements and employment in the occupation.

We proceed with our regression results and estimate model (1) above using Ordinary Least Squares. The objective is to explore the existence of a systematic correlation between entry requirements and employment that accounts for the joint effects of the three entry restriction measures. Table 4.1 reports the estimation results. As it can be seen from the table, there is no systematic correlation between employment and entry requirements. Even controlling for occupation specific fixed effects in column 4, the estimated coefficient for the entry requirements are small and very imprecisely estimated.

Table 4.1 The impact of entry requirements on employment, j=1.

	N_{1ic}	N_{1ic}	N_{1ic}	N_{1ic}
Experience requirement	0.014			-0.001
	(0.011)			(0.007)
Examination requirement		-0.086		-0.005
		(0.059)		(0.032)
Education requirement			0.010	-0.001
			(0.002)	(0.001)
Occupation fixed effects?	No	No	No	Yes
				(0.013)
R2	0.01	0.02	0.17	0.71
N	175	175	175	175

Note: Note: Each observation represents one occupation (ISCO codes 1 through 9) in one country (EU28 member states excluding Luxembourg, Malta, and Cyprus). Employment is defined as j=1, number of workers in occupation i and country c / number of workers in country c.

Table 4.2 reports the estimation results for the second definition of employment, number of licensed workers in occupation i and country c / total workers in country c. Again, there is no systematic relationship. If anything, there seems to be a small positive relationship between two of the entry requirements, namely experience and examinations, and employment. But the relationship between this measure of employment and requirements is very noisy.

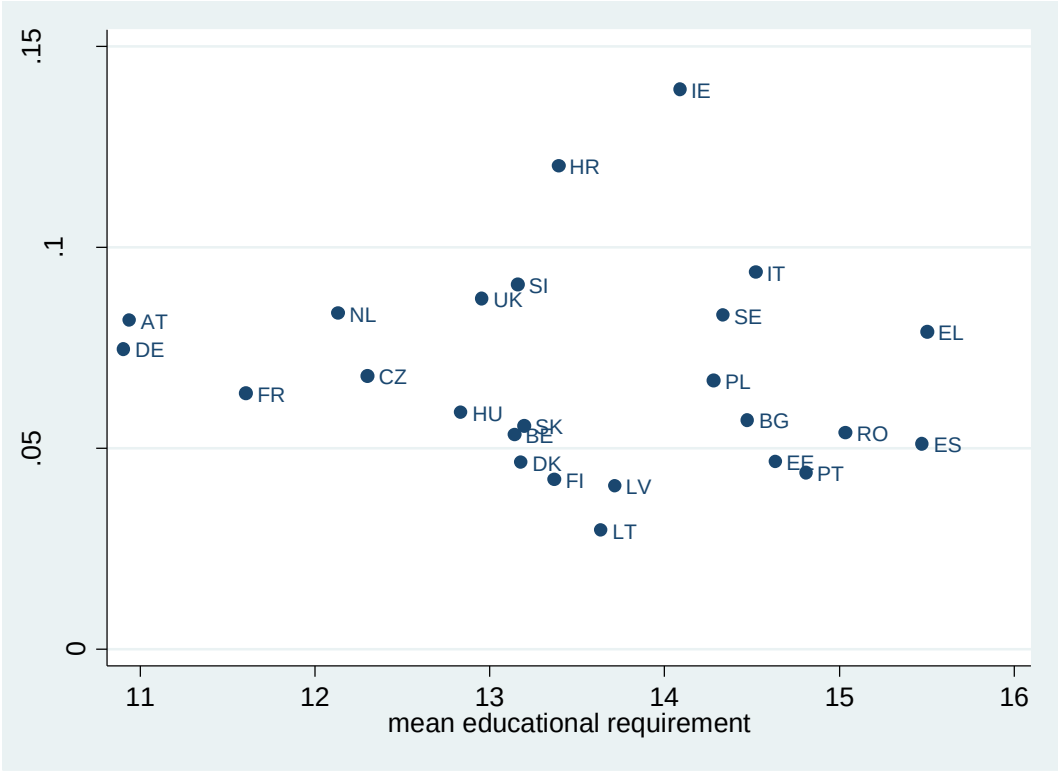
Table 4.2 The impact of entry requirements on employment, j=2.

	N_{2ic}	N_{2ic}	N_{2ic}	N_{2ic}
Experience requirement	0.007			0.005
	(0.004)			(0.002)
Examination requirement		-0.007		0.010
		(0.014)		(0.009)
Education requirement			0.002	-0.000
			(0.001)	(0.000)
Occupation fixed effects?	No	No	No	Yes
R2	0.03	0.00	0.10	0.60
N	175	175	175	175

Note: Each observation represents one occupation (ISCO codes 1 through 9) in one country (EU28 member states excluding Luxembourg, Malta, and Cyprus). Employment is defined as j=2, number of licensed workers in occupation i and country c / number of workers in country c.

We can further illustrate this in Figure 4.4, which describes an example for a specific occupational group, namely professionals. Each dot represents employment of this group (ISCO code 2) in one country. As it can be seen from the figure, there is no clear relationship between educational requirements for entry into this occupation and the employment levels in each country.

Figure 4.4 Mean employment (j=2) and mean educational requirement by occupation and country (Professionals, ISCO code 2).



Note: Each dot represents employment of professionals in one country (EU28 member states excluding Luxembourg, Malta, and Cyprus). Employment is defined as j=2, number of licensed professionals in country c / number of workers in country c. The educational requirement is measured by the average number of years of education required to licensed professionals in country c.

Table 4.3 reports the estimation results for the third definition of employment. Each observation in these regressions represents one occupation in one country, but employment (j=3) is equal to the number of licensed workers in occupation i and country c /

total number of workers in the same occupation and country. Also in this case, the regression results are inconclusive. If anything, there seems to be a negative correlation between the educational requirements and employment, but this is not confirmed in column 4, which includes the occupation-specific fixed effects.

Table 4.3 The impact of entry requirements on employment, j=3.

	N_{3ic}	N_{3ic}	N_{3ic}	N_{3ic}
Experience requirement	0.004			0.022
	(0.018)			(0.014)
Examination requirement		0.071		0.035
		(0.072)		(0.053)
Education requirement			-0.006	-0.000
			(0.003)	(0.003)
Occupation fixed effects?	No	No	No	Yes
R2	0.00	0.01	0.03	0.52
N	175	175	175	175

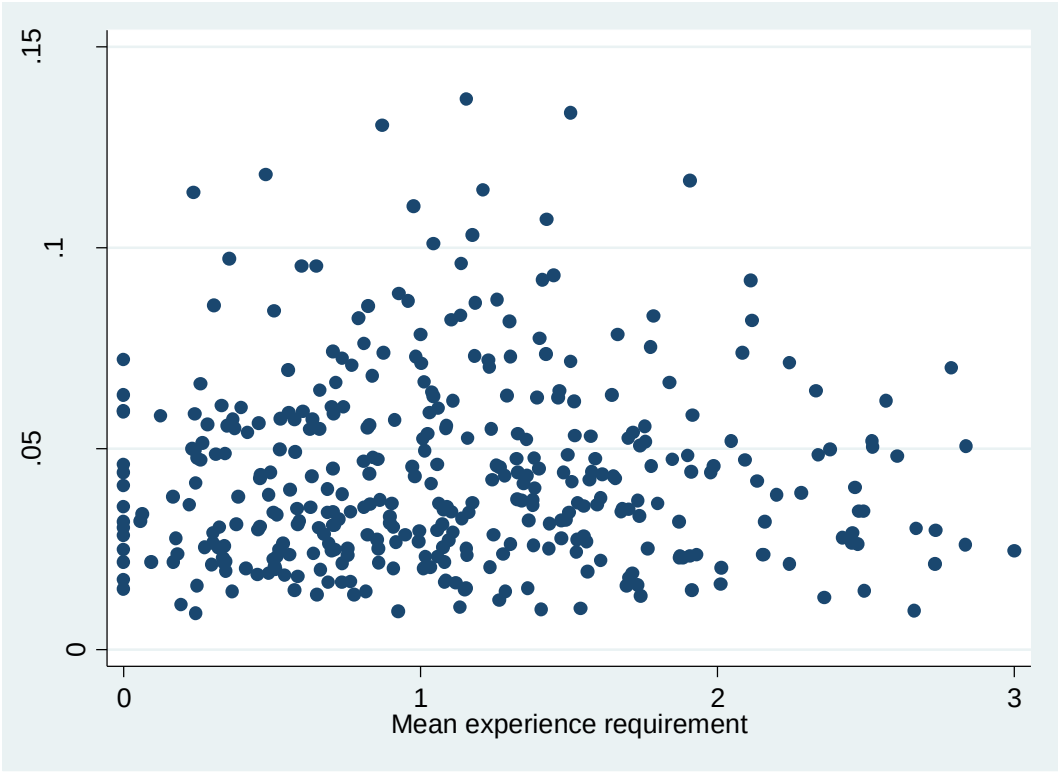
Note: Each observation represents one occupation (ISCO codes 1 through 9) in one country (EU28 member states excluding Luxembourg, Malta, and Cyprus). Employment is defined as j=3, number of licensed workers in occupation i and country c / number of workers in occupation i and country c.

It is important to note that in our analyses so far we have used data on one-digit occupations, which include a number of licensed and unlicensed two-digit occupations. The information on entry requirements does not come from administrative data on licensing regulations but from workers' responses in the survey. While this approach provides us with sufficiently high sample sizes for our estimates, it has the disadvantage of capturing the requirements for all licensed workers in the occupation, which are of course likely to be very diverse.

We now compute our three measures of employment (N_{jic}) and our various measures of stringency ($\bar{R}_{kic}$) using two-digit occupations. This approach avoids the problem of aggregating heterogeneous workers into one single group. On the other hand, the two variables of interest will be computed with a small number of observations (survey respondents) for each occupation-state combination. Because of the small number of respondents, we are forced to ignore some occupations in some states.

Figure 4.5 describes the weak correlation between employment and experience requirements. We do not report the similar figures for the other definitions of employment and the other entry requirements, as the results are similar. The regression results in Table 4 are not qualitatively different from those in previous tables, namely small and not significant relationships. This suggests that the aggregation at one digit level is not the main driving force of the inconclusive results in the previous tables.[76]

Figure 4.5 Mean employment (j=1) and mean experience requirement by occupation (two-digit) and country.



Note: Each dot represents one occupation (two-digit ISCO codes) in one country (EU28 member states excluding Luxembourg, Malta, and Cyprus). Some occupation-country combinations with too few observations are excluded from the sample. Employment is defined as j=1 number of workers in occupation i and country c / number of workers in country c. The educational requirement is measured by the average number of years of education required to licensed workers in occupation i and country c.

[76] There are too few observations in each country-occupation cell to use more detailed occupational codes.

Table 4.4 The impact of entry requirements on employment, j=1 (two-digit occupations).

	N_{1ic}	N_{1ic}	N_{1ic}	N_{1ic}
Experience requirement	0.00018			0.00030
	(0.002)			(0.002)
Examination requirement		-0.010		-0.0044
		(0.007)		(0.006)
Education requirement			0.00084	0.00011
			(0.00033)	(0.000)
Occupation fixed effects?	No	No	No	Yes
R2	0.00	0.01	0.02	0.38
N	372	372	372	372

Note: Each observation represents one occupation (27 two-digit ISCO codes) in one country (EU28 member states excluding Luxembourg, Malta, and Cyprus). Employment is defined as j=1, number of workers in occupation i and country c / number of workers in country c.

4.6 Conclusions

According to theoretical expectations, we would expect a negative relationship between licensing and employment. As we have argued, such an effect is likely to be driven by higher wages and/or wages associated with restrictions in supply to the occupation. However, various factors are likely to mediate this effect, including how new entry requirements compare to the existing skills equilibrium within the occupation, any grandfathering rights granted to incumbents and the elasticity of demand for the occupation. It is also possible that the effect on employment is smaller in the long run, as the supply of skills adjusts to the new requirements.

Based on standard assumptions for the labour demand elasticity and a conservative estimate of the wage gap of about 3 percent, we are able to provide an estimate of the potential magnitude of the employment effect of licensing. We also explore the variation in stringency of licensing requirements at occupation and country level to detect any adverse effect on employment. In theory, we would expect more stringent requirements to be associated with a negative impact on employment. We find no such significant relationship between licensing and employment. In the absence of detailed information regarding the

various mediating factors discussed above (i.e. the stringency of the licensing regime, how new entry requirements compare to the existing skill level within the occupation, any grandfathering rights granted to incumbents, the elasticity of labour demand for each occupation), we cannot make any conclusive judgements about the impact of licensing on employment. The cross-sectional nature of the data is likely to be affecting our ability to pick up any employment effects, as broadly confirmed by the literature[77]. Given the complexity associated in detecting the effect of licensing on employment, a better approach is examining the relationship at occupation level and at different stages in the occupation's regulation trajectory (e.g. once licensing has been introduced and after it has been operating for a certain amount of time[78]).

[77] For a review see Kleiner, M. M. (2006). *Licensing occupations: Ensuring quality or restricting competition?*. WE Upjohn Institute.

[78] However even this approach assumes exogenous factors are comparable in the two time periods of observation.

5. Effects of Regulation on Labour Mobility

Chapter Summary

- Licensing is expected to increase the cost of migration, especially when there is considerable variation in educational, work experience and administrative requirements.
- We find that licensing imposes a significant cost to foreign-born workers, but that this is not the case with certification. In particular, the proportion of foreign-born workers is about one third lower among licensed workers, while there is no significant difference in the proportion of foreign-born workers between unregulated and certified workers.
- The automatic recognition arrangements currently present in the EU are effective in facilitating entry into foreign markets and mobility across countries.
- The incidence of licensed foreign-born workers varies by occupation. Licensed foreign-born workers are under represented, relative to unregulated workers, in elementary occupations, craft and related trades, and skilled agricultural occupations. This could reflect considerable variations in regulatory regimes and/or be indicative of complex and expensive bureaucratic procedures associated with labour mobility.

5.1 Theoretical Background

Perhaps the largest knowledge gaps in relation to the labour market impact of occupational regulation lies in the area of labour migration. Standard economic theory predicts that investment in educational credentials is likely to increase the cost of migration, especially if the acquired knowledge is also not transferable (Sjaastad, 1962)[79]. Since occupational licensing is associated with the acquisition of certain occupation specific skills, often involving investments over and beyond schooling (e.g. exams, periods of apprenticeships), we would predict that it is likely to act as a deterrent to geographical movements. Further, for many professionals, practicing an occupation involves location-specific investments such

[79] Sjaastad, L. (1962) 'Costs and Returns of Human Migration'. The Journal of Political Economy, 60 (5), pp. 80-93.

as investments in local reputation and building a clientele, an additional cost that the worker has to bear if he or she decides to migrate (Pashigian 1980)[80].

Finally, to the extent that regulation in the form of licensing is associated with a wage premium, then the decision to move to another labour market will partly depend on whether such wage gains can be maintained. For example, we would expect a worker to be less inclined to move from a licensed occupation in country A, to a less regulated one in country B, if this is going to entail a wage penalty. As such, one would expect licensing to add to the cost of mobility and to be inversely related to labour movements, or else the demand for mobility amongst licensed workers to be lower than amongst non-licensed ones (Friedman 1962[81]).

The negative impact of licensing on mobility is likely to be mediated by the extent to which educational and other regulation-related requirements are harmonised. Further, from an administrative perspective, the ease with which one can access information on entry to the profession (e.g. procedures to follow for recognition of qualifications, language requirements etc.) is also likely to facilitate or deter movement.

Contrary to licensing, certification is not expected to negatively affect movement, at least not to the extent that licensing does. The voluntary nature of certification means that individuals in principle can freely enter other labour markets, although the extent to which they do so is likely to depend on the demand for non-certified practitioners vis-à-vis their certified counterparts in the destination country. Also, individuals that have invested in becoming certified in the country of origin might also be less prone to move to a member state where such credentials are not well known by consumers. Therefore, while we would expect the effect on movement to be considerably less than that of licensing, it would be interesting to compare the certified and unregulated workers.

[80] Pashigian, P. B. (1979) 'Occupational Licensing and the Interstate Mobility of Professionals,' Journal of Law and Economics. 22(1), pp. 1-25.
[81] Friedman, M. (1962) Capitalism and Freedom, Chicago, University of Chicago Press.

5.2 Empirical Evidence

Research confirms such assertions. Early work by Holen, (1965[82]) shows that US State licensing deters interstate mobility among dentists and lawyers and distorts the allocation of professional personnel in these fields. This is further supported by the work of Pashigian (1979) showing that occupational licensing reduces the mobility of individuals across state lines, as well as the work of Kleiner, Gay and Greene (1982)[83] and Tenn (2001)[84] who find that restrictive licensing may operate as a barrier to mobility causing a misallocation of labour resources across U.S. states, with increased earnings for the practitioners in those states with the most restrictive barriers.

The latest US study by Johnson and Kleiner (2016[85]) explores whether lawyers, teachers, barbers/hairdressers, dentists and nurses (all licensed occupations) move at a lower rate between and within states than individuals in similar non-licensed occupations. Using the 2001-2014 American Community Survey they show that lawyers, teachers, and barbers/ hairdressers move at a lower rate across state lines (where regulatory arrangements are different) than within states, compared to similar individuals in other occupations. This indicates that in the case of harmonised regulatory arrangements (i.e. within state) practitioners engage in a certain degree of movement, which is not replicated when licensing becomes a consideration.

Federman *et al*. (2006)[86] are behind the first attempt to estimate the effects of licensing regulations on migration patterns in a low-skilled occupation, namely manicurists. Their findings show that the level of migration is impeded by the existence and restrictiveness (in

[82] Holen, A. (1965). 'Effects of Professional Licensing Arrangements on Interstate Labor Mobility and Resource Allocation', Journal of Political Economy, 73(5), pp. 492-498.
[83] Kleiner, M., Gay R. and Greene K. (1982) 'Barriers to Labor Migration: The Case of Occupational Licensing.' Industrial Relations. 21(3), pp.383-91.
[84] Tenn, S. (2001) Occupational Licensing: An Effective Barrier to Entry? Unpublished Dissertation, University of Chicago.
[85] Johnson, J.E. and Kleiner, M. (2016) Is Occupational Licensing a Barrier to Interstate Migration? Paper presented at the ASSA Meetings, Chicago.
[86] Federman, M.N., Harrington, D. E., and Krynski, J.K. (2006) 'The Impact of State Licensing Regulations on Low-Skilled Immigrants: The Case of Vietnamese Manicurists' The American Economic Review, 96 (2) pp. 237-241.

terms of minimum entry standards) of state licensing regulations. In particular, they estimate that the requirement to have an additional 100 hours of training reduces the likelihood of a Vietnamese manicurist migrating by 4.5 per cent, while states requiring some level of English proficiency were 5.7 percentage points less likely to have a Vietnamese manicurist.

Taken together, these studies support the view that licensing is likely to deter migration, or else that migrants are less likely to be found in licensed occupations. In the EU, there is very little research on how occupational regulation affects labour movement. A recent study by Koumenta *et al.* (2014[87]) shows that EU migrants enter occupations that are less likely to be subject to occupational regulation, although significant differences exist across EU member states. Interestingly, in its analysis of migration into licensed occupations in the UK, the same report finds little evidence of licensing affecting the movement of professionals to the UK labour market both before and after the introduction of the MRPQ Directive, as well as no substantial differences in the mobility of individuals from the EU to occupations subject to the automatic system of recognition of the MRPQ Directive compared to their general system counterparts.

Finally, the evidence base is non-existent in the case of certification, where in theory we would expect it to have a lower effect on labour movement compared to licensing.

5.3 Methodology

Using a cross-sectional framework, we compare the proportion of foreign-born workers in licensed, certified and unregulated occupations. We do so by exploring the item questionnaire asking respondents to name the country in which they were born and comparing it to the country where the survey was conducted. In the survey (Appendix 1) this refers to questionnaire item 15 ('In which country were you born?) coded based on the list of 28 EU countries and 'Other' if the respondent was born outside the EU.

[87] Koumenta, M., Humphris, A., Kleiner, M. and Pagliero, M. (2014) Occupational Regulation in the UK and EU: Prevalence and Labour Market Impact, Department for Business, Innovation and Skills, London

We further distinguish between those in licensed occupations subject to automatic recognition procedures (namely nurses, midwives, doctors, dental practitioners, dentists, pharmacists, architects and veterinary surgeons) and evaluate whether such arrangements are more conducive to movement. Finally, we explore how mobility of licensed professionals varies by broad occupational category.

The results described in this section will focus on a simple definition of inter-country mobility based on country of birth. A worker is classified as mobile if the country of birth is different from the country in which she lives. Other definitions are possible. For example, one may investigate the proportion of workers born in a country outside the EU, or who declared to have moved specifically for work related reasons. While these alternatives approaches are also interesting, they suffer from the fact that the proportion of mobile workers is then much smaller, hence the number of observations for mobile workers in the sample is much smaller. This lowers the precision of the estimated results and the quality of the inference.

5.4 Effect of Occupational Regulation on Labour Mobility

We begin with a descriptive analysis of how licensed workers differ from their non-licensed counterparts. Table 5.1 identifies the proportion of workers born in another country that work in licensed and non-licensed occupations by country of employment. While for countries such as Luxemburg, France, Latvia, Estonia, Netherlands and Portugal we find that the proportion of licensed foreign- born workers exceeds that of non-licensed ones, for the majority of member states the opposite is true, although the difference is small for countries like Sweden and Croatia.

Overall, for the EU28 we find that 8.8 percent of unregulated workers are foreign-born. The proportion for licensed workers is 6.5 percent. While a 2.3 percent difference may seem small, it is important to note that, in relative terms, the proportion of foreign-born workers among unregulated workers is higher by more than one third with respect to licensed workers.

Table 5.1 Proportion of workers born in another country.

	Non-licensed	Licensed	All workers
LU	0.627	0.375	0.573
FR	0.091	0.121	0.096
LV	0.082	0.111	0.086
EE	0.093	0.109	0.096
NL	0.082	0.109	0.089
PT	0.094	0.107	0.096
SE	0.109	0.105	0.109
BE	0.119	0.103	0.116
HR	0.108	0.102	0.106
UK	0.131	0.101	0.125
CY	0.119	0.082	0.112
AT	0.137	0.079	0.124
ES	0.097	0.079	0.094
MT	0.079	0.074	0.078
DK	0.045	0.066	0.048
IT	0.105	0.060	0.096
EL	0.096	0.056	0.088
CZ	0.061	0.054	0.059
DE	0.104	0.050	0.087
IE	0.133	0.050	0.109
LT	0.039	0.043	0.040
SK	0.023	0.042	0.028
SI	0.044	0.040	0.043
HU	0.039	0.024	0.035
FI	0.029	0.007	0.025
PL	0.009	0.000	0.007
RO	0.004	0.000	0.003
BG	0.002	0.000	0.002
EU 28	**0.088**	**0.065**	**0.083**

Note: The table reports the proportion of workers born outside the country of residence.

Table 5.2 shows that in 7 out of 10 occupational groups the proportion of foreign-born workers is lower amongst licensed workers. However, we know that there are many other variables that can explain the proportion of foreign-born workers in the labour market, some of which could be even more relevant than the regulation status of the occupation. We therefore proceed and try to disentangle the effects of some of these variables from that of regulation.

Table 5.3 shows regression results in which the dependent variable is an indicator variable equal to one if a worker was born outside of the country of residence. Column 1 shows that, on average, the proportion of foreign-born workers is 2.3 percent lower among licensed

workers. This proportion does not significantly change as we progressively include additional control variables accounting for individual characteristics of the worker and the job. Interestingly, there is no significant difference in the proportion of foreign-born workers between unregulated and certified workers. This holds true whether or not one controls for individual characteristics of the worker and the job. These results are consistent with theoretical predictions about licensing imposing a significant cost to foreign-born workers, while in the case of certification the effect is similar to that of being unregulated.

Table 5.2. Proportion of immigrant workers by occupation and licensing status.

	Non-licensed	Licensed	All workers
Managers	0.069	0.091	0.072
Professionals	0.077	0.065	0.074
Technicians and associate professionals	0.078	0.079	0.079
Clerical support workers	0.065	0.021	0.059
Service and sales workers	0.107	0.073	0.100
Skilled agricultural	0.047	0.010	0.041
Craft and related trades workers	0.116	0.054	0.104
Plant and machine operators	0.095	0.062	0.083
Elementary occupations	0.160	0.039	0.147
Armed forces occupations	0.014	0.125	0.067
EU 28	0.089	0.066	0.084

Note: The table reports the proportion of workers born outside the country of residence by occupation.

We can further investigate this result by isolating those workers subject to automatic recognition of their title. While these workers are generally licensed, they face lower costs for moving across countries relative to other workers.[88] We create an indicator variable equal to one for workers in these professions. We then interact it with the indicator variable for licensed workers. In Table 5.4 we report regression results including this additional variable. As before, we find that the proportion of foreign-born workers is about 2 percent lower among licensed workers not subject to automatic recognition. However, the

[88] In studies of migration, the term cost is used to describe not only financial costs but broader notions of cost associated with job search costs, establishment of a reputation and networks, as well as costs associated with securing recognition of qualifications and experience.

proportion of immigrants among licensed workers subject to automatic recognition is not lower than among unregulated workers.

The results are then consistent with licensing imposing significant mobility costs for workers who cannot benefit from the automatic recognition of the title. In other words, the automatic recognition seems to be effective in facilitating entry into foreign markets and mobility across countries compared to general recognition of licensed occupations. In Table 5.4, there is no difference in the proportion of foreign-born workers between certified and unregulated workers. From that, we can conclude that certification does not seem to impose specific costs to foreign-born workers and in that sense is comparable to unregulated status.

Table 5.5 explores the differential effect of licensing across occupations. The estimated model is the same as that in Table 5.3, but we now include interactions of the licensed and occupation-specific indicator variables. The results illustrate the difference in the proportion of foreign-born workers between licensed and unregulated that work in each occupation. Licensed foreign-born workers are under represented, relative to unregulated workers, in elementary occupations, craft and related trades, and skilled agricultural occupations. This suggests that entry into these licensed professions is particularly difficult for foreigners and could reflect considerable variations in regulatory regimes between member states in relation to skills and experience and/or be indicative of complex and expensive bureaucratic procedures associated with receiving recognition.

Table 5.3. Determinants of the proportion of immigrant workers.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
licensed	-0.0227***	-0.0211**	-0.0211**	-0.0193**	-0.0180**	-0.0170**	-0.0202**
	(0.00773)	(0.00824)	(0.00825)	(0.00820)	(0.00823)	(0.00823)	(0.00867)
certified	0.00128	0.00386	0.00386	0.00574	0.00599	0.00727	0.00680
	(0.00975)	(0.0100)	(0.0100)	(0.0100)	(0.0100)	(0.0100)	(0.0100)
male			-2.91e-05	1.07e-05	-0.000745	-0.00491	0.000554
			(0.00693)	(0.00693)	(0.00694)	(0.00737)	(0.00781)
age				-0.00101***	-0.00109***	-0.000934***	-0.000973***
				(0.000296)	(0.000299)	(0.000302)	(0.000303)
Lower secondary education (usually age 11-15)					-0.0311	-0.0231	-0.0208
					(0.0292)	(0.0285)	(0.0285)
Upper secondary education (usually age 16-19)					-0.0620**	-0.0454*	-0.0418
					(0.0267)	(0.0262)	(0.0261)
Post-secondary education (not university)					-0.0617**	-0.0405	-0.0400
					(0.0299)	(0.0299)	(0.0300)
University (undergraduate and post-graduate)					-0.0542**	-0.0216	-0.0170
					(0.0266)	(0.0269)	(0.0269)
PHD/ advanced research qualification					-0.0419	-0.00636	-0.00520
					(0.0346)	(0.0353)	(0.0358)
Country f.e.?		yes	yes	yes	yes	yes	yes
Occupation controls?						yes	
Detailed occupation controls?							yes

Note: Linear probability model. The dependent variable is an indicator variable for being born outside of the country of residence. Omitted indicator variables: Primary education, Employee in private firm or business. Robust standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1

Table 5.4. Determinants of the proportion of immigrant workers (licensing, certification, and automatic recognition)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
licensed and no automatic recognition	-0.0268***	-0.0247***	-0.0247***	-0.0229***	-0.0215**	-0.0211**	-0.0220**
	(0.00782)	(0.00837)	(0.00840)	(0.00834)	(0.00838)	(0.00833)	(0.00856)
licensed and automatic recognition	0.0269	0.0197	0.0198	0.0216	0.0217	0.0307	0.00826
	(0.0273)	(0.0275)	(0.0274)	(0.0276)	(0.0279)	(0.0282)	(0.0368)
certified	0.00128	0.00360	0.00356	0.00545	0.00568	0.00703	0.00674
	(0.00975)	(0.0100)	(0.0100)	(0.0101)	(0.0101)	(0.0100)	(0.0100)
male			0.000722	0.000761	-9.02e-05	-0.00424	0.000515
			(0.00693)	(0.00692)	(0.00693)	(0.00735)	(0.00784)
age				-0.00101***	-0.00109***	-0.000925***	-0.000972***
				(0.000296)	(0.000299)	(0.000302)	(0.000304)
Lower secondary education (usually age 11-15)					-0.0311	-0.0231	-0.0209
					(0.0292)	(0.0285)	(0.0285)
Upper secondary education (usually age 16-19)					-0.0617**	-0.0449*	-0.0416
					(0.0267)	(0.0262)	(0.0261)
Post-secondary education (not university)					-0.0618**	-0.0403	-0.0398
					(0.0299)	(0.0299)	(0.0300)
University (undergraduate and post-graduate)					-0.0549**	-0.0212	-0.0170
					(0.0266)	(0.0269)	(0.0269)
PHD/ advanced research qualification					-0.0445	-0.00744	-0.00535
					(0.0347)	(0.0354)	(0.0358)
Country f.e.?		yes	yes	yes	yes	yes	yes
Occupation controls?						yes	
Detailed occupation controls?							yes
Observations	23,246	23,246	23,246	23,246	23,246	23,246	22,986
R-squared	0.002	0.022	0.022	0.024	0.026	0.032	0.041

Note: Linear probability model. The dependent variable is an indicator variable for being born outside of the country of residence. The indicator variable "licensed and no automatic recognition" is equal to one if a worker is licensed and her title is not subject to the automatic recognition. The indicator variable "licensed and automatic recognition" is equal to one if a worker is licensed and her title is subject to automatic recognition (nurses, midwives, doctors, dental practitioners, dentists, pharmacists, architects, veterinary surgeons). Omitted indicator variables: Primary education. Robust standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1.

Table 5.5. Determinants of the proportion of immigrant workers (licensing and certification) with interactions by occupation.

	(1)	(2)	(3)	(4)	(5)	(6)
	Coef.	Std. Err.	t	Coef.	Std. Err.	t
certified				0.008	0.010	0.76
licensed x managers	0.022	0.034	0.65	0.024	0.034	0.71
licensed x professionals	-0.016	0.013	-1.18	-0.013	0.014	-0.96
licensed x Technicians and associate professionals	0.010	0.019	0.53	0.013	0.020	0.68
licensed x Clerical support workers	-0.041	0.014	-2.91	-0.038	0.014	-2.68
licensed x Service and sales workers	-0.032	0.021	-1.52	-0.029	0.021	-1.4
licensed x Skilled agricultural	-0.051	0.025	-2.05	-0.049	0.025	-1.92
licensed x Craft and related trades workers	-0.063	0.024	-2.63	-0.059	0.024	-2.46
licensed x Plant and machine operators	-0.016	0.026	-0.64	-0.014	0.026	-0.55
licensed x Elementary occupations	-0.110	0.030	-3.64	-0.109	0.030	-3.58
licensed x Armed forces occupations	0.118	0.078	1.51	0.119	0.078	1.53
Difference between licensing and certification:						
Managers				0.017	0.035	0.47
Professionals				-0.021	0.015	-1.43
Technicians and associate professionals				0.006	0.021	0.27
Clerical support workers				-0.046	0.015	-3
Service and sales workers				-0.037	0.022	-1.66
Skilled agricultural				-0.056	0.026	-2.2
Craft and related trades workers				-0.067	0.024	-2.74
Plant and machine operators				-0.022	0.027	-0.81
Elementary occupations				-0.117	0.031	-3.72
Armed forces occupations				0.111	0.078	1.42

Note: Linear probability model. The dependent variable is an indicator variable for being born outside of the country of residence. The coefficients of education, occupation, gender, country indicators, and age are not reported. Robust standard errors.

5.5. Conclusions on Occupational Regulation on Labour Mobility

The aim of this section was to explore the links between licensing and labour mobility in the EU. In relation to prevalence, we do not find stark differences between licensed and non-licensed foreign-born workers. In particular, 6.5 per cent of foreign workers are licensed and while this figure looks small when taken in isolation, it is only about 2 per cent lower compared to the 8.8 per cent figure for non-licensed migrants in EU28. In line with theoretical predictions, we provide the first EU evidence that supports the view that professional licensing is negatively associated with labour movements.

We show that foreign-born workers are less likely to be found in licensed occupations, while no much variation is found between foreign born workers in certified and unregulated occupations. We further test whether the policy of automatic recognition adopted by the EU has a positive effect on the movement of licensed practitioners. According to the results, while it does not compare favourably with when occupations are completely unregulated, automatic recognition seems to be effective in facilitating entry into foreign markets and mobility across countries compared to general recognition of licensed occupations. Finally, when comparing movement of licensed practitioners by occupational category we see that relative to unregulated workers, licensed foreign-born workers are under represented, in elementary occupations, craft and related trades, and skilled agricultural occupations. We conclude that variations in licensing regimes and administrative burdens are some possible explanations for this finding.

To the extent that labour mobility is an important attribute of the EU, then the findings presented here are alarming. Given that occupational licensing appears to be associated with less movement, policy makers would need to reconsider whether the benefits of licensing outweigh this potential cost to the labour market. However, it is encouraging to see that a similar effect is not observed in the case of certification. As such, where signalling competence of practitioners is important, certification can provide a policy alternative that does not appear to affect mobility. It is also encouraging to see that where the adoption of professional licensing is inevitable (usually in occupations associated with high information asymmetries), its negative effect on movement can be reduced if policy makers and regulators intervene to impose automatic recognition arrangements.

6. Effects of Regulation on Skills

Chapter Summary

- Economic theory predicts that licensing has the potential to increase skills in the labour market. Research evidence from both the US and the EU provides a mixed picture.
- We compare the levels of training (mandatory and non-mandatory) and the educational attainment of unregulated, licensed and certified workers in our sample. We supplement this analysis by comparing the returns on investment in education by different types of regulation.
- Licensed workers without any training requirements undertake 0.851 days more training and certified workers take on average 1.287 days more training than unregulated workers. We conclude that licensing is not the only way to induce workers to invest in training. Certified workers seem to be able to invest more in training than licensed workers without any obligation to do so. However, licensed workers obtain on average a higher level of investment because of the compulsory training requirement.
- The upskilling effect of licensing seems to kick in only when educational requirements are set above upper secondary education level. When regulation requires only elementary or lower secondary education, the overall educational achievement of licensed workers is much higher than the mandatory requirement thus demonstrating that regulation is merely standardising existing practice in the labour market.
- The return on investment in education of a licensed worker with elementary education is on average 17 per cent higher than a similarly educated unregulated one. The same figure for a certified worker is on average 7 per cent more.
- Occupational licensing distorts the returns to education in that it flattens the returns to education for those with low educational attainment. It also increases the returns to having a university degree.

6.1 Theoretical Background

The key impetus for regulation for policy makers rests on the assumption that the resulting higher investments in training have the potential to enhance the skills base in the economy (Shapiro 1986[89]). In particular, the hypothesis is that there are failures in the market for investment in skills, caused by (among other things): a lack of reliable information for

[89] Shapiro, C. (1986) 'Investment, Moral Hazard and Occupational Licensing', Review of Economic Studies, 53, 843-62.

workers or employers on the likely benefits that may accrue for skills investments; problems in obtaining funding to invest in skills; or employers' inability to recoup investments in skills because of poaching (Keep, 2006). Coupled with solving the information asymmetries problem, it is argued that the introduction of skill based entry barriers (through occupational regulation) will correct these market failures.

Such an effect will vary depending on the type of regulation in place and the strictness of the regulation regime. In the case of licensing for example, where the requirement is legally enforced, we would expect in theory a clear upskilling effect across the occupational spectrum. In the case of certification where the requirements are voluntary in nature, regulation can still have an upskilling effect, but ultimately this will depend on the degree of uptake amongst professionals given the market demand for such skills (or else consumer willingness to pay for certified practitioners rather than use unregulated ones).

The extent to which licensing will have a positive effect on skills is also likely to depend on the difference between the existing average skill levels prior to regulation. For example, if regulation is merely standardising existing labour market practice in relation to training and skills, upskilling will be minimal. If on the other hand licensing introduces higher training requirements, then skills should increase. The strength of this effect will also depend on any grandfathering provisions made available. For example, if the licensing requirements do not apply to existing practitioners (i.e. they can continue practising legally with their current skills) then we would expect a lagged effect on skills, since it will kick in only as new practitioners enter the market. It will further depend on how successfully the licensing regime is enforced, i.e. the degree to which practitioners comply with the new requirements.[90]

Of course, the ultimate goal of regulation is to improve the performance of practitioners as evidenced by the quality of their output. However, the link between up-skilling and productivity is not straightforward. A key distinction in the economic literature on skills is that of 'inputs' versus 'outputs' and the link between the two. Licensing is only likely to lead to higher productivity if inputs in the form of higher skills requirements are translated into

[90] Sadly, the nature of our dataset does not enable us to include such considerations in our estimates, but they are nevertheless worth considering. Such dimensions could be for example captured by a before and after study of the introduction of licensing using a difference-in-difference approach.

outputs or else better quality products and services. Such a link however should not be taken for granted (i.e. it is not causal), as it depends on a number of unobserved factors such as ability and resources. For example, licensing doctors can only go as far as guaranteeing a minimum skill level. Whether this translates to better medical services depends on the context within which these skills are enacted. As such, while licensing can lead to up-skilling (provided that regulations are set at appropriate levels), caution must be exercised when linking licensing to productivity and product quality. However, such an analysis can only be undertaken at occupation level and has very demanding data requirements[91]. Instead, here we focus on the relationship between regulation, skills and training since improvements in skills is one way in which improvements in productivity can be triggered.

6.2 Empirical Evidence

Starting with the US, a recent study by Klee does not find a clear relationship between professional licensing and training (Klee, 2010[92]). In his analysis of accountants, lawyers, cosmetologists, and teachers he finds that licensing generally seems to be unrelated to the probability of enrollment in a vocational class. However, he does find evidence that professional licensing regulations are positively related to training since the current job began, suggesting some positive influence of occupational regulation for this type of training for these occupations.

Using UK interview data from the social care sector, Gospel and Thompson (2003[93]) show that the introduction of minimum training requirements for licensed care providers had a positive effect on the training of managers and care staff. However, the study also finds that

[91] For a detailed description of the challenges and data requirements associated with empirically assessing the impact of licensing on quality see Koumenta, M., Humphris, A., Kleiner, M. and Pagliero, M. (2014) Occupational Regulation in the UK and EU: Prevalence and Labour Market Impact, Department for Business, Innovation and Skills, London (pages 93-97)

[92] Klee M (2010) "How do professional licensing regulations affect practitioners? New evidence", Department of Economics, Yale University, mimeo. [Last retrieved 4th March 2009 from: http://www.econ.yale.edu/~mak76/Training%20Paper%20-%20Mark%20A%20Klee.pdf]

[93] Gospel, H. and Thompson, M. (2003). 'The Role and Impact of the Statutory Framework for Training in the Social Care Sector'. *Research Report RR495*. DfES (Sheffield)

regulation reduced the levels of training above and beyond the minimum required by law. The authors conclude by warning of the danger of the new training minimum (as set out by the licensing regime) becoming the new maximum in the labour market. Fernie (2011[94]) on the other hand in her study of the introduction of licensing within the UK private security industry does not find a positive effect of licensing on skills. In particular, the low training requirements set out by the licensing regime coupled with considerable scope for non-compliance mean that licensing is seen to be placing demanding administrative requirements in exchange for dubious quality outcomes. The study further demonstrates that the low level of training required by the law has replaced the more comprehensive training schemes previously offered by many employers and questions the extent to which the introduction of licensing has in fact led to an overall upskilling of security guards.

Survey evidence from the UK also provides a mixed picture. Using a difference-in-differences approach, Forth et al. (2011[95]) find a rise in qualification levels and job-related training among care workers as a result of the introduction of a organisation-level licensing system in 2005, but not in the case of childcare workers and automotive technicians. According to the authors, this can be due to the regulations being somewhat weaker in these latter cases, placing qualifications requirements only on a minority of workers (in the case of childcare) or comprising only of a voluntary scheme (in the case of vehicle repairers). A subsequent analysis of dental practitioners, plumbers, security guards, social workers, secondary school teachers, pharmacists, architects and chartered accountants in the UK shows that licensing is positively associated with higher skills levels compared to no regulation for some but not all occupations (Koumenta *et al*. 2014[96]). In particular, the relationship is strongest for security workers, followed by secondary teachers and plumbers, while no significant relationship is found for social workers and chartered accountants.

Overall, the literature points to mixed findings on the relationship between regulation and skills. While the direct link between regulation and productivity cannot be evaluated here,

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[94] Fernie, S. (2011) 'Occupational Licensing in the UK: The Case of the Private Security Industry', in Marsden, D. (ed.) *Employment in the Lean Years: Policy and prospects for the next decade*, Oxford University Press: Oxford

[95] Forth, J., Bryson, A., Humphris, A., Kleiner, M. and Koumenta, M. (2011) A Review of Occupational Regulation and its Impact, UK Commission for Employment and Skills, London

[96] Koumenta, M., Humphris, A., Kleiner, M. and Pagliero, M. (2014) Occupational Regulation in the UK and EU: Prevalence and Labour Market Impact, Department for Business, Innovation and Skills, London

the EU Survey of Regulated Occupations employed in this study allows us to improve on existing empirical work that explores the relationship between regulation, skills and the uptake of training.

6.3 Methodology

Using a cross-sectional framework, we compare the levels of training (mandatory and non-mandatory) and the educational attainment of unregulated, licensed and certified workers in our sample. In doing so, we provide the first EU-based evidence on how skills and occupational regulation are associated. We supplement this analysis by comparing the returns on investment in education by different types of regulation. This is a novel line of enquiry in the literature of occupational regulation and one that we believe adds value to our current empirical analysis and wider research on this topic.

We focus on the number of days of training that workers have undertaken during the past year and the highest educational qualification they are in possession of.

Training is measured by the number of days of training. Our data set enables us to distinguish between training that is required to maintain the licence and other non-mandatory training. Mandatory training is measured by the number of days of training that are required for a licensed worker to renew or maintain the license. Non-mandatory training refers to the number of days of non-mandatory training, and this applies to licensed and non-licensed workers. In the survey (see Appendix 1), this refers to questionnaire items 14a and 14b ('Roughly how much time have you spent on courses, training or similar activities related to your job in the past year?'). Answers are coded as follows: 'Up to one day' is coded as 1, 'more than one day' is coded as 3, 'more than a week' is coded as 8 days (about one and a half weeks).

Turning to *education*, we compute the estimated years of education using data on the highest degree achieved. This simplifies the comparison of workers across countries with heterogeneous education systems. For licensed workers, we can also observe the level of education that was required to obtain the license. Mandatory education is the number of mandatory years of education that are required to obtain the license. Years of education are

defined in the same way in each country, based on the classification of educational qualifications used in the survey: 'Primary education' 5 years, 'Lower secondary education' 8 years, 'Upper secondary' 13 years, 'Post-secondary' 15 years, 'University (postgraduate and undergraduate)' 17, 'PhD' 20. This procedure generates a 'normalized' or 'standardized' numerical variable that captures the main differences between educational achievement across individuals and countries.[97]

[97] Still, it has the disadvantage of ignoring some country-specific features of the educational system and some specific differences in the duration of educational programs belonging to the same group.

6.4 The Effects of Occupational Regulation on Skills

6.4.1 Training

We begin with a descriptive analysis of training undertaken depending on the regulation status of those at work in our sample. Table 6.1, column 1 shows that on average licensed workers in the EU undertake more training than certified workers, who in turn undertake more training than unregulated workers. However, about one third of the training of licensed workers is required to maintain or renew the license (column 3). When we look at the number of days of non-mandatory training, the figures in column 2 show that it is actually certified workers that undertake more training than all the other groups, although the difference with licensed workers is small.

Table 6.1. Training of unregulated, certified, and licensed workers (mean number of days per year).

	Total training	Non-mandatory training	Mandatory training
Unregulated	2.558	2.558	0
Certified	3.845	3.845	0
Licensed	5.330	3.582	1.745
Total	3.429	3.061	0.373

Note: Mandatory training refers to the number of mandatory days of training that are required to renew or maintain the license. The responses to questions 14a and 14b in the survey ('Roughly how much time have you spent on courses, training or similar activities related to your job in the past year?') are coded as follows: 'Up to one day' is coded as 1, 'more than one day' is coded as 3, 'more than a week' is coded as 8.

In Table 6.2 we break down these estimates by EU Member State. We find that licensed workers undertake more training than certified and unregulated workers also within EU member states, with two exceptions (Greece and Sweden) in which the difference in training between licensed and certified workers is negative.

Table 6.2. Training of unregulated, certified, and licensed workers (mean number of days per year).

	Unregulated	Certified	Licensed	Total
NL	2.845	4.334	5.530	3.847
UK	2.697	4.456	6.799	3.808
DE	3.043	3.601	4.749	3.802
ES	3.057	4.306	5.644	3.744
AT	2.758	3.861	5.618	3.662
PL	2.675	4.046	5.302	3.497
IE	2.379	3.264	5.630	3.493
LV	2.538	3.918	6.463	3.401
RO	2.158	3.606	5.904	3.336
LU	2.263	4.391	5.165	3.316
SK	2.306	3.513	5.254	3.313
HR	2.215	3.853	5.027	3.307
DK	2.705	3.996	5.427	3.293
BG	2.126	3.831	5.456	3.209
BE	2.834	3.743	4.271	3.203
IT	2.130	3.885	6.828	3.197
PT	2.350	3.589	6.683	3.196
FI	2.795	4.303	4.456	3.195
EL	2.636	4.365	4.101	3.156
SE	2.840	3.932	3.782	3.141
EE	2.452	3.475	4.992	3.104
CZ	2.221	3.599	4.950	3.096
HU	1.747	3.866	4.325	2.866
LT	2.109	3.167	4.676	2.808
MT	1.927	4.076	4.406	2.764
CY	1.922	3.020	5.595	2.725
FR	2.302	3.230	4.006	2.714
SI	1.530	3.077	5.274	2.515
EU28	2.558	3.845	5.330	3.429

Source: EU Survey of Regulated Occupations

We repeat this analysis for non-mandatory training. Table 6.3 shows that certified workers tend to undertake more non-mandatory training than licensed workers and unregulated workers in 21 member states. Table 6.4 shows the amount of mandatory training required by licensed workers in each country. Countries like Italy and the UK require more than three days of training, which is almost half of the total training undertaken by licensed workers within a year. Germany and Sweden on the other hand require less than one day of training, or less than 20 percent of the total training of licensed workers. Overall, there seems to be

significant heterogeneity in the importance given to continuing education programs, which would be difficult to account for without country-specific knowledge of the content of such programs and understanding of the rationale that regulators base such decisions on.

Table 6.3. Non-mandatory training of unregulated, certified, and licensed workers (mean number of days per year).

	Unregulated	Certified	Licensed	Total
BE	2.834	3.743	2.596	2.931
DK	2.705	3.996	3.973	3.102
DE	3.043	3.601	3.900	3.528
EL	2.636	4.365	3.305	2.987
ES	3.057	4.306	4.504	3.566
FI	2.795	4.303	2.978	2.958
FR	2.302	3.230	2.687	2.501
IE	2.379	3.264	3.781	2.979
IT	2.130	3.885	3.457	2.592
LU	2.263	4.391	3.760	3.024
NL	2.845	4.334	3.028	3.247
AT	2.758	3.861	4.408	3.398
PT	2.350	3.589	4.569	2.876
SE	2.840	3.932	3.296	3.068
UK	2.697	4.456	3.730	3.253
BG	2.126	3.831	3.372	2.805
CY	1.922	3.020	3.763	2.433
CZ	2.221	3.599	3.341	2.717
EE	2.452	3.475	2.291	2.612
HU	1.747	3.866	2.748	2.474
LV	2.538	3.918	3.594	3.003
LT	2.109	3.167	2.609	2.468
MT	1.927	4.076	3.207	2.564
PL	2.675	4.046	3.649	3.178
RO	2.158	3.606	3.367	2.807
SK	2.306	3.513	3.200	2.788
SI	1.530	3.077	3.876	2.253
HR	2.215	3.853	2.532	2.539
EU28	2.558	3.845	3.582	3.061

Note: Mandatory training is the number of mandatory days of training that are required to renew or maintain the license.

Table 6.4. Mandatory training of licensed workers (mean number of days per year).

	Licensed	Proportion of total training
IT	3.257	0.477
UK	3.072	0.452
LV	2.864	0.443
EE	2.782	0.557
NL	2.555	0.462
HR	2.510	0.499
RO	2.447	0.414
PT	2.094	0.313
LT	2.027	0.434
SK	1.995	0.380
IE	1.966	0.349
BG	1.947	0.357
CY	1.911	0.342
DK	1.748	0.322
BE	1.692	0.396
CZ	1.627	0.329
HU	1.586	0.367
PL	1.568	0.296
FI	1.464	0.329
LU	1.403	0.272
SI	1.372	0.260
ES	1.287	0.228
FR	1.277	0.319
AT	1.202	0.214
MT	1.148	0.261
DE	0.867	0.183
EL	0.797	0.194
SE	0.451	0.119
Total	1.745	0.327

Note: Mandatory training is the number of mandatory days of training that are required to renew or maintain the license.

We proceed with the results from the regressions. Table 6.5 reports regression results in which the dependent variable is the total number of days of training undertaken by a worker in the previous year. The independent variables include an indicator variable for licensing and its interaction with the number of mandatory days of training required to

licensed workers (if any). An indicator variable equal to one for certified workers is also included.

The regression results in Table 6.5, column 1 show that licensed workers without any training requirement undertake 0.851 days of training more than unregulated workers (the reference group). Certified workers undertake on average 1.287 days of training more than unregulated workers. Hence, on average, they are in receipt of more training than licensed workers without any continuing education requirement. Finally, not surprisingly, workers who are subject to continuing education programs comply with regulation and take about one day of training (1.104) for each day that is required to maintain their license. These results are very robust even when we control for union status, gender, age, education, experience, type of employment, country fixed effects, occupation fixed effects, and industry fixed effects.

Taken together, these findings suggest that licensing is not the only way to induce workers to invest in training. Certified workers seem to be able to invest more in training than licensed workers without any legal obligation to do so. This is an encouraging finding in that it alludes to the idea that skill acquisition happens independent of licensing, or else that regulation is not always essential to ensure that workers invest in upskilling. However, on average, licensed workers obtain a higher level of investment because of the compulsory training requirement.

Table 6.6 provides further details on this finding. We now include among the independent variables interactions of the indicator variable for licensing with the number of mandatory days of training. Certified workers invest more in training than licensed workers without training requirements, and they also invest more than licensed workers with one day of training. Only when the training requirement is three days or more do the licensed workers invest more in training than certified workers.

Table 6.5. Determinants of total training of workers (mean number of days per year).

	(1) training	(6) training	(7) training	(8) training	(9) training	(10) training	(11) training
licensed	0.851***	0.749***	0.727***	0.593***	0.558***	0.485***	0.433***
	(0.113)	(0.113)	(0.113)	(0.113)	(0.113)	(0.114)	(0.115)
licensed x Mandatory training (number of days)	1.104***	1.089***	1.088***	1.091***	1.082***	1.071***	1.067***
	(0.0303)	(0.0302)	(0.0303)	(0.0306)	(0.0302)	(0.0298)	(0.0297)
certified	1.287***	1.210***	1.207***	1.168***	1.104***	1.083***	1.060***
	(0.102)	(0.103)	(0.103)	(0.103)	(0.102)	(0.102)	(0.101)
union		0.572***	0.532***	0.355***	0.393***	0.354***	0.353***
		(0.0925)	(0.0941)	(0.0976)	(0.0968)	(0.0971)	(0.0974)
male		0.222***	0.230***	0.351***	0.391***	0.478***	0.442***
		(0.0738)	(0.0742)	(0.0755)	(0.0780)	(0.0788)	(0.0828)
		-	-	-	-	-	-
age		0.0162***	0.0231***	0.0229***	0.0224***	0.0243***	0.0247***
		(0.00339)	(0.00397)	(0.00396)	(0.00393)	(0.00390)	(0.00390)
Lower secondary education (usually age 11-15)		0.794***	0.754***	0.771***	0.621***	0.564**	0.541**
		(0.216)	(0.221)	(0.224)	(0.222)	(0.223)	(0.223)
Upper secondary education (usually age 16-19)		1.249***	1.208***	1.206***	0.888***	0.824***	0.771***
		(0.194)	(0.200)	(0.203)	(0.204)	(0.205)	(0.206)
Post-secondary education (not university)		1.787***	1.740***	1.707***	1.251***	1.134***	1.030***
		(0.237)	(0.242)	(0.245)	(0.246)	(0.248)	(0.248)
University (undergraduate and post-graduate)		2.475***	2.448***	2.355***	1.628***	1.471***	1.338***
		(0.195)	(0.201)	(0.205)	(0.217)	(0.219)	(0.221)
PHD/ advanced research qualification		3.224***	3.256***	3.056***	2.174***	1.965***	1.817***
		(0.319)	(0.322)	(0.327)	(0.338)	(0.337)	(0.340)
Experience			0.0170	0.0124	0.00565	0.00550	0.00721

			(0.0106)	(0.0106)	(0.0105)	(0.0105)	(0.0106)
Experience^2/1,000			-0.0853	-0.0499	0.0352	0.0620	0.0143
			(0.268)	(0.268)	(0.265)	(0.266)	(0.269)
Employee in public sector or non-profit				0.714***	0.584***	0.415***	0.407***
				(0.0902)	(0.0920)	(0.116)	(0.116)
Self-employed with employees				0.0628	0.0132	0.0495	0.207
				(0.179)	(0.183)	(0.179)	(0.181)
Self-employed without employees				-0.226*	-0.301**	-0.286**	-0.198
				(0.127)	(0.133)	(0.132)	(0.135)
Country f.e?		yes	yes	yes	yes	yes	yes
Occupation controls?					yes	yes	
Industry controls?						yes	yes
Detailed occ controls?							yes
Observations	26,247	22,815	22,631	22,631	22,631	22,631	22,381
R-squared	0.226	0.289	0.290	0.298	0.309	0.318	0.323

Note: The dependent variable is the total number of days of training in the current year. Mandatory training is the number of manadory days of training that are required to renew or maintain the license. Omitted indicator variables: Primary education, Employee in private firm or business. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 6.6. Determinants of total training of workers (mean number of days per year).

	(1) training	(6) training	(7) training	(8) training	(9) training	(10) training	(11) training
licensed x no training requirement	1.073***	0.924***	0.901***	0.760***	0.707***	0.635***	0.584***
	(0.126)	(0.126)	(0.126)	(0.126)	(0.126)	(0.126)	(0.128)
licensed x 1 day training requirement	0.970***	1.174***	1.164***	1.117***	1.181***	1.107***	1.041***
	(0.220)	(0.220)	(0.221)	(0.218)	(0.214)	(0.216)	(0.215)
licensed x 3 days training requirement	3.752***	3.637***	3.607***	3.464***	3.390***	3.268***	3.206***
	(0.188)	(0.187)	(0.187)	(0.189)	(0.193)	(0.192)	(0.191)
licensed x 8 days training requirement	9.956***	9.686***	9.659***	9.557***	9.438***	9.282***	9.202***
	(0.223)	(0.223)	(0.225)	(0.228)	(0.227)	(0.224)	(0.224)
certified	1.287***	1.214***	1.211***	1.172***	1.108***	1.086***	1.063***
	(0.102)	(0.103)	(0.103)	(0.103)	(0.102)	(0.102)	(0.101)
union		0.574***	0.535***	0.360***	0.397***	0.358***	0.356***
		(0.0924)	(0.0941)	(0.0976)	(0.0966)	(0.0970)	(0.0973)
male		0.236***	0.244***	0.364***	0.401***	0.486***	0.451***
		(0.0739)	(0.0743)	(0.0756)	(0.0781)	(0.0788)	(0.0827)
age		-0.0163***	-0.0231***	0.0228***	0.0223***	0.0243***	0.0247***
		(0.00339)	(0.00397)	(0.00396)	(0.00393)	(0.00390)	(0.00390)
Lower secondary education (usually age 11-15)		0.777***	0.736***	0.754***	0.610***	0.553**	0.531**
		(0.215)	(0.221)	(0.223)	(0.221)	(0.222)	(0.222)
Upper secondary education (usually age 16-19)		1.232***	1.191***	1.189***	0.878***	0.814***	0.762***
		(0.194)	(0.199)	(0.202)	(0.203)	(0.204)	(0.205)
Post-secondary education (not university)		1.754***	1.706***	1.676***	1.229***	1.113***	1.008***
		(0.237)	(0.242)	(0.244)	(0.246)	(0.248)	(0.248)
University (undergraduate and post-graduate)		2.442***	2.415***	2.327***	1.610***	1.455***	1.321***

		(0.195)	(0.201)	(0.204)	(0.216)	(0.218)	(0.220)
PHD/ advanced research qualification		3.170***	3.202***	3.008***	2.137***	1.931***	1.782***
		(0.320)	(0.322)	(0.327)	(0.338)	(0.337)	(0.340)
Experience			0.0163	0.0119	0.00526	0.00516	0.00694
			(0.0106)	(0.0106)	(0.0105)	(0.0105)	(0.0106)
Experience^2/1,000			-0.0683	-0.0353	0.0476	0.0733	0.0247
			(0.268)	(0.268)	(0.265)	(0.266)	(0.268)
Employee in public sector or non-profit				0.705***	0.579***	0.414***	0.405***
				(0.0902)	(0.0920)	(0.116)	(0.116)
Self-employed with employees				0.0623	0.0164	0.0524	0.208
				(0.179)	(0.183)	(0.179)	(0.180)
Self-employed without employees				-0.233*	-0.304**	-0.291**	-0.203
				(0.127)	(0.133)	(0.132)	(0.135)
Country f.e?		yes	yes	yes	yes	yes	yes
Occupation controls?					yes	yes	
Industry controls?						yes	yes
Detailed occ controls?							yes
Observations	26,247	22,815	22,631	22,631	22,631	22,631	22,381
R-squared	0.226	0.289	0.290	0.298	0.309	0.318	0.323

Note: The dependent variable is the total number of days of training in the current year. Mandatory training is the number of manadory days of training that are required to renew or maintain the license. Omitted indicator variables: Primary education, Employee in private firm or business. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

6.4.2. Years of Education

The analysis of skills as measured by education follows the same methodology used to study training. Table 6.7 shows the mean (normalized) years of education for unregulated, certified, and licensed workers in the EU. Interestingly, there are no significant differences in the educational achievement of the three groups of workers, despite being subject to different legal requirements. On average, licensed workers are required to have completed at least 10 years of education.

Table 6.7. Education of unregulated, certified, and licensed workers (mean normalized years of education).

	Achieved education	Mandatory education
Unregulated	13.953	-
Certified	13.532	-
Licensed	13.862	10.008
Total		

Note: Mandatory education is the number of manadory years of education that are required to obtain the license. Normalized years of education are defined in the same way in each country, based on the highest level of education achieved by the respondent: "Primary education" 5 years, "Lower secondary education" 8 years, "Upper secondary" 13 years, "Post-secondary" 15 years, "University (postgraduate and undergraduate)" 17, "PhD" 20.

When looking at the educational achievement of workers across countries (Table 6.8), no significant differences emerge. On average, unregulated, certified, and licensed workers do not appear to be very different also within member states. However, some differences emerge across educational requirements for licensed workers (Table 6.9). For example, Slovenia, Croatia, Sweden, Greece, Bulgaria, and Italy seem to be requiring more years of education than Malta, Finland, Germany, and the Czech Republic. This suggests differences in the way educational requirements are enacted across countries.

Table 6.8. Years of education of unregulated, certified, and licensed workers (mean normalized years of education).

	Unregulated	Certified	Licensed	Total
BE	14.554	14.138	14.736	14.52202
DK	14.505	14.074	14.863	14.48229
DE	13.518	11.686	11.933	12.33318
EL	14.527	15.097	15.224	14.74713
ES	12.957	13.492	14.104	13.26776
FI	14.642	14.617	13.834	14.50552
FR	14.890	14.519	15.054	14.86316
IE	14.861	14.998	15.201	14.98997
IT	12.368	13.429	14.137	12.83603
LU	13.798	14.577	14.646	14.14207
NL	14.368	14.396	13.992	14.28145
AT	13.012	12.405	13.155	12.89435
PT	11.493	11.395	13.108	11.75506
SE	14.843	15.567	15.767	15.08927
UK	14.427	14.978	15.206	14.69044
BG	14.170	15.083	14.348	14.42795
CY	15.010	15.045	15.220	15.05426
CZ	14.425	14.191	13.954	14.27146
EE	14.967	14.408	14.507	14.77441
HU	14.173	14.616	14.191	14.27459
LV	14.651	14.230	14.826	14.58417
LT	15.301	15.392	15.219	15.3098
MT	13.982	14.273	14.259	14.08657
PL	14.717	14.896	14.883	14.79078
RO	14.360	14.421	14.581	14.42443
SK	14.524	14.599	14.258	14.46733
SI	14.432	14.805	15.017	14.61007
HR	13.944	14.280	14.419	14.13958
EU28	13.953	13.532	13.862	13.84208

Source: EU Survey of Regulated Occupations

Table 6.9. Years of mandatory education of licensed workers (mean normalized years of education).

	Licensed
SI	12.899
HR	12.552
SE	12.479
EL	12.450
BG	12.092

IT	11.945
IE	11.708
LU	11.638
RO	11.615
CY	11.572
HU	11.048
LV	10.590
ES	10.518
BE	10.426
DK	10.412
AT	10.036
PT	10.035
NL	10.013
SK	9.990
UK	9.773
LT	9.732
FR	9.486
PL	9.227
EE	8.997
CZ	8.931
DE	8.905
FI	8.409
MT	7.551
Total	10.008

Note: Mandatory education is the number of mandatory years of education that are required to obtain a license.

Table 6.10 illustrates educational requirements for licensed workers in more detail. In Croatia, Hungary, Slovenia, and Bulgaria over 90 percent of licensed workers had to meet some educational requirements. In Finland, France, Estonia, Malta, and Poland less than 70 percent of workers needed to do so. Table 6.10 provides further details in the type of workers subject to licensing in each country. In Greece and Sweden over 50 percent of the licensed workers needed to have a university degree to obtain their license. In Germany and the Czech Republic about 10 percent needed to do so. Italy, Ireland, and Denmark require a university degree to about 40 percent of licensed workers. Looking at the figures for secondary education, we see that in the Czech Republic 48 percent of licensed workers are required to have secondary education. In Germany, over 50 percent of licensed workers are required to have lower secondary education.

This suggests that educational requirements may vary for a given profession across countries, but it also reflects the fact that countries tend to license very different professions (see Table 3.6 above). For example, Table 3.6 shows that Germany licenses a much larger proportion of workers in the crafts and related trades industry than Italy, which focuses more on professionals.

Table 6.10. Proportion of licensed workers subject to different levels of minimum educational requirements.

	No minimum education	Elementary or lower secondary	Upper Secondary	Post secondary	University or higher	*Some minimum education*
AT	0.177	0.266	0.293	0.104	0.16	0.823
BE	0.255	0.061	0.288	0.082	0.314	0.745
BG	0.049	0.111	0.524	0.068	0.248	0.951
CY	0.206	0.031	0.364	0.064	0.335	0.794
CZ	0.292	0.084	0.486	0.026	0.113	0.708
DE	0.121	0.533	0.205	0.04	0.101	0.879
DK	0.237	0.154	0.154	0.044	0.411	0.763
EE	0.303	0.078	0.303	0.139	0.177	0.697
EL	0.136	0.064	0.217	0.076	0.508	0.864
ES	0.123	0.319	0.177	0.008	0.373	0.877
FI	0.391	0.035	0.309	0.08	0.185	0.609
FR	0.333	0.068	0.243	0.023	0.333	0.667
HR	0.054	0.063	0.564	0.101	0.218	0.946
HU	0.085	0.227	0.507	0.066	0.116	0.915
IE	0.179	0.083	0.242	0.085	0.411	0.821
IT	0.113	0.167	0.342	0	0.378	0.887
LT	0.276	0.057	0.276	0.14	0.252	0.724
LU	0.182	0.045	0.319	0.145	0.309	0.818
LV	0.188	0.144	0.331	0.112	0.224	0.812
MT	0.472	0.037	0.149	0.095	0.247	0.528
NL	0.204	0.161	0.351	0.079	0.206	0.796
PL	0.317	0.063	0.344	0.021	0.255	0.683
PT	0.159	0.334	0.152	0.005	0.351	0.841
RO	0.14	0.119	0.401	0.059	0.281	0.86
SE	0.187	0.023	0.137	0.054	0.6	0.813
SI	0.077	0.069	0.43	0.122	0.301	0.923
SK	0.224	0.084	0.462	0.079	0.15	0.776
UK	0.288	0.024	0.277	0.085	0.325	0.712
Total	0.191	0.233	0.281	0.045	0.250	0.809

Source: EU Survey of Regulated Occupations

Table 6.11 show the achieved education of unregulated, certified, and licensed workers. On average, workers in the three groups are not very different. When regulation requires only elementary or lower secondary education, the overall educational achievement of licensed workers is much higher than the requirement thus demonstrating that regulation is merely standardising existing practice in the labour market. This is consistent with minimum educational requirements that are not binding for most workers. One reason for this finding is that most workers are subject to compulsory schooling requirements according to national law. The educational requirements imposed by occupational licensing may be binding for selected groups of workers, older workers or immigrant workers who were not subject to the same compulsory education requirements as the average European worker.

Table 6.11. Education by regulation type and minimum required education (mean normalized years of education).

Required years of education	Unregulated	Certified	Licensed	Total
0 none	14.0	13.5	12.5	13.8
5 Elementary			11.4	11.4
8 Lower secondary			10.9	10.9
13 Upper Secondary			14.4	14.4
15 Post secondary			14.8	14.8
17 University			17.0	17.0
20 PhD			19.9	19.9
Total	14.0	13.5	13.9	13.8

Source: EU Survey of Regulated Occupations

However, Table 6.11 shows that educational requirements seem to become binding for professions requiring upper secondary (about 13 years of education), post secondary (about 15 years of education), university (about 17 years), or PhD education (about 20 years). In all these cases, the average number of years of education of licensed workers is about the same as the required number of years. Overall, minimum education requirements seem to have an upskilling effect on practitioners only when they are set above upper secondary education level.

Tables 6.12 and 6.13 provide further details on this issue. The number of years of education is explained by the usual set of regressors. Table 6.12 confirms the small differences (always below half a year of education) between unregulated, certified, and licensed workers that we have observed in previous tables. Table 6.13 extends the results in Table 6.11 by controlling for a number of confounding factors.

Table 6.12. Determinants of years of education (mean normalized years of education).

	(1)	(6)	(7)	(8)	(9)	(10)
licensed	-0.0486	0.191*	-0.0331	-0.0587	-0.131	-0.212**
	(0.103)	(0.0982)	(0.0975)	(0.0873)	(0.0878)	(0.0891)
certified	-0.420***	-0.0830	-0.150	-0.238***	-0.258***	-0.286***
	(0.109)	(0.105)	(0.104)	(0.0896)	(0.0889)	(0.0887)
union		0.208**	0.0187	0.105	0.0533	0.0570
		(0.0948)	(0.0967)	(0.0864)	(0.0855)	(0.0853)
male		-0.492***	-0.325***	0.0669	0.114	0.0482
		(0.0775)	(0.0786)	(0.0718)	(0.0728)	(0.0747)
age		-0.00413	-0.00665	-0.00884**	-0.0112***	-0.00917**
		(0.00426)	(0.00426)	(0.00372)	(0.00371)	(0.00369)
Experience		0.0281**	0.0183	0.00170	0.000850	0.000237
		(0.0120)	(0.0120)	(0.0105)	(0.0105)	(0.0103)
Experience^2/1,000		-1.254***	-1.144***	-0.796***	-0.750***	-0.777***
		(0.315)	(0.316)	(0.277)	(0.274)	(0.268)
Employee in public sector or non-profit			1.187***	0.380***	0.0222	0.0265
			(0.0905)	(0.0827)	(0.107)	(0.106)
Self-employed with employees			0.613***	0.106	0.162	0.319*
			(0.199)	(0.180)	(0.178)	(0.176)
Self-employed without employees			0.582***	0.0811	0.0841	0.188
			(0.139)	(0.123)	(0.123)	(0.123)
Country f.e?		yes	yes	yes	yes	yes
Occupation controls?				yes	yes	
Industry controls?					yes	yes
Detailed occ controls?						yes
Observations	23,018	22,929	22,929	22,929	22,929	22,673
R-squared	0.002	0.105	0.126	0.348	0.360	0.376

Note: The dependent variable is the normalized number of years of education. Omitted indicator variable for employee in private firm or business. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 6.13. Determinants of years of education (mean normalized years of education).

	(1)	(2)	(3)	(4)	(5)	(6)
certified	-0.420***	-0.159	-0.213**	-0.272***	-0.291***	-0.316***
	(0.109)	(0.105)	(0.104)	(0.0896)	(0.0888)	(0.0886)
Licensed x No education required	-1.476***	-1.535***	-1.515***	-0.779***	-0.843***	-0.866***
	(0.195)	(0.176)	(0.176)	(0.168)	(0.169)	(0.167)
Licensed x Required elementary education	-2.524***	-1.931***	-2.144***	-1.199**	-1.309***	-1.389***
	(0.523)	(0.513)	(0.510)	(0.505)	(0.494)	(0.501)
Licensed x Required lower secondary education (usually age 11-15)	-3.102***	-2.101***	-2.293***	-1.709***	-1.749***	-1.838***
	(0.205)	(0.224)	(0.223)	(0.227)	(0.226)	(0.224)
Licensed x Required upper secondary education (usually age 16-19)	0.459***	0.584***	0.357***	0.325***	0.241**	0.132
	(0.105)	(0.117)	(0.115)	(0.117)	(0.118)	(0.111)
Licensed x Required post-secondary education (not university)	0.876**	0.853***	0.752**	0.862***	0.793***	0.805***
	(0.355)	(0.314)	(0.319)	(0.278)	(0.280)	(0.293)
Licensed x Required university (undergraduate and post-graduate)	3.022***	2.988***	2.669***	1.421***	1.344***	1.262***
	(0.0819)	(0.0919)	(0.0944)	(0.0943)	(0.0941)	(0.0974)
Licensed x Required PHD/ advanced research qualification	5.901***	6.089***	5.560***	3.970***	3.900***	3.910***
	(0.124)	(0.297)	(0.294)	(0.322)	(0.297)	(0.294)
Union		0.159*	-0.00259	0.0902	0.0398	0.0495
		(0.0899)	(0.0919)	(0.0835)	(0.0827)	(0.0825)
male		-0.425***	-0.288***	0.0569	0.0934	0.0149
		(0.0747)	(0.0758)	(0.0703)	(0.0713)	(0.0734)
age		-0.00509	-0.00703*	-0.00895**	-0.0112***	-0.00949***
		(0.00410)	(0.00412)	(0.00362)	(0.00362)	(0.00360)

Experience		0.0222*	0.0145	-0.000145	-0.00102	-0.00194
		(0.0115)	(0.0116)	(0.0103)	(0.0102)	(0.0101)
Experience^2/1,000		-1.066***	-0.984***	-0.705***	-0.664**	-0.675**
		(0.302)	(0.304)	(0.271)	(0.268)	(0.262)
Employee in public sector or non-profit			0.996***	0.341***	0.00291	0.0117
			(0.0877)	(0.0811)	(0.105)	(0.104)
Self-employed with employees			0.500**	0.0731	0.126	0.284
			(0.196)	(0.179)	(0.178)	(0.177)
Self-employed without employees			0.396***	0.0193	0.0183	0.129
			(0.133)	(0.121)	(0.121)	(0.121)
Constant	13.95***	14.82***	14.59***	15.54***	14.94***	13.89***
	(0.0525)	(0.190)	(0.189)	(0.191)	(0.276)	(0.617)
Country f.e?	yes	yes	yes	yes	yes	yes
Occupation controls?				yes	yes	
Industry controls?					yes	yes
Detailed occ controls?						yes
Observations	23,018	22,929	22,929	22,929	22,929	22,673
R-squared	0.096	0.174	0.189	0.371	0.382	0.398

Note: The dependent variable is normalized years of education. Omitted indicator variable: Employee in private firm or business. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

6.5 Effects of Occupational Regulation on the Return to Education.

What is the economic return to education? On average, a PhD graduate earns about three times as much as a workers with elementary education (see Figure 3.2, which reports log wages by education). Wage regressions in Table 3.7 show that even controlling for work experience, gender, age, union status, type of employment, and country fixed effects, the difference in wage due to education remains as large as 80 percent. This is consistent with a large literature showing a significant return to investment in education.

How does the return to education vary between unregulated, certified, and licensed individuals? This is a new question and there is no evidence on this issue in the literature. We can estimate wage regressions (described in Section 3) allowing for group-specific returns to education. Table 6.14 reports the estimated coefficients of a wage regression with group-specific returns to education. These are obtained including in the regression the interaction of the "licensed" and "certified" indicator variables with indicator variables for each level of educational achievement. The regression also includes as regressors gender, age, union status, work experience (linear and squared effect), country, industry, and occupation fixed effects.

The results are also described in Figure 6.1, which shows the returns to education for the three groups of workers. The salary of an unregulated worker with elementary education is normalized to zero. A similarly educated but certified worker earns on average 7 percent more, a licensed worker 17 percent more, holding constant all the other variables.

The average wage of unregulated workers systematically grows with education, particularly for workers with more than upper secondary education. The return to education for licensed workers follows a very different pattern. While licensed workers with elementary education earn more than unregulated workers, they do not experience any growth in returns to education until after post secondary education. The growth in the return to education for licensed workers is basically zero in this range of education. This implies that there is no

significant difference between the return to education for a licensed and unlicensed worker with upper secondary or post secondary education.

However, the return to a university degree is much larger for licensed workers than for unregulated workers: Licensed workers with a university degree earn significantly more than unregulated workers with the same characteristics. Hence, licensing seems to flatten the returns to education for low levels of education, while it increases the growth in the return to education for university degrees and advanced research qualifications.

The returns to education for certified workers are more similar to unregulated workers than licensed workers. There is a steady growth in wages as education increases. This suggests that the legal requirement to hold a license may be causing the significant kink in the profile of the returns to education for licensed workers. These results are consistent with previous results on the heterogeneous effects of licensing across occupations (Table 3.9). They are also consistent with the overall impact of licensing on wage inequality: licensing increases the wage of some groups but not necessarily those with lower wages, because of their occupation or education. In fact, the high return to a university degree for licensed workers contributes to the overall increase in wage inequality that is associated with licensing.

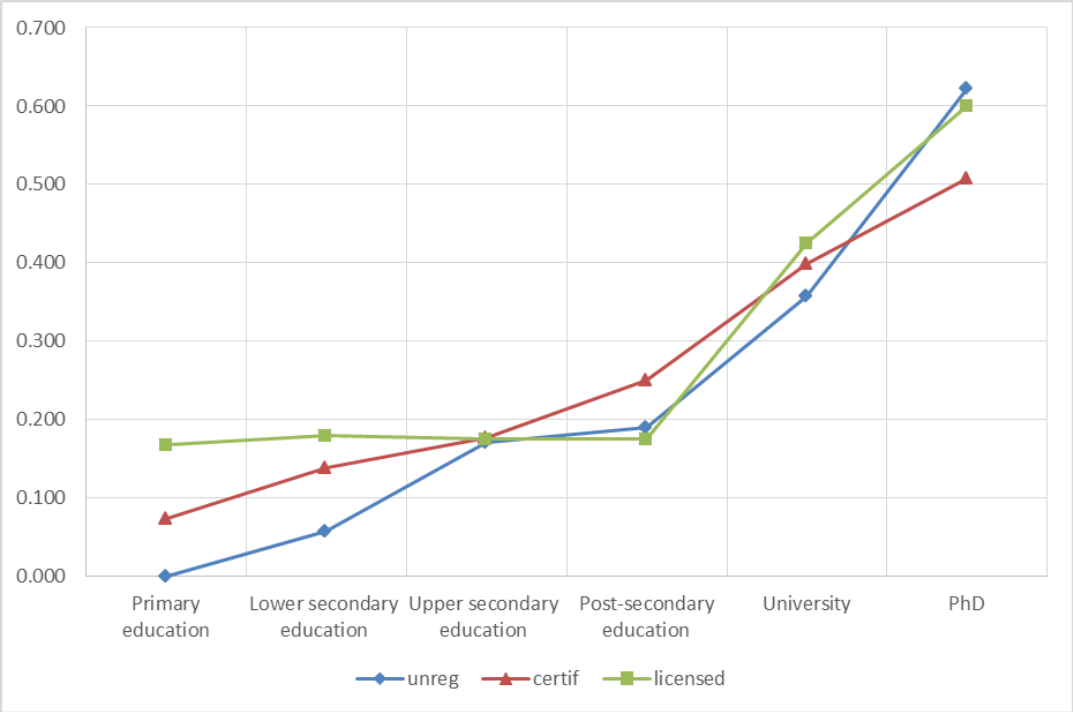
Table 6.14. Coefficients from log wage regressions (licensing and certification) with interactions by education.

	(7)	(8)	(9)
	Coef.	Std. Err.	t
Lower secondary education	0.057	0.056	1.020
Upper secondary education	**0.170**	**0.053**	**3.180**
Post-secondary education	**0.190**	**0.060**	**3.140**
University	**0.358**	**0.055**	**6.450**
PhD	**0.622**	**0.072**	**8.700**
licensed x Primary education	0.168	0.111	1.510
licensed x Lower secondary education	**0.122**	**0.039**	**3.120**
licensed x Upper secondary education	0.006	0.024	0.240
licensed x Post-secondary education	-0.015	0.060	-0.260
licensed x University	**0.067**	**0.024**	**2.770**
licensed x PhD	-0.022	0.078	-0.280

certified x Primary education	0.072	0.073	0.980
certified x Lower secondary education	**0.081**	**0.041**	**2.000**
certified x Upper secondary education	0.006	0.026	0.250
certified x Post-secondary education	0.060	0.053	1.140
certified x University	0.041	0.029	1.410
certified x PhD	-0.114	0.075	-1.530

Note: The dependent variable is the log of hourly wage. The occupation, industry, work status, gender, union, country indicators, age, experience, and experience squared are not reported. Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1.

Figure 6.1. The returns to education for unregulated, certified, and licensed workers.



Note: the figure describes the coefficients of the wage regression reported in Table 6.14.

6.6 Conclusions on Occupational Regulation and Skills.

Our results show that contrary to the claims of proponents of regulation, licensing is not the only policy lever to induce workers to invest in training. Certified workers seem to be able to invest more in training than licensed workers who do not have any continuing education

requirement. However, licensed workers with significant continuing education requirements obtain a higher level of investment.

The results are consistent with both certification and licensing promoting human capital investments. Still, the higher investment in training made by licensed workers is subject to different interpretations. Since a significant proportion of this investment is driven by regulation and not voluntarily chosen by the worker, there is no guarantee that the individual return is higher than the cost. In the case of certification, where worker preferences dictate uptake of training, it is more likely that the private benefits (such as signaling competence to consumers) outweigh the costs (such as financial and time investments in training as well as the income forgone when in training). Hence, one may conclude that the effectiveness of the type of training chosen by certified workers is likely to be higher than that provided for by regulation.

Nevertheless, the comparison of private benefits and costs does not fully account for the possible effects of training. In principle, regulation may indeed force workers to invest in activities in which the social return is higher than the social cost, although the individual private benefits may be lower than the costs. Hence, one would need to dig deeper in the difference in the type of training taken by licensed and certified workers to examine relative effectiveness of training chosen by the worker and mandated by regulation.

Occupational licensing often introduces minimum educational requirements, which seem to be particularly important in professions requiring more than upper secondary education. Finally, occupational licensing distorts the returns to education. The returns to education for unregulated and certified workers increase monotonically with the years of education achieved. In contrast, the returns to education for licensed workers are basically flat until post-secondary education. The return to a university degree is then much larger for licensed workers than for unregulated workers. Hence, licensing seems to flatten the returns to education for low levels of education, while it increases the growth in the return to having a university degree or higher, thus disproportionately affecting those at the upper levels of the skills distribution.

Chapter 7. Licensing and Asymmetric Information

Chapter Summary

- Opponents of professional licensing understand it as an arrangement seeking to capture rents for incumbents, while for proponents it is a means by which problems of information asymmetries in the supply of services can be resolved.
- We exploit respondents' views on the degree to which the quality of their work can be evaluated by consumers to provide some initial findings on the degree to which the incidence of professional licensing is associated with the presence of information asymmetries.
- At the aggregate level, we find support for the public interest explanations of licencing. In particular, perceived asymmetric information and licensing are positively correlated. The same applies to certification. However, once controls are introduced in the models, the relationship disappears.
- Although with some caveats, we reject asymmetric information as the main explanation for occupational licensing.

7.1. Theoretical Background

Professional associations and proponents of regulation have traditionally maintained that the sole goal of professional regulation is to protect the public. Economists have framed these arguments in to what is known as 'public interest theory' according to which professional licensing may serve to remedy the market failure derived from asymmetric information (Akerlof 1970[98], Leland 1979[99]). In markets where consumers cannot observe the quality of professionals, the imposition of a minimum quality standard by the social planner may lead to

[98] Akerlof, G. (1970). The Market for Lemons: Qualitative Uncertainty and the Market MechanismV. *Quarterly Journal of Economics*, *84*.

[99] Leland, H. E. (1979). Quacks, lemons, and licensing: A theory of minimum quality standards. *The journal of political economy*, 1328-1346.

increased welfare (relative to the free entry equilibrium). Establishing the optimal minimum standard implies a trade-off between the quality-enhancing and the competition-reducing effects of licensing. The underlying assumption is that asymmetric information is relevant and that professional regulation serves the public interest.

Some economists however, have long held two opposing views on the subject. Capture theory, pioneered by Stigler (1971[100]), argues that "regulation is acquired by the industry and is designed and operated primarily for its benefit". This position can be traced back to Adam Smith (1776[101]), who claimed that the objective of licensing requirements is to limit competition by reducing the number of practitioners willing to enter a trade. According to this view, professional examinations serve to limit the number of professionals, increase prices, and weaken competition, thereby introducing the typical inefficiencies caused by market power. Obviously, licensing authorities do not necessarily operate in pursuit of a single goal. In practice, both theories may provide some insight into how licensed professions are regulated.

7.2. Measuring asymmetric information

There is little evidence on the correlation between the intensity of asymmetric information and the prevalence of occupational licensing. This is mainly due to the difficulty of measuring asymmetric information. However, asymmetric information is a central issue in the study of occupational regulation, since it is the main justification for regulation based on safety or public protection arguments.

The new survey data employed in this report includes one question that solicits workers' opinion on the relevance of asymmetric information regarding the quality of the good of service

[100] Stigler, G. J. (1971). The theory of economic regulation. *The Bell journal of economics and management science*, 3-21.

[101] Smith, A. (1776). The wealth of nations. *New York: The Modern Library*.

they directly produce, or contribute to produce within their firm or organization. In particular, self-employed workers are asked:

To what extent to do you agree or disagree with the following statement…?

- *Customers or people you deliver your goods and/or services to can easily evaluate the quality of the work you do.*

Employees in a private firm or non-profit organization are proposed a slightly different wording:

- *Customers or people you deliver your goods and/or services to can easily evaluate their quality.*

This question focuses on consumers' ability to observe the quality of the good or service provided. Respondents are asked to choose one of four possible answers:

- Strongly agree.
- Agree.
- Disagree.
- Strongly disagree.

The responses provide a subjective measure of the amount of asymmetric information in the market, which enables us to test the basic ideas put forward by the public interest and rent capture theories.

If licensing is motivated by the existence of asymmetric information, we expect to observe more licensed workers in markets with more asymmetric information. Equivalently, we expect to observe that licensed workers perceive more asymmetric information than unregulated workers. In summary, perceived asymmetric information and licensing are expected to be positively correlated.

If asymmetric information is the main reason for occupational regulation, we expect to observe this correlation in the full data but also looking at workers with a given level of education, or

workers within a given industry, or workers with a given age. In the next section, we will provide the first evidence on this issue using (a) simple correlations in the full sample and then (b) regressions that account for the effect of variables such as education, industry, and age.

A similar prediction can be derived for certification, which is another mechanism to overcome asymmetric information. We expect certified workers to operate in markets with more asymmetric information than unregulated workers. Hence, we expect certified workers to report more asymmetric information than unregulated workers. The issue of the relative efficiency of licensing and certification in overcoming asymmetric information is open. In this section, we will contribute to the debate by trying to measure if there is a difference in the intensity of asymmetric information perceived by workers under the two alternative schemes.

This approach relies on individual workers' judgments about the relevance of asymmetric information for the product or service they provide. Hence, it may be biased for a number of reasons, as perceptions may often differ from reality. Still, one would expect on average a higher perception of asymmetric information in markets in which there is, on average, more asymmetric information. While perceptions are admittedly noisy measures of asymmetric information, they may well capture average differences in asymmetric information across markets.

More problematic is the situation in which licensed workers are induced to believe that asymmetric information is relevant by the emphasis that professional associations put on this specific issue. Indeed, asymmetric information is typically used to justify occupational regulation. In this case, our approach may not capture the causal effect from perceived asymmetric information to regulation, but the opposite effect from regulation to perceived asymmetric information. With this caveats in mind, we explore the correlation between perceived asymmetric information and occupational regulation.

7.3. Empirical Results

On average, 14.4 percent of workers disagree with the statements above, indicating the existence of asymmetric information. We call such proportion "perceived asymmetric information", since it measures the intensity of the perception of asymmetric information among workers. Table 7.1 shows that perceived asymmetric information is only 12.3 percent for unregulated workers, it increases to 15.1 percent for certified workers, and further increases to 19.2 percent for licensed workers.

Table 7.1 Perceived asymmetric information by type of regulation.

Unregulated	0.123
Certified	0.151
Licensed	0.192
Total	0.144

Note: Perceived asymmetric information is the proportion of workers who disagree with the statement "Customers or people you deliver your goods and/or services to can easily evaluate their quality (or the quality of the work you do)"

Table 7.2 shows that perceived asymmetric information is generally higher for certified and licensed workers than unregulated workers within occupations. Asymmetric information is higher for licensed workers in 6 out of 10 professions. Table 7.3 shows similar results when grouping workers by main activity of the firm or organization they work in (industry).

Overall, there is a positive correlation between asymmetric information and certification, and asymmetric information and licensing. This is consistent with asymmetric information generating the need for a mechanism that signals the quality of the product or service. There is also some evidence that asymmetric information is more intense for licensed workers. However, the results in Tables 7.1-7.3 do not account for other variables that could potentially affect the results. For example, Table 3.2 in Section 3 shows that licensed workers are more likely to be male, union members, employees in a public or non-profit organization, and to have

a university degree. Hence, we want to measure differences in perceived asymmetric information after controlling for individual characteristics.

Table 7.2. Perceived asymmetric information by regulation and occupation.

	Regulation			
	Unregulated	Certified	Licensed	Total
Managers	0.084	0.095	0.081	0.086
Professionals	0.161	0.198	0.209	0.182
Technicians and associate professionals	0.118	0.153	0.252	0.162
Clerical support workers	0.115	0.169	0.154	0.130
Service and sales workers	0.092	0.105	0.180	0.114
Skilled agricultural	0.177	0.173	0.438	0.218
Craft and related trades workers	0.101	0.114	0.149	0.114
Plant and machine operators	0.116	0.158	0.130	0.128
Elementary occupations	0.152	0.165	0.139	0.152
Armed forces occupations	0.310	0.229	0.308	0.302
Total	0.123	0.151	0.193	0.145

Note: Perceived asymmetric information is the proportion of workers who disagree with the statement "Customers or people you deliver your goods and/or services to can easily evaluate their quality (or the quality of the work you do)"

Table 7.4 reports regressions coefficients of a linear probability model in which the dependent variable is an indicator variable equal to one if the interviewed worker disagrees with the statements discussed above, indicating the existence of some asymmetric information. In column 1, we report the results without any control variables. As noted in Table 7.1, the proportion of licensed workers who report the existence of asymmetric information is about 7 percent higher than the corresponding proportion for unregulated workers. The proportion of certified workers is about 3 percent higher.

However, as soon as we start controlling for gender, education, experience, unionization, type of employment, and country fixed effects (column 2), the difference between licensed workers and unregulated workers decreases by half, while the difference between certified and unregulated workers disappears. There is no statistically significant difference in perceived asymmetric information between licensed, certified, and unregulated workers when we further

control for broad occupational groups and industry (columns 4 and 5). This implies that the observed differences in Table 7.1 are mainly due to differences in workers' characteristics. After controlling for these characteristics, we cannot conclude that licensing is more prevalent in markets with significant asymmetric information.

Table 7.3 Perceived asymmetric information by regulation and main activity of the company or organization.

	Regulation			
	Unregulated	Certified	Licensed	Total
Agriculture	0.201	0.208	0.296	0.216
The manufacturing of products	0.076	0.133	0.085	0.090
Construction or energy	0.122	0.100	0.155	0.123
Wholesale or retail trade	0.058	0.076	0.097	0.066
Hotels and restaurants	0.057	0.092	0.289	0.086
Transportation and communication	0.131	0.157	0.142	0.140
Finance, real estate	0.151	0.113	0.179	0.149
Public administration	0.198	0.214	0.263	0.224
Education	0.194	0.223	0.198	0.202
Health and social work	0.160	0.179	0.226	0.188
Professional services	0.117	0.170	0.220	0.150
Cultural activities	0.134	0.125	0.082	0.124
Total	0.123	0.151	0.192	0.144

Note: Perceived asymmetric information is the proportion of workers who disagree with the statement "Customers or people you deliver your goods and/or services to can easily evaluate their quality (or the quality of the work you do)"

Table 7.4. Perceived asymmetric information by type of regulation controlling for individual characteristics.

	(1)	(2)	(3)	(4)	(5)
licensed	0.0698***	0.0275**	0.0251**	0.0162	0.0132
	(0.0115)	(0.0113)	(0.0113)	(0.0114)	(0.0117)
certified	0.0278***	-0.00363	-0.00418	-0.00747	-0.00750
	(0.0106)	(0.0108)	(0.0107)	(0.0107)	(0.0107)
union		-0.00247	-0.00292	-0.00386	-0.00296
		(0.0105)	(0.0105)	(0.0105)	(0.0106)
male		-0.00500	-0.00641	-0.00450	-0.00562
		(0.00831)	(0.00860)	(0.00889)	(0.00928)
age		0.000436	0.000439	0.000331	0.000380
		(0.000411)	(0.000412)	(0.000413)	(0.000418)
Lower secondary education (usually age 11-15)		-0.0880***	-0.0845***	-0.0861***	-0.0852***
		(0.0282)	(0.0284)	(0.0280)	(0.0283)
Upper secondary education (usually age 16-19)		-0.0563**	-0.0553**	-0.0571**	-0.0559**
		(0.0256)	(0.0260)	(0.0256)	(0.0260)
Post-secondary education (not university)		-0.0219	-0.0241	-0.0288	-0.0307
		(0.0306)	(0.0316)	(0.0313)	(0.0314)
University (undergraduate and post-graduate)		-0.0580**	-0.0701***	-0.0758***	-0.0762***
		(0.0257)	(0.0270)	(0.0268)	(0.0272)
PHD/ advanced research qualification		-0.00202	-0.0228	-0.0307	-0.0313
		(0.0442)	(0.0450)	(0.0448)	(0.0451)
Experience		-0.000471	-0.000681	-0.000550	-0.000630
		(0.00116)	(0.00116)	(0.00114)	(0.00116)
Experience^2/1,000		0.0233	0.0249	0.0229	0.0254
		(0.0307)	(0.0306)	(0.0302)	(0.0305)
Employee in public sector or non-profit		0.0845***	0.0766***	0.0433***	0.0401***

		(0.0103)	(0.0105)	(0.0128)	(0.0128)
Self-employed with employees		-0.00146	0.00210	-0.00352	-0.00309
		(0.0184)	(0.0189)	(0.0190)	(0.0196)
Self-employed without employees		0.0146	0.00861	-0.00809	-0.0107
		(0.0125)	(0.0128)	(0.0132)	(0.0132)
Country f.e?		yes	yes	yes	yes
Occupation controls?			yes	yes	
Industry controls?				yes	yes
Detailed occ controls?					yes
Observations	23,246	22,968	22,968	22,968	22,712
R-squared	0.006	0.049	0.054	0.062	0.067

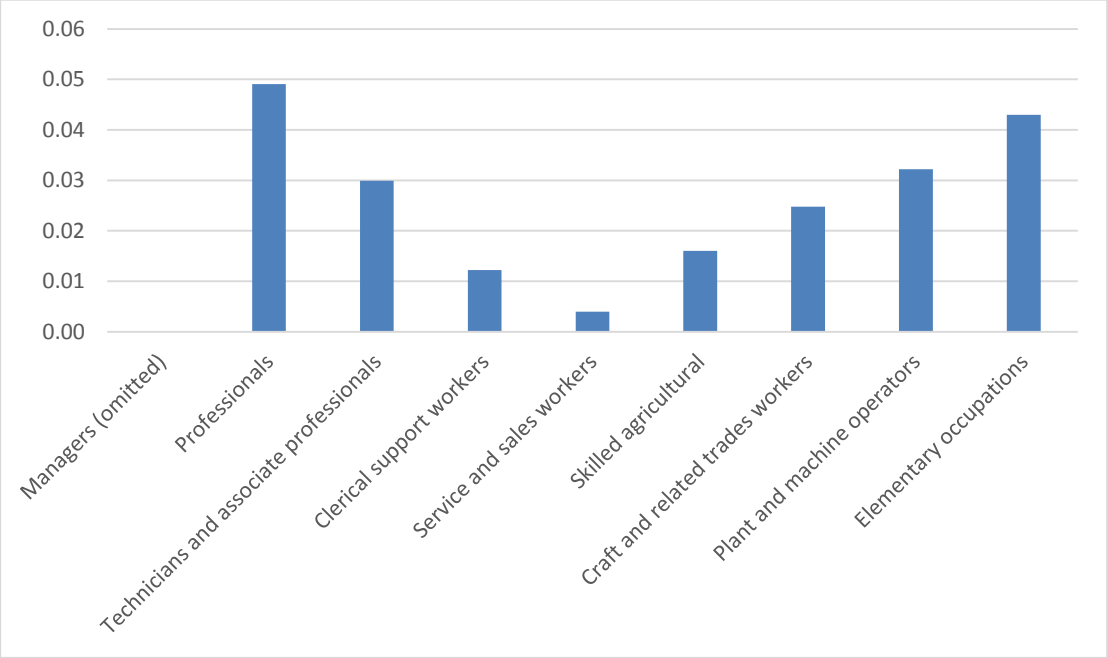
Note: The dependent variable is an indicator variable equal to one if the interviewed worker disagrees with the statement "Customers or people you deliver your goods and/or services to can easily evaluate their quality (or the quality of the work you do)". Omitted indicator variables: Primary education, Employee in private firm or business, Managers, Agriculture. Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 7.4, column 4 shows that employees in the public sector are 4 percent more likely to report asymmetric information. This is not surprising, since the quality of the services provided by the public administration, such as health, education, and justice are very difficult to evaluate. Asymmetric information is also reported to be high by workers with the lowest and highest levels of education, possibly for different reasons. The former are more likely to work in low skilled occupations, in which the quality of their work is unlikely to affect the overall quality of the services or products delivered to consumers (by the firms or organizations in which they work). The latter are more likely to be high skilled professionals (e.g. doctors) providing high quality services that consumers may find difficult to evaluate because of their complexity.

Figures 7.1 and 7.2 report the estimated coefficients for occupation and industry indicator variables corresponding to the specification in Table 7.4. Relative to managers (the omitted category and the group with lowest perceived asymmetric information), professionals are about 5 percent more likely to report asymmetric information, after controlling for individual characteristics. Workers in the armed forces are about 13 percent more likely to report asymmetric information. This is expected, as the quality of the services provided by the armed forces cannot be possibly evaluated by citizens, but in very special circumstances. Service and sales workers are about as likely as managers to report asymmetric information (Figure 7.1), which is small for this type of occupations.

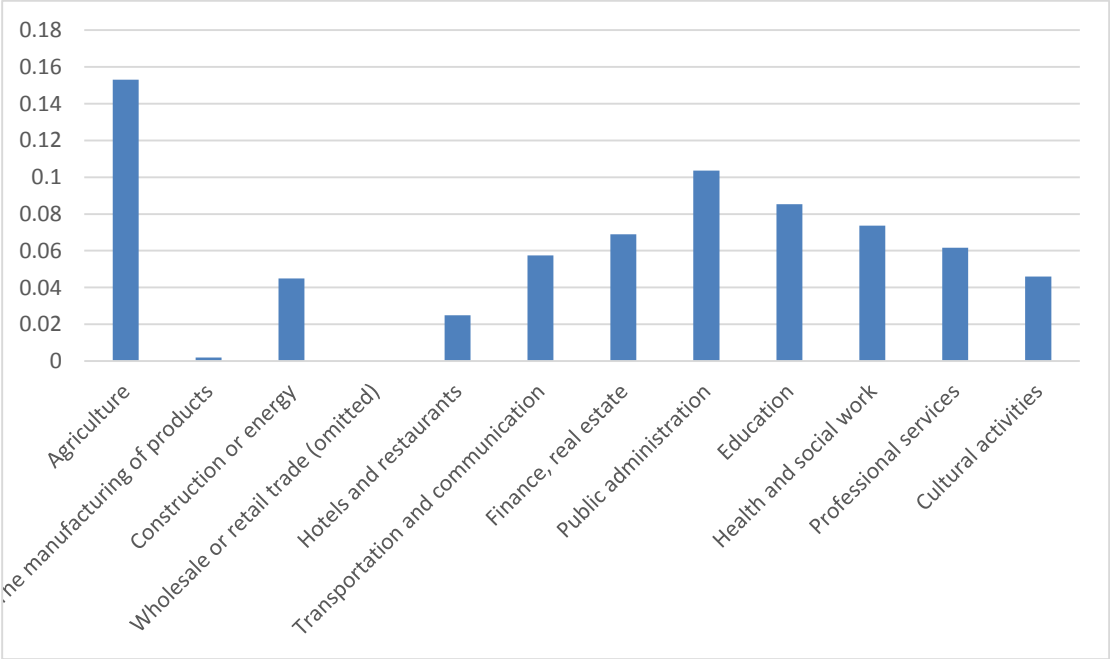
Figure 7.2 shows that, relative to the wholesale and retail industry (the omitted category and the industry with lowest perceived asymmetric information), workers in agriculture are about 15 percent more likely to report asymmetric information, after controlling for individual characteristics. In fact, consumers cannot generally evaluate the quality of agricultural products, unless they rely on additional information provided by labels or certifications of different types. These are, in fact, a way for the market to overcome the problems generated by asymmetric information (e.g. bio labels for organic food). Asymmetric information is also perceived to be high in the public sector and education.

Figure 7.1. Estimated differences across professions in asymmetric information.



Note: The figure reports the estimated coefficients of occupation indicator variables corresponding to column 4 in Table 7.4. The coefficient of the indicator variable for Armed Forces (not reported in the figure) is 0.134.

Figure 7.2. Estimated differences across industries in asymmetric information.



Note: The figure reports the estimated coefficients of industry indicator variables corresponding to column 4 in Table 7.4.

7.4. Conclusions on regulation and asymmetric information

In this section we provide some initial estimates of the correlation between the perceived asymmetric information within occupations and their regulation status. Our propositions are based on the assumptions put forward by two competing explanations relating to the reasons why professional licensing is introduced. Overall, the evidence on the correlation between asymmetric information and licensing is mixed. At the aggregate level, perceived asymmetric information and licensing are positively correlated. Also asymmetric information and certification are positively correlated, thus lending support to the public interest explanations of licencing. However, after controlling for some important characteristics of the individuals and their jobs, we do not find a statistically significant correlation. Hence, the observed aggregate correlation seems to be mainly caused by differences in education, type of employment, type of occupation and industry.

While the nature of the data and our methodological framework do not allow us to provide a firm test of the two theoretical standpoints, our findings do allude to the possibility that reasons other than protecting the public interest might be at play when licensing is present. They can therefore serve as a useful starting point for policy makers when thinking about the nature and characteristics of occupations that are currently subject to licensing and whether the observed regulatory arrangement is optimal in terms of serving the interests of consumers rather than those of practitioners and their professional associations.

Chapter 8. Conclusions

Occupational regulation is an under-researched labour market institution in the EU. Nevertheless, it has long been evident to policy-makers and researchers that this is neither necessarily a reflection of its low pervasiveness and growth, nor an indication of its economic insignificance in terms of its labour market effects. This study is therefore long overdue. However, its execution has only been possible due to the new EU Survey of Regulated Occupations, commissioned by the EU Commission, since it is the first time that researchers can provide accurate estimates of the prevalence of regulation and some initial estimates of its labour market impact. Indeed, the key strength of the survey is that occupational regulation is measured by asking respondents directly whether they work in a regulated occupation, as opposed to using the occupation as a proxy to infer the regulation status of the individual. A further strength of the survey is that it also reports certain key labour market indicators, thus providing the basis for further empirical analysis of the links between regulation and key variables of interest such as wages, employment, skills and mobility.

As such, the analysis of the survey provides us with some important insights. First, given that just under half (43%) of workers are either licensed or certified, occupational regulation is clearly a dominant labour market institution in the EU context and it deserves more attention than it has commonly attracted. Further, 22% of the EU workers, or about 47 million people are subject to licensing arrangements, meaning that its labour market impact can be fairly significant. In some countries, this exceeds the proportion of the workforce that belongs to trade unions or that is covered by national minimum wage provisions, two labour market institutions that receive far more attention than professional regulation. While its prevalence varies from country to country, even at its lowest it still covers 14% of the workforce. It is therefore evident that going forward, occupational regulation should enter mainstream debates on EU labour market policy.

What further follows from the point on prevalence is that given the well-established literature on the economic outcomes associated with regulating occupations, policy-makers and regulators must take the economic impact of regulation in general and licensing in particular into account in their decision-making. In this study, for example we were able to provide an aggregate picture of how regulation is associated with certain labour market outcomes.

More specifically, in our study, we show that, on average, licensing is associated with higher wages, which were as high as 19% in the case of craft occupations in our sample. This is clearly an alarming finding, since this increase in wages can be interpreted as the consequence of the legal requirement to hold a license, which does not necessarily correspond to any increase in worker productivity. Also alarming is the fact that licensing distorts relative wages in the economy. Wages are a key mechanism by which workers are allocated in the labour market, and any such distortions are creating inefficiencies in its operation. Finally, the wage premium associated with licensing disproportionately benefits those at the higher end of the income distribution thus contributing to income disparities in society. To the extent that growing income inequality is a policy concern in many EU economies, understanding licensing's share to such an effect is one step towards more evidence-based policy. We further tested the effect of certification on the same indicators and we found it to be less pronounced, thus leading us to conclude that in the context of regulation, certification appears to be a better policy alternative to licensing. Therefore, to the extent that some form of regulation is deemed necessary, before resorting to licensing, policy-makers should consider whether certification is sufficient in serving the regulatory goals.

Our findings in relation to the effect of licensing on employment are less conclusive. Although we estimate that licensing is associated with a loss of about 705,000 jobs and that, depending on the occupation, there could be between 3 and 9 % more people working in a given profession should access requirements be made less stringent, our cross-sectional analysis did not yield any clear results either way. Given existing research on this theme, we are inclined to attribute this to the characteristics of our dataset and we urge economists

and policy makers not to interpret our inability to reach a robust conclusion as evidence that regulation does not affect employment. Instead, we encourage future work to consider more suitable data sources and in particular before and after studies of changes in the regulatory status of occupations, as well as studies that also consider the effect that the introduction of licensing has on employment in neighbouring occupations (an important theme that we could not explore in this study).

Turning to the relationship between professional regulation and labour movement, a key political priority of the EU, the results are of concern. In particular, the stock of foreign-born workers is significantly lower among licensed workers. The effect varies by occupation, so we recommend that going forward policy makers take this into consideration and engage in occupation-specific analysis before implementing new licensing regulations. We predict that this finding most likely reflects variations in regulatory regimes and/or be indicative of complex and expensive bureaucratic procedures associated with recognition of qualifications. This assumption is also strengthened by the finding that licensed workers under automatic recognition are more likely than their general system counterparts to be found working in another EU country. It further leads us to recommend that policy makers consider extending automatic recognition to other occupations subject to licensing arrangements, as from a mobility point of view this policy seems to be effective.

With regards to training and education, we find that licensing is not always associated with skills acquisition over and above that achieved by certification, thus demonstrating that upskilling can be achieved via alternative routes. This strengthens our previous conclusion that certification might for some occupations be a more effective policy alternative compared to licensing. Moreover, whether more training and education is reflected into better quality products and services for the consumer is something that we are not able to establish in this study. We thus urge policy-makers to treat this aspect with caution as superior skills do not necessarily translate to more productive workers or better quality products. Further, education and training require the investment of scarce economic resources and thus involve an opportunity cost. For example, current licensing regulation

could be increasing the skills of some individuals, at the expense of the education of others. However, alternative types of regulation (e.g. certification) or a more careful calibration of the skill requirements could lead to educating more workers at a level that would still suffice in ensuring quality.

In the final section, our study places the impetus for licensing under scrutiny. In doing so, we provide an initial test as to whether licensing is indeed associated with the existence of information asymmetries in occupations, admittedly the key justification of its existence amongst policy makers, regulators, and professional associations. Our findings, albeit with some caveats, lead us to reject the asymmetric information argument as the main explanation for the incidence of licensing in our survey. This is an interesting finding which, coupled with some of the negative labour market effects discussed earlier, leads us to question the main justification for the widespread adoption of licensing regulations. On the basis of the evidence presented here, we conclude that licensing, as a policy lever to improve the skill base in the EU economy and overcome information asymmetries, should be re-examined. At the same time, certification and accreditation deserve more attention as in many cases they could represent viable policy alternatives to licensing.

Appendix 1: Survey Questionnaire by TNS

Questionnaire
Measuring the prevalence of occupational regulation
06/03/2015

Target: population 15+

Coverage: EU28

DK/NA = don't know/no answer – always spontaneous
(OUR COUNTRY) will be replaced by the name of the country in each country
(NATIONALITY) will be replaced by the nationality of the country in each country
Q1 is always the question about nationality
SPLIT BALLOT[102]: not needed

D1 **How old are you?**
(WRITE DOWN - IF "REFUSAL" CODE '99')
_ _°

D2 **Gender**

Male	1
Female	2

D4 **How old were you when you stopped full-time education?**
(INT.: IF "STILL STUDYING", CODE '00' - IF "NO EDUCATION" CODE '01' - IF "REFUSAL" CODE '98' - IF "DK" CODE '99')
_ _°

[102] A Split Ballot is a procedure where a sample is divided into two halves and each receives a slightly different questionnaire – ESOMAR definition

D12 **In which region do you currently live?**
(READ OUT IF NECESSARY - ONE ANSWER ONLY)
_ _°

D13 **Would you say you live in a...?**
(READ OUT – ONE ANSWER ONLY)

Rural area or village	1
Small or middle sized town	2
Large town	3
DK (DO NOT READ OUT)	4

ASK D18 IF RESPONDENT WAS REACHED ON A FIXED/LANDLINE PHONE (PH1=2)

D18 **Have you got a mobile phone?**

Yes	1
No	2

ASK D20 IF RESPONDENT WAS REACHED ON MOBILE PHONE (PH1=1)

D20 **Have you got a landline phone?**

Yes	1
No	2

D22 **Could you tell me how many people aged 15 years or more live in your household, yourself included?**
(WRITE DOWN - IF "DK" CODE '98' - IF "REFUSAL" CODE '99')
Number of people aged 15 or more in the household

INTRO **Good morning/evening , I hope I'm not calling at an inconvenient time. My name is [ ] and I am calling from [name of national institute] on behalf of the European Commission. We are conducting a study to understand how different employment regulations across Europe affect citizens, I'd be grateful if you could spare 10 minutes to answer a few quick/simple questions. All of your answers will be treated in the strictest confidence. Are you happy to proceed? Is now a convenient time for you?**

Agree	1
Refuse	2
Appointment	3

Q1 **Thank you. I would like to know first about your working status. Are you currently not employed, an employee or self-employed?**
Interviewer instructions: After having the general status, just ask the two options for each. If the person has more than one paid job, please ask them to answer about their main current job (the one where they spend the most number of hours).
READ OUT - ONE ANSWER ONLY

Employee in a private firm or business	1
Employee in public sector or non-profit organization	2
Self-employed with employees	3
Self-employed without employees	4
Not employed and looking for work	5
Not employed and not looking for work	6
Retired	7
DK/NA	8

IF "NOT EMPLOYED AND NOT LOOKING FOR A JOB", OR "RETIRED", OR "DK/NA" THEN THANK AND CLOSE INTERVIEW. OTHERS GO TO Q20

ASK IF Q1=CODE1 TO CODE 5 **(INCLUDES UNEMPLOYED)**

Q20 **What is/was your occupation/profession?**
Interviewer instruction: If you have more than one occupation refer to the one where you spend most hours.
Example: trained accountants currently working MOST HOURS as waiters should answer "waiter".
ISCO-08 CODED AT 4 DIGIT LEVEL
INTERVIEWER: Ask and write in full details. Probe for as much information as possible with view to obtaining accurate 4-digit ISCO classification.

ASK IF Q1=CODE1 TO CODE 5 **(INCLUDES UNEMPLOYED)**

Q19 **What is/was the main activity of the company or organisation where you work/worked? Instruction for interviewers: once somebody selects a sector, do not continue reading.**

READ OUT - ONE ANSWER ONLY

Agriculture	1
The manufacturing of products	2
Construction or energy	3
Wholesale or retail trade	4
Hotels and restaurants	5
Transportation and communication	6
Finance, real estate	7
Public administration	8
Education and research	9
Health and social work	10
Professional services	11
DK/NA	12

ASK IF Q1=CODE1 TO CODE 5 (INCLUDES UNEMPLOYED)

Q12 **The next question is about your school/academic education. What is the highest level of education you have achieved?**

DO NOT READ OUT - RECODE - ONE ANSWER ONLY

Primary education. Help text for the interviewer: "primary school" / "Skills for Life" or equivalent	1
Lower secondary education (usually ages 11-15) Help text for the interviewer: "Secondary school" / "Skillstart" or equivalent	2
Upper secondary education (usually ages 16-19) Help text for the interviewer: "GCSE / SCE Standard Grades"/ "General National Vocational Qualification", Apprenticeship/ Scottish National Qualification Higher / General Certificate of Education / Welsh Advanced Baccalaureate / International Baccalaureate	3
Post-secondary education (after secondary school, not including university or equivalent) Help text for the interviewer: HE Access	4
University (undergraduate and post-graduate) or equivalent vocational training Help text for the interviewer: Bachelor's Degree / Master's Degree / National Vocational Qualification (Level 4 or 5) / Higher National Certificate / Professional Post-Graduate on-the-job training / Post-Graduate Diplomas and Certificates	5
PHD/ advanced research qualification Help text for the interviewer: Doctor of Philosophy	6
DK/NA	7

ASK IF Q1=CODE1 TO CODE 5 (INCLUDES UNEMPLOYED)

Q2a **In addition to this education, do you have a professional certification, licence or did you have to take an exam which is required to practice your occupation?**
Interviewer instruction: A professional certification or license shows you are qualified to perform a specific job and may give you the right to enter a regulated profession or professional association. Only include certifications or licenses obtained by the respondent as an individual. Examples include "licensed medical doctor" and "licensed taxi driver".
IF UNEMPLOYED, THE OCCUPATION THEY HAD BEFORE BEING MADE UNEMPLOYED. IF NO PREVIOUS OCCUPATION, CODE NO
(READ OUT – ONE ANSWER ONLY)

Yes	1
No – but currently in process of obtaining one	2
No	3
DK/NA	4

ASK IF Q2A=CODE1 OR CODE 2

Q2b **Without this professional certification, license or exam would you be legally allowed to practice your occupation?**
Interviewer instruction: Refer to the respondent's specific occupation and personal circumstances. Refer to the current laws and regulations affecting the respondent's occupation (current main paid job).
(READ OUT – ONE ANSWER ONLY)

Yes	1
No	2
DK/NA	3

ASK Q3 TO Q6 IF Q2a=CODE 1 OR 2 AND IF Q2b=CODE 2 (REGULATED PROFESSIONS)
OTHERS GO TO Q10b

INTERVIEWER: READ OUT: **To make things simpler, for the remainder of this interview, I will be referring to this professional certification, license or exam you have obtained or in the process of obtaining as an: "authorisation"**

Q3 **Who granted/ gave you or grants/ gives this authorisation?**
PROMPT IF NECESSARY - MULTIPLE ANSWERS POSSIBLE

A national government or regulatory body	1
A regional government or regulatory body	2
A local government or regulatory body	3
A professional association	4
A school or university	5
Someone else	6
DK/NA	7

Q4 **Is/ was a minimum level of education required in order to apply for this authorisation?**
Interviewer instruction: In doubt, ask the respondent to refer to his/ her individual case.
PROMPT IF NECESSARY - ONE ANSWER ONLY

No minimum level of education required	1
Primary education. Help text for the interviewer: "primary school" / "Skills for Life" or equivalent	2
Lower secondary education (usually ages 11-15) Help text for the interviewer: "Secondary school" / "Skillstart" or equivalent	3
Upper secondary education (usually ages 16-19) Help text for the interviewer: "GCSE / SCE Standard Grades"/ "General National Vocational Qualification", Apprenticeship/ Scottish National Qualification Higher / General Certificate of Education / Welsh Advanced Baccalaureate / International Baccalaureate	4
Post-secondary education (after secondary school, not including university or equivalent) Help text for the interviewer: HE Access	5
University (undergraduate and post-graduate) or equivalent vocational training Help text for the interviewer: Bachelor's Degree / Master's Degree / National Vocational Qualification (Level 4 or 5) / Higher National Certificate / Professional Post-Graduate on-the-job training / Post-Graduate Diplomas and Certificates	6
PHD/ advanced research qualification Help text for the interviewer: Doctor of Philosophy	7
DK/NA	8

Q5 **How much work experience is/ was required to obtain this authorisation?**
(READ OUT – ONE ANSWER ONLY)

No work experience is/was required	1
Up to a year	2
More than 1 year up to 2 years	3
Longer than 2 years	4
DK/NA	5

Q6 **Do/did you have to take an exam to obtain this authorisation?**
(ONE ANSWER ONLY)

Yes	1
No	2
DK/NA	3

ASK Q7 IF Q2a=CODE1 AND IF Q2b=CODE 2 (REGULATED OCCUPATION)
AND Q1=1-4 (CURRENTLY WORKING ONLY)

Q7 **How much do you have to pay each year to have the authorisation maintained or renewed?**
INTERVIEWER: Use local currency - if fee is more/ less frequently ask respondent to estimate an ANNUAL fee
(READ OUT – ONE ANSWER ONLY)

I don't have to pay an annual fee	1
Less than 50 euros	2
51-100 euros	3
100-200 euros	4
More than 200 euros	5
DK/NA	6

ASK Q8 IF Q2a=CODE1 AND IF Q2b=CODE 2 (REGULATED OCCUPATION)
AND Q1=1-4 (CURRENTLY WORKING ONLY)

Q8 **Do you need to continue to have mandatory training to maintain or renew the authorisation?**
(READ OUT – ONE ANSWER ONLY)

None, not required	1
Up to a day per year	2
Up to a week per year	3
Longer than a week per year	4
DK/NA	5

ASK Q9 IF Q8= CODE 2 OR 3 OR 4. OTHERS GO TO Q10a

Q9 **How much money did you spend in the past year on this?**
Interviewer instruction: how much the respondent personally spent.
(READ OUT – ONE ANSWER ONLY)

Nothing - it was free	1
Nothing - my company paid the cost	2
Less than 50 euros	3
50-100 euros	4
101-200 euros	5
201-500 euros	6
More than 500 euros	7
DK/NA	8

ASK Q10a IF Q2a=CODE1 AND IF Q2b=CODE 2 (REGULATED OCCUPATION)

Q10a **Roughly how much time have you spent on other non-mandatory courses, training, seminars, conferences, lessons, or similar activities related to your job in the past year?**
Interviewer instruction: we are now talking about non-mandatory learning activities.
(READ OUT – ONE ANSWER ONLY)

None	1
Up to a day	2
Up to a week	3
Longer than a week	4
DK/NA	5

ASK Q10b IF Q2a= CODE 2 OR 3 OR Q2b = CODE 1

Q10b **Roughly how much time have you spent on courses, training or similar activities related to your job in the past year?**
(READ OUT – ONE ANSWER ONLY)

None	1
Up to a day	2
Up to a week	3
Longer than a week	4
DK/NA	5

ASK Q11 IF Q10a=CODE 2 TO CODE 4 OR IF Q10b=CODE 2 TO CODE 4. OTHERS GO TO Q21

Q11 **How much money did you spend on these non-mandatory learning activities (in the past year)?**
Interviewer: how much the respondent personally spent.
(READ OUT – ONE ANSWER ONLY)

Nothing - it was free	1
Nothing - my company paid the cost	2
Less than 50 euros	3
50-100 euros	4
101-200 euros	5
201-500 euros	6
More than 500 euros	7
DK/NA	8

ASK Q21 IF Q1=CODE 1 OR CODE 2 (EMPLOYEES). OTHERS GO TO Q22

Q21 **How many people work for your employer at the establishment where you work?**
Interviewer: include full and part time workers.
(READ OUT – ONE ANSWER ONLY)

less than 10	1
between 10 and 50	2
between 51 and 250	3
More than 250	4
DK/NA	5

ASK Q22 IF Q1=1-4 (CURRENTLY WORKING ONLY)

Q22 **In which year did you start working for your current employer (or as self-employed)?**
(ONE ANSWER ONLY)

[_____] YEAR
DK/NA

ASK Q23 IF Q1=1-4 (CURRENTLY WORKING ONLY)

Q23 **Approximately how many hours do you work in a typical week in your main job?**

DO NOT READ OUT - ONE ANSWER ONLY

less than 15 hours	1
15-20 hours	2
21-25 hours	3
26-30 hours	4
31-35 hours	5
36-40 hours	6
41-45 hours	7
More than 45 hours	8
DK/NA	9

ASK Q24 IF Q1=1-4 (CURRENTLY WORKING ONLY)

Q24a **Please can you tell us how much are your net monthly earnings from your main paid job (i.e., the amount you receive each month after tax)?**
Interviewer: Please refer to the average earnings in the recent months. If you don't know the exact figure, please give an estimate.
(ONE ANSWER ONLY)

[_____] EUROS
DK/NA

Q24b **INTERVIEWER INSTRUCTION: PLEASE RECODE AMOUNT INTO APPROPRIATE RANGE**

ONE CODE ONLY

Less than 500€	1
500€ to less than 1000€	2
1000€ to less than 2000€	3
2000€ to less than 3000€	4
3000€ to less than 4000€	5
4000€ to less than 5000€	6
5000€ to less than 7500€	7
7500€ to less than 10000€	8
10000€ or more	9

ASK Q25 IF Q1=1-4 (CURRENTLY WORKING ONLY)

Q25 **Are you a member of a trade union?**

(ONE ANSWER ONLY)

Yes	1
No	2
DK/NA	3

ASK Q27 IF Q1=CODE3 OR CODE4 (SELF EMPLOYED) OTHERS GO TO Q28

Q27 **In your occupation, are there any regulations concerning …?**
(READ OUT – MULTIPLE ANSWERS POSSIBLE)

Minimum prices for services provided or goods sold	1
Maximum prices for services provided or goods sold	2
Whether you can advertise your services or not	3
Restrictions on the location where one can work	4
None	5
DK/NA	6

ASK Q28 ITEM 1 IF Q1=3 OR 4 (SELF EMPLOYED). ASK Q28 ITEM 2 IF Q1=1 OR 2 (EMPLOYED). ASK Q28 ITEM 3 AND Q28 ITEM 4 IF Q2a=1 AND Q2b=2 (REGULATED OCCUPATION)

Q28	(READ OUT – ONE ANSWER ONLY)	Strongly agree	Agree	Disagree	Strongly disagree	DK/NA
1	Customers or people you deliver your goods and/or services can easily evaluate the quality of the work you do	1	2	3	4	5
2	Customers or people you deliver your goods and/or services can easily evaluate their quality	1	2	3	4	5
3	The standards that you need to fulfil in order to practice your occupation are set too high	1	2	3	4	5
4	The legal requirements for working in the same occupation in other EU member states make it difficult for you to work abroad					

ASK ALL

Q15 **In which country were you born?**

(DO NOT READ OUT – ONE ANSWER ONLY)
Recode :
- List of 28 EU countries
- Other

IF Q15 IS DIFFERENT FROM (COUNTRY) ASK Q16 AND Q17 AND Q18, OTHERWISE GO TO Q29

Q16 **In which year did you arrive in [COUNTRY]? (refer to most recent arrival)**
(ONE ANSWER ONLY)

[_____] YEAR

DK/NA

Q17 **In which country did you live before moving to [COUNTRY]? (refer to most recent arrival)**

(DO NOT READ OUT – ONE ANSWER ONLY)
Recode :
- List of 28 EU countries
- Other

Q18 **Did you move to [COUNTRY] because of work related reasons? For example, you moved because you found a job in [COUNTRY] or you wanted to look for a job in [COUNTRY].**
(ONE ANSWER ONLY)

Yes	1
No	2
DK/NA	3

ASK 29 IF Q2a= CODE 1 OR 2 AND Q2b= CODE 2 (REGULATED PROFESSIONS)

Q29 **Next question is the last one in this survey which is part of a long term work strand hoping to improve job opportunities in the EU. Would you be willing to be recontacted in a year or two year's time to take part in a similar survey?**
(ONE ANSWER ONLY)

Yes	1
No	2

IF CODE 1 IN Q29 THEN GO TO Q30

Q30 **INTERVIEWER: RECORD NAME AND CONFIRM NUMBER**