

A Service of

ZBW

Leibniz-Informationszentrum Wirtschaft Leibniz Information Centre for Economics

Bredtmann, Julia; Otten, Sebastian; Rammert, Timo

Working Paper The effect of occupational deregulation on wage premiums

Ruhr Economic Papers, No. 1134

Provided in Cooperation with: RWI – Leibniz-Institut für Wirtschaftsforschung, Essen

Suggested Citation: Bredtmann, Julia; Otten, Sebastian; Rammert, Timo (2024) : The effect of occupational deregulation on wage premiums, Ruhr Economic Papers, No. 1134, ISBN 978-3-96973-316-5, RWI - Leibniz-Institut für Wirtschaftsforschung, Essen, https://doi.org/10.4419/96973316

This Version is available at: https://hdl.handle.net/10419/312407

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.



WWW.ECONSTOR.EU



RUHR ECONOMIC PAPERS

Julia Bredtmann Sebastian Otten Timo Rammert

The Effect of Occupational Deregulation on Wage Premiums





Imprint

Ruhr Economic Papers

Published by

RWI – Leibniz-Institut für Wirtschaftsforschung Hohenzollernstr. 1-3, 45128 Essen, Germany Ruhr-Universität Bochum (RUB), Department of Economics Universitätsstr. 150, 44801 Bochum, Germany Technische Universität Dortmund, Department of Economic and Social Sciences Vogelpothsweg 87, 44227 Dortmund, Germany Universität Duisburg-Essen, Department of Economics Universitätsstr. 12, 45117 Essen, Germany

Editors

Prof. Dr. Thomas K. Bauer RUB, Department of Economics, Empirical Economics Phone: +49 (0) 234/3 22 83 41, e-mail: thomas.bauer@rub.de Prof. Dr. Ludger Linnemann Technische Universität Dortmund, Department of Business and Economics Economics – Applied Economics Phone: +49 (0) 231/755-3102, e-mail: Ludger.Linnemann@tu-dortmund.de Prof. Dr. Volker Clausen University of Duisburg-Essen, Department of Economics International Economics Phone: +49 (0) 201/1 83-3655, e-mail: vclausen@vwl.uni-due.de Prof. Dr. Ronald Bachmann, Prof. Dr. Almut Balleer, Prof. Dr. Manuel Frondel, Prof. Dr. Ansgar Wübker RWI, Phone: +49 (0) 201/81 49-213, e-mail: presse@rwi-essen.de

Editorial Office

Sabine Weiler

RWI, Phone: +49 (0) 201/81 49-213, e-mail: sabine.weiler@rwi-essen.de

Ruhr Economic Papers #1134

Responsible Editor: Volker Clausen All rights reserved. Essen, Germany, 2024

ISSN 1864-4872 (online) - ISBN 978-3-96973-316-5

The working papers published in the series constitute work in progress circulated to stimulate discussion and critical comments. Views expressed represent exclusively the authors' own opinions and do not necessarily reflect those of the editors.

Ruhr Economic Papers #1134

Julia Bredtmann, Sebastian Otten, and Timo Rammert

The Effect of Occupational Deregulation on Wage Premiums





Bibliografische Informationen der Deutschen Nationalbibliothek

The Deutsche Nationalbibliothek lists this publication in the Deutsche Nationalbibliografie; detailed bibliographic data are available on the Internet at http://dnb.dnb.de

RWI is funded by the Federal Government and the federal state of North Rhine-Westphalia.

https://dx.doi.org/10.4419/96973316 ISSN 1864-4872 (online) ISBN 978-3-96973-316-5 Julia Bredtmann, Sebastian Otten, and Timo Rammert*

The Effect of Occupational Deregulation on Wage Premiums

Abstract

We analyze the impact of occupational deregulation on the wages of licensed workers. To do so, we exploit a deregulation policy in the German craft sector that removed the master certificate as a requirement for starting a business in about half of the craft occupations. Specifically, we examine the impact of this deregulation policy on the wage premium of incumbent master craftsmen. Our results indicate that the reform led to a 3% increase in the wage premium of masters in deregulated relative to regulated occupations. This effect is primarily driven by a substantial increase in the wages of masters in deregulated occupations. We attribute this increase to heightened competition for highly skilled workers in the affected occupations, stemming from a sharp decline in the number of craftsmen pursuing a master craftsmen degree after the reform. We further show that the increase in the wage premium of master craftsmen was particularly pronounced in East Germany, which experienced a large outflow of skilled workers after reunification. This general shortage of skilled labor, exacerbated by the increased scarcity of master craftsmen, is likely to have intensified competition for their expertise.

JEL-Codes: J24, J31, J44, L51

Keywords: Occupational licensing; deregulation; labor supply; wages

December 2024

^{*} Julia Bredtmann, RWI, UDE, CReAM, and IZA; Sebastian Otten, UDE and CReAM; Timo Rammert, RWI and UDE. – The authors are grateful to Elke Jahn, Philipp Lergetporer, and Michel Serafinelli for valuable comments and suggestions. – All correspondence to: Julia Bredtmann, RWI, Hohenzollernstraße 1–3, 45128 Essen, Germany, e-mail: julia.bredtmann@rwi-essen.de

1 Introduction

Over the past three decades, occupational regulation—particularly occupational licensing has become increasingly prevalent, governing nearly a quarter of the workforce in both the United States and Europe (Gittleman et al. 2018; Pagliero 2019). These regulations are primarily designed to improve quality standards (Shapiro 1986) and to address information asymmetries between consumers and service providers (Leland 1979), thereby protecting consumers from unqualified practitioners. They often impose a series of requirements, such as obtaining specific qualifications, passing standardized examinations, completing mandatory training programs, or obtaining licenses to legally practice in a given field (Kleiner 2000).

Despite these objectives, the labor market impacts of occupational regulation remain the subject of ongoing debate.¹ Proponents argue that occupational regulation provides incentives for skill acquisition and human capital investment, thereby increasing the overall skill base of the economy (Shapiro 1986). Critics, however, view these regulations as rent-seeking mechanisms, created by professional associations to limit competition through lobbying efforts (Maurizi 1974; Kleiner 2016). This dual role—as a driver of skill development and a barrier to market entry—raises important questions about the broader economic consequences of occupational regulation. By restricting entry into certain occupations, occupational regulation can reduce labor market competition, constrain the supply of skilled workers, and inflate the wages of licensed workers, thereby exacerbating wage inequality (Kleiner 2000; Pagliero 2011).

While previous research has extensively examined the effects of occupational licensing on entrepreneurial activity, employment, and wages (Kleiner 2000; Prantl 2012; Kleiner and Krueger 2013), relatively little is known about how deregulation affects wage structures. This paper aims to address this gap by providing causal evidence on the impact of occupational deregulation on wages. To do so, we exploit a deregulation policy in the

¹Examples of this policy debate include "New Steps to Reduce Unnecessary Occupation Licenses that are Limiting Worker Mobility and Reducing Wages" (The White House 2016), "Executive Order on Promoting Competition in the American Economy" (The White House 2021) or "Why Does a Hair Braider Need a License?" (The New York Times 2022).

German crafts sector as a natural experiment to examine the effects of removing entry barriers on the wages of incumbent workers. Specifically, we focus on the wage premium of master craftsmen, the primary target group of the reform, to assess how deregulation has influenced their wages relative to other workers.

Implemented in 2004, the amendment to the German Trade and Crafts Code (*Handwerksordnung*) aimed to stimulate entrepreneurial activity and reverse the decline in employment in craft occupations (Lergetporer et al. 2018). A central aspect of this reform was the removal of the requirement to hold a master craftsman certificate (*Meisterbrief*) in order to establish a business in approximately half of all craft occupations (see Appendix Table A.1). This shift transformed these deregulated crafts from licensed to certified occupations, with the master craftsman certificate now serving solely as a signal of the holder's proficiency and productivity.

Theoretical predictions regarding the impact of deregulation on the wage premium of master craftsmen are ambiguous. On the one hand, increased competition from the entry of new firms is expected to reduce prices and firms' profits, which could in turn lower wages for both master and non-master craftsmen. On the other hand, deregulation diminishes the incentives for workers to pursue a master craftsman certificate, thereby reducing the supply of workers holding this qualification. If the skills acquired through the certification process or the signaling value of the certificate are valuable to firms, this reduction in supply could exert upward pressure on the wages of master craftsmen.

Given the quasi-experimental nature of the German crafts reform, it is uniquely suited to examine the effects of occupational deregulation. To establish a causal link between deregulation and the wage premium of master craftsmen, we employ two types of difference-in-differences (DiD) strategies. We start our analysis by comparing changes in wages of incumbent master craftsmen in deregulated (treatment group) and regulated (control group) occupations before and after the 2004 reform. Next, to further strengthen our causal inference, we employ a triple difference design (see Olden and Møen 2022), comparing changes in wages of master and non-master craftsmen in both deregulated and regulated occupations. This approach enables us to identify whether the deregulation policy has led to a change in the wage premium of masters in deregulated relative to regulated occupations. We present event-study estimates for both models to identify treatment effects over time. Pre-reform trends are found to be relatively flat, supporting the common-trend assumption.

Our analysis relies on longitudinal registry data from the German Sample of Integrated Labour Market Biographies (SIAB), provided by the Institute for Employment Research (IAB) (Graf et al. 2023; Schmucker et al. 2023). This dataset, which covers a 2% random sample of the entire population employed within the social security system, offers detailed information on individual earnings, socio-demographic characteristics (e.g., age, gender, educational background), and job-related factors (e.g., employment status, occupation, industry, firm size). We focus on the period around the 2004 reform, restricting the sample to the years 2000 to 2008.

We find that the deregulation policy led to a 3% increase in the wage premium of masters in deregulated relative to regulated occupations. This effect is largely attributable to a considerable increase in the wages of masters in deregulated occupations, which counteracts a slightly negative overall trend in wages in deregulated relative to regulated occupations. Event study estimates for the years 2000 to 2008 reveal no immediate reform effect but a persistent increase in the wages (and wage premiums) of master craftsmen in deregulated occupations starting in 2005, one year after the reform. This temporal pattern supports the conclusion that the wage increase is driven by a gradual reduction in the number of high-skilled workers, which unfolds over time in the labor market. To validate our findings, we perform several robustness checks, addressing potential biases from observable differences and compositional changes in the sample. In addition, a placebo test for an earlier period (1995 to 2003) confirms the robustness of our baseline results.

Finally, we examine possible heterogeneity in the reform effect. Separate analyses by firm size reveal that the effect of the deregulation policy was particularly pronounced in small firms, while there was no effect in large firms. Looking at regional heterogeneity, we find that the impact of deregulation on the wage premium of master craftsmen was substantially larger in East Germany (12%) than in to West Germany (2%). This large difference may be due to the out-migration of skilled workers from East Germany after reunification, which created a shortage of master craftsmen and intensified competition for their expertise.

Our paper relates primarily to the literature that examines the labor market effects of regulation policies. In particular, it builds on and contributes to the growing body of literature on occupational licensing. Most studies of the effects of occupational licensing focus on the impact on wages and earnings. This literature mainly documents a wage premium associated with occupational licensing.² For example, Koumenta and Pagliero (2019) show that entry regulation is associated with 4% higher hourly wages in the EU. Kleiner and Krueger (2013) and Gittleman and Kleiner (2016) find a slightly larger effect in the range of 7 to 11% for the US.

A related topic of growing interest is the study of the impact of licensing on different parts of the income distribution. Through the monopoly effect, licensing can lead to the creation of rents. If distributed unevenly across income groups, economic rents can increase income dispersion, such that those at the top of the income distribution fare better than those at the bottom (Koumenta and Pagliero 2019). While studies for the US (Kleiner and Krueger 2013; Gittleman and Kleiner 2016) do not find significant effects of licensing on wage dispersion, Koumenta and Pagliero (2019) and Zhang and Gunderson (2020) provide evidence for the EU and Canada, respectively, that occupational licensing contributes to wage dispersion by benefiting those at the top of the income distribution.

Once a profession is licensed, it is rare for it to be de-licensed. Therefore, knowledge about the effects of de-licensing is scarce. Notable exceptions include the studies by Kleiner et al. (2016), who find a positive wage effect for nurses due to the relaxation of their scope of practice restrictions, Pizzola and Tabarrok (2017), who find that occupational de-licensing in the funeral services industry in the US state of Colorado in 1983 caused a

²For example, studies by Kleiner and Kudrle (2000), Weeden (2002), Timmons and Thornton (2008), Kleiner and Krueger (2010), Thornton and Timmons (2013), Chi et al. (2017), Kleiner and Vorotnikov (2017), Ingram (2019), Zhang (2019), Carollo (2020), Dodini (2023), Lyu et al. (2023), and Blair and Chung (2024) find positive effects of occupational licensing on wages and earnings. In contrast to these studies, Redbird (2017) finds no positive wage effect.

decrease in wages for Colorado funeral services by about 11%, and Timmons and Thornton (2019), who find that de-licensing of barbers in the US state of Alabama in the early 1980s led to a reduction in the relative earnings of Alabama barbers by about 8%. We contribute to this literature by analyzing a deregulation policy in Germany.

Our paper is most directly related to the literature analyzing the effects of occupational regulation in the German trade and craft sector. Despite a substantial number of studies examining the effects of occupational regulation on various labor market outcomes (see, e.g., Bol (2014); Bol and Weeden (2015); Damelang et al. (2018); Lergetporer et al. (2018); Fredriksen (2020); Haupt (2023) for the effects of regulation on wages and Prantl and Spitz-Oener (2009); Prantl (2012); Rostam-Afschar (2014); Runst et al. (2019) for the effects of regulation on self-employment and entrepreneurship), the specific role of such regulatory mechanisms in shaping within-occupation wage dispersion remains under-explored. This paper contributes to the existing literature by demonstrating that deregulation policies led to increased wage dispersion in the crafts sector by raising the wage premiums of master craftsmen in deregulated occupations.

The remainder of this paper proceeds as follows. Section 2 provides an overview of the occupational regulation system in Germany, including a detailed discussion of the 2004 reform. In Section 3, we describe the data and the sample construction, and present descriptive statistics. Section 4 outlines the empirical strategy to identify the causal impact of the reform. We discuss our main findings in Section 5, where we also present the results of robustness checks and explore potential heterogeneity in the reform effect. Finally, Section 6 summarizes our key findings.

2 Background

2.1 Occupational Regulation

Occupational regulation refers to the set of rules and requirements that govern entry into specific occupations. These regulations can take various forms, each imposing different levels of restriction on who may practice a particular occupation.

Occupational licensing represents the most stringent form of regulation. It typically requires individuals to meet a series of prerequisites, such as obtaining a specific educational qualification, passing standardized examinations, completing mandatory training programs, or acquiring a special permit, in order to legally operate a business or practice in their chosen field (Kleiner 2000). In licensed occupations, it is illegal to perform certain tasks without holding the appropriate license.

A less restrictive form of regulation is certification, which does not restrict the right to practice but allows individuals to voluntarily seek certification from a regulatory body. Certification attests to the competency of workers and allows consumers to choose between certified and non-certified service providers. Unlike licensing, certification does not legally bar non-certified individuals from engaging in the occupation, making it a less restrictive form of regulation (Kleiner 2000).

The primary rationale for occupational regulation is to improve service quality by setting skill requirements and to address information asymmetries between consumers and providers (Shapiro 1986; Leland 1979). However, compared to licensing, certification provides weaker incentives for skill development, as the absence of mandatory entry barriers means that the effectiveness of certification in promoting human capital investment depends largely on the demand for certified workers in the labor market (Forth et al. 2011).

While licensing aims to protect consumers by ensuring high standards, it can also have unintended economic consequences. By restricting entry into certain occupations, licensing can reduce competition, increase prices and firms' profits, limit the supply of skilled workers, and raise the wages of those who are licensed (Kleiner 2000; Pagliero 2011). In both the US and Europe, nearly a quarter of the workforce is subject to these licensing requirements (Gittleman et al. 2018; Pagliero 2019), highlighting the widespread impact of such regulations on labor markets.

2.2 The 2004 Deregulation Policy in Germany

Occupational regulation in Germany has historically been stringent, particularly in the crafts sector. These regulations date back to the Middle Ages, when guilds played a central role in controlling entry into crafts occupations and maintaining quality standards (Ogilvie 2004, 2014). Until 2004, entry barriers in the German crafts sector included the requirement to hold a master craftsman certificate (*Meisterbrief*) to establish a business and the restriction that only master craftsmen could train apprentices. The master craftsman certificate, a professional qualification administered by regional chambers of crafts, typically requires two years of coursework and successful completion of exams, with costs ranging from two to ten thousand Euros (Lergetporer et al. 2018).³

In response to concerns about declining numbers of craftsmen and apprentices, the German government implemented a significant reform of the Trade and Crafts Code (*Handwerksordnung, HwO*) in January 2004.⁴ This reform, which was part of the broader "Agenda 2010" labor market and economic policy package, aimed to facilitate entry into entrepreneurship, stimulate employment growth, and enhance economic competitiveness. The reform emerged as a compromise from political negotiations involving employer associations, labor unions, and political parties. While the initial plan was to deregulate only low-risk occupations, the final legislation did not adhere strictly to this criterion, leading to inconsistencies in the classification of occupations. For instance, similar occupations, such as tile laying (deregulated) and bricklaying (regulated), ended up in different regulatory categories (Rostam-Afschar 2014).

The 2004 reform deregulated entry requirements for 52 out of 93 crafts occupations, removing the requirement to hold a master craftsman certificate to start a business in these trades. The remaining 41 occupations, including those deemed hazardous, continued to require the master craftsman certificate or a comparable qualification (see Appendix Table A.1).

³To be eligible for the master craftsman certificate exams, craftsmen must successfully complete an apprenticeship in their respective craft trade and typically gain additional work experience as journeymen.

⁴The reform was announced in March 2003 and implemented on January 1, 2004, less than a year after the initial announcement, thereby minimizing potential anticipation effects.

This policy change effectively changed the deregulated occupations from licensed to certified. Although the master craftsman certificate was no longer legally required to operate a business in these occupations, it retained its value as a signal of quality and productivity (Rottenberg 1980).

As a result, the number of master craftsman examinations in deregulated occupations fell sharply after the reform. As is shown in Figure 1, before the reform regulated and deregulated occupations showed a similar downward trend in the number of master exams. However, following the deregulation, the number of master examinations in deregulated crafts declined more rapidly and more significantly than in regulated crafts. By 2007, the number of completed master craftsman examinations in deregulated occupations had fallen to approximately 40% of the 2003 level, while it remained at around 85% in regulated occupations. Despite this sharp decline, the number of examinations did not fall to zero, indicating that the master craftsman certificate continues to have value, as a signal of high quality standards or because of the skills acquired during the training, even when not required by law.



Figure 1: Number of Master Craftsmen Examinations in Regulated and Deregulated Craft Occupations

Notes: The figure shows the number of successfully completed master craftsmen examinations relative to 2003 for regulated and deregulated occupations. Data source: German Confederation of Skilled Crafts, 1998-2022.

3 Data and Descriptive Statistics

3.1 Data and Sample

The empirical analysis is based on data from the Sample of Integrated Labor Market Biographies (SIAB), provided by the Institute for Employment Research (IAB) at the German Federal Employment Agency (Graf et al. 2023; Schmucker et al. 2023).⁵ The SIAB represents a 2% random sample of administrative social security records in Germany covering the years 1975 to 2021. This dataset is representative of individuals covered by the German social security system, which accounts for approximately 80% of the workforce. Notably, the SIAB excludes self-employed individuals, civil servants, and military personnel. It provides longitudinal data on individuals' employment histories, including detailed information on daily wages, occupations, industries, and firm sizes, as well as socio-demographic characteristics such as age, gender, and educational attainment.

To construct our estimation sample, we focus on main job spells as of June 30 for the years 2000 to 2008, covering the period four years before and five years after the deregulation policy. Within this window, we select workers employed in one of 93 craft occupations, ensuring that each worker has at least one observation before and one observation after the policy's implementation. This restriction ensures that the sample remains consistent over time and prevents the estimated reform effects from being confounded by compositional changes due to workers entering or leaving the sample. We exclude individuals who are younger than 18 and older than 65 from the sample. Since the dataset lacks information on hours worked, the analysis is limited to full-time employees. To mitigate the influence of implausible earnings values and outliers, we exclude observations with daily earnings below 40 Euros and censor the top 1% of the earnings distribution, setting those values to the 99th percentile.⁶

To classify occupations as either regulated or deregulated, we adopt the procedure

⁵This study uses the weakly anonymous version of the SIAB (years 1975-2021). Access to the data was provided via on-site use at the Research Data Centre of the German Federal Employment Agency at the IAB, followed by remote data access.

⁶Robustness checks confirm that our main results are not sensitive to these sample restrictions.

outlined by Lergetporer et al. (2018). Specifically, we map occupations from the official Trade and Crafts Code—where regulated occupations are listed in Annex A and deregulated occupations in Annex B1—to the 3-digit German Classification of Occupations 1988 (KldB88) used in the SIAB data. This approach allows for matching all but four small occupations.⁷

While the SIAB provides information on workers' occupations and the industry of their employers, it does not allow for precise identification of whether a firm is registered within the craft sector or belongs to other sectors, such as the industrial or public sectors. As a result, our sample may include workers employed in firms that are not part of the craft sector and, thus, not directly affected by the deregulation reform. Since these firms were not subject to the removal of entry barriers in the craft sector, their workers should not experience direct effects from the policy change. Given that firms in the craft sector are typically small or medium-sized, we address this identification challenge in a heterogeneity analysis presenting results by firm size, under the assumption that smaller firms are very likely to belong to the craft sector.

The assignment of workers to either the treatment or the control group is based on their occupation in 2003. In cases where no observation is available for 2003, we use the last available pre-reform observation from 2000 to 2002. The treatment group consists of workers employed in one of the 52 occupations deregulated by the reform, while the control group consists of workers employed in the remaining 41 regulated craft occupations. All control variables (e.g., age, educational attainment, occupation, industry, and firm size) are fixed at their respective pre-reform base period. In a robustness check, we further refine the sample by including only workers from pre-reform period who remained in occupations within the same craft group before and after the reform, while allowing for occupational mobility within each group.

⁷See Appendix Tables A.2 and A.3 for an overview of the occupation matching. Lergetporer et al. (2018) provide a detailed description of the procedure.

3.2 Descriptive Statistics

In this section, we present descriptive statistics for the analysis sample and highlight key patterns of wage dispersion within the crafts sector. A comparison of daily wages of workers in regulated and deregulated occupations in the pre-reform period reveals that individuals in deregulated occupations earn, on average, approximately 5.2% less. Several factors contribute to this wage gap, including a higher proportion of women (17% vs. 7%) and foreign nationals (10% vs. 5%) in deregulated occupations. The share of master craftsmen is also modest, with 5% in regulated occupations and 3% in deregulated occupations. Moreover, workers are predominantly employed in small and medium-sized enterprises, with 74% of workers in regulated occupations and 68% in deregulated occupations working for such firms (see Appendix Table A.4 for detailed sample statistics).

Panel A of Figure 2 shows the evolution of the logarithm of average daily wages for both master and non-master craftsmen from 2000 to 2008, separately for regulated and deregulated occupations. While the wage trends are relatively flat for most groups, we see a clear increase in the wages of master craftsmen in deregulated occupations starting in 2005, one year after the policy change. Accordingly, as can be seen in Panel B of Figure 2, there is a clear increase in the wage premium for master craftsmen in deregulated occupations after the reform, while no such increase can be observed for regulated occupations.





Notes: The left panel shows the average wages for regulated and deregulated master and non-master craftsmen from 2000 to 2008. The right panel shows the average wage premium for regulated and deregulated master craftsmen from 2000 to 2008. Data source: SIAB, 2000-2008.

4 Empirical Strategy

The deregulation policy provides a unique opportunity to study the effect of removing occupational entry barriers on the wages of incumbent workers. Leveraging this quasi-natural experiment, we employ different difference-in-differences (DiD) strategies to estimate the impact of the policy on the wages and wage premiums of master craftsmen. In these models, workers who worked in the pre-reform period in an occupation that was eventually deregulated constitute the treatment group, while workers who worked in an occupation that remained regulated constitute the control group. We start our analysis by estimating a DiD model to compare changes in the wages of master craftsmen between deregulated and regulated occupations. The model is specified as follows:

$$log\left(\text{wage}_{ijt}\right) = \alpha_0 + \alpha_1 \operatorname{deregulated}_i \times \operatorname{post}_t + X'_i \alpha_2 + \mu_j + \kappa_t + \varepsilon_{ijt}, \tag{1}$$

where $log(wage_{ijt})$ is the log of the real average daily wage of individual *i* in occupation *j* in year *t*. deregulated_j is an indicator variable that takes the value one for individuals working in an occupation *j* that was deregulated after the reform in the base year. post_t is an indicator variable that takes the value one in the post-reform period, i.e., from 2004 onward. μ_j represents occupation fixed effects that control for unobserved factors that vary across occupations, such as average wage differences, and κ_t represents year fixed effects that control for common economic shocks. X'_i is a set of control variables including individual (e.g., gender, age, education), firm (e.g., firm size) and regional (East vs West Germany) characteristics measured in the base year. We cluster standard errors, ε_{ijt} , at the individual level to account for idiosyncratic within-individual correlations. As mentioned above, we only include incumbent workers in order to follow workers over time and to keep the sample composition constant. While our main interest is in the reform effect on master craftsmen, we also estimate the model including all craftsmen.

In this specification, α_1 identifies the average change in log wages of workers in deregulated occupations relative to workers in regulated occupations between the pre- and post-reform periods, conditional on covariates. A causal interpretation of this effect relies on the common trend assumption, which is crucial to ensure that any observed differences in wage outcomes are due to the reform and not to pre-existing trends that differ between the groups.⁸ Under the additional assumption of no compositional changes, this effect can be interpreted as the causal effect of the deregulation policy on the wages of incumbent craftsmen.⁹

To examine the dynamic effects of the deregulation policy and to assess pre-trends to validate the parallel trends assumption, we estimate event-study versions of Eq. (1). This involves interacting our treatment indicator, deregulated_j, with year-specific indicators, year_t, resulting in the following equation:

$$log\left(\text{wage}_{ijt}\right) = \beta_0 + \sum_{\substack{t=2000\\t\neq2003}}^{2008} \rho_t \times \text{deregulated}_j \times \text{year}_t + X'_i \beta_2 + \mu_j + \kappa_t + \varepsilon_{ijt}.$$
 (2)

The last pre-treatment indicator is omitted and serves as the reference category. Consequently, the coefficients ρ_t represent the treatment effects on wages relative to the year 2003. We visualize these effects using event study graphs, which provide a clear representation of the temporal evolution of the treatment effects.

The primary identifying assumption of the DiD model is that, in the absence of the reform, wages in deregulated occupations would have followed the same trajectory as those in regulated occupations (parallel trends assumption). Even in the absence of differential pre-trends, this assumption could be violated if contemporaneous shocks affected the regulated and deregulated groups differently. For example, a sudden increase in the demand for services provided by deregulated occupations due to economic policy changes could lead to differential wage effects compared to regulated occupations.

To mitigate this concern and strengthen the validity of the parallel trends assumption,

⁸Violations of the parallel trends assumption could occur if firms and workers had anticipated the reform and adjusted their behavior in advance. However, given the rapid passage and implementation of the policy within a year, such anticipation effects are unlikely.

⁹This assumption would be violated if workers systematically switched between deregulated and regulated occupations, thereby contaminating both the treatment and the control group. As a robustness check, we thus estimate our model for a sample that excludes workers who switched between regulated and deregulated occupations or from being non-master to master after the reform, in order to rule out that our results are due to compositional changes (see Section 5.2).

we employ a triple difference (DDD) design (Olden and Møen 2022), using non-masters as an additional comparison group. The DDD approach thus exploits wage differences along three dimensions: (i) between masters and non-masters, (ii) between deregulated ('treated') and regulated ('control') occupations, and (iii) before and after the reform. Specifically, we compare the difference in wages between masters and non-masters within deregulated occupations to the difference within regulated occupations, both before and after the reform. The DDD approach provides a more robust control for unobserved factors that could affect wage trends differently between the groups. In particular, it helps eliminate the influence of contemporaneous occupation-specific shocks, and the parallel trends assumption holds as long as no such shocks affect masters and non-masters within the same occupation differentially. Formally, the triple difference model is specified as follows:

$$log (wage_{ijt}) = \gamma_0 + \gamma_1 \operatorname{master}_i + \gamma_2 \operatorname{deregulated}_j \times \operatorname{master}_i + \gamma_3 \operatorname{deregulated}_j \times \operatorname{post}_t + \gamma_4 \operatorname{master}_i \times \operatorname{post}_t + \gamma_5 \operatorname{deregulated}_j \times \operatorname{master}_i \times \operatorname{post}_t$$

$$+ X'_i \gamma_6 + \mu_j + \kappa_t + \varepsilon_{ijt}.$$
(3)

As before, $log(wage_{ijt})$ is the log of the real average daily wage of individual *i* in occupation *j* in year *t*. The variable master_{*i*} is an indicator that takes the value one if individual *i* holds a master certificate before the reform. In this specification, γ_5 identifies the causal effect of the deregulation policy on wages. To assess whether γ_5 might be biased due to unobserved firm or worker characteristics that are correlated with wages, we estimate alternative specifications of Eq. (3) that include firm or individual fixed effects, which help control for time-invariant unobserved characteristics at the firm or worker level, respectively. In addition, to examine the dynamic effects of the deregulation policy and assess pre-trends, we estimate event-study versions of Eq. (3) using a similar specification as in Eq. (2).

5 Results

5.1 Baseline Results

Table 1 shows the results of estimating the effect of the deregulation policy on the wages of master craftsmen. Column (1) presents the results of estimating a DiD model for the sample of master craftsmen (Eq. (1)). The results show that after the reform, masters in deregulated occupations gained a wage premium of 2% compared to masters in regulated occupations. The effect is statistically significant at the 10% level. Interestingly, this positive effect of occupational deregulation on the wages of master craftsmen is opposite to the effect for all incumbent workers. As shown in column (2), which presents the results from estimating Eq. (1) for all incumbent workers in the craft sector, occupational deregulation led to a modest decrease of 0.7% in the wages of workers in affected occupations relative to workers in unaffected occupations.¹⁰ This modest effect can be attributed to the pre-reform market conditions, which were already characterized by strong competition and low economic rents. At the end of 2003, approximately 75,000 companies were operating in the trades that comprise the deregulated market segment, leaving limited scope for further wage reductions (Fredriksen 2020).

Figure 3 shows the dynamic effects of the deregulation policy on the wages of master craftsmen as estimated based on Eq. (2). As can be seen, the wages of masters in regulated and deregulated occupations followed similar trends in the years prior to the reform, supporting the parallel trends assumption. After the reform, however, the wages of masters in deregulated occupations increase relative to those of masters in regulated occupations. The effect increases until 2006, with an estimated effect of 3.7%, and remains relatively stable thereafter. The deregulation policy thus led to a permanent increase in the wages of masters in deregulated occupations, which took effect one to two years after the reform.

Column (3) of Table 1 shows the results of the triple difference estimation as depicted in Eq. (3), which compares the wages of masters and non-masters in regulated and deregulated

¹⁰This result is qualitatively consistent with Lergetporer et al. (2018), who find a slightly larger effect (-2.3%), primarily due to their inclusion of post-2008 data, which we exclude from our analysis. It is also in line with Damelang et al. (2018), who report a similar effect of -0.65%.

| | DiD | | Tr | iple Differer | nce |
|--|---------------|-------------------|-------------------|-----------------------|----------------|
| | (1) Master | (2) All | (3) Occ. FE | (4) Firm FE | (5) Ind. FE |
| Master | _ | 0.212^{\dagger} | 0.216^{\dagger} | 0.228^{\dagger} | _ |
| | | (0.005) | (0.006) | (0.009) | |
| $\mathbf{Deregulated} \times \mathbf{Post}$ | 0.020^{*} | -0.007^{***} | -0.008^{***} | -0.009^{***} | -0.010^{***} |
| | (0.011) | (0.002) | (0.002) | (0.002) | (0.001) |
| Master \times Post | _ | _ | -0.014^{***} | -0.010^{***} | -0.011^{***} |
| | | | (0.004) | (0.003) | (0.003) |
| Deregulated \times Master | _ | _ | 0.010 | 0.041^{*} | _ |
| - | | | (0.017) | (0.023) | |
| $\mathbf{Deregulated} \times \mathbf{Master} \times \mathbf{Post}$ | _ | _ | 0.030*** | 0.020^{*} | 0.020^{*} |
| - | | | (0.011) | (0.011) | (0.010) |
| Occupation FE | Yes | Yes | Yes | No | No |
| Firm FE | No | No | No | Yes | No |
| Individual FE | No | No | No | No | Yes |
| Adjusted R^2 | 0.461 | 0.585 | 0.585 | 0.845 | 0.901 |
| Observations | $20,\!696$ | $474,\!929$ | 474,929 | $474,\!929$ | $474,\!929$ |

 Table 1: Effect of Deregulation on Wages – DiD and Triple Difference Results

Notes: The table shows estimated average effects of the reform on log wages between 2000 and 2008. Columns (1) and (2) show coefficient estimates derived from Eq. (1). Results in column (1) are based on a sample including only master craftsmen and results in column (2) are based on a sample including all craftsmen. Columns (3) to (5) show coefficient estimates derived from Eq. (3) using a sample of all craftsmen in the regulated and deregulated occupations. In all specifications, individual and firm characteristics, measured in the base period, as well as year fixed effects are controlled for. Standard errors (in parentheses) are clustered at the individual level. Significance level: † 0.1%, *** 1%, ** 5%, * 10%. Data source: SIAB, 2000–2008.

occupations before and after the reform. Compared to the DiD model, the triple difference estimator accounts for possible contemporaneous occupation-specific shocks that are common to both masters and non-masters in the same occupation. The results show that after the reform, the wages of both non-masters in deregulated occupations and masters in regulated occupations decreased relative to the wages of non-masters in regulated occupations (by 0.8% and 1.4%, respectively). In contrast, the wage premium of masters (over non-masters) in deregulated occupations increased significantly after the reform. Based on the specification including occupation fixed effects, the deregulation policy has led to a 3% increase in the wage premium of masters in affected occupations relative to unaffected occupations. This estimated reform effect becomes somewhat smaller (2%) when including firm or individual fixed effects (columns (4) and (5) of Table 1). However, it remains both economically and statistically significant.

Figure 4 shows the dynamic effects of the deregulation policy on the wage premium of master craftsmen. The pattern is similar to that shown in Figure 3. The wage premiums of



Figure 3: Yearly Effects of Occupational Deregulation on the Wages of Masters Notes: The figure shows the coefficient estimates and 95%-confidence intervals of the yearly effects of occupational deregulation on the wages of master craftsmen based on the DiD approach (Eq. (2)). Data source: SIAB, 2000-2008.

master craftsmen in regulated and deregulated occupations followed similar trends before the reform. One year after the reform, however, there is a significant increase in the wage premium of masters in deregulated occupations relative to those in regulated occupations, which persists over time (ranging between 3.7-4.3%).



Figure 4: Yearly Effects of Occupational Deregulation on the Wage Premium of Masters Notes: The figure shows the coefficient estimates and 95%-confidence intervals of the yearly effects of occupational deregulation on the wage premium of master craftsmen. The estimates are based on the triple difference approach including occupation fixed effects. Data source: SIAB, 2000-2008.

Our finding that occupational deregulation increased the wages of incumbent master craftsmen, both in absolute terms and relative to the wages of non-master craftsmen, is at first surprising. In theory, occupational deregulation should increase competition by lowering barriers to entry into the affected occupations, which in turn reduces prices and firms' profits. Consequently, the wages of workers holding the relevant certification are expected to decline (Kleiner 2000). What, then, is the explanation for the increased wage premium of masters following occupational deregulation? The 2004 occupational deregulation policy led to a sharp decline in the number of craftsmen who decided to become masters. This is evident from Figure 5, which shows the effect of the deregulation policy on the log number of successfully completed master examinations.¹¹ While occupational deregulation has no immediate effect on the number of craftsmen examinations, we observe a strong negative effect on completed master examinations beginning in 2005. This negative reform effect intensifies over time, from a reduction of about 45% in 2005 to 58% in 2008.



Figure 5: Yearly Effects of Occupational Deregulation on Number of Master Exams Notes: The figure shows the coefficient estimates and 95%-confidence intervals of the effects of occupational deregulation on the log number of successfully completed master craftsmen examinations. The average effect over all post-reform years is -0.343. Data source: German Confederation of Skilled Crafts, 2000-2008.

By reducing the incentive to pursue a master certificate, the 2004 deregulation policy thus

¹¹The results are based on a dynamic DiD model estimated at the occupation level similar to the one depicted in Eq. (2). This model regresses the log number of successfully completed master examinations on a set of interaction terms between year dummies and a dummy for deregulated occupations, controlling for year and occupation fixed effects.

led to a significant decline in the number of master craftsmen in deregulated occupations. Even though a master craftsman certificate was no longer legally required to operate a business, having a master seemed to remain valuable to firms, either because the skills acquired during the training were still valued or because the certificate retained its value as a signal of quality and productivity (Spence 1973). Supporting this argument, Fredriksen et al. (2019) find that firms led by master craftsmen deliver higher service quality and receive better consumer ratings in the deregulated market segment. The master certification thus serves as a signal of quality, reducing information search costs for consumers—a particularly important function in markets with high search costs due to non-standardized services and the specific nature of the tasks. The sudden reduction in the supply of highly skilled workers, combined with a sharp increase in the number of new firms entering the market, intensified competition for these workers. This, in turn, led to higher wage growth for masters in deregulated occupations and increased wage dispersion within these occupations.

5.2 Robustness Checks and Heterogeneity Analysis

We perform a number of robustness checks, the results of which are presented in Table 2. First, we address the issue that workers in regulated and deregulated occupations differ in observable characteristics that determine wages. To adjust for covariate imbalances between the two groups of workers, we perform an entropy balancing based on the means and standard deviations of observable worker characteristics (see Hainmueller 2012). As matching variables, we use the pre-treatment covariates included in our estimation (see Table A.5), supplemented by the pre-reform wage. As can be seen in column (1) of Table 2, the estimated effect of the deregulation policy on the wage premium of master craftsmen obtained from the triple difference approach is still positive and of similar size as the respective baseline estimate.

Second, we address the issue that our results may be due to reform effects on occupational mobility between regulated and deregulated occupations or to a change in

| | (1) Entropy Balancing | (2) Alternative Sample | (3) Placebo Sample |
|--|-----------------------------|------------------------------|--------------------------|
| Master | 0.200^{+} | 0.233^{\dagger} | 0.227^{\dagger} |
| | (0.008) | (0.006) | (0.005) |
| Deregulated \times Post | -0.010^{\dagger} | -0.008^{***} | 0.011 |
| | (0.002) | (0.002) | (0.015) |
| Master \times Post | -0.008^{*} | -0.016^{***} | -0.012^{***} |
| | (0.005) | (0.004) | (0.004) |
| Deregulated \times Master | 0.024 | 0.002 | 0.011 |
| | (0.019) | (0.018) | (0.015) |
| $\mathbf{Deregulated} \times \mathbf{Master} \times \mathbf{Post}$ | 0.028^{**} | 0.032^{***} | 0.003 |
| | (0.012) | (0.013) | (0.010) |
| Adjusted R ² | 0.542 | 0.602 | 0.578 |
| Observations | $373,\!218$ | 408,917 | $526,\!360$ |

Table 2: Effect of Deregulation on the Wage Premium of Masters – Robustness Checks

Notes: The table shows estimated average effects of the reform on log wages. Coefficient estimates are derived from estimating Eq. (3), controlling for individual and firm characteristics as well as year and occupation fixed effects. Standard errors (in parentheses) are clustered at the individual level. While columns (1) and (2) show average effects for the period 2000 to 2008, the results of the placebo regression in column (3) are based on the period 1995 to 2003. Significance level: † 0.1%, *** 1%, ** 5%, * 10%. Data source: SIAB, 1995–2008.

the incentive to obtain a master certificate. To rule out that our results are driven by such compositional changes, we re-estimate our model based on a restricted sample that excludes workers who switched between regulated and deregulated occupations or who obtained a master certificate after the reform. As can be seen in column (2) of Table 2, the estimated reform effect is robust to this sample change and still shows a significant positive effect of occupational deregulation on the wage premium of incumbent masters.

Finally, we conduct a falsification test by running a placebo regression. Specifically, we estimate our model for the pre-reform period 1995 to 2003 and define the year 1999 as the placebo reform date. As can be seen in column (3) of Table 2, the estimated reform effect is close to zero and not statistically significant, showing that this placebo deregulation reform has no effect on the wage premium of master craftsmen.

We further explore possible heterogeneity in the effect of occupational deregulation across different workers and firms. First, we investigate whether the reform effect varies by firm size. While wages are typically higher in large firms than in medium and small firms, the wage premium for master craftsmen is most pronounced in medium and small firms, indicating that the reform effect may vary by firm size.¹² Columns (1) to (3) of Table 3 present the results of the triple difference approach estimated separately for small, medium, and large firms. The results show a particularly strong reform effect in small firms, where occupational deregulation led to a 5% increase in the wage premium of masters in affected occupations. Medium firms are also affected, with an estimated increase in the wage premium of master craftsmen in deregulated occupations of about 3% following the reform. However, occupational deregulation has no effect on the wage premium of masters in large firms, where the reform effect is close to zero and not statistically significant.

These results support our interpretation that the sharp decline in the supply of master craftsmen in deregulated occupations led to increased competition for these highly skilled workers. Since the wages of masters are generally lower in small firms, small firms are particularly forced to raise their wage offers to attract and retain master craftsmen. In addition, large firms are more likely to employ multiple master craftsmen, reducing their vulnerability to the departure of a single master craftsman. In such cases, the signaling value of employing a master craftsman remains intact even if a master leaves the firm, giving large firms greater bargaining power in wage negotiations. Furthermore, large firms are less likely to be craft firms and more likely to be industrial firms. As a result, large firms are less affected by the deregulation of craft-specific occupational licensing policies, which further explains the negligible reform effect in these firms.

Second, we analyze whether the deregulation policy had differential effects for workers in East and West Germany. Columns (4) and (5) of Table 3 show that the deregulation policy had a positive impact on the wage premium of master craftsmen in affected occupations in both parts of Germany. However, the effect is much stronger in East Germany (12%) than in West Germany (2%). This is also evident from Figure 6, which shows the yearly reform effects separately for East Germany (Panel A) and West Germany (Panel B). In East Germany, the wage premium of master craftsmen increased sharply one year after the reform, peaking at approximately 20% in 2005, and subsequently declined over time.

 $^{^{12}}$ According to the European Commission (2003), we define small firms as those with less than 50 employees, medium firms as those with 50 to less than 250 employees, and large firms as those with 250 or more employees.

| | | Firm Size | | | gion |
|--|--------------------|----------------------|---------------------|-------------------|------------------------|
| | (1) Small | (2) Medium | (3) Large | (4)East | $(5) \\ \mathbf{West}$ |
| Master | 0.200^{\dagger} | 0.259^{\dagger} | 0.189^\dagger | 0.216^{\dagger} | 0.214^{\dagger} |
| | (0.007) | (0.012) | (0.013) | (0.015) | (0.006) |
| Deregulated \times Post | -0.010^{\dagger} | -0.009^{***} | 0.019^{***} | -0.005 | -0.009^{\dagger} |
| | (0.003) | (0.003) | (0.003) | (0.004) | (0.002) |
| Master \times Post | -0.011^{**} | -0.014^{*} | 0.002 | -0.027^{***} | -0.012^{**} |
| | (0.005) | (0.007) | (0.008) | (0.010) | (0.004) |
| Deregulated \times Master | -0.009 | -0.010 | -0.009 | -0.053 | 0.013 |
| | (0.026) | (0.026) | (0.026) | (0.071) | (0.017) |
| $\mathbf{Deregulated} \times \mathbf{Master} \times \mathbf{Post}$ | 0.049*** | 0.029^{*} | -0.004 | 0.119^{***} | 0.022^{*} |
| | (0.018) | (0.016) | (0.027) | (0.041) | (0.012) |
| Adjusted \mathbb{R}^2 | 0.473 | 0.514 | 0.514 | 0.461 | 0.546 |
| Observations | 220,327 | $118,\!644$ | $135,\!958$ | $94,\!961$ | $379,\!968$ |

Table 3: Heterogeneous Effects of Deregulation by Firm Size and Region

Notes: The table shows estimated average effects of the reform on log wages between 2000 and 2008 by firm size (columns (1) to (3)) and by region (columns (4) and (5)). Coefficient estimates are derived from estimating Eq. (3), controlling for individual and firm characteristics as well as year and occupation fixed effects. Standard errors (in parentheses) are clustered at the individual level. Significance level: † 0.1%, *** 1%, ** 5%, * 10%. Data source: SIAB, 2000–2008.

In West Germany, the reform effect was immediate and relatively stable, though it was considerably smaller, ranging between 2.1% and 3.7% after 2005.

The higher wage premium for master craftsmen in East Germany can be attributed to structural and labor market differences between the two regions in the period following reunification. During the 1990s and early 2000s, East Germany experienced a significant out-migration of skilled workers to West Germany, leading to a persistent shortage of high-skilled labor in the region (Hunt 2006; Fuchs-Schündeln and Schündeln 2009).¹³ This shortage is likely to have intensified competition among firms for master craftsmen after the implementation of the deregulation policy, particularly given that the policy reduced the incentive for workers to obtain a master craftsmen certificate, thereby further constraining the supply of skilled workers. In contrast, West Germany, with a more stable and abundant supply of skilled workers, was less affected by these dynamics. Furthermore, the smaller and less competitive market in East Germany, which is characterized by a predominance of small firms (Burda and Hunt 2001), may have amplified the signaling value of the master craftsman certificate. This is because firms sought to differentiate

 $^{^{13}}$ Between 1991 and 2008, approximately 2.7 million people migrated from East Germany to West Germany (Destatis 2024).

themselves in markets where non-standardized services and information asymmetries were more pronounced. Consequently, these factors resulted in a more pronounced increase in the wage premium for master craftsmen in East Germany compared to their counterparts in West Germany.



Figure 6: Yearly Effects of Occupational Deregulation on the Wage Premium of Masters in East and West Germany Notes: The figure shows the coefficient estimates and 95%-confidence intervals of the yearly effects of occupational deregulation on the wages of master craftsmen based on the DiD approach (Eq. (2)). Data source: SIAB, 2000-2008.

Finally, a heterogeneity analysis by gender indicates that the deregulation reform increased the wage premium of male masters (by 3.3%), but not of female masters. However, as female masters comprise only 5% of the total number of masters in our sample, the sample of female masters may be too small to detect at least non-sizable reform effects.¹⁴

6 Conclusion

In this paper, we analyze the impact of occupational deregulation on the wages of licensed workers. We exploit a reform in the German craft sector that was implemented in 2004, which removed the requirement to hold a master certificate for starting a business in about half of all craft occupations. Specifically, we examine the theoretically ambiguous effects of this deregulation policy on the wage premium of incumbent masters.

To establish a causal link between deregulation and wages, we employ two types of difference-in-differences strategies. First, we compare changes in the wages of incumbent

¹⁴The results of the heterogeneity analysis by gender are presented in Appendix Table A.6.

master craftsmen in deregulated and regulated occupations before and after the reform. Second, using a triple difference design, we compare changes in the wages of master and non-master craftsmen in both deregulated and regulated occupations. Our analysis is based on longitudinal registry data from the German Sample of Integrated Labour Market Biographies (SIAB) (Graf et al. 2023; Schmucker et al. 2023), covering a 2% random sample of the entire population employed within the social security system. We focus on the period around the 2004 reform, restricting the sample to the years 2000 to 2008.

Our findings indicate that the reform led to a 3% increase in the wage premium of masters in deregulated relative to regulated occupations. This effect is primarily driven by a substantial increase in the wages of masters in deregulated occupations, which counteracts a slightly negative overall trend in wages in deregulated relative to regulated occupations. Event study estimates for the years 2000 to 2008 reveal no immediate reform effect but a persistent increase in the wages (and wage premiums) of master craftsmen in deregulated occupations beginning in 2005, one year after the reform. We attribute this increase to heightened competition for highly skilled workers in the affected occupations, stemming from a sharp decline in the number of craftsmen pursuing a master craftsmen degree after the reform. We perform several robustness checks to validate our findings, addressing potential biases from observable differences and compositional changes in the sample. In addition, a placebo test for an earlier period (1995 to 2003) confirms the robustness of our baseline results.

Our heterogeneity analysis reveals significant variation in the effects of the reform by firm size and between East and West Germany. The wage premium for master craftsmen increased by 5% in small firms and by 3% in medium firms but showed no significant change in large firms, where wages were largely unaffected by the reform. This suggests that small firms, which typically offer lower wages, were forced to raise their wage offers to attract and retain master craftsmen in response to the sharp reduction in supply. In terms of regional heterogeneity, the impact of the deregulation policy was substantially stronger in East Germany, where the wage premium for master craftsmen increased by 12% compared to an increase of 2% in West Germany. This large difference may be due to the out-migration of skilled workers from East Germany during the 1990s and early 2000s, which created a scarcity of master craftsmen and intensified competition for their expertise.

This paper makes a significant contribution to the broader policy debate on the role of occupational regulations by providing robust empirical evidence on the impact of occupational deregulation on the wages of incumbent workers. Our findings offer valuable insights into the impact of deregulation on labor markets and underscore the dual role of occupational regulations. While they restrict competition, they also incentivize skill acquisition and serve as quality signals in the market. Deregulation policies, such as the one analyzed here, can reshape these dynamics and lead to unintended consequences, including increased wage dispersion and regional disparities. Policymakers must carefully balance the trade-offs between lowering barriers to entry and maintaining incentives for skill development and quality assurance.

References

- Blair, Peter Q., and Bobby W. Chung. 2024. "Job Market Signaling through Occupational Licensing." *The Review of Economics and Statistics*. forthcoming.
- **Bol, Thijs.** 2014. "Economic returns to occupational closure in the German skilled trades." Social Science Research, 46: 9–22.
- Bol, Thijs, and Kim A. Weeden. 2015. "Occupational Closure and Wage Inequality in Germany and the United Kingdom." *European Sociological Review*, 31(3): 354–369.
- Bundesministerium der Justiz. 2004. "Gesetz zur Ordnung des Handwerks." §18, https://www.gesetze-im-internet.de/hwo.
- Burda, Michael C., and Jennifer A. Hunt. 2001. "From Reunification to Economic Integration: Productivity and the Labor Market in Eastern Germany." *Brookings Papers* on Economic Activity, 2: 1–92.
- Carollo, Nicholas A. 2020. "The Impact of Occupational Licensing on Earnings and Employment: Evidence from State-Level Policy Changes." Working Paper, https://www.ncarollo.net.
- Chi, Wei, Morris M. Kleiner, and Xiaoye Qian. 2017. "Do Occupational Regulations Increase Earnings? Evidence from China." *Industrial Relations: A Journal of Economy* and Society, 56(2): 351–381.
- Damelang, Andreas, Andreas Haupt, and Martin Abraham. 2018. "Economic consequences of occupational deregulation: Natural experiment in the German crafts." *Acta Sociologica*, 61(1): 34–49.
- **Destatis.** 2024. "East-west migration." https://www.destatis.de/EN/Themes/ Society-Environment/Population/Migration/east-west-migration.html.
- **Dodini, Samuel.** 2023. "The spillover effects of labor regulations on the structure of earnings and employment: Evidence from occupational licensing." *Journal of Public Economics*, 225: 104947.
- European Commission. 2003. "Commission Recommendation of 6 May 2003 concerning the definition of micro, small and medium-sized enterprises." Official Journal of the European Union, L 124: 36–41. https://eur-lex.europa.eu/eli/reco/2003/361/oj.
- Forth, John, Alex Bryson, Amy Humphris, Maria Koumenta, and Morris Kleiner. 2011. "A Review of Occupational Regulation and its Impact." UK Commission for Employment and Skills Evidence Report 40, London, UK.

- **Fredriksen, Kaja.** 2020. "Does occupational licensing impact incomes? A replication study for the German crafts case." *Journal for Labour Market Research*, 54(8).
- Fredriksen, Kaja, Petrik Runst, and Kilian Bizer. 2019. "Masterful Meisters? Voluntary Certification and Quality in the German Crafts Sector." *German Economic Review*, 20(1): 83–104.
- Fuchs-Schündeln, Nicola, and Matthias Schündeln. 2009. "Who stays, who goes, who returns?" *Economics of Transition*, 17(4): 703–738.
- Gittleman, Maury, and Morris M. Kleiner. 2016. "Wage Effects of Unionization and Occupational Licensing Coverage in the United States." *ILR Review*, 69(1): 142–172.
- Gittleman, Maury, Mark A. Klee, and Morris M. Kleiner. 2018. "Analyzing the Labor Market Outcomes of Occupational Licensing." Industrial Relations: A Journal of Economy and Society, 57(1): 57–100.
- Graf, Tobias, Stephan Grießemer, Markus Köhler, Claudia Lehnert, Andreas Moczall, Martina Oertel, Alexandra Schmucker, Andreas Schneider, Stefan Seth, Ulrich Thomsen, and Philipp vom Berge. 2023. "Weakly anonymous Version of the Sample of Integrated Labour Market Biographies (SIAB) Version 7521 v1." Research Data Centre of the Federal Employment Agency (BA) at the Institute for Employment Research (IAB). DOI: https://doi.org/10.5164/IAB.SIAB7521.de.en.v1.
- Hainmueller, Jens. 2012. "Entropy Balancing for Causal Effects: A Multivariate Reweighting Method to Produce Balanced Samples in Observational Studies." *Political Analysis*, 20(1): 25–46.
- Haupt, Andreas. 2023. "Who Profits from Occupational Licensing?" American Sociological Review, 88(6): 1104–1130.
- Hunt, Jennifer. 2006. "Staunching Emigration from East Germany: Age and the Determinants of Migration." Journal of the European Economic Association, 4(5): 1014– 1037.
- Ingram, Samuel J. 2019. "Occupational Licensing and the Earnings Premium in the United States: Updated Evidence from the Current Population Survey." *British Journal of Industrial Relations*, 57(4): 732–763.
- Kleiner, Morris M. 2000. "Occupational Licensing." Journal of Economic Perspectives, 14(4): 189–202.
- Kleiner, Morris M. 2016. "Battling over Jobs: Occupational Licensing in Health Care." American Economic Review, 106(5): 165–170.

- Kleiner, Morris M., Allison Marier, Kyoung Won Park, and Coady Wing. 2016. "Relaxing Occupational Licensing Requirements: Analyzing Wages and Prices for a Medical Service." *The Journal of Law and Economics*, 59(2): 261–291.
- Kleiner, Morris M., and Alan B. Krueger. 2010. "The Prevalence and Effects of Occupational Licensing." *British Journal of Industrial Relations*, 48(4): 676–687.
- Kleiner, Morris M., and Alan B. Krueger. 2013. "Analyzing the Extent and Influence of Occupational Licensing on the Labor Market." *Journal of Labor Economics*, 31(S1): S173–S202.
- Kleiner, Morris M., and Evgeny Vorotnikov. 2017. "Analyzing occupational licensing among the states." *Journal of Regulatory Economics*, 52(2): 132–158.
- Kleiner, Morris M., and Robert T. Kudrle. 2000. "Does Regulation Affect Economic Outcomes? The Case of Dentistry." *The Journal of Law and Economics*, 43(2): 547–582.
- Koumenta, Maria, and Mario Pagliero. 2019. "Occupational Regulation in the European Union: Coverage and Wage Effects." British Journal of Industrial Relations, 57(4): 818–849.
- Leland, Hayne E. 1979. "Quacks, Lemons, and Licensing: A Theory of Minimum Quality Standards." *Journal of Political Economy*, 87(6): 1328–1346.
- Lergetporer, Philipp, Jens Ruhose, and Lisa Simon. 2018. "Entry Barriers and the Labor Market Outcomes of Incumbent Workers: Evidence from a Deregulation Reform in the German Crafts Sector." IZA Discussion Papers No. 11857.
- Lyu, Mengjie, Tingting Zhang, and Hua Ye. 2023. "Labour market impacts of occupational licensing and delicensing: New evidence from China." *British Journal of Industrial Relations*, 61(4): 895–921.
- Maurizi, Alex. 1974. "Occupational Licensing and the Public Interest." Journal of Political Economy, 82(2): 399–413.
- **Ogilvie, Sheilagh.** 2004. "Guilds, efficiency, and social capital: evidence from German proto-industry." *The Economic History Review*, 57(2): 286–333.
- **Ogilvie, Sheilagh.** 2014. "The Economics of Guilds." *Journal of Economic Perspectives*, 28(4): 169–192.
- Olden, Andreas, and Jarle Møen. 2022. "The triple difference estimator." *The Econometrics Journal*, 25(3): 531–553.

- **Pagliero, Mario.** 2011. "What is the objective of professional licensing? Evidence from the US market for lawyers." *International Journal of Industrial Organization*, 29(4): 473–483.
- **Pagliero, Mario.** 2019. "Occupational Licensing in the EU: Protecting Consumers or Limiting Competition?" *Review of Industrial Organization*, 55(1): 137–153.
- Pizzola, Brandon, and Alexander Tabarrok. 2017. "Occupational licensing causes a wage premium: Evidence from a natural experiment in Colorado's funeral services industry." *International Review of Law and Economics*, 50: 50–59.
- **Prantl, Susanne.** 2012. "The impact of firm entry regulation on long-living entrants." Small Business Economics, 39(1): 61–76.
- Prantl, Susanne, and Alexandra Spitz-Oener. 2009. "How does entry regulation influence entry into self-employment and occupational mobility?" *Economics of Transition*, 17(4): 769–802.
- Redbird, Beth. 2017. "The New Closed Shop? The Economic and Structural Effects of Occupational Licensure." *American Sociological Review*, 82(3): 600–624.
- Rostam-Afschar, Davud. 2014. "Entry regulation and entrepreneurship: a natural experiment in German craftsmanship." *Empirical Economics*, 47(3): 1067–1101.
- Rottenberg, Simon. 1980. Occupational Licensure and Regulation. Washington, DC: American Enterprise Institute.
- Runst, Petrik, Jörg Thomä, Katarzyna Haverkamp, and Klaus Müller. 2019. "A replication of 'Entry regulation and entrepreneurship: a natural experiment in German craftsmanship'." *Empirical Economics*, 56(6): 2225–2252.
- Schmucker, Alexandra, Stefan Seth, and Philipp vom Berge. 2023. "Sample of Integrated Labour Market Biographies (SIAB) 1975–2021." FDZ Datenreport, 02/2023 (en), Nuremberg. DOI: https://doi.org/10.5164/IAB.FDZD.2302.en.v1.
- Shapiro, Carl. 1986. "Investment, Moral Hazard, and Occupational Licensing." The Review of Economic Studies, 53(5): 843–862.
- **Spence, Michael.** 1973. "Job Market Signaling." *The Quarterly Journal of Economics*, 87(3): 355–374.
- The New York Times. 2022. "Why Does a Hair Braider Need a License?" https://www.nytimes.com/2022/04/08/opinion/professional-licensing.html.

- The White 2016. "Fact Sheet: New Steps House. to Reduce Unnec-Occupation Licenses that are Limiting Worker Mobility and essarv Reducing Wages." https://obamawhitehouse.archives.gov/the-press-office/2016/06/17/ fact-sheet-new-steps-reduce-unnecessary-occupation-licenses-are-limiting.
- The White "Fact House. 2021. Sheet: Executive Order on Promoting Economy." Competition in the American https:// www.whitehouse.gov/briefing-room/statements-releases/2021/07/09/ fact-sheet-executive-order-on-promoting-competition-in-the-american-economy/.
- Thornton, Robert J., and Edward J. Timmons. 2013. "Licensing One of the World's Oldest Professions: Massage." *The Journal of Law and Economics*, 56(2): 371–388.
- Timmons, Edward J., and Robert J. Thornton. 2008. "The Effects of Licensing on the Wages of Radiologic Technologists." *Journal of Labor Research*, 29(4): 333–346.
- Timmons, Edward J., and Robert J. Thornton. 2019. "There and Back Again: The De-Licensing and Re-Licensing of Barbers in Alabama." *British Journal of Industrial Relations*, 57(4): 764–790.
- Weeden, Kim A. 2002. "Why Do Some Occupations Pay More than Others? Social Closure and Earnings Inequality in the United States." *American Journal of Sociology*, 108(1): 55–101.
- **Zhang, Tingting.** 2019. "Effects of Occupational Licensing and Unions on Labour Market Earnings in Canada." *British Journal of Industrial Relations*, 57(4): 791–817.
- Zhang, Tingting, and Morley Gunderson. 2020. "Impact of Occupational Licensing on Wages and Wage Inequality: Canadian Evidence 1998–2018." *Journal of Labor Research*, 41(4): 338–351.

Appendix

| Regulated | Deregulated |
|--|--|
| 1. Bricklayer and concretor | 1. Tile, slab and mosaic layer |
| 2. Stove and air heating mechanic | 2. Cast stone and terrazzo maker |
| 3. Carpenter | 3. Screed layer |
| 4. Roofer | 4. Vessel and equipment constructor |
| 5. Road construction worker | 5. Clockmaker |
| 6. Thermal and acoustic insulation fitter | 6. Engraver |
| 7. Well sinker | 7. Metal former |
| 8. Stonemason | 8. Galvaniser |
| 9. Plasterer | 9. Metal and bell founder |
| 10. Painter and lacquerer | 10. Cutting tool mechanic |
| 11. Scaffolder | 11. Goldsmith and silversmith |
| 12. Chimney sweep | 12. Parquet layer |
| 13. Metal worker | 13. Shutter and sunshade mechatronics |
| 14. Surgical instrument maker | 14. Model builder |
| 15. Coachbuilder | 15. Turner (ivory carver) and wooden toy maker |
| 16. Precision engineer | 16. Wood carver |
| 17. Motorbike and bicycle mechanic | 17. Cooper |
| 18. Refrigeration mechanic | 18. Basket maker |
| 19. Communication technician | 19. Costume tailor |
| 20. Automotive mechatronics technician | 20. Embroiderer |
| 21. Mechanic for agricultural machinery | 21. Milliner |
| 22. Gunsmith | 22. Weaver |
| 23. Plumber | 23. Sailmaker |
| 24. Installer and heating fitter | 24. Furrier |
| 25. Electrics technician | 25. Shoemaker |
| 26. Electrical machine engineer | 26. Saddler |
| 27. Joiner | 27. Interior decorator |
| 28. Boat builder | 28. Miller |
| 29. Rope maker | 29. Brewer and maltster |
| 30. Baker | 30. Wine cellarperson |
| 31. Pastry-cook | 31. Textile cleaner |
| 32. Butcher | 32. Building cleaner |
| 24. Harving official | 33. Glass fillister |
| 34. Hearing aid acoustician | 34. Precision optician |
| 26. Orthopaedia shoomalor | 26 Dreasons and china painter |
| 27 Dental technician | 27 Distographer |
| 29 Heindressen | 28 Doolchinden |
| 30. Clarier | 30. Typesetter and printer |
| 40 Class blower and glass apparatus maker | 40 Screen printer |
| 40. Glass blower and glass apparatus maker | 40. Sereen printer 41. Elevographer |
| 41. Meenanie for tyres and vulcanization | 42 Coromist |
| | 43. Organ and harmonium maker |
| | 44. Piano and harpsichord maker |
| | 45. Reed and organ musical instrument maker |
| | 46. Violin maker |
| | 47. Bow maker |
| | 48. Metal wind instrument maker |
| | 49. Wooden wind instrument maker |
| | 50. Plucked instrument maker |
| | 51. Gilder |

 Table A.1: List of Regulated and Deregulated Occupations

Source: Bundesministerium der Justiz (2004).

52. Sign and illuminated advertisement maker

| | Crafts and Trade Code – Annex B1 | Classification of Occupations 1988 (KldB88) | | |
|------|--|---|--|--|
| Code | Name | Code | Name | |
| 1 | Fliesen-, Platten- und Mosaikleger | 483 | Fliesenleger | |
| 2 | Betonstein- und Terrazzohersteller | 112 | Formstein-, Betonhersteller | |
| 3 | Estrichleger | 486 | Estrich-, Terrazzoleger | |
| 4 | Behälter- und Apparatebauer | 252 | Behälterbauer, Kupferschmiede und verwandte Berufe | |
| 5 | Uhrmacher | 286 | Uhrmacher | |
| 6 | Graveure | 232 | Graveure, Ziseleure | |
| 7 | Metallbildner | 193 | Metallzieher | |
| 7 | Metallbildner | 213 | Sonstige Metallverformer | |
| | | | (spanlose Verformung) | |
| 7 | Metallbildner | 225 | Metallschleifer | |
| 7 | Metallbildner | 233 | Metallvergüter | |
| 7 | Metallbildner | 244 | Metallkleber und übrige Metallverbinder | |
| 8 | Galvaniseure | 234 | Galvaniseure, Metallfärber | |
| 9 | Metall- und Glockengießer | 202 | Formgießer | |
| 10 | Schneidwerkzeugmacher | 291 | Werkzeugmacher | |
| 11 | Gold- und Silberschmiede | 302 | Edelmetallschmiede | |
| 12 | Parkettleger | - | n/a | |
| 13 | Rollladen- und Sonnenschutztechniker | 627 | Übrige Fertigungstechniker | |
| 14 | Modellbauer | 306 | Puppenmacher, Modellbauer, Präparator | |
| 15 | Drechsler (Elfenbeinschnitzer) und | 183 | Holzwarenmacher | |
| | Holzspielzeugmacher | | | |
| 16 | Holzbildhauer | 182 | Holzverformer und zugehörige Berufe | |
| 17 | Böttcher | 503 | Stellmacher, Böttcher | |
| 18 | Korb- und Flechtwerkgestalter | 184 | Korb-, Flechtwarenmacher | |
| 19 | Maßschneider | 351 | Schneider | |
| 20 | Textilgestalter (Sticker, Weber, Klöppler, | 342 | Weber | |
| | Posamentierer, Stricker) | | | |
| 20 | Textilgestalter (Sticker, Weber, Klöppler, | 346 | Textilverflechter | |
| | Posamentierer, Stricker) | | | |
| 20 | Textilgestalter (Sticker, Weber, Klöppler, | 354 | Sticker | |
| | Posamentierer, Stricker) | | | |
| 20 | Textilgestalter (Sticker, Weber, Klöppler, | 352 | Oberbekleidungsnäher | |
| | Posamentierer, Stricker) | | | |
| 20 | Textilgestalter (Sticker, Weber, Klöppler, | 356 | Näher, a.n.g | |
| | Posamentierer, Stricker) | | | |
| 20 | Textilgestalter (Sticker, Weber, Klöppler, | 357 | Sonstige Textilverarbeiter | |
| | Posamentierer, Stricker) | | | |
| 21 | Modisten | 355 | Hut-, Mützenmacher | |
| 22 | Segelmacher | 362 | Textilausrüster | |
| 23 | Kürschner | 378 | Fellverarbeiter | |

Table A.2: Mapping of Occupations from Crafts and Trade Code to Classification of
Occupations 1988: Deregulated Occupations

To be continued on the next page.

| Cr | Crafts and Trade Code – Annex B1 | | assification of Occupations 1988 (KldB88) |
|------|--------------------------------------|------|---|
| Code | Name | Code | Name |
| 24 | Schuhmacher | 372 | Schuhmacher |
| 25 | Sattler und Feintäschner | 374 | Groblederwarenhersteller, Bandagisten |
| 25 | Sattler und Feintäschner | 375 | Feinlederwarenhersteller |
| 25 | Sattler und Feintäschner | 376 | Lederbekleidungshersteller und sonstige Lederverarbeiter |
| 26 | Raumausstatter | 491 | Raumausstatter |
| 27 | Müller | 432 | Mehl-, Nährmittelhersteller |
| 29 | Brauer und Mälzer | 422 | Brauer, Mälzer |
| 29 | Weinküfer | 421 | Weinküfer |
| 30 | Textilreiniger | 932 | Textilreiniger, Färber und Chemischreinige |
| 31 | Wachszieher | - | n/a |
| 32 | Gebäudereiniger | 934 | Glas-, Geb¨audereiniger |
| 33 | Glasveredler | 135 | Glasbearbeiter, Glasveredler |
| 34 | Feinoptiker | 135 | Glasbearbeiter, Glasveredler |
| 35 | Glas- und Porzellanmaler | 514 | Kerammaler, Glasmaler |
| 36 | Edelsteinschleifer und -graveure | 102 | Eselsteinbearbeiter |
| 37 | Fotografen | 837 | Photographen |
| 38 | Buchbinder | 163 | Buchbinderberufe |
| 39 | Drucker | 173 | Buchdrucker (Hochdruck) |
| 39 | Drucker | 174 | Flach-, Tiefdrucker |
| 40 | Siebdrucker | 175 | Spezialdrucker, Siebdrucker |
| 41 | Flexografen | 172 | Druckstockhersteller |
| 42 | Keramiker | 121 | Keramiker |
| 43 | Orgel- und Harmoniumbauer | 305 | Musikinstrumentenbauer |
| 44 | Klavier- und Cembalobauer | 305 | Musikinstrumentenbauer |
| 45 | Handzuginstrumentenmacher | 305 | Musikinstrumentenbauer |
| 46 | Geigenbauer | 305 | Musikinstrumentenbauer |
| 47 | Bogenmacher | 305 | Musikinstrumentenbauer |
| 48 | Metallblasinstrumentenmacher | 305 | Musikinstrumentenbauer |
| 49 | Holzblasinstrumentenmacher | 305 | Musikinstrumentenbauer |
| 50 | Zupfinstrumentenmacher | 305 | Musikinstrumentenbauer |
| 51 | Vergolder | 235 | Emaillierer, Feuerverzinker und andere Metalloberflächenveredler |
| 52 | Schilder- und Lichtreklamehersteller | 834 | Dekorationen-, Schildermaler |

Table A.2: Mapping of Occupations from Crafts and Trade Code to Classification of
Occupations 1988: Deregulated Occupations (Continued)

Notes: Occupations are classified as deregulated following the procedure described by Lergetporer et al. (2018).

| | Crafts and Trade Code – Annex A | | Classification of Occupations 1988 (KldB88 | | |
|------|--|------|--|--|--|
| Code | Name | Code | Name | | |
| 1 | Maurer und Betonbauer | 441 | Maurer | | |
| 1 | Maurer und Betonbauer | 442 | Betonbauer | | |
| 2 | Ofen- und Luftheizungsbauer | 484 | Ofensetzer, Luftheizungsbauer | | |
| 3 | Zimmerer | 451 | Zimmerer | | |
| 4 | Dachdecker | 452 | Dachdecker | | |
| 5 | Straßenbauer | 462 | Straßenbauer | | |
| 6 | Wärme-, und Kälte- und Schallschutzisolierer | 482 | Isolierer, Abdichter | | |
| 7 | Brunnenbauer | 465 | Kultur-, Wasserbauwerker | | |
| 8 | Steinmetzen und Steinbildhauer | 101 | Steinbearbeiter | | |
| 9 | Stukkateure | 481 | Stukkateure, Gipser, Verputzer | | |
| 10 | Maler und Lackierer | 511 | Maler, Lackierer (Ausbau) | | |
| 10 | Maler und Lackierer | 512 | Warenmaler, -lackierer | | |
| 11 | Gerüstbauer | 453 | Gerüstbauer | | |
| 12 | Schornsteinfeger | 804 | Schornsteinfeger | | |
| 13 | Metallbauer | 301 | Metallfeinbauer, a.n.g. | | |
| 14 | Chirurgiemechaniker | 285 | Sonstige Mechaniker | | |
| 15 | Karosserie- und Fahrzeugbauer | 285 | Sonstige Mechaniker | | |
| 16 | Feinwerkmechaniker | 284 | Feinmechaniker | | |
| 17 | Zweiradmechaniker | 285 | Sonstige Mechaniker | | |
| 18 | Kälteanlagenbauer | 285 | Sonstige Mechaniker | | |
| 19 | Informationstechniker | 628 | Sonstige Techniker | | |
| 20 | Kraftfahrzeugtechniker | 621 | Maschinenbautechniker | | |
| 21 | Landmaschinenmechaniker | 621 | Maschinenbautechniker | | |
| 22 | Büchsenmacher | 211 | Blechpresser, -zieher, -stanzer | | |
| 23 | Klempner | 211 | Blechpresser, -zieher, -stanzer | | |
| 23 | Klempner | 261 | Feinblechner | | |
| 24 | Installateur und Heizungsbauer | 262 | Rohrinstallateure | | |
| 25 | Elektrotechniker | 311 | Elektroinstallateure, -monteure | | |
| 25 | Elektrotechniker | 622 | Techniker des Elektofaches | | |
| 26 | Elektromaschinenbauer | 314 | Elektrogerätebauer | | |
| 27 | Tischler | 501 | Tischler | | |
| 28 | Boots- und Schiffbauer | 275 | Stahlbauschlosser, Eisenschiffbaue | | |
| 29 | Seiler | 332 | Spuler, Zwirner, Seiler | | |
| 30 | Bäcker | 391 | Backwarenhersteller | | |
| 31 | Konditoren | 392 | Konditoren | | |
| 32 | Fleischer | 401 | Fleischer | | |
| 33 | Augenoptiker | 304 | Augenoptiker | | |
| 34 | Hörgeräteakustiker | | n/a | | |
| 35 | Orthopädietechniker | 628 | Sonstige Techniker | | |
| 36 | Orthopädieschuhmacher | | n/a | | |
| 37 | Zahntechniker | 303 | Zahntechniker | | |
| 38 | Friseure | 901 | Friseure | | |
| 39 | Glaser | 485 | Glaser | | |
| 40 | Glasbläser und Glasapparatebauer | 132 | Hohlglasmacher | | |
| 40 | Glasbläser und Glasapparatebauer | 133 | Flachglasmacher | | |
| 40 | Glasbläser und Glasapparatebauer | 134 | Glasbläser (vor der Lampe) | | |
| 41 | Vulkaniseure und Reifenmechaniker | 144 | Vulkaniseure | | |

Table A.3: Mapping of Occupations from Crafts and Trade Code to Classification of
Occupations 1988: Regulated Occupations

Notes: Occupations are classified as regulated following the procedure described by Lergetporer et al. (2018).

| | Reg | Regulated Deregulat | | gulated |
|-----------------------------------|---------|---------------------|---------|---------|
| | Mean | SD | Mean | SD |
| Daily wage, absolute | 107.712 | 44.655 | 102.066 | 36.283 |
| Log of daily wage | 4.605 | 0.380 | 4.567 | 0.344 |
| Master craftsmen | 0.045 | 0.208 | 0.030 | 0.170 |
| Age | 38.693 | 10.107 | 39.903 | 10.217 |
| Female | 0.074 | 0.261 | 0.171 | 0.377 |
| Foreigner | 0.049 | 0.215 | 0.096 | 0.295 |
| East Germany | 0.217 | 0.413 | 0.166 | 0.372 |
| University entrance qualification | 0.069 | 0.253 | 0.033 | 0.180 |
| Job tenure | | | | |
| Below 4 years | 0.496 | 0.500 | 0.405 | 0.491 |
| Between 4 and 8 years | 0.181 | 0.385 | 0.192 | 0.394 |
| Between 8 and 14 years | 0.178 | 0.383 | 0.208 | 0.406 |
| Over 14 years | 0.145 | 0.352 | 0.196 | 0.397 |
| Industry | | | | |
| Manufacturing | 0.393 | 0.488 | 0.749 | 0.434 |
| Construction | 0.335 | 0.472 | 0.094 | 0.292 |
| Wholesale and retail | 0.080 | 0.271 | 0.056 | 0.229 |
| Real estate and others | 0.192 | 0.394 | 0.101 | 0.302 |
| No. of employees $(in 1,000)$ | 1.225 | 5.359 | 0.779 | 3.709 |
| Firm size | | | | |
| Micro and small | 0.510 | 0.500 | 0.365 | 0.482 |
| Medium | 0.231 | 0.421 | 0.310 | 0.462 |
| Large | 0.260 | 0.438 | 0.325 | 0.468 |
| Observations | 50 | ,647 | 10 | ,868 |

 Table A.4: Descriptive Statistics

Notes: The table shows the means and standard deviations of the variables included in the analysis sample, measured in the last pre-reform year.

| | D | biD | Tr | iple Differer | nce |
|--|--------------------|--------------------|--------------------|---------------------------------------|--------------------|
| | (1) Master | (2) All | (3) Occ. FE | (4) Firm FE | (5) Ind. FE |
| Master | - | 0.212^{\dagger} | 0.216^{\dagger} | 0.228^{\dagger} | _ |
| | | (0.005) | (0.006) | (0.009) | |
| $\mathbf{Deregulated} 	imes \mathbf{Post}$ | 0.020* | -0.007^{***} | -0.008^{\dagger} | -0.009^{\dagger} | -0.010^{\dagger} |
| Master M Dat | (0.011) | (0.002) | (0.002) | (0.002) | (0.001) |
| Master × Post | _ | - | -0.014 | -0.010° | -0.011 |
| Deregulated × Master | _ | _ | (0.004) | 0.041* | (0.003) |
| Deregulated × Master | | | (0.017) | (0.023) | |
| $\mathbf{Deregulated} \times \mathbf{Master} \times \mathbf{Post}$ | _ | _ | 0.030*** | 0.020* | 0.020** |
| | | | (0.011) | (0.011) | (0.010) |
| Female | -0.163^{\dagger} | -0.200^{\dagger} | -0.200^{\dagger} | -0.163^{\dagger} | / |
| | (0.033) | (0.005) | (0.005) | (0.006) | |
| Foreigner | -0.074^{*} | -0.033^{\dagger} | -0.033^{\dagger} | -0.023^{\dagger} | — |
| | (0.039) | (0.004) | (0.004) | (0.005) | |
| East Germany | -0.274^{\dagger} | -0.275^{\dagger} | -0.275^{\dagger} | _ | — |
| | (0.016) | (0.003) | (0.003) | | |
| Age | 0.032^{\dagger} | 0.019^{\dagger} | 0.019^{\dagger} | 0.013^{\dagger} | - |
| | (0.005) | (0.001) | (0.001) | (0.001) | |
| $Age \times Age$ | -0.000^{\dagger} | -0.000^{\dagger} | -0.000^{\dagger} | -0.000^{\dagger} | - |
| | (0.000) | (0.000) | (0.000) | (0.000) | |
| Job tenure (Ref.: Below 4 years) | | | | | |
| Between 4 and 8 years | 0.050^{\dagger} | 0.044^{\dagger} | 0.044^{\dagger} | 0.065^{\dagger} | _ |
| | (0.014) | (0.003) | (0.003) | (0.004) | |
| Between 8 and 14 years | 0.073^{\dagger} | 0.059^{\dagger} | 0.059^{\dagger} | 0.094^{\dagger} | _ |
| , | (0.014) | (0.003) | (0.003) | (0.004) | |
| Over 14 years | 0.110^{\dagger} | 0.088^{\dagger} | 0.088^{\dagger} | 0.111^{\dagger} | — |
| 5 | (0.015) | (0.003) | (0.003) | (0.005) | |
| University entrance qualification | 0.016 | 0.167^{\dagger} | 0.167^{\dagger} | 0.158^{\dagger} | — |
| <i>y</i> 1 | (0.020) | (0.005) | (0.005) | (0.006) | |
| Industry (Ref.: Manufacturing) | . , | . , | . , | , , , , , , , , , , , , , , , , , , , | |
| Construction | -0.042** | -0.035^{\dagger} | -0.035^{\dagger} | _ | _ |
| | (0.019) | (0.003) | (0.003) | | |
| Wholesale and retail | -0.121^{\dagger} | -0.034^{\dagger} | -0.034^{\dagger} | _ | — |
| | (0.020) | (0.004) | (0.004) | | |
| Real estate and other industries | 0.004 | -0.032^{\dagger} | -0.032^{\dagger} | _ | _ |
| | (0.017) | (0.003) | (0.003) | | |
| Log of no. of employees | 0.057^{\dagger} | 0.050^{\dagger} | 0.050^{\dagger} | - | - |
| | (0.003) | (0.001) | (0.001) | | |
| Constant | 3.892^{\dagger} | 4.030^{+} | 4.020^{\dagger} | 4.253^{\dagger} | 4.627^{\dagger} |
| | (0.095) | (0.013) | (0.013) | (0.017) | (0.000) |
| Occupation FE | Yes | Yes | Yes | No | No |
| Firm FE | No | No | No | Yes | No |
| Individual FE | No | No | No | No | Yes |
| Adjusted R^2 | 0.461 | 0.585 | 0.585 | 0.845 | 0.901 |
| Observations | 20,696 | 474,929 | 474,929 | 474,929 | 474,929 |

Table A.5: Effect of Deregulation on Wages – Full Results

Notes: The table shows estimated average effects of the reform on log wages between 2000 and 2008. Columns (1) and (2) show coefficient estimates derived from Eq. (1). Results in column (1) are based on a sample including only master craftsmen and results in column (2) are based on a sample including all craftsmen. Columns (3) to (5) show coefficient estimates derived from Eq. (3) using a sample of all craftsmen in the regulated and deregulated occupations. In all specifications, individual and firm characteristics, measured in the base period, as well as year fixed effects are controlled for. Standard errors (in parentheses) are clustered at the individual level. Significance level: † 0.1%, *** 1%, ** 5%, * 10%. Data source: SIAB, 2000–2008.

| | Gender | | |
|--|-------------------------------|---------------------------|--|
| | (1) Male | (2) Female | |
| Master | 0.216^{\dagger} | 0.164^{\dagger} | |
| Deregulated \times Post | (0.008) -0.008^{\dagger} | (0.024) -0.015^{***} | |
| Master \times Post | $(0.002) \\ -0.012^{\dagger}$ | $(0.005) \\ -0.042^{**}$ | |
| Deregulated \times Master | $(0.004) \\ 0.010$ | $(0.020) \\ 0.019$ | |
| $\mathbf{Deregulated} \times \mathbf{Master} \times \mathbf{Post}$ | (0.017) 0.033^{***} | $(0.080) \\ 0.016$ | |
| ~ | (0.012) | (0.047) | |
| Adjusted R^2 | 0.571 | 0.553 | |
| Observations | $435,\!243$ | $39,\!686$ | |

Table A.6: Heterogeneous Effects of Deregulation by Gender

Notes: The table shows estimated average effects of the reform on log wages between 2000 and 2008 by gender. Coefficient estimates are derived from estimating Eq. (3), controlling for individual and firm characteristics as well as year and occupation fixed effects. Standard errors (in parentheses) are clustered at the individual level. Significance level: † 0.1%, *** 1%, ** 5%, * 10%. Data source: SIAB, 2000–2008.