Essays on the Labour Market Performance of Immigrants in Germany

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Abstract

Immigrants in Germany have lower success in the labour market than native Germans. This circumstance not only applies to the immigrants themselves but also persists in subsequent generations. The reasons for lower labour market success are as manifold as the group of immigrants themselves, but the cause often lies in inadequate occupational integration. The literature clearly shows that besides differences in occupational qualifications, language proficiency, and cognitive abilities, immigrants also face bureaucratic obstacles and reservations in the workplace that diminish their labour market performance. The consequence of immigrants' disadvantaged position is fewer labour market opportunities, which often results in a lower social status and thus reduced participation in society.

The aim of this thesis is to measure several aspects of immigrants' economic integration of immigrants. A particular focus of this study is the identification of unequal treatment of immigrants in the German labour market. The findings of the thesis are intended to identify starting points for the improvement of the labour market situation of immigrants. It appears that a considerable share of the wage gap between immigrants and natives is not due to differences in human capital endowment, indicating that immigrants are paid at a disadvantage. The introduction of a statutory minimum wage in Germany also has not led to wage convergence at the lower end of the wage distribution. In fact, the minimum wage led to increased competition for employment, putting lower-skilled immigrants at a further disadvantage. Furthermore, additional investigations reflect perceptions of an increased workload and accompanying health complaints among immigrants. The disadvantaged position of immigrants in the German labour market is thus reflected not only in remuneration but also in increased strain in the workplace.

Keywords: Germany, Immigrants, Wage Gap, Minimum Wage Introduction, Workload and Health

Kurzzusammenfassung

Zuwanderer in Deutschland haben einen geringeren Arbeitsmarkterfolg als gebürtige Deutsche. Dieser Umstand betrifft nicht nur die Zuwanderer selbst, sondern hat auch Bestand in den nachfolgenden Generationen. Die Gründe für den geringeren Arbeitsmarkterfolg sind so vielfältig wie die Gruppe der Einwanderer selbst, die Ursache jedoch liegt häufig in einer unzureichenden beruflichen Integration. Die Literatur zeigt deutlich, dass neben Unterschieden in der beruflichen Qualifikation, den Sprachfertigkeiten und kognitiven Fähigkeiten, Zuwanderer auch bürokratische Hürden und Vorbehalte am Arbeitsplatz gegenüberstehen, die deren Arbeitsmarktleistung mindern. Die benachteiligte Position der Einwanderer hat geringere Arbeitsmarktchancen zur Folge, was häufig zu einem niedrigeren sozialen Status und damit zu einer geringeren Teilhabe an der Gesellschaft führt.

Das Ziel dieser Arbeit ist es, verschiedene Aspekte der wirtschaftlichen Integration von Zuwanderern zu messen. Dabei liegt ein besonderes Augenmerk dieser Studie auf der Identifizierung von Ungleichbehandlung von Zuwanderern auf dem deutschen Arbeitsmarkt. Die gewonnenen Erkenntnisse der Arbeit sollen dazu beitragen Ansatzpunkte zur Verbesserung der Arbeitsmarktsituation von Zuwanderern aufzuzeigen. Es stellt sich heraus, dass je nach Herkunftsland ein nennenswerter Anteil der Lohnlücke zwischen Zuwanderern und Einheimischen nicht allein auf Unterschiede in dessen Humankapitalausstattung zurückzuführen ist, was auf eine benachteiligte Entlohnung von Zuwanderern hindeutet. Auch die Einführung eines gesetzlichen Mindestlohns in Deutschland führte zu keiner Lohnkonvergenz am unteren Ende der Lohnverteilung. Der Mindestlohn führte gar zu einem erhöhten Wettbewerb um Arbeitsplätze, wodurch geringer qualifizierte Zuwanderer eine weitere Benachteiligung erfuhren. Darüber hinaus geben zusätzliche Untersuchungen die Wahrnehmung einer erhöhten Arbeitsbelastung und damit einhergehender gesundheitlicher Beschwerden bei Zuwanderern wieder. Die benachteiligte Position von Zuwanderern auf dem deutschen Arbeitsmarkt spiegelt sich somit nicht nur in der Entlohnung wider, sondern ist auch in der erhöhten Belastung am Arbeitsplatz erkennbar.

Schlagwörter: Deutschland, Zuwanderer, Lohnunterschiede, Mindestlohneinführung, Arbeitsbelastung und Gesundheit

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Chapter 1

Introduction

In the mid-1990s, shortly after German reunification, the German labour market underwent a transformation during which labour market conditions were challenging. There was an increase in (long-term) unemployment and in the share of young people without educational qualifications (Koch and Walwei, 2005). Furthermore, from the 1990s to the early 2000s, a strong increase in wage inequality occurred (Biewen et al., 2017; Gernandt and Pfeiffer, 2007), particularly at the lower end of the wage distribution (Dustmann et al., 2009). Since 2005, inequality has stagnated at a high level (Biewen et al., 2017). Subsequent labour market reforms have resulted in the deregulation of labour law, where the reduction of unemployment has been achieved by expanding the low-wage sector (among other means) and led to an increase in marginal employment (Schwahn et al., 2018; Oschmiansky et al., 2007). Lower-qualified workers at the bottom end of the wage distribution were especially negatively affected by these circumstances, including a considerable share of persons with a migration background. Due to their comparatively worse labour market position, immigrants were more likely to slip into the low-wage sector following the reforms, from which upward mobility into regular employment is difficult to achieve (Oschmiansky et al., 2007). However, current labour market inequalities between immigrants and natives did not emerge with the 2005 labour market reforms but rather have their origins in the past.

Improving the labour market situation of workers with foreign roots has been a key concern in Germany for many decades (OECD, 2005). However, immigrants encountered a different economic capability and political willingness for labour market integration (and social integration) at different points in time. The integration of immigrants in the present started with the displaced persons of the Second World War, followed by ethnic German immigrants (resettlers) in the post-war years, guest workers in the 1960s, and war refugees in the 1990s and 2015-2016, to name a few examples. Thus, the motives for immigration as well as the intention to settle in Germany were very different among each of these groups.

For example, low-skilled guest workers from southern Europe were specifically recruited to work temporarily as complements to skilled native workers. As they came to Germany with the intention of temporary residence, it made the necessity of integration take low precedence from the political, economic, social, and even individual immigrant perspectives (Danzer and Yaman, 2016; Seifert, 1997). Thus, 'their integration was limited to transitory economic incorporation, as they were not intended to become a permanent part of the German society' (Hübschmann, 2015, p. 14). Against all expectations, many of these guest workers and their families remained in Germany without ever having experienced active integration efforts.

In recent decades, immigrants have become an even more important part of the German labour force. The share of the labour force with an immigrant background increased from 17.9 % to 25.9 % in the period from 2005 to 2020, and the share will continue to increase sharply in the coming years (Federal Statistical Office, 2007, 2022).[1] However, disparities in labour market performance between immigrants and native Germans still exist. For example, immigrants have comparatively lower labour participation, are more affected by unemployment, work more often in demanding jobs (shift work, etc.) and on fixed-term employment contracts, hold a lower average job position, and have a lower monthly income (Federal Statistical Office, 2022). Although second-generation immigrants have been able to increase their occupational success, they are still considerably worse off than natives of the same age (Algan et al., 2010; Hübschmann, 2015).

The reasons for the lower labour market position of immigrants compared to natives are manifold. On the one hand, these inequalities can be attributed to explainable differences in characteristics between immigrants and natives, such as differences in human capital endowments (e.g., education, language skills, and cognitive competence) or cultural background (Aldashev et al., 2012; Coulombe et al., 2014; Lang, 2005). On the other hand, there are also work-related inequalities between immigrants and natives that are not due to differences in endowments. These inequalities include imperfect transferability of human capital across country borders; restricted approval of foreign educational achievements; reservations of employers, colleagues or authorities towards ethnic groups; and even discrimination (Aldashev et al., 2012; Bartolucci, 2014; Basilio et al., 2017).

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[1] Over the same period, the share of people with an immigrant background in the population increased from 18.6 % to 26.7 %. For those under the age of 15 years, the share was 39.5 % in 2020 (Federal Statistical Office, 2007, 2022).

The poorer position of immigrants in the labour market can mostly be explained by a lack of host-country-specific human capital (Fertig and Schurer, 2007; Tverdostup and Paas, 2017). The lower average qualification level of immigrants (Kalter and Granato, 2018) is often attributed to the 'limited transferability of skills and imperfect compatibility of home and host country labour markets' (Basilio et al., 2017, p. 260). In this context, foreign vocational qualifications that are not (yet) recognised are often an obstacle to better labour market entry for immigrants. In order to integrate successfully into the labour market, immigrants first need to acquire host-country-specific human capital (Chiswick, 1978). A fundamental part of host-country-specific human capital is language proficiency (Chiswick, 1978; Gundel and Peters, 2008), as insufficient language proficiencies are a substantial barrier to labour market participation (Aldashev et al., 2009; Hübschmann, 2015). For predominantly low-income immigrants, however, investing in host-country-specific human capital involves relatively high costs and a high degree of risk in terms of return on investment (Kalter and Granato, 2018).

Moreover, immigrants are particularly affected by the segmentation of the labour market. According to Doeringer and Piore's (1971) theory of dual segmentation of labour markets, a labour market is divided into relatively enclosed sub-labour markets. Occupational mobility processes primarily take place within firms (internal labour markets), whereas the external labour market is characterised by low wages, low skill levels, and limited opportunities for advancement. As new entrants to the labour market, first-generation immigrants generally enter at the bottom of a corporate hierarchy and/or in highly cyclical industries or occupations (Kalter and Granato, 2018). 'Given the severely limited mobility between segments, these initial disadvantages may then result in very long-term barriers to economic success' (Kalter and Granato, 2018, p. 366). Children of immigrants (second-generation immigrants) have only a marginally easier situation in the labour market because labour market success depends heavily on the education and occupational position of the parents. Social background essentially determines educational success, which puts immigrant children at a disadvantage due to their parents' generally low socio-economic positions (Gabrielli and Impicciatore, 2022; Kalter and Granato, 2018). Constant and Massey (2005, p. 509) found a 'high degree of initial occupational segmentation, with immigrants being less able than natives to translate their human capital into good first jobs and being channeled into first occupations of significantly lower status than natives'. Thus, immigrants are more likely than natives to work in jobs that are below

their human capital endowment or qualification (Constant and Massey, 2005). In occupations with lower qualification requirements, earnings tend to be lower and the health burden higher than in occupations with higher qualification requirements (Becker and Faller, 2019). Overall, this multitude of challenges and obstacles prevents immigrants from comparatively better labour market performance (Aldashev et al., 2009; Brynin and Güveli, 2012).

In order to remove or at least reduce these barriers to immigrants' labour market success, it is important to promote immigrant integration in the context of equal opportunity. Besides social and cultural aspects, income and wages are essential to holistic integration (e.g., Lehmer and Ludsteck, 2015). The absence of integration efforts leads to immigrants' social and economic exclusion, which in turn promotes inequality, economic disadvantage, impoverishment, and lower social participation (Hübschmann, 2015). However, the leverage points for better integration of immigrants and thus greater success in the labour market are often unclear because the reasons for labour market obstacles are as diverse as the immigrants themselves. One important instrument for better integration is language promotion because insufficient language skills are a major obstacle to participation in the labour market (Aldashev et al., 2009). Additionally, successful integration into the education system can bring improvements in occupational success across generations (Kalter and Granato, 2018). Short-term approaches include simplified and faster recognition of foreign vocational qualifications in order to enable immediate access to the labour market. A rapid recognition of qualifications prevents immigrants from entering the low-wage sector, from which it is hard to advance.

The contribution of this study is to identify inequalities in labour market performance between immigrants and natives in Germany that are not attributable to differences in individual characteristics or occupation. Understanding the unequal treatment of individuals and ethnic groups in the labour market has high social as well as economic relevance. The consequences of a comparatively lower level of appreciation of an individual or group in the context of hiring, salary, workload, or interpersonal dealings, lead to social disparities (Nolte and Hradil, 1984). As immigrant employees may work in occupations below their qualifications and thus cannot exhaust their full production potential, this pushes immigrants into a low socio-economic status. Moreover, social inequality is also an economic problem as it weakens economic performance (Stiglitz, 2016) and slows down growth in the long run (Islam and McGillivray, 2020). Furthermore, inadequate job allocation causes a welfare

loss, and these undesirable circumstances in turn increase government spending on social services. In addition, this study also examines whether policies to reduce labour market inequality serve disadvantaged groups such as immigrants as well. In this study, three topics on inequality between immigrants and natives in Germany are addressed in depth.

Chapter 2, co-authored with Stephan L. Thomsen, addresses the wage inequality experienced by foreigners and naturalised immigrants relative to native Germans in the period from 1994 to 2015. The extent of the gap in earnings between natives and immigrants indicates the economic integration of immigrants (Chiswick, 1978; Hübschmann, 2015). The purpose of studying the immigrant-native wage gap is to reveal the extent to which wage differentials between these two groups are due to differences in endowments and whether there may be a pay disadvantage. Unequal treatment leads to social disparities, which should be avoided. We consider this specific period as these years were characterised by a strong increase in wage inequality (Dustmann et al., 2009) that negatively affected low-skilled workers and immigrants in particular (Algan et al., 2010; Gernandt and Pfeiffer, 2007). The analyses contribute to the literature in two ways. Firstly, to expose unequal treatment, we decompose the wage gap using unconditional quantile regression models by employing a regression of the (recentered) influence function (RIF) of gross hourly wages; this relatively new approach enables us to estimate contributions made across the whole wage distribution. Secondly, we add a previously disregarded set of socio-economic and labour-related aspects, such as human capital quality, cultural background, and immigrants' personalities. The combination of in-depth methodology and a rich set of explanatory variables enables us to gain new insights into the extent and the underlying reasons for wage inequality between immigrants and natives.

Chapter 3, co-authored with Stephan L. Thomsen, investigates the effects of the introduction of a statutory minimum wage in Germany in 2015 on the wages and employment of immigrants. Thus, this analysis directly follows Chapter 2 in terms of both content and timing. In response to rising wage inequality, the introduction of a statutory minimum wage was intended to protect employees in the low-wage sector from wage dumping and thereby improve social security (The Federal Government, 2014). Since immigrants more often work in the low-wage sector, typically characterised as marginal or part-time employment (Grabka and Schröder, 2019), this creates structural wage inequalities compared to native workers (Aldashev et al., 2012). Therefore, it is to be expected that immigrants particularly benefit from a minimum wage. We examine whether

this labour market reform was able to counteract the wage and employment gap between immigrants and natives. We apply a "differential trend adjusted difference-in-differences estimator" (DTADD) to evaluate the impact of the minimum wage introduction in 2015 on hourly wages, working hours and monthly salaries. We complement our causal analysis with comprehensive descriptive analyses of labour market participation patterns and wage distribution to illustrate and discuss potential changes.

Chapter 4, co-authored with Stephan L. Thomsen, examines the degree to which inequality is reflected not only in wages but also in the treatment of immigrants in terms of workload. As different occupations are associated with specific patterns of health-related aspects – whether directly or indirectly –, occupational selection of socio-economic groups may relate to systematic health differences in society (Aittomäki et al., 2006). However, there are indications that even within the same occupation, immigrants are exposed to a comparatively higher health burden (Oldenburg et al., 2010; Becker and Faller, 2019). Using a self-designed framework, we investigate differences in workplace-related stress between immigrants and natives within the same occupations and their role in health. Our analysis takes a comprehensive set of work-related aspects into account, such as work tasks, job requirements, and working conditions.

These three issues of the investigation were chosen because they jointly encompass economic, political, and societal levels of inequality. At the same time, the studies provide a holistic picture of the extent to which occupational segmentation and inequalities between immigrants and natives exist in the German labour market; and the impact they might have on social inequalities and even ethnic segregation in German society.

Chapter 2

The Immigrant-Native Wage Gap in Germany [2]

with:
Stephan L. Thomsen

2.1 Introduction

The recent inflow of migrants into Europe has reinforced the opposing currents in the societies of European countries. In many countries in Europe and around the world, right-wing populist parties have recently achieved high rates of approval in elections. Germany as an immigration country cannot deprive from these contrary currents (Sola, 2018). From the experience of previous waves of immigration to Germany[4] and its problems experienced in the integration process, critics of immigration are supported by the fact that the benefit system is demonstrably claimed by a growing number of foreigners (Riphahn et al., 2013). This public concern is fuelled by a perception of rising levels of income inequality (Roth et al., 2017). Although the development of inequality in terms of wages has stagnated in recent years (Biewen et al., 2017), research shows that especially low-skilled workers and immigrants are increasingly being negatively affected by wage inequality in Germany (e.g., Algan et al., 2010; Gernandt and Pfeiffer, 2007).[5] Because the wage gap between immigrants and natives is a good indicator of economic integration and reflects the effectiveness of a country's immigration and labour market policies, we study the immigrant-native wage gap to reveal unjust remuneration between different ethnic groups in Germany. We aim to expose a number of key influencing factors. For this purpose, we are adding a previously disregarded comprehensive set of socio-economic and labour-related aspects, such as the human capital quality, the cultural background, and the personalities of immigrants.

The labour market integration of immigrants is a major policy concern, as immigrants' contributions to the economy depend directly on their success. 'Together with social and cultural aspects, income and wages are indispensable to holistic integration' (e.g., Lehmer and Ludsteck, 2015, p. 677). In the first place, a welfare loss occurs due to inadequate job allocation: Immigrant employees may work in occupations below their qualifications and thus cannot exhaust their full production potential. In extreme cases, high wage differentials lead to larger unemployment assistance and social assistance payments in the medium run while social insurance contributions and tax revenues decrease. To identify the triggers of social division of ethnic groups, it is important to analyse whether wage differentials are due to observable differences, for example, in human capital endowments or otherwise due

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[4] For further information on German migration history, see Appendix A.2.

[5] Earnings discrepancies in Germany have reached average levels in Europe (Simón, 2010). The development of wage inequality from the 1990s to the early 2000s in Germany is addressed by Card et al. (2013), Dustmann et al. (2009) and Gernandt and Pfeiffer (2007).

to unobservable influences comprising ethnic discrimination (Aldashev et al., 2012). A wage disadvantage or even discrimination against an equivalent job occurs when the same degree of employee labour productivity – equal qualifications and (labour market) experience, similar personal characteristics and equal overall conditions (sector, etc.) – is remunerated to varying degrees.[6] A wage differential usually originates from limited access to the labour market (Aldashev et al., 2009; Brynin and Güveli, 2012). To improve the employment and labour market prospects of foreigners, in the last two decades the German government has started to offer courses specially designed for immigrants on language instruction, social integration, integration through apprenticeship, work, and (university) education (The Federal Government, 2016; Kosyakova and Sirries, 2017).[7] Both the total number of courses and the demand for specific courses such as those on literacy and youth integration have been expanded over the last decade (Federal Office for Migration and Refugees, 2017).

We decompose the immigrant-native wage gaps for males for the years 1994 to 2015 using data from the German Socio-Economic Panel (SOEP). SOEP data include a rich set of household and labour-related characteristics relevant for understanding the determinants of labour market success across groups. We consider a comprehensive set of control variables that recognises typically unobservable labour market influences. In particular, we examine individual personality traits and integration barriers by taking into account metrics of immigrants' cultural proximity to Germany based on their home countries' positions of cultural distance (Kaasa et al., 2016). We further consider foreign education degrees and employ the home country's economic performance as an indicator of human capital quality (Coulombe et al., 2014). To allow for heterogeneous effects of these factors along the whole wage distribution, we apply a variant of the Blinder-Oaxaca decomposition proposed by Firpo et al. (2009) based on a recentered influence function (RIF) for unconditional quantile regression (UQR) models. The main advantage of this approach lies in its more precise decomposition, since it allows one to estimate the contributions of each variable to composition effects observed along the entire wage distribution (Galego and Pereira, 2014).

Consideration of the immigration pool as a homogenous group veils important heterogeneity across migrant origins. This variety of origins (and migration motives) involved makes it extremely difficult to depict the foreign qualifications of persons due to the presence of different education systems and requirements. In our study, we take this

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[6] For further details on direct and indirect discrimination, see OECD (2013).
[7] See, e.g., Thomsen and Walter (2010) and Thomsen et al. (2013) for corresponding programme evaluations.

diversity explicitly into consideration. We differentiate between three main population groups in our analysis: (1) *Native Germans*, (2) *Naturalised Immigrants*, and (3) *Foreigners*. We further consider (i) *citizens of Turkey*, (ii) *citizens of the former Yugoslavia*, and (iii) *citizens of southern European countries* as subgroups of Foreigners, as the influx of guest-workers mainly during the 1960s and subsequent family reunification formed large demographic groups from the Mediterranean within Germany. *Naturalised Immigrants* are further divided into (j) *ethnic German repatriates*[8] and (jj) *naturalised immigrants without ethnic immigrants*.

Our estimation results show a significant gap in wages for *Foreigners* and *Naturalised Immigrants* relative to *Native Germans* without a migration background[9] for more than two decades of analysis. Regarding individual and labour market characteristics affecting wages, on average, roughly three quarters of gaps along the wage distribution can be attributed to observable differences in individuals' human capital endowments and work-related factors but with distinct differences observed between immigrant groups. With respect to human capital transferability across borders, a perceptible disadvantage can still be attributed to education obtained abroad. This implies an insufficient adaptation of qualifications in Germany. Furthermore, we observe a rising gap in average wages for both immigrant main groups over time. We find a consistently high degree of explanation due to individual and labour market characteristics indicating that the human capital endowments of immigrants have deteriorated relative to those of native Germans over time. Given the above mentioned strong public and private efforts made to socially and economically integrate immigrants in Germany, these results raise doubts surrounding the effectiveness and efficiency of such programmes.

The remainder of this paper is organised as follows: We first review the related literature on wage inequality and the wage gap (section 2.2). Section 2.3 provides information on the data used for the empirical analysis, which is followed with a presentation of selected descriptive statistics (section 2.4). We introduce the econometric approach of the decomposition method in section 2.5. The empirical results are illustrated and evaluated in section 2.6. The final section 2.7 provides conclusions.

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[8] *Ethnic German repatriates* are individuals with German ethnicity from successor states of the former Soviet Union and from other Eastern European states who returned to their ancestral homeland to settle permanently.

[9] As the reference group in the analyses, we use 'native Germans without a migration background'. A person with a migration background is defined as someone who immigrated to Germany or who has at least one foreign, immigrant or naturalised parent (Federal Bureau of Statistics, 2017a).

2.2 Related Literature

Wage differentials between natives and foreigners have been analysed in a number of studies. Because the convergence of immigrants' wage levels to natives' wage levels serves as an important indication of their degrees of labour market integration, a recurring contemplation of wage differences between these groups is essential to uncovering structural and persistent disadvantages (Coulombe et al., 2014). Despite current political and societal discussions, however, much of the evidence available for Germany refers to the period surrounding the turn of the millennium. A more recent account on the situation of the last decade is not available. The results from earlier studies note levels of wage discrimination against immigrants of 13 to 17 % in western Germany from 1996 to 2005 (Bartolucci, 2014).[10] For the same period, Lehmer and Ludsteck (2011) identify a heterogeneous pattern of immigrant wage disadvantages depending on the country of origin (1995-2006).[11] Here, even lower wages can be observed for second-generation immigrants (Algan et al., 2010).[12] Further results provided by Aldashev et al. (2012) reveal significant wage gaps for both foreigners (25 %) and naturalised immigrants (19 %) based on SOEP data from 1992 to 2009. However, Germany is not the only country in Europe experiencing wage inequality between its host and immigrant population. The majority of migrants within the European Union faces income disadvantages, which tend to be even more pronounced for migrants from non-EU countries than for migrants from EU member states (Adsera and Chiswick, 2007; Lehmer and Ludsteck, 2011, 2015). For Austria, where the share of foreigners is higher than that in Germany, Hofer et al. (2017) reveal a wage gap between immigrants and natives of 15 % for 2008 to 2010; the majority of this wage gap can be attributed to differences in human capital endowments. Moreover, wage differentials tended to be larger for higher incomes in 2008. For Germany, related evidence indicates the opposite trend: 'the wage gap decreases steadily with higher incomes and may turn even positive at a wage peak' (Grandner and Gstach, 2015, p. 63).

Generally, wage differences between natives and immigrants can be attributed to a lack of host-country-specific human capital. Therefore, immigrants face an initial income disadvantage upon arrival relative to natives (Fertig and Schurer, 2007; Tverdostup and

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[10] Bartolucci (2014) uses matched employer-employee data (LIAB) from the Institute for Employment Research (IAB).

[11] Lehmer and Ludsteck (2011) use employment register data (BEH) of the German Federal Empl. Agency.

[12] Algan et al. (2010) use data from German Mircocensus 2005/2006.

Paas, 2017). To compensate for this lack of required human capital, immigrants immediately start on a path with high(er) investment costs. Hence, earnings are low directly after arrival, but high levels of human capital will guarantee economic assimilation into the host labour market afterwards (Borjas, 1985), leading to the diminution of the initial income gap (Fertig and Schurer, 2007). By acquiring knowledge on the language, customs, and nature of the labour market of the host country over time, immigrants can achieve supplementary and holistic integration. These factors can have positive effects in terms of raising immigrants' earnings. In addition, it should be noted that a positive self-selection of immigrants concerning assimilation is likely. A long period of residence in the host country may be accompanied with successful integration into the labour market and into society whereas unsuccessful integration may increase the probability of remigration (Gundel and Peters, 2008). Related to this, Gathmann and Keller (2018) show that faster access to German citizenship promotes immigrants' incentives to invest in skills, thereby causing them to enhance their labour market performance (earnings) and establish social contacts with the domestic culture. All of these processes result in deeper levels of social and cultural integration (Felfe et al., 2019).

Nevertheless, due to its correlation with social and cultural assimilation, time of residence may be an important factor shaping naturalised immigrants' and foreigners' wages (Chiswick, 1978). Descriptive statistics given by Lehmer and Ludsteck (2015) show a decline in wage differences between immigrants and natives in Germany. According to their results, immigrants assimilate through the accumulation of firm-specific human capital and by moving to better paying firms, i.e., immigrants realise search gains. The process of assimilation slows down throughout the appropriation of host-country-specific human capital (Borjas, 2015). This assimilation behaviour among immigrants is tested conventionally under the framework of the assimilation hypothesis developed by Chiswick (1978). Based on this concept, Fertig and Schurer (2007) estimated a catch-up interval of wages of approximately nine years for Germany and the USA. Nevertheless, Borjas (1985) directly criticises the assimilation hypothesis due to cohort effects, i.e. compositional differences of different immigrant groups over time with respect to socio-economic characteristics and qualifications.

A key component of host-country-specific human capital is language proficiency (Gundel and Peters, 2008). Hochman and Davidov (2014, p. 352) confirm that 'proficiency in the host country's language is central to immigrants' labour market achievements'. The

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effect of language on wages, however, is usually underestimated (Dustmann and Van Soest, 2002) because insufficient levels of language proficiency diminish the probability of immigrant labour market participation and therefore may not affect wages fully (Aldashev et al., 2009). Language proficiency, however, is a prerequisite to holding professions of higher standing. The results by Guven and Islam (2015) indicate that poor language skills particularly in childhood imply significant disadvantages in terms of social assimilation and academic and labour market success. According to Christl et al. (2018), closely related literacy skills also have a significant impact on wages and explain the wage differential between immigrants and natives to a certain extent.

Whether education is obtained from the host or home country serves a further strong explanation for the immigrant-native wage gap (Fortin et al., 2016; Warman et al., 2015). Regarding the educational levels of persons of foreign backgrounds, human capital obtained in the home country may not be equivalent to that obtained in the host country due to the limited transferability of skills or due to imperfect compatibility of home and host country labour markets (Basilio et al., 2017). Indeed, Basilio et al. (2017) consider lower levels of human capital quality and the incomplete transferability of human capital to be major factors in explaining the wage differential between natives and immigrants in Germany. The returns to education and labour market experience obtained outside of Germany are demonstrably lower than those to human capital obtained in Germany (Aldashev et al., 2009). The acquisition of host-country-specific skills is exacerbated further by greater linguistic and cultural distance between countries of origin and the host country. The more similar two countries are in language and culture, the easier it is to acquire these resources (Isphording and Otten, 2014). It is therefore necessary to quantify the influence of cultural differences on labour market success.

Cognitive abilities are complemented with personality traits as determinants of labour market success. While certain personality traits result in stronger job performance, others may be unfavourable in the labour market. For example, people with certain dispositions of personality traits may gain easier access to specific occupations and positions than others (Brenzel and Laible, 2016; Heineck and Anger, 2010; John and Thomsen, 2014). Because cognitive abilities and personal characteristics influence each other, an early investment in character-shaping activities is required. The recent empirical labour literature therefore increasingly reflects the role and significance of cognitive abilities. Personality traits affect wages mostly through the channel of educational attainment and through a higher likelihood

of engaging in labour market participation accompanied with more social integration (Thiel and Thomsen, 2013). Unique characteristics already lead to greater success on the educational path (Busato et al., 1999).

These and other factors influencing wage inequality have to be evaluated at different levels. For instance, Giesecke and Verwiebe (2009) show a decreasing wage differential between highly educated and less skilled employees in Germany but at the same time increasing wage differentials between occupational classes. Occupations also explain a large proportion of ethnic wage differentials in the United Kingdom (Longhi, 2017). At the same time, payment differentials within and between industries reinforce the existing wage gap between natives and immigrants, especially since immigrants are concentrated in sectors of manual activity (Antonczyk et al., 2010; Aydemir and Skuterud, 2008). Furthermore, a change in employment patterns, e.g., the growth of (marginal) part-time work, contributes to an overall increase in wage inequality (Biewen and Juhasz, 2012). Longhi (2017) concurrently highlights the spatial level of wage discrimination and stresses that estimated ethnic wage differentials are fundamentally overstated when they refer to the national level. When minorities are compared to the majority in the same local labour market while facing similar socio-economic conditions, the results reveal that ethnic wage differentials tend to be more heterogeneous across regions.

2.3 Description of the Estimation Sample

For the empirical analysis, we use data from the German Socio-Economic Panel (SOEP). SOEP is a wide-ranging and representative longitudinal panel study of roughly 30,000 persons who are interviewed annually on issues related to income, employment, education and health (see Goebel et al., 2019 for more information). We focus on the survey waves from 1994 to 2015 to exclude short-term fluctuations in the labour market occurring at the start of the 1990s. We consider strong waves of immigration occurring after the downfall of the Iron Curtain to secure sufficient sample sizes for each ethnic group and especially for *ethnic German repatriates*. The comprehensive set of sociodemographic variables included in the SOEP allows for the identification of immigration status beyond the concept of citizenship. In particular, information on whether a person or one parent immigrated to Germany (migration background) can be collected by combining a persons' citizenship, country of origin and year of immigration to Germany (see Aldashev et al., 2012). In our

empirical analysis, we distinguish between *Foreigners*, *Naturalised Immigrants* and *Native Germans*:

- *Foreigners* are all persons without German citizenship. We further consider three subgroups covering the main regions of origin of guest-workers: *citizens of Turkey*, *citizens of the former Socialist Federal Republic of Yugoslavia* (SFRY)[13] and *citizens of southern European countries* (Greece, Italy, Spain and Portugal).

- *Naturalised Immigrants* are former citizens of foreign countries who received German citizenship at or after immigration to Germany. Since *Naturalised Immigrants* are a highly heterogeneous group given the different origins and motivations for naturalisation, we distinguish between *ethnic German repatriates* and *naturalised immigrants without ethnic Germans* as two separate groups. We define *ethnic German repatriates* as persons with German citizenship originating from countries of the former Soviet Union[14] or from Eastern Europe[15] and arriving in Germany after 1987.[16]

- The remaining persons form the group of *Native Germans*. However, we distinguish between native Germans with and without an indirect migration background. *Native Germans with an indirect migration background* represent the second-generation of naturalised immigrants; they did not immigrate themselves. As a reference group in the analyses ahead, we use *native Germans without a migration background* to avoid strong cultural and language ties to (partly) naturalised parents.

Distinguishing between these groups is useful to identify potential differences and similarities between ethnic groups. We look at naturalised immigrants separately, as they clearly differ in their labour market characteristics (see below) from those of foreigners and native Germans. Legally, naturalised immigrants are not distinguishable from native Germans (the same political participation rights), but foreign roots may determine a divergent cultural and economic background. Since these people possess skills predominantly obtained abroad, they may be valued differently in the regulated German

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[13] The group also includes SFR Yugoslavia's successor states: Slovenia, Croatia, Bosnia and Herzegovina, Serbia (incl. Kosovo), Montenegro and Macedonia.

[14] Russia, Ukraine, Moldavia, Belarus, Kazakhstan, Tadzhikistan, Turkmenistan, Kirgizstan, Uzbekistan, Estonia, Latvia, Lithuania, Georgia, Armenia, and Azerbaijan.

[15] Poland, the Czech Republic and Slovakia (formerly Czechoslovakia), Hungary, and Romania but not Bulgaria (earlier repatriation).

[16] The definition of *ethnic German repatriates* is imprecise to a certain extent because all immigrants from the selected countries who have acquired German citizenship are considered and not just ethnic Germans alone. As SOEP data statistics show high immigration rates for each selected country of origin only for the beginning of the 1990s, a good approximation persists.

labour market. In addition, naturalised immigrants can be expected to differ from foreigners in terms of their time of residence and intentions to stay in Germany. In order to capture indirect influences of a foreign cultural background on person's remuneration, we resort to the concept of the cultural distance between the country of origin and Germany. We use the revised measurement method developed by Kaasa et al. (2016) which is based on Hofstede's (1980) original concept of cultural dimensions using the Kogut-Singh index. In addition to cultural influences, also personality traits shape a person's success on the labour market, directly in his or her profession or at the labour market entrance, but also indirectly during his or her training (Brunello and Schlotter, 2011; Heineck and Anger, 2010).We consider individuals' personality traits using the widely adopted Big Five personality traits. The approach defines individuals' personality comprehensively based on five independent domains.

We augment the available data by regional information at the state level to control for the regional economic environment and for labour force supplies in the empirical analysis using statistics provided by the Federal Employment Agency (2017) and the Federal Statistical Office (2017b). The incorporated regional information includes, among other, the share of the foreign population to depict the ethnic composition. A high ethnic concentration has a significantly negative effect on immigrants' levels of German language proficiency (Danzer and Yaman, 2016) and leads in general to lower investments in human capital (Battisti et al., 2018). Table A.1 in the appendix provides a detailed description of the variables considered.

Our variable of interest 'gross hourly wage' is obtained by dividing the gross wages for each month by the reported real working hours of the last week extrapolated to monthly hours. We assume that there are 4.35 weeks in each month for the calculation. To analyse developments occurring over 22 years, we adjust wages for inflation using the GDP deflator and measure them in prices for 2010. We further apply symmetric trimming to the wage distribution by dropping the upper and lower 2 % from the analysis to correct for outliers.

For homogeneity reasons, we impose a number of restrictions on the estimation sample. We only consider first-generation immigrants living in western Germany (incl. Berlin) – which means persons who were born abroad and who have immigrated to Germany. To ensure a reliable comparison of groups, we concentrate our analysis on the population of prime aged males (25 to 54 years) in full-time employment. Full-time employment shares are high in these groups independently of origin. *Foreigners* have a full-time employment

share of 94 %, *Native Germans* of 95.3 % and *Naturalised Immigrants* of 95.4 %. For women (not considered), rates differ substantially with 52.5 % only in full-time employment on average. Nevertheless, we conduct a robustness check whether the consideration of part-time employment affects the results (see section 2.6.1 below). For the same reason, self-employed persons, apprentices, civil servants and soldiers are not regarded either. Focussing on males ensures avoiding biased interpretations due to differences in labour force participation rates of females by origin (Ñopo, 2008). The age range is limited at both ends due to different patterns of participation in the educational system at the lower end and due to differences concerning (early) retirement at the upper end. With these restrictions in place, the estimation sample includes 51,959 observations of *Native Germans* without a migration background (76.8 %), 6,296 observations of *Naturalised Immigrants* (9.3 %), and 9,427 observations of Foreigners (13.9 %) (see Table A.2 in the appendix for a detailed description). We use provided survey weights at the individual level to mitigate a potential bias due to an over-representativeness of high-income households and immigrants in SOEP data.

2.4   Descriptive Statistics

Before turning to the econometric methodology and empirical estimates, we should be conscious about the background of the different ethnic groups. Therefore, we first look at the wage development over time within and across immigrant groups. Proceeding from an almost unchanged mean log hourly wage level for Native Germans without a migration background since 2004 (see Figure A.1 in the appendix), we illustrate the wage development of immigrant groups through wage divergences (Figure 2.1).

   Both *Foreigners* and *Naturalised Immigrants* present a considerable wage gap relative to Native Germans. The wage gap for *Naturalised Immigrants* consistently increased between 1994 and the middle of the 2000s (-1.5 to -6.5 %); afterwards, it declined slightly (-4.5 %). On the other hand, the wage gap for *Foreigners* initially narrowed in phases (-6.0 to -4.5 %) but since 2006 has widened substantially (-7.5 %). Wage development within the immigrant subgroups is more differentiated. Although *citizens of Turkey* and *citizens of southern European countries* show almost the same average wage level in 1994 (-6 %), their wage gap development runs in opposite directions. While *Southern Europeans* almost caught up with *Native Germans'* wages in the 2000s (and declined afterwards), the wage

gap for *Turkish citizens* has remained constantly low. For *citizens of Turkey*, the wage gap has widened since 2011 relative to Native Germans (-10 %). Compared to other foreigners*, citizens of the former Yugoslavia* had an even lower average wage level in 1994 (-8 %). While their situation improved especially between 2005 and 2009, a sharp decline to the same extent followed directly afterwards (±6 ppts). The wage gap for *ethnic German repatriates* continually diminishes relative to Native Germans (-4.5 %) but also undergoes a minor wage drop in 2011. The wage development of *naturalised immigrants without ethnic Germans* is the most conspicuous because wage levels exceed Native Germans' average wages in the 1990s. At the turn of the millennium, the group experienced a sharp drop in wages until it successively reached the level of other immigrant groups in 2010 (-5 %). We observe temporal coincidence with the introduction of the new citizenship law in 2000, which abruptly gave a large number of foreigners the right to German citizenship. This may have led to positive self-selection in naturalisation regarding the socio-economic status of foreigners. We confirm this result with a robustness check. A cautious regeneration of the wage gap started in 2011.

Previous literature and a descriptive comparison of wages already reveal an immigrant-native wage gap independent of the regarded immigrant group (see section 2.2). To understand such diverse wage differences, it is also necessary to examine the labour market-related characteristics of each group. A characterisation of the estimation sample based on descriptive statistics is given in Table 2.1. To emphasise differences in means between the group of Native Germans (without a migration background) and each immigrant group, we present significant differences obtained by t-tests. The statistics show that corresponding waves of immigration can be easily identified with reference to the time of residence. Despite comparable ages,[17] differences in labour market experience can be observed: *Citizens of southern European countries* and *naturalised immigrants without ethnic Germans* have significantly higher levels of mean labour market experience for 1994 to 2015 (each 19 years) than *Native Germans* (18 years). *Citizens of the former Yugoslavia* (17 years) and especially *citizens of Turkey* and *ethnic Germans repatriates* have significant less experience (16 years each).

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[17] The structure of the panel dataset leads to an uneven change in the age structure of immigrant groups relative to *native Germans*, as immigration is uneven in time and as age selection is given.

Immigrant main groups

Immigrant subgroups
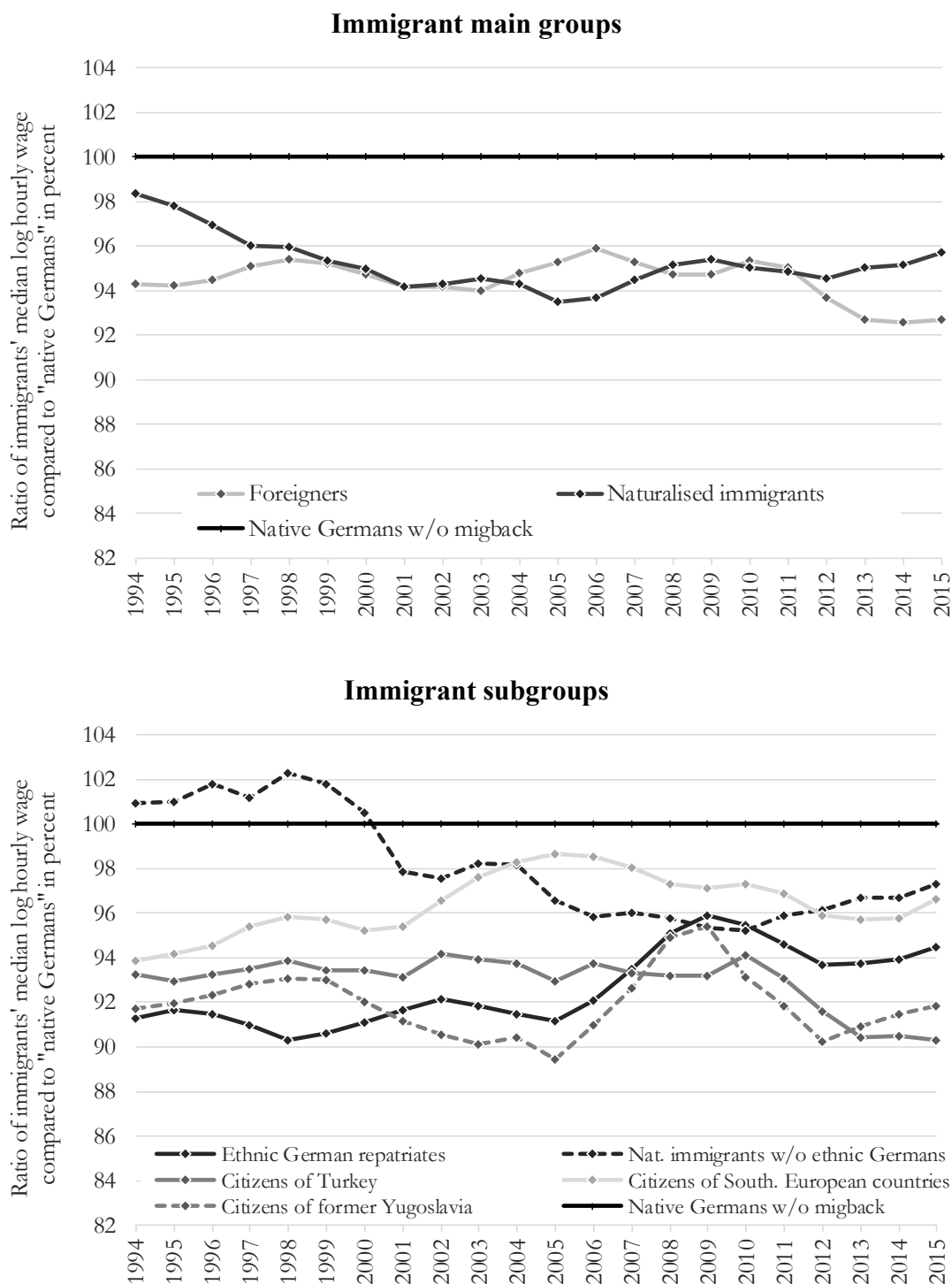
Figure 2.1: Ratio of immigrants' mean log hourly wages relative to native Germans

Notes: Own calculations. Survey weights are integrated to counteract sample bias. Mean wages are smoothed with adjacent years.

Furthermore, we consider education as an indicator for qualification at three levels. Based on the CASMIN educational classification, people without formal occupational training are regarded as low-skilled, persons with occupational training are medium-skilled, and those with a college or university degree are considered highly skilled. The share of low-skilled persons is statistically higher across all immigrant groups but is the most pronounced for the group of *Foreigners*. Accordingly, all immigrant groups – except for *naturalised immigrants without ethnic Germans* – have lower shares of highly skilled workers. Moreover, *naturalised immigrants without ethnic Germans* exhibit the lowest shares of persons who have completed their highest education abroad (38 %) while *ethnic German repatriates* – who immigrate at a comparatively higher age – present the highest ratio (68 %).

When considering the home country's economic performance in the year of immigration as a human capital quality indicator, we observe the largest economic distances to the countries of origin for *ethnic German repatriates* and *citizens of the former Yugoslavia*. On the other hand, the distance for southern European countries is relatively small (see section 2.6.4 for further details on the calculation). German language proficiency (speaking, reading and writing) is represented as a self-assessment of writing skills in the German language for non-native Germans whereby skills are evaluated with scores of 1 (not at all) to 5 (very good). We note a slightly positive correlation with time of residence in Germany for all groups in consideration.

Table 2.1: Means of select characteristics (pooled for 1994 to 2015)

	Native Germans without mig.back	Naturalised immigrants	Foreigners [d]	Naturalised immigrants without ethn. Germans	Ethnic German repatriates	Citizens of Turkey	Cit. of southern European countries	Citizens of the former Yugoslavia
Dependent variable								
log(wage)	2.78	2.65***	2.63***	2.73***	2.59***	2.59***	2.68***	2.55***
Independent variables								
age	40.5	40.0***	39.0***	42.2***	38.3***	37.3***	40.0***	39.5***
age at immigration [b]	-	20.8	17.2	16.0	24.5	14.7	12.7	19.5
labour market experience	17.9	17.1***	16.9***	18.9***	15.7***	16.0***	19.0***	16.9***
time of residence [b]	-	19.2	21.8	26.4	13.8	22.6	27.1	19.9
log(cultural distance) [b]	0.00	0.43	0.35	0.43	0.43	0.52	0.20	0.42
cohabitation	0.60	0.77***	0.76***	0.73***	0.81***	0.88***	0.68***	0.76***
Education								
Low-skilled	0.39	0.53***	0.67***	0.52***	0.55***	0.81***	0.74***	0.71***
Medium-skilled	0.47	0.34***	0.21***	0.33***	0.34***	0.14***	0.17***	0.22***
High-skilled	0.14	0.13**	0.12***	0.16***	0.11***	0.05***	0.09***	0.06***
education abroad	0.01	0.55***	0.53***	0.38***	0.68***	0.47***	0.40***	0.59***
economic distance (abs) [b]	-	0.75	0.46	0.67	0.81	0.58	0.09	0.71
German writing skills (1-5) [b]	4.79	3.97***	3.47***	4.15***	3.82***	3.30***	3.48***	3.41***
Occupational class								
high service	0.20	0.11***	0.11***	0.19**	0.05***	0.03***	0.10***	0.03***
low service	0.25	0.12***	0.09***	0.15***	0.10***	0.05***	0.11***	0.04***
rout. non-manual	0.03	0.03	0.04***	0.05***	0.01***	0.05***	0.05***	0.04
rout. services-sales	0.13	0.07***	0.08***	0.09***	0.05***	0.08***	0.10***	0.05***
skilled manual	0.26	0.39***	0.39***	0.31***	0.46***	0.43***	0.41***	0.45***
semi-/unsk. manual	0.13	0.26***	0.28***	0.20***	0.31***	0.35***	0.23***	0.37***
farm labour	0.01	0.01**	0.01***	0.01**	0.01	0.01	0.00***	0.02***
other	0.00	0.00	0.00	0.00	0.00***	0.00**	0.00	0.00
Economic sector								
manufacturing	0.34	0.53***	0.49***	0.48***	0.58***	0.55***	0.53***	0.48***
construction	0.09	0.11***	0.12***	0.10**	0.11***	0.08*	0.10**	0.22***
wholesale & retail trade	0.09	0.07***	0.07***	0.08	0.05***	0.08	0.07***	0.07**
transportation & storage	0.05	0.06***	0.05**	0.05	0.06***	0.06***	0.04**	0.04
finance, insurance & real estate	0.05	0.01***	0.02***	0.02***	0.01***	0.01***	0.02***	0.00***
other	0.38	0.22***	0.25***	0.27***	0.19***	0.22***	0.24***	0.19***
Firm size								
< 20 employees	0.21	0.22***	0.24***	0.22	0.22**	0.17***	0.26***	0.29***
20-199 employees	0.26	0.31***	0.29***	0.25	0.36***	0.28***	0.31***	0.29***
200-1999 employees	0.24	0.24	0.24	0.25	0.24	0.27***	0.24	0.26**
> 2,000 employees	0.30	0.22***	0.23***	0.28	0.17***	0.28**	0.20***	0.15***
job tenure	11.6	8.3***	8.9***	10.3***	6.8***	9.7***	10.4***	8.1***
Regional information [c]								
urban	75.1	81.4***	89.6***	82.6***	80.6***	95.5***	89.4***	88.4***
share of foreign pop.	10.1	10.3***	10.7***	10.6***	10.0	10.6***	10.6***	10.8***
real GDP p.c. (Euro)	33,228	33,225	33,820***	33,710***	32,842***	33,861***	33,832***	34,021***
unemployment rate	9.0	8.6***	8.5***	8.5***	8.7***	8.9	8.1***	8.1***
no. of obs.	51,959	6,296	9,427	2,437	3,859	2,889	3,089	1,506

Stars refer to t-tests conducted on the equality of means for native Germans and respective immigrant groups; significant differences are indicated at the 1 % (***), 5 % (**), and 10 % (*) levels. Survey weights are integrated to counteract sample bias

a) Calculated for immigrant groups only; no tests are provided

b) Regional information refers to the federal state level (NUTS 1)

c) *Foreigners* also include remaining foreigners who are not regarded as citizens from guest-worker countries

Source: SOEP (2017). Own calculations

Furthermore, a larger cultural distance – expressed as, e.g., language, religion, and social norms –between home and host countries could hamper social integration (for a detailed description of measurement see section 2.6.6 below). The cultural distance to Germany is the largest for Turkey. Turkish culture is characterised by different epochs and ethnicities and is heavily influenced by Islam. The average cultural distance to southern European countries is considerably lower than to Yugoslavs and *ethnic German repatriates* from Eastern Europe. The cultural distance of *ethnic German repatriates* is large, as they already emigrated from Germany in the mid-18th century to the Russian Empire. The long foreign history of so-called "Russian Germans" and the partial cultural assimilation induced a detachment from German culture. The culture of *Naturalised Immigrants* is highly heterogeneous and therefore the average value offers limited information only. The smallest cultural distance is to Germany's neighbouring countries, such as the Benelux countries. An additional comparison of Big Five personality traits (see Table A.3 in the appendix) reveals significant differences in average personality traits between *ethnic German repatriates*, *citizens of southern European countries* and occasionally *citizens of Turkey* relative to *Native Germans*. The two latter immigrant groups are very similar in these characteristics.

As is reported extensively in the literature, occupational segmentation serves as a strong explanation for wages. Germany recruited foreigners in the 1960s and 1970s predominantly for work of low status, resulting in a corresponding high level of ethnic stratification across occupations (Constant and Massey, 2005). This pattern has remained very persistent over time. To consider occupational selection, we refer to a classification developed by Erikson-Goldthorpe-Portocarero (EGP) that clusters occupations by social status. The lower end of the scope reflects unskilled manual occupations for which no vocational training is required, whereas the upper end reflects higher services covering managers and academic occupations. While immigrants still mainly perform jobs involving manual tasks (skilled and unskilled), *Native Germans* are relatively more specialised in high and low services.[18] These differences are reflected also in their distribution across economic sectors, whereas "manufacturing" is the largest sector for all immigrant groups, followed by "construction". By contrast, *Native Germans* are more often employed in "financial services". Their distribution is also more evenly spread across sectors. The remaining sectors are considered

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[18] The intensity of skill use at work is relevant in explaining the immigrant-native wage gap. A Europe-wide study proves that immigrants, even when they acquire skills comparable to those of natives, use their skills less often at work (Tverdostup and Paas, 2017). See Peri and Sparber (2009) on the task-specialisation of foreign- and native-born workers.

in the category "other". The sectoral distribution may further be explained by language proficiency, whereby, e.g., in the service sectors stronger language skills are generally required than in occupations mainly involving manual tasks. The distribution across occupations and economic sectors show groups-specific differences implying immigrant selection patterns. Hence, we will consider these aspects in the estimation below to compare the comparable when decomposing the wage gaps. Furthermore, *Foreigners* work more often in small- and medium-sized firms than *Native Germans*. Overall, immigrant groups and *Native Germans* differ verifiably in their work-related characteristics.

2.5 Econometric Methodology

2.5.1 Wage Gap Decomposition

The descriptive statistics show significantly divergent log hourly wages between *Native Germans* and each of the immigrant groups. To quantify the underlying influence factors of wage differences, we apply a Blinder-Oaxaca decomposition for unconditional quantile regression (UQR) models proposed by Firpo et al. (2009).

The widely used Blinder-Oaxaca method decomposes mean wage differentials into explanatory determinants and an unexplained part. In its original setting, the decomposition technique uses a wage equation taking the form of a linear regression estimation $Y_i^j = X_i^j \beta^j + \varepsilon_i^j$ for individuals i of group $j \in \{A, B\}$. The mean difference R between groups A and B can be formulated as follows:

$$R = \bar{Y}_A - \bar{Y}_B = \bar{X}_A' \hat{\beta}_A - \bar{X}_B' \hat{\beta}_B, \tag{2.1}$$

where $\bar{Y}$ denotes output means while $\bar{X}$ denotes sample averages of the explanatory variables for each group. Here, Y_i^j is the log hourly wage of individual i of group j, X_i^j denotes the corresponding independent variables, e.g., individual and labour market characteristics (including a constant), β^j is the vector of regression coefficients, and ε_i^j is random error (Jann, 2008). The decomposition method divides the outcome difference of the wage equation into two components:

$$R = (\bar{X}_A - \bar{X}_B)' \hat{\beta}_A + \bar{X}_B'(\hat{\beta}_A - \hat{\beta}_B). \tag{2.2}$$

23

The first term $(\overline{X}_A\text{-}\overline{X}_B)'\hat{\beta}_A$ represents the "endowment effect" attributable to mean differences in background characteristics (e.g., education and experience). The second term $\overline{X}_B'(\hat{\beta}_A\text{-}\hat{\beta}_B)$ denotes the "coefficient effect" and represents differences in returns to similar characteristics.[19] However, 'the effects of covariates will vary along the wage distribution, making it appropriate to capture the influence of particular variables on wages not only at the mean but also at different stages along the distribution' (Agyire-Tettey et al., 2018, p. 540). For this purpose, Firpo et al. (2009) elaborated the Blinder-Oaxaca decomposition for unconditional quantile regression (UQR) models. Instead of using the simple mean, their method enables one to estimate the effect of a particular covariate on the wage structure and on composition effects along the entire wage distribution (Galego and Pareira, 2014). '"Unconditional quantiles" are quantiles of the marginal distribution of the outcome variable' (Firpo et al., 2009, p. 953).

The underlying concept of UQR is the use of a recentered influence function (Agyire-Tettey et al., 2018). An influence function measures the influence of a single observation on a distributional statistic. 'The RIF of the τth quantile is given by the following expression' (Galego and Pareira, 2014, p. 2516):

$$RIF(Y, q_\tau) = q_\tau + \frac{\tau - I(Y \leq q_\tau)}{f_Y(q_\tau)}. \tag{2.3}$$

It is computed by estimating the marginal density $f_Y(q_\tau)$ of Y for each sample quantile q_τ. This is achieved by using kernel methods and by forming a dummy variable $I(Y \leq q_\tau)$ indicating whether the value of the outcome variable falls below q_τ (Firpo et al., 2009, p. 954 ff.). Afterwards, 'the regression of the recentered influence function (RIF), which is similar to a standard OLS regression except that the dependent variable Y (in our case: the log wage) is replaced by the RIF of the statistic of interest' (Fortin et al., 2011, p. 76).[20] In the last step, we estimate the Blinder-Oaxaca decomposition for each q_τ as the unconditional quantile regression model.

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[19] We use twofold decomposition because the additional "interaction effect" of threefold decomposition has no relevance to our study purpose.

[20] Nicole M. Fortin provides a Stata package *rifreg* to perform RIF-regressions and package *oaxaca8* for enhanced Blinder-Oaxaca decompositions (Fortin n.d.).

2.5.2 Interpretation

The endowment effect of the decomposition indicates the extent to which existing wage differentials can be explained by differences in individual skills and labour market-related factors. The coefficient effect exposes differences in returns and is commonly appraised as a measure of discrimination investigating wage discrepancies (Firpo et al., 2018; Jann, 2008). However, this interpretation is vulnerable because the coefficient effect captures both the impact of discrimination and unobserved group differences (Lehmer and Ludsteck, 2011; O'Neill and O'Neill, 2015). Unobserved causes of wage gaps may also underlie individuals' soft motives (e.g., motivation, preferences, and aspirations), further unobservable skills (e.g., negotiating skills and assertiveness), or cultural and social norms in general. The consideration of further control variables inevitably reduces the estimated magnitude of discrimination (Grandner and Gstach, 2015). In addition, Altonji and Blank (1999) emphasise that it is also deceptive to label this second component alone as the result of discrimination, as discriminatory barriers in the labour market can affect the characteristics of individuals. Regardless of the chosen model, the direct comparison of individuals or groups is limited: Certain combinations of individual characteristics and job requirements are only possible for one group and may not be for others (Ñopo, 2008). In conclusion, the coefficient effect of the decomposition serves as only an indication of discrimination and less as a proof (Canal-Domínguez and Rodríguez-Gutiérrez, 2008).

2.5.3 Implementation

The final model specification used for the estimation of the wage gap decomposition is the result of a deductive process of variable selection. In the wage equation, we consider as the base set of independent variables the individual characteristics of labour market experience (and its square), a cohabitation dummy, three skill levels obtained from the international education classification, and an indicator of German language proficiency. We further control for job-related attributes such as firm size (categorical), dummy variables for industry affiliation, and dummy variables for occupational class. In addition, time and regional fixed effects are included. We augment the model with regional information at federal state level by approximating the economic environment and the labour supply: the region's settlement structure type, the share of the foreign population, real GDP per capita, and the unemployment rate.

The wage gap decomposition is computed for each decile of the wage distribution.[21] We consider the first to ninth decile because for the method to work, observations above our highest percentile of interest are required. Endowment and coefficient effects for each of the nine wage sections are estimated. We implement various model specifications to test for the influence of foreign educational degrees, human capital quality, personality, and cultural distinctness. We assume that a large cultural and economic distance as well as the limited transnational transferability of human capital prove to be a disadvantage in the German labour market. Furthermore, we review the labour market situation of immigrants over time because we expect a rising wage gap due to various legislative amendments (see section 2.6.2 below). We present the results for the two immigrant main groups of *Foreigners* and *Naturalised Immigrants* and supplement them with results for the subgroups. The derivation of the model specification precedes the respective results.

2.6   Estimation Results

2.6.1   The Immigrant-Native Wage Gap

The wage gap decompositions show different results for *Foreigners* and *Naturalised Immigrants*. The RIF-regression wage model estimates reveal comparable effects of the independent variables on wages for the principal groups (Table A.4, Table A.5 and Table A.6 in the appendix).[22] A person's labour market experience and higher educational level each have a significantly positive impact on wages for all groups. Here, the influence of higher education is enhanced with higher wages. Furthermore, larger firms pay significantly higher wages on average. For *Native Germans* and *Foreigners*, this impact of firm size is comparatively strong at lower wages. The industrial sectors of 'manufacturing' and 'construction' are both important factors explaining the low wages of *Foreigners*. While service-based occupations more heavily affect *Native Germans* than manual jobs, service occupations are of greater importance for *Naturalised Immigrants* and *Foreigners* especially at high wage deciles. We obtain the highest coefficients of determination for medium to high wage deciles: for *Native Germans* (27-30 %), *Naturalised Immigrants* (30-35 %) and *Foreigners* (29-32 %).

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[21] The even distribution of all observations among deciles may lead to different ratios between immigrant groups and native Germans within the respective deciles.

[22] For the number of observations for each wage decile, see Table A.9 in the appendix.

For the period 1994 to 2015, we find substantial wage gaps for both main groups relative to *Native Germans* (without migration background) (Figure 2.2). *Naturalised Immigrants'* wage gaps relative to *Native Germans* reach 10.0 to 16.4 %, rising with higher wage deciles (mean: 13.0 %).[23] At the same time, the endowment effect rises from 50 to 100 % (mean: 70 %). Therefore, a large proportion of the wage gap for low wage deciles remains unexplained when capturing unobserved factors of influence. The wage gap for *Foreigners* is consistently higher and less diverse (13.6-17.6 %, mean: 13.8 %). The explanatory power of individuals' endowments of *Foreigners* is greater overall (compared to *Naturalised Immigrants*) and reaches shares of 75 to 85 % for low and middle wage deciles (see Figure 2.2).[24] In addition, the endowment effect reveals an overvaluation in high wage deciles, suggesting an above-average remuneration in terms of qualification (mean: 90 %). For both *Naturalised Immigrants* and *Foreigners*, the explanation of the wage gap is mainly driven by individuals' levels of language proficiency and by occupation in high and low services (see Figure A.2 in the appendix). Education has only a slightly positive effect. However, the explanatory power of labour market experience is greater for *Naturalised Immigrants* in high wage deciles whereas for *Foreigners* it is stronger for low wage deciles.

Our findings demonstrate the advantages of decomposition for unconditional quantile regressions over the standard Blinder-Oaxaca decomposition. Regarding wage gap development along deciles, we obtain results opposing those of Grandner and Gstach (2015) but consistent with results for Austria (Hofer et al., 2017). On the one hand, increasing wage gaps along the wage distribution are observed; on the other hand, we find a greater wage disadvantage for low wage deciles that would otherwise have not been discovered.[25]

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[23] Table A.7 in the appendix provides corresponding results of the UQR-decomposition with standard errors. Table A.8 in the appendix shows the results of Blinder-Oaxaca decomposition at the mean.

[24] We classify deciles 1 to 3 as low wage deciles, deciles 4 to 6 as middle wage deciles, and deciles 7 to 9 as high wage deciles.

[25] For the lower wage deciles, wage gaps may be bounded by social security benefits and minimum wages.
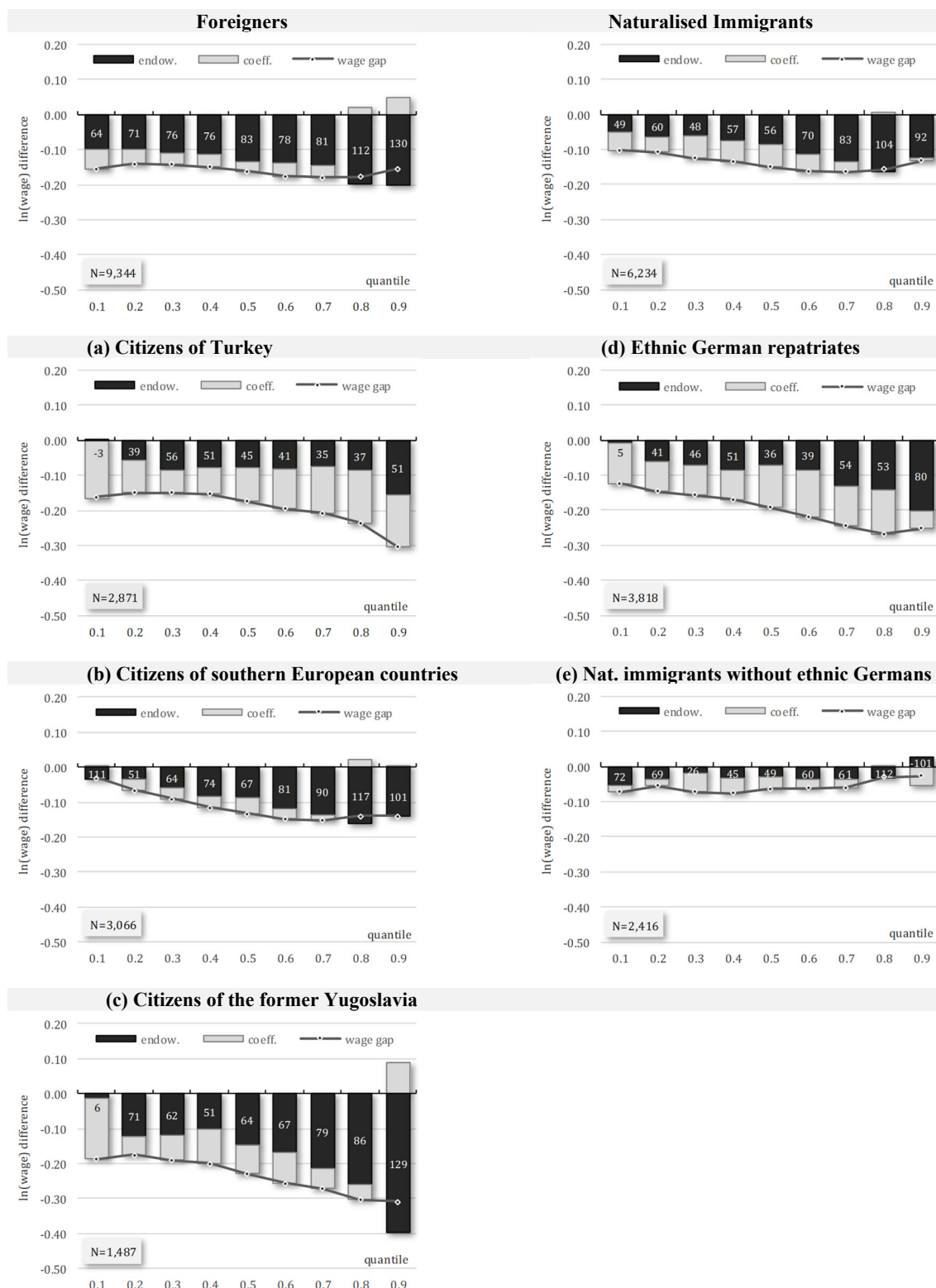
Figure 2.2: Blinder-Oaxaca wage decomposition for UQR by immigrant groups

Notes: Period 1994-2015. The reference group is "Native Germans without migration background". The dark grey line shows the wage gap along the wage distribution, the dark bars represent the "endowment effect" of the wage decomposition, and the light bars show the "coefficient effect" of the wage decomposition. The numbers display the share of the endowment effect. Survey weights are considered to counteract sample bias. Covariates considered in the estimation include labour market experience, labour market experience squared, marital status, three skill levels, German writing skills, dummy variables for firm size, dummy variables for occupational class, dummy variables for industry, regional fixed effects, year fixed effects, region type, the regional share of the foreign population, regional real GDP per capita, and the regional unemployment rate.

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The wage gap varies considerably among the immigrant subgroups. The wage gap for *ethnic German repatriates* has grown almost linearly from 11.7 to 26.8 % with increasing wage deciles (Figure 2.2). A comparable distribution for the wage gap can be observed for *citizens of Turkey* (14.8-30.5 %) and for *citizens of the former Yugoslavia* (17.7-31.2 %) with the exception of relatively large gaps for low and high wage deciles. The endowment effect remains at consistently low levels for *citizens of Turkey* (30–50 %) and increases for *citizens of the former Yugoslavia* (50-90 %) and for *ethnic German repatriates* (40-80 %). The wage gap is consistently smaller for *citizens of southern European countries* (2.4-14.2 %) and follows a declining course with increasing wages. For lower wage deciles, the explanation accounts for 70 % and approximately 90 % for higher wage deciles. The wage differential of *naturalised immigrants without ethnic Germans* is the smallest of all groups (4.1–7.9 %) and the only group showing a shrinking gap at higher wages. Although the endowment effect reaches shares of roughly 60 % only, the results imply that naturalised immigrants no longer seem to differ considerably from *Native Germans* in terms of personal characteristics and payoffs. Crucial explanatory factors continue to include language proficiency and occupation in high and low services. For *naturalised immigrants without ethnic Germans*, however, these patterns are less pronounced.

These results may indicate selectivity in naturalisation, i.e., those who are more integrated into the German labour market are more likely to be naturalised. In this respect, von Haaren-Giebel and Sandner (2016) mention higher levels of integration and language proficiency and higher probabilities of staying for naturalised first-generation immigrants compared to foreigners. Overall, foreigners face stronger labour market entry barriers. For robustness, we additionally run a RIF-decomposition where the group of *Naturalised Immigrants* includes those foreigners who naturalised during our analysis period. We find no divergent results. The inclusion of part-time workers also leads to only a minimal shift, resulting in a slight narrowing of the wage gap for the lowest deciles (see Figure A.3 in the appendix).[26] Nonetheless, predominantly widening gaps observed along the wage distribution as the level of explanation increases indicate deficient human capital endowments for immigrants for better-paid occupations. Adding individual job tenure to the base model consistently enhances the explanatory content of wage gaps; however, it may be endogenously driven.

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[26] The share male part-time employees is 4.2 % for Foreigners, 2.9 % for Naturalised Immigrants and 3.4 % for Native Germans. The part-time share of *ethnic German repatriates* and of *citizens of southern European countries* is about 2 %.

2.6.2 Effect Heterogeneity

We want to investigate whether there are age-related wage disadvantages and to what extent they persist or change with increasing age. To identify potential changes over time for different (1) age groups and (2) age cohorts, we consider three age groups: 25–34 years, 35–44 years, and 45–54 years. We exclude foreigners of the first period who have been naturalised thereafter in order to minimise unavoidable biases resulting from changes in-group compositions. During our analysis period, some important labour market reforms and a new citizenship law have been undertaken. (1) In 2000, a new citizenship law was introduced in Germany. It gave a large number of foreigners the right to German citizenship through "birthright citizenship" (Geburtsortsprinzip) and "naturalisation based on a legal entitlement" (Anspruchseinbügerung). (2) From 2003 to 2005, the German government introduced comprehensive labour market reforms (the so-called Hartz reforms), facilitating flexible forms of employment such as mini-jobs, subcontracted work, and temporary employment while reducing unemployment benefits. (3) In 2007, the European Union adopted the "freedom of movement" law (Freizügigkeitsgesetz) in Eastern European member states, changing the composition of immigrants entering Germany.

Age groups over time

In considering age groups over time, we equally decompose the wage gap for two periods (1994–1999 and 2010–2015) whereas an interval of 10 years between the two analysis periods is applied to exclude multiple assignments of observations to the same age group. Overall, wage gaps are perceptibly larger for the second period for both immigrant main groups (see Figure 2.3). The observed growth stems mainly from a widening in the lower wage deciles. Young Foreign workers (25–34 years) are especially affected. Rather, in the first period, the gap increases slightly from -7 to -12 % along the wage distribution. In the second period, a complete reversal takes place and the wage gap for lower deciles escalates to -16 to -20 % with an explanatory power of roughly 90 %. We observe a different situation for young Naturalised Immigrants whose wage gap rises linearly from -2.5 to -13 % in the first period (see Figure 2.3). In the second period, however, the wage gap is reduced to a minimum in the lower deciles (+1 to -5 %) while it rises sharply in the higher deciles (-10 to -17 %).
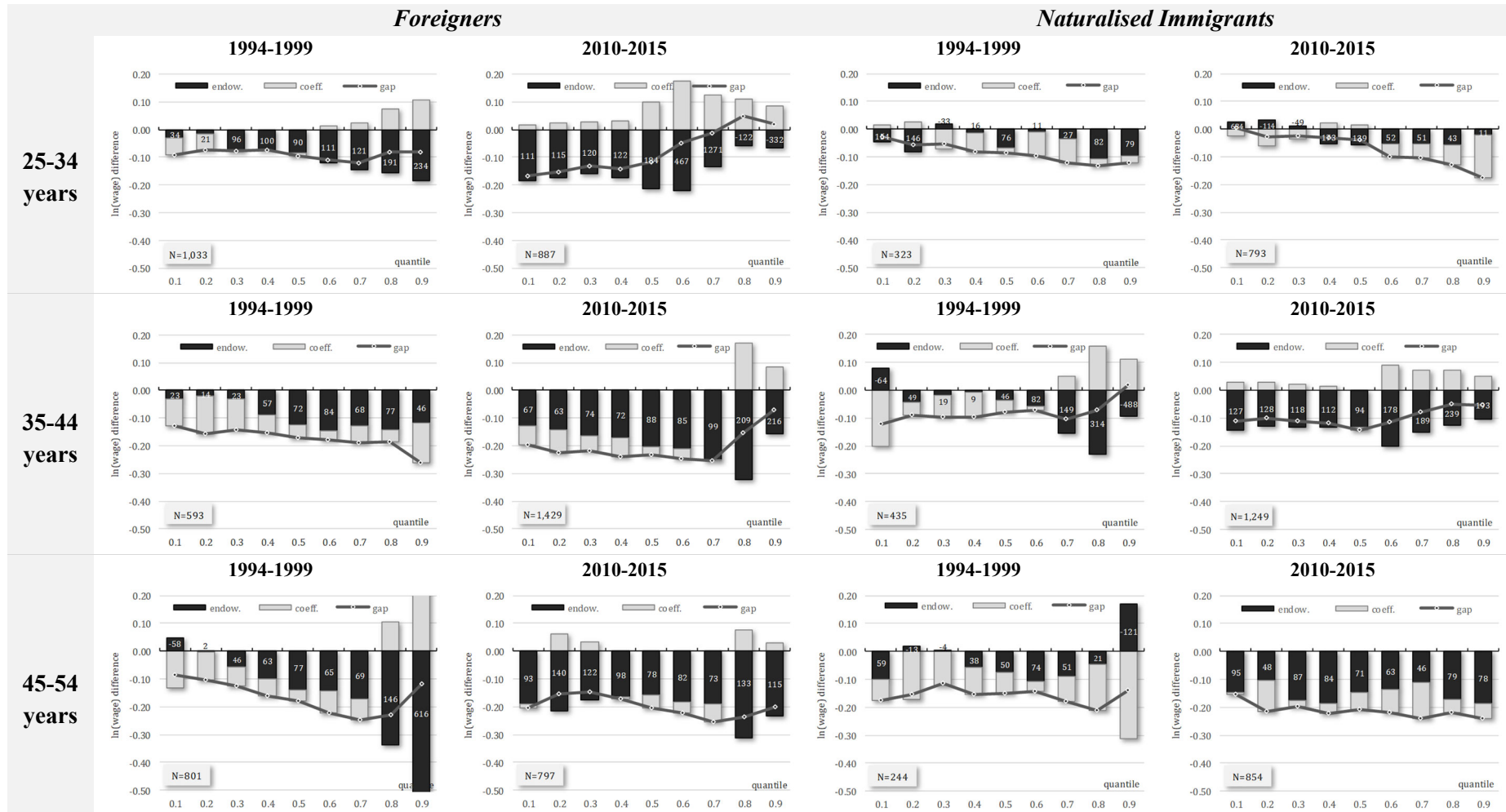
Figure 2.3: Blinder-Oaxaca wage decomposition for UQR: age groups

Notes: Periods 1994-1999 and 2010-2015 The reference group is "Native Germans without migration background". The dark grey line shows the wage gap along the wage distribution, the dark bars represent the "endowment effect" of the wage decomposition, and the light bars show the "coefficient effect" of the wage decomposition. The numbers display the share of the endowment effect. Survey weights are considered to counteract sample bias. Covariates considered in the estimation include labour market experience, labour market experience squared, marital status, three skill levels, German writing skills, dummy variables for firm size, dummy variables for occupational class, dummy variables for industry, regional fixed effects, year fixed effects, region type, the regional share of the foreign population, regional real GDP per capita, and the regional unemployment rate. We exclude *Foreigners* who immigrated in the later period.

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The wage gaps of both immigrant main groups of 35 to 44 years are for the first interval almost constant along the wage deciles: 15.3 % for *Foreigners* and 9.3 % for *Naturalised Immigrants* on average (except for the highest deciles). While in the second period the wage gap of lower deciles increases for *Foreigners* (20–24 %), a continuous decline towards zero is noticeable at the highest wage deciles. The coefficient effect of the wage gap decomposition is large for each of the middle deciles (70–90 %). On the other hand, the wage gap for *Naturalised Immigrants* hardly changes, but a partly strong overestimation due to the endowment effect occurs. The wage gap for 45–54 years-old *Foreigners* is small at first but increases substantially with higher wages (-6.0 to -24.5 %). The overall expansion of the gap towards the second period is valued at 5.5 ppts on average and primarily takes place at the lower end of the wage distribution. Although a slight overestimation emerges, the model shows a high level of explanatory content overall. In the second period, *Naturalised Immigrants* of this age group experience a wage gap of 21 to 25 % and therefore an increase of 7.5 ppts relative to the first period. The endowment effect levels out at ratios of roughly 75 %.

For both immigrant main groups, we predominantly note growing wage gaps and a stronger explanation by individuals' endowments for almost all wage deciles. This indicates that the human capital endowment has deteriorated over time relative to *Native Germans*. Foreign low-wage earners of all age cohorts are especially affected. Additionally, we observe an upward shift within the endowment effect of the wage gap decomposition. For both immigrant main groups, the significance of language proficiency remains high but progressively declines. On the other hand, labour market experience and occupations are increasingly important in explaining the wage gap whereas economic sector affiliations are becoming less and less important (see Figure A.2 in the appendix).

Age cohorts over time

The consideration of cohort effects requires an adjustment of analysis periods. To ensure a virtually identical composition of age cohorts over time, the ranges of the analysis period and age groups must be harmonised, producing four age cohorts from which a temporal trend can be captured for two. For example, 25- to 34-year-olds of the first period (1996–2005) correspond to 35- to 44-year-olds of the second period (2006–2015).

The first age cohort (aged 45–54 years in period 1) of the two immigrant main groups shows a comparatively large wage gap of roughly 20 % with a small share of endowment effects for lower wage deciles. A consideration of these cohorts for the following period is

not possible due to their leaving from the sample. The second age cohort (aged 35–44/45–54 years) of both immigrant main groups experiences an overall increase in the wage gap with consistently high levels of explanatory content. The increase is, however, greater for *Naturalised Immigrants* than it is for *Foreigners* (see Figure A.4 and Figure A.5 in the appendix).

Developments are more extensive for the third age cohort (aged 25–34/35–34 years). While *Foreigners* undergo a massive increase in the wage gap towards the second period (from 9.2 to 19.9 % for deciles 1 to 7) and while the endowment effect rises in terms of its share, the increase is much less pronounced and more differentiated for *Naturalised Immigrants*. In addition to a minor widening in lower wage deciles, we observe a decline in the wage gap for higher deciles. Particular attention has to be paid to the fourth and youngest age cohorts (aged 25–34 years in period 2). Here, the group of *Foreigners* and the group of *Naturalised Immigrants* present a contrasting picture. Wage convergence to *Native Germans* is observed for *Naturalised Immigrants* in the lower wage deciles while this occurs for *Foreigners* in the higher deciles. The larger wage gaps observed at opposite ends of the wage distribution are characterised by large unexplained shares. These gains of the unexplainable wage gap for young immigrants may not only be due to the deterioration of human capital but also due to changes in the age cohort's soft motives and soft skills.

The growth of the wage gap observed towards the second period of each age cohort and especially for *Foreigners* is worrying. It implies that wage disadvantages persist over time and even intensify with age and job tenure. On the other hand, wage gaps of *Naturalised Immigrants* tend to narrow for later age cohorts. However, the influence of the naturalisation process on group compositions cannot be completely ruled out.

2.6.3   The Origins of Educational Degrees

In testing the transferability of human capital, it is necessary to distinguish whether education was obtained in the immigrant's home country or in Germany (Aldashev et al., 2012; Basilio et al., 2017; Chiswick and Miller, 2009). We therefore exclude all individuals with a foreign highest vocational or school degree. When these restrictions apply, the immigrant-native wage gap of all immigrant groups diminishes substantially: by approximately 4 ppts for *Foreigners* and by approximately 6 ppts for *Naturalised Immigrants* in higher deciles relative to the results of our main model (see Figure 2.4). The endowment effect of the wage gap for *Naturalised Immigrants* improves by roughly 20 ppts

at the lower and middle wage deciles. For *Foreigners*, the endowment effect even drops a little.

The results indicate a lower appreciation (or lower quality) of foreign educational degrees compared to those obtained in Germany. However, we have to bear in mind that those immigrants with a German education generally came to Germany at a younger age and were therefore able to gain easier access to the labour market. For *ethnic German repatriates* and *Turkish citizens*, a reduction in the wage gap can be observed whereas the decline is stronger for higher wage deciles. In contrast, wage gaps remain almost unchanged for *naturalised immigrants without ethnic Germans*, for *citizens of the former Yugoslavia and for southern European countries*. The coefficient effect of the wage decile decompositions increases along all deciles, and underestimations and overestimations occur at the margins of the wage distribution.
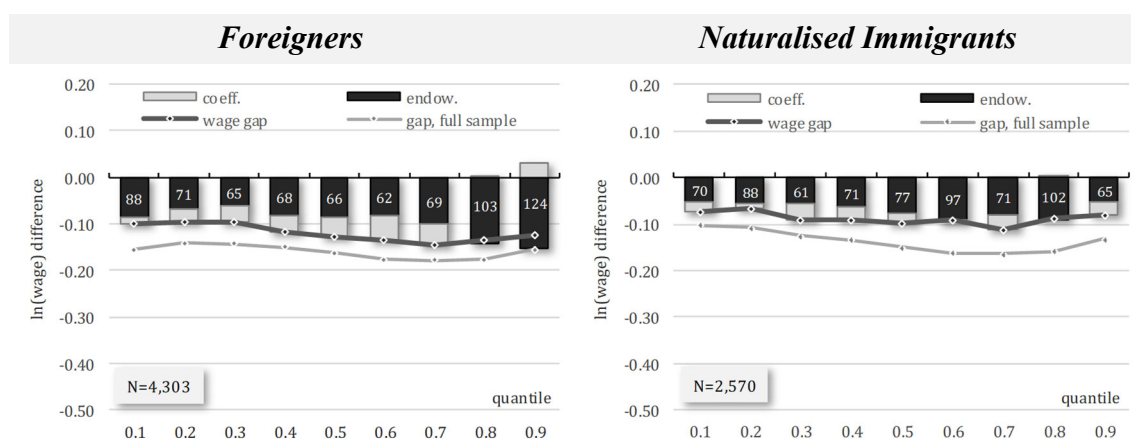
Figure 2.4: Blinder-Oaxaca wage decomposition for UQR: educational degree completed in Germany

Notes: Period 1994-2015. The reference group is "Native Germans without migration background". The dark grey line shows the wage gap along the wage distribution, the dark bars represent the "endowment effect" of the wage decomposition, and the light bars show the "coefficient effect" of the wage decomposition. The numbers display the share of the endowment effect. Survey weights are considered to counteract sample bias. Covariates considered in the estimation include labour market experience, labour market experience squared, marital status, three skill levels, dummy variables for firm size, dummy variables for occupational class, dummy variables for industry, regional fixed effects, year fixed effects, region type, the regional share of the foreign population, regional real GDP per capita, and the regional unemployment rate

Our results point to the imperfect transferability of human capital across country borders and confirm its relevance in explaining the wage differential between natives and immigrants (Basilio et al., 2017). The scope of alterations in wage differences observed when comparing the full sample to the sample of persons with an education in Germany conform to the results of Aldashev et al. (2012). We therefore can assume that comparable

educational qualifications are not appreciated to the same extent. However, restrictions also exist due to a lack of formal recognition of qualifications and due to labour market regulations. The "Recognition Act" (Anerkennungsgesetz), which came into force in April 2012, is intended to improve the use of vocational qualifications acquired abroad for the German labour market in order to facilitate near-qualification employment. Whether the measures taken were sufficient to improve access to the labour market cannot yet be ascertained from the data.

2.6.4 Human Capital Quality

To what extent a lower appreciation (or lower quality) of foreign educational degrees in Germany is comprehensible, we would like to examine by a separate consideration of human capital quality. We consider the economic distance between one's home country and Germany at the time of immigration as a cross-country proxy for the quality of foreign schooling and work experience (Coulombe et al., 2014). We assume that the more similar a country is in its level of development to that of Germany, the more equal educational standards are and the more likely a common knowledge base is to form with respect to the level of education. For this purpose, we use the relative gross domestic product per capita (GDP p.c.) and calculate the logarithmic function of the home country's percentage GDP p.c. in terms of Germany's GDP p.c. corrected by the logarithm for Germany's economic distance to itself:

$$EcoDist_i = \log\left(\frac{GDPpc_i}{GDPpc_{GER}} * 100\right) - 2 \tag{2.4}$$

The logarithm of GDP p.c. is used to denote the marginal return of countries' levels of economic performance on its human capital endowment. The indicator range runs from -2 to infinity whereas values of greater than 0.5 can be classified as a large economic distance. The closer a value is to zero, the smaller the economic distance to the country of origin. Corresponding values of the original differences can be found in Table A.10 in the appendix.

Adding the economic distance in absolute terms, we observe an increasing endowment effect for both immigrant main groups. For *Foreigners*, the endowment effect in deciles 1 to 8 increases from 75 to 90 %, on average. The previously very low explanatory content in the lower deciles for *Naturalised Immigrants* also rises considerably and reaches the same rates as for foreigners (see Figure 2.5). For robustness, we alternatively use the "Human Capital Index" (HCI) provided by the World Bank. The index measures the amount of

human capital that a child born today can expect to achieve by age 18 based on risks of poor health and poor education that prevail in the country in which she lives. The HCI scale runs from 0 (insufficient) to 1 (comprehensive) (The World Bank, 2018). The HCI confirms the validity of GDP p.c. as an indicator for the quality of foreign schooling and work experience.
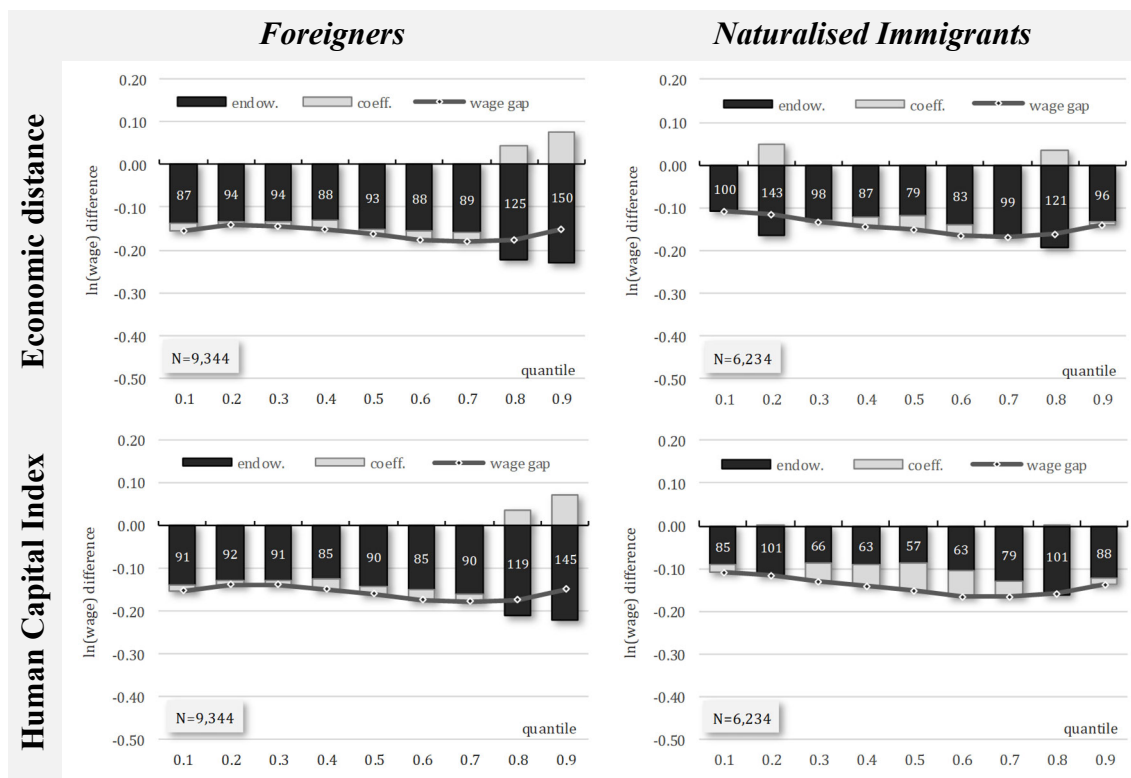
Figure 2.5: Blinder-Oaxaca wage decomposition for UQR: Human Capital Quality

Notes: Period 1994-2015. The reference group is "Native Germans without migration background". The dark grey line shows the wage gap along the wage distribution, the dark bars represent the "endowment effect" of the wage decomposition, and the light bars show the "coefficient effect" of the wage decomposition. The numbers display the share of the endowment effect. Survey weights are considered to counteract sample bias. Covariates considered in the estimation include labour market experience, labour market experience squared, marital status, three skill levels, German writing skills, dummy variables for firm size, dummy variables for occupational class, dummy variables for industry, regional fixed effects, year fixed effects, region type, the regional share of the foreign population, regional real GDP per capita, and the regional unemployment rate

2.6.5 Personality Traits

Personality traits of the individual are complementary to their cognitive and non-cognitive abilities and thus determine their success on the labour market. To investigate potential differences in personality composition, we consider the 5-factor model of personality (Big Five) in our analysis for 2005 to 2015. This approach defines personality comprehensively based on five independent domains. John and Thomsen (2014, p. 554) characterise the Big Five traits as follows: '(1) Conscientiousness relates to whether a person is reliable,

organised, and responsible. (2) Extraversion corresponds to an enthusiastic, outgoing attitude, while (3) Agreeableness relates to a kind and compassionate attitude. (4) Neuroticism instead is defined as being unstable, prone to worry, and anxious and finally (5) Openness to Experience refers to imaginative, original individuals with broad interests. The values of the Big Five are averaged and standardised on the basis of three questions each'.
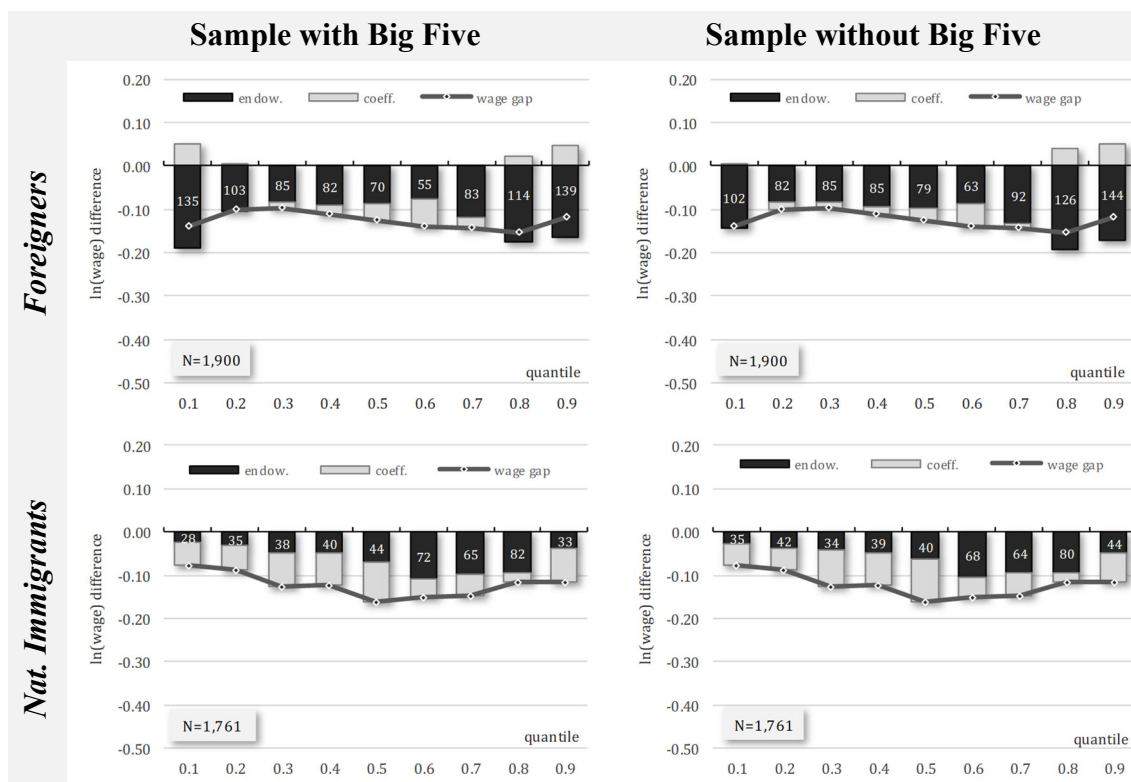
Figure 2.6: Blinder-Oaxaca wage decomposition for UQR: Personality Traits

Notes: Period 2005-2015 The reference group is "Native Germans without migration background". The dark grey line shows the wage gap along the wage distribution, the dark bars represent the "endowment effect" of the wage decomposition, and the light bars show the "coefficient effect" of the wage decomposition. The numbers display the share of the endowment effect. Survey weights are considered to counteract sample bias. Covariates considered in the estimation include labour market experience, labour market experience squared, marital status, three skill levels, German writing skills, dummy variables for firm size, dummy variables for occupational class, dummy variables for industry, regional fixed effects, year fixed effects, region type, the regional share of the foreign population, regional real GDP per capita, and the regional unemployment rate

Individual personality traits were recorded for 2005, 2009, and 2013. Due to the consistency of personality over time, we perform a linear interpolation, providing us with more stable results. We determine whether an individuals' personality has an impact on his or her salary. Upon comparing the sample with Big Five personality traits to the same sample without these personality variables, the decomposition reveals no mentionable change in the endowment effect (see Figure 2.6). This finding is supported by results of an

OLS regression showing only a partly significant influence of the Big Five on wages with no change in explanatory power. When considering the Big Five without further control variables, wage gap decompositions show that personality traits have even less of an effect than the comparative model. On the other hand, the corresponding wage regression shows a significant influence of certain dimensions of Big Five. We therefore cannot confirm the influence of the Big Five as recognised by Brenzel and Laible (2016), who control for similar characteristics. This result may be attributed to the indirect effect of personality on wages. Since personality traits determine educational success and later fields of activity, they may be of minor importance to the analysis at hand.

2.6.6 Cultural Distance

As a final channel of influence, we examine potential barriers to integration by considering metrics of immigrants' proximity to Germany based on their home countries' levels of cultural distance. From social norms in the labour market (e.g., work behaviour), it can be assumed that a strongly divergent culture of immigrants partly induces reservations from which personnel decisions may be influenced negatively. We use the revised measurement method developed by Kaasa et al. (2016), which is based on a revision of Hofstede's (1980) original work referring to four cultural dimensions of a society: '(1) Power distance shows the extent to which less powerful individuals of a society accept and expect an unequal distribution of power. (2) Uncertainty avoidance reveals to what degree people feel comfortable with uncertainty. Laws, guidelines, and security measures characterise cultures with a high uncertainty avoidance. (3) Masculinity shows to what degree masculine values, such as orientation towards achievement, success, and assertiveness prevail over female values like caring, cooperation, and modesty. (4) Individualism describes the extent to which people appreciate to act as individuals rather than as members of a collectivist culture' (Kaasa et al., 2016, p. 234). Differences in the average scores for these four dimensions are the basis for the distance matrix between countries using the Kogut-Singh index (Kaasa et al., 2016). We use the logarithm of the composite index to capture the cultural distance between countries.
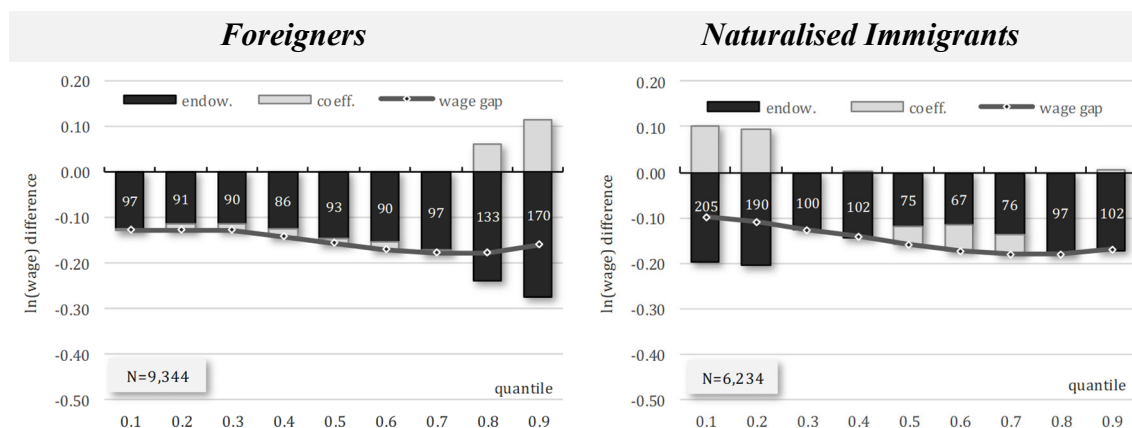
Figure 2.7: Blinder-Oaxaca wage decomposition for UQR: Cultural Distance

Notes: Period 1994-2015. The reference group is "Native Germans without migration background". The dark grey line shows the wage gap along the wage distribution, the dark bars represent the "endowment effect" of the wage decomposition, and the light bars show the "coefficient effect" of the wage decomposition. The numbers display the share of the endowment effect. Survey weights are considered to counteract sample bias. Covariates considered in the estimation include labour market experience, labour market experience squared, marital status, three skill levels, German writing skills, dummy variables for firm size, dummy variables for occupational class, dummy variables for industry, regional fixed effects, year fixed effects, region type, the regional share of the foreign population, regional real GDP per capita, and the regional unemployment rate.

In a group-independent regression, the country of origin only shows a slightly higher explanatory content for lower wage deciles than in the initial model. However, cultural distance shows a consistently significant negative impact on the wages of *Naturalised Immigrants*, and the negative impact on *Foreigners*' wages is significant for low wage deciles. In applying cultural distance to the wage gap decomposition, however, we respectively recognise an overestimation of *Foreigners*' and *Naturalised Immigrants*' endowment effects for the lower and upper ends of the wage distribution in contrast to the main model. Nevertheless, the cultural distance seems to provide an additional explanation of the wage gap in the other deciles (see Figure 2.7). When we use cultural distance without further control variables, a strong explanation rate emerges for *Foreigners*, but not for *Naturalised Immigrants*. Therefore, we conclude that wage differences of *Foreigners* may be attributed to their original culture to a certain extent.

2.7 Conclusion

The convergence of immigrants' wage levels with natives' wage levels serves as an important indicator of labour market integration. We therefore analysed wage differentials to reveal unjust remuneration between native Germans without migration background and two immigrant groups, *Foreigners* and *Naturalised Immigrants*. Aiming to expose a number of key influencing factors, we are adding a previously disregarded comprehensive set of socio-economic and labour-related aspects, such as the human capital quality, the cultural background, and the personalities of immigrants. We apply the Blinder-Oaxaca decomposition for unconditional quantile regression (UQR) models as recommended by Firpo et al. (2009). This approach allowed us to divide wage differences into observable and unobserved factors of influence not only at the mean, but also along the entire wage distribution.

The wage gap decompositions reveal a growing wage gap with higher deciles for *Foreigners* (10.0–16.4 %) and *Naturalised Immigrants* (13.6–17.6 %) for the years 1994 to 2015. Differences in individuals' characteristics and work-related factors (endowment effect) can thereby explain roughly 80 % of *Foreigners*' wage gap. For *Naturalised Immigrants*, the endowment effect increases from 50 to 100 % along the wage distribution, implying that a large proportion of the wage gap for low wage deciles remains unexplained due to unobserved factors (coefficient effect). Our results therefore infer certain wage disadvantages for people with a migration origin. Language proficiency and occupation in high and low services are the main determinants of the wage gap for both immigrant groups (*Naturalised Immigrants* and *Foreigners*). In contrast, the explanatory content of education is only slightly positive.

Moreover, we can identify heterogeneity of the wage gaps of further ethnic subgroups relative to native Germans: *Foreigners from Turkey and the former Yugoslavia* as well as *ethnic German repatriates* suffer from a stronger wage disadvantage than *southern European citizens*. Again, inadequate language skills can partly explain these gaps to a large extent. Our results furthermore indicate a lower appreciation (or lower quality) of foreign educational degrees compared to those obtained in Germany. The estimated wage gap for *Naturalised Immigrants* and *Foreigners* graduating in Germany is smaller at approximately 4 to 6 ppts relative to the results of the basic model. When testing for human capital quality as a cross-country proxy for the quality of foreign schooling and work experience, we apply the economic distance between the host and home country. We observe an improvement of

the endowment effect to the optimum. When taking the home country's cultural distance to Germany into account to depict foreign social norms, we also recognise positive changes in the endowment effect - but also overestimation at the outer deciles. Contrary to our expectations, our estimation results do not confirm an influence of personal traits (Big Five) on the wage gaps.

With reference to age groups, we further analyse whether wage disadvantages for immigrants have changed over time. *Foreigners*' average wage gap rises over time mainly due to a broadening in lower wage deciles in all age groups. Thereby, the oldest workers contributed most strongly to the increase of the average wage gap for *Naturalised Immigrants*. Age cohort results confirm an increase in wage gaps over time, especially for *Foreigners*. On the other hand, the wage gaps of *Naturalised Immigrants* tend to narrow in later age cohorts. In addition, we predominantly ascertain a stronger explanation from individuals' endowment and labour market characteristics showing that the human capital endowments of immigrants has deteriorated compared to native Germans over time and with more recent immigration cohorts.

Given this evidence provided, previous public and private programmes for the social and economic integration of migrants in Germany tend to be insufficient in effectively tackling this long-term challenge. However, a reliable identification of programmes' effectivity would require causal evaluation. Nevertheless, the results of our paper clearly indicate that there is a need for research in this area - both to ascertain the effectiveness of the programmes and to improve the activities of integration policy. A stronger recognition of foreign educational qualifications would favour career decisions made based on actual qualifications while fully exploiting existing and future labour force potential and lessening economic inefficiencies. Moreover, an improvement in immigrants' labour market prospects could be achieved by adjusting vocational training, which so far has been predominantly oriented towards labour market entry (extensive margin) rather than the activation the individual performance potential (intensive margin). Nonetheless, immigrants' efforts towards labour market integration must be continued to improve immigrants' prospects and to diminish the social disadvantaging and rejection of ethnic groups.

Chapter 3

Minimum Wage in Germany: Countering the Wage and Employment Gap between Migrants and Natives? [27]

with:
Stephan L. Thomsen

3.1 Introduction

In 2015, Germany introduced a nationwide statutory minimum wage of €8.50 with two main objectives: First, to protect employees in the low-wage sector from wage dumping and second, for precipitating an improvement in social security for lower income groups (The Federal Government, 2014). This introduction was justified by the reduction in the number of employees covered by collective agreements. Falling wages at the lower end of the wage distribution (Bossler and Schank, 2020) contributed to rising wage inequality in Germany (Biewen et al., 2017). Two years after the minimum wage introduction, however, approximately one quarter of the German labour force was still employed in the low-wage sector (Grabka and Schröder, 2019). Despite a growing number of studies providing evidence on the effects of the minimum wage introduction in 2015 (see, e.g., Ahlfeldt et al., 2018; Bossler and Gerner, 2020; Bossler and Schank, 2020; Caliendo et al., 2018; Caliendo et al., 2019; Dustmann et al., 2022; Garloff, 2019; Holtemöller and Pohle, 2020), none of the studies consider the effects on migrants. One in four persons in the German labour force has a migration background (Federal Statistical Office, 2020), and was much more likely to earn less than the new minimum wage threshold in 2014 than native-born employees (Amlinger et al., 2016). Research about the effects of the minimum wage on migrants has been limited almost exclusively to the U.S. (Zavodny, 2014).

For this reason, this paper analyses the unnoticed effects of the minimum wage introduction in 2015 on the labour market situation of migrants in Germany. Based on data from the German Socio-Economic Panel (SOEP), we estimate the causal effects of the minimum wage reform on hourly wages, working hours and monthly salaries of migrants and natives by application of a differential trend adjusted difference-in-differences (DTADD) analysis (suggested by Burauel et al., 2020; Dustmann et al., 2022). This approach considers an innovative research design of defining treatment and comparison groups. We distinguish different lengths for providing insights on the potential dynamics of effects over time (one-year, two-year and three-year analysis after the introduction of minimum wage). To account for a likely violation of the identifying common trends assumption, the estimation approach further allows explicit consideration of placebo effects prior to the introduction of the minimum wage. Moreover, to allow a better understanding of underlying effect patterns, we conduct distinct estimations on selected socio-economic groups (gender, age, qualification). Besides the individual effects, the minimum wage introduction has likely imposed distributional shifts, such as potential squeeze and spillover

effects. For that reason, we complement the causal analysis with comprehensive descriptive analyses of labour market participation patterns and wage distribution to illustrate and discuss potential changes.

Compared to natives, migrants are often a particularly disadvantaged labour market group due to lower language proficiency, job qualifications, and the usability of their human capital (Aldashev et al., 2009; Kogan, 2011). In addition, they are more likely to be victims of statistical discrimination (Kaas and Manger, 2012). These circumstances are not necessarily the result of intentional decisions but partly arise from misaligned incentives. Consequently, migrants more often work in the low-wage sector, typically characterized as marginal employment (so-called mini-jobs)[28] or part-time employment (Grabka and Schröder, 2019). This creates structural wage inequalities compared to native workers (Aldashev et al., 2012; Ingwersen and Thomsen, 2021). Due to this comparatively lower labour market position, migrants were expected to have benefited more from the introduction of minimum wages – at least in terms of hourly wage gains. Contrary to that, rising hiring standards could also lead migrants to compete more fiercely for jobs with natives (Butschek, 2022) implying they might benefit less or even suffer.

Our empirical results of the causal effect analysis, however, cannot confirm the positive expectations unambiguously. Our preferred two-year analysis shows an overall effect on hourly wages of 9.3 ppts that veils heterogeneity between migrants – who benefited more (10.2 ppts) – and natives (8.7 ppts). Furthermore, our analysis reveals some socio-economic heterogeneity within groups: E.g., female migrants experienced higher average wage raises than natives, but the pattern is reversed for males. However, consideration of weekly working hours as a second outcome attenuates the at first sight positive impression. The minimum wage led to a reduction of weekly working hours for migrants by about 7.0 ppts; for natives, the effect is less pronounced (5.7 ppts). The combined effects – approximated by monthly salary (third outcome) – is thus smaller than the hourly wage effect: Although it tends to be positive overall, there is an insignificant effect of 6.9 ppts for migrants. For natives, our estimates indicate an increase by 13.7 ppts, twice as large as for migrants.

Since the wage effects refer to the intensive margin only and leave out potential effects on the extensive margin, we complement the causal effect analysis by a descriptive

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[28] 'Mini-jobs are marginal employment with a maximum monthly salary of €450 or a work assignment of a maximum of 70 days per calendar year (until 09/2022). Due to the lack of contributions to social insurance, mini-jobs do not provide social security' (Federal Employment Agency, 2022). In 2014, the share of employed migrants with a monthly income below €500 (the lowest reported income class) was 19.9 % compared to 11.5 % of natives (Federal Statistical Office, 2020).

elicitation of labour market participation and the wage distribution over the period of interest. Our results do not reveal any appreciable migrant-native difference in full-time employment deviating from the previous group-specific trends. Nevertheless, we observe a noticeable higher growth of part-time employment for migrants coinciding with the minimum wage introduction. Regarding marginal employment and unemployment, shares are falling less for migrants than for natives. We interpret this evidence, that the introduction of the minimum wage did not coincide with a shift away from precarious employment for migrants, but trends tend to have slowed down slightly. Moreover, it indicates that natives have been affected less by job losses, maybe due to an intensified competition of the least productive. The investigation of the wage distribution points to a particularly high increase in wage divergence between natives and migrants shortly before 2015, and a temporal convergence across the lower part of the wage distribution thereafter. Our results provide – at least tentative – evidence that migrants tended to became less likely to work in the low-wage sector for a short time, but this development was not persistent, and divergence started soon again.

Given all the reported patterns, our empirical results depict a worsened labour market situation of migrants relative to natives coinciding with the introduction of the minimum wage. Since migrants have comparatively less competitive labour market characteristics, on average, this puts them in a worse position than natives when seeking employment. In the end, a (too) high minimum wage then protects native workers from competition with migrants with similar qualifications (Edo and Rapoport, 2019). This can also increase the wage inequality between these groups and may further explain the sharp decline in the number of hours worked per week, evident for migrants but not for natives. Overall, the minimum wage has helped to improve hourly wages at the cost of employment relationships for migrants. Importantly, regarding the policy implications of our study, we have to emphasise that the presented results relate to a period of a booming German economy. The high inflation and recession that have both started in 2022 and will potentially persist into the coming year will further increase competition in the labour market between migrants and natives. Hence, we expect the rise in the statutory minimum wage in October 2022 up to €12.00, the so-called "poverty-proof minimum wage" (Federal Ministry of Labour and Social Affairs, 2022), will aggravate the less beneficial or even negative effects for migrants – and therefore increase inequality. Although intended as a holistic social protection measure, the minimum wage does not consider vulnerable groups equally: We presume

reinforced allocation according to productivity differentials, exacerbating labour market segregation.

The remainder of the paper proceeds as follows: Section 3.2 gives a brief insight into the reasons for and the extent of the introduction of minimum wages in Germany. This is accompanied by a literature review of the evidence to date on the effects of the minimum wage with a special focus on the effects on migrants. Section 3.3 describes the data and sample details for our empirical analysis. Section 3.4 is devoted to the methodology and comprises the econometric specifications. The empirical results of our causal analysis are given in Section 3.5. Section 3.6 elicits potential mechanisms by descriptive analysis of labour market participation and wage distribution. A discussion of the results is provided in Section 3.7. The study closes with some conclusions in the final section.

3.2 Minimum Wages: Introduction in Germany and Related Evidence

3.2.1 Introduction in Germany

The introduction of the mandatory minimum wage in 2015 was one of the most profound social policy reforms in recent years in Germany and directly affected approximately 4 million workers (Bossler and Gerner, 2020). Before this reform, Germany was one of the few European countries and economically strong industrial nations worldwide without a statutory minimum wage (Bruttel et al., 2018; Schulten, 2021).[29] Until then, the right of free collective bargaining ("Tarifautonomie") applied, which allowed trade unions and employers' associations to negotiate wage and working conditions free from state intervention. Thus, wage pricing took place entirely through the interaction of labour supply and demand.[30] Since the end of the 1990s, however, collective bargaining coverage in Germany fell from over 70 % to below 50 % by 2014 (Garloff, 2019). Deunionization, outsourcing of service personnel, a change in working hours, and low-skilled workers being employed in low-paying firms caused an increasing lower wage tail inequality (Antonczyk et al., 2010; Bossler and Gerner, 2020; Bossler and Schank, 2020).

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[29] There is no statutory minimum wage in Denmark, Norway, Sweden, Finland, Italy, Austria and Switzerland (Schulten, 2021).
[30] By setting a minimum price for labour, a redistribution takes place between consumer surplus and producer surplus.

The main objective of the minimum wage implementation was to secure the subsistence level for the working population. The statutory minimum wage was intended to protect workers in the low-wage sector from wage dumping (Federal Ministry of Labour and Social Affairs, 2021). However, higher wages encourage individuals to enter the labour market, which inevitably leads to more competition and potentially more unemployment. Thus, only those who keep their jobs will benefit from the minimum wage and increased competition will negatively affect the least-skilled workers. In a competitive market, hence, the level of the minimum wage determines the unemployment rate.

The minimum wage was introduced during a stable, long-lasting growth phase of the German economy. The gross domestic product has been growing steadily since 2006 (with a brief dip in 2008/2009), at least from 2010 to 2019. Employment also rose steadily from 2012 to 2019. The minimum wage was set at €8.50 per hour for 2015/16 and increased to €8.84 in 2017/18.[31] Based on the 2013 wage level, the initial minimum wage was approximately 50 % of the median income or roughly the 15th wage percentile, which had declined significantly before, widening wage inequality below the median (Bossler and Schank, 2020). At the time of its introduction, it was a moderate minimum wage compared to other EU countries (Eurostat, 2021). Based on a 39-hour week, an employee working full-time received a gross monthly salary of €1,440 in 2015/16 or €1,500 in 2017/18.[32]

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[31] Further annual increases resulted in a minimum wage of €9.82 in the first half of 2022 and to €12.00 starting in October 2022.

[32] The *Minimum Wage Act* only applies where the provisions in the existing industry or company collective agreement were previously lower. In selected sectors with a particularly large impact due to the minimum wage, wages were still allowed to be below the general minimum wage during the transitional period until the end of 2017 (The Federal Government, 2014). This applies to 2.1 % of the workforce in 2015, for example, in agriculture and forestry, in horticulture and in the textile and clothing industry. The share of migrants in industries with and without transitional arrangements is the same (own calculations).
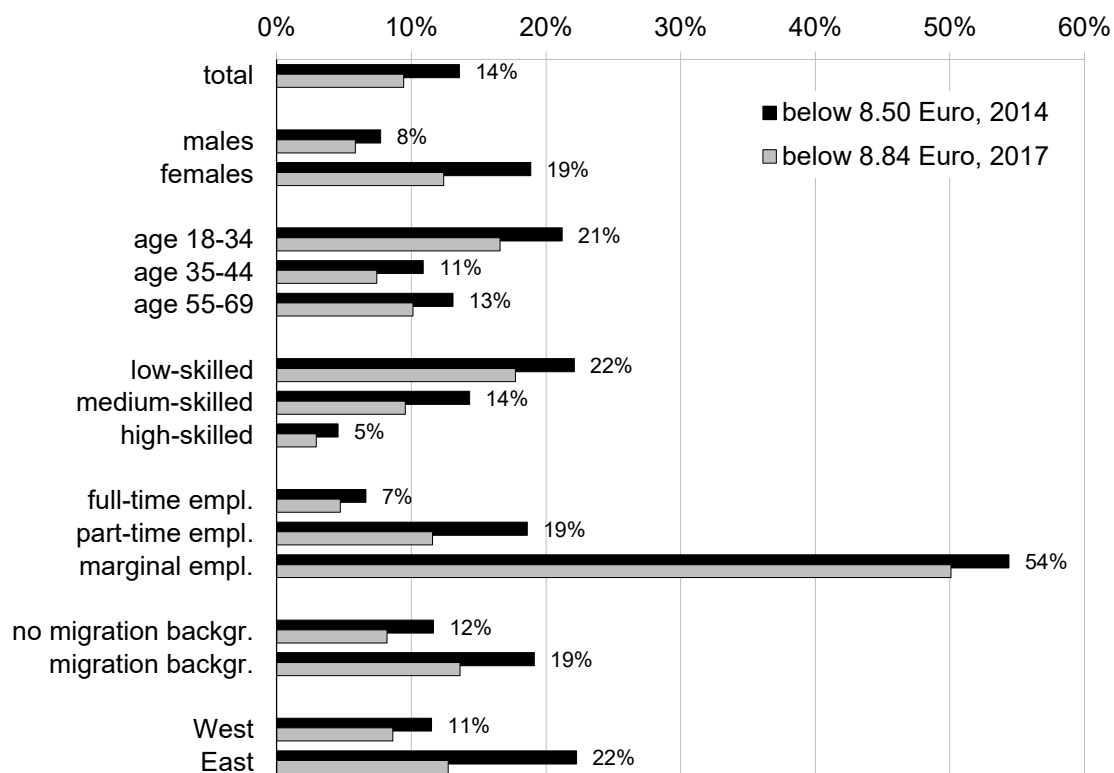
Figure 3.1: Employees with gross wages below minimum wage by subgroups

Notes: The figure shows the share of employees with gross hourly wages below minimum wage by different subgroups. Self-employed, apprentices, interns, handicapped workers in sheltered workshops, and branches with industrial wage floors above the statutory minimum wage are excluded from the sample. *Source*: SOEP v36. Own calculations. Illustration based on Amlinger et al. (2016).

With regard to the socio-economic situation, the 2015 introduction of the minimum wage affected employees to different degrees (see Figure 3.1). The direct impact on employees with a migration background (19 %) was considerably larger compared to the impact on natives (12 %). Women (19 %) were affected more than twice as often as men (8 %), and younger employees were comparatively more likely to earn less than €8.50 per hour than other age groups. Furthermore, the differences were particularly noticeable by employment status and qualification: In more than half of all jobs with marginal employment (54 %), employees received an hourly wage of below €8.50, while the proportion was much lower for part-time (19 %) and full-time jobs (7 %). Low-skilled workers were strongly affected by the introduction of the minimum wage (22 %), while high-skilled workers were hardly affected (5 %). Additionally, due to the lower average wage in eastern Germany, the *wage bite* – the ratio of the minimum wage and the median hourly wage – was larger in this region (Caliendo et al., 2018).

3.2.2 Related Evidence

According to competitive market theory, the minimum wage introduction affects labour market opportunities in the form of wage increases and employment losses (Bruttel, 2019; Zavodny, 2014), i.e., the interplay of income and substitution effects. Employers have several options to respond to higher hourly wages: To keep labour costs stable, they may reduce the contractual weekly working hours, demanding that employees work harder or face termination (Bruttel et al., 2018; Bruttel, 2019; Holtemöller and Pohle, 2020). Workers with low productivity face a comparatively higher risk of job loss. They will increase their efforts (and thus their productivity) to forestall a possible layoff, which simultaneously helps to mitigate the higher labour costs that arise with the minimum wage (Ku, 2022). However, 'minimum wage gives employers a profit incentive to substitute away from the least-skilled towards more-skilled workers' (Zavodny, 2014, p. 3), which can lead to reduced hiring of low-skilled workers. Due to that, a statutory minimum wage may serve as a labour market screening device by which primarily better-qualified workers in the low-wage sector may transition into regular employment. As higher wages encourage additional people to enter the labour market, this forces some workers out of their current jobs. Therefore, a minimum wage theoretically causes unemployment to rise, and the least-skilled workers are particularly vulnerable to layoffs. If primarily low-wage earners become unemployed because of the minimum wage, this could both raise the average wage of the lower income groups and promote inequality in the country. Alternatively, employers could also pass along the additional labour costs to their customers by raising prices for goods and services (Bruttel et al., 2018; Bruttel, 2019). Companies that raised prices relatively frequently were less likely to lay off employees in return (Link, 2022). However, a reduction in investments and adjusted work requirements are equally conceivable (Caliendo et al., 2019). Eventually, additional costs may force predominantly small employers to exit the market (Dustmann et al., 2022).

On the other hand, the employees themselves could also initiate a reduction in working hours, for example, if they wish to work less while keeping the same monthly salary (Bruttel, 2019). Caliendo et al. (2019) therefore recommend also considering monthly salaries when evaluating the effects of the minimum wage reform. Several studies found that the average contractual working hours in regular employment fell significantly following the minimum wage implementation in Germany (Bonin et al., 2020), preventing higher hourly wages from translating into higher monthly salaries (Caliendo et al., 2019).

With regard to its primary objectives, the introduction of the minimum wage has significantly increased the hourly wages at the bottom of the distribution at an above-average rate from 2014 to 2016 (e.g., Bruttel, 2019; Caliendo et al., 2019; Dustmann et al., 2022). Therefore, it may play a key role in the reduction of wage inequality in Germany (Grabka and Schröder, 2019). In particular, low-skilled employees and marginally employed persons experienced an over-proportional increase in hourly wages (Caliendo et al., 2019; Amlinger et al., 2016; Burauel et al., 2020). However, the estimated reduction in wage inequality may also arise from job losses in the low-wage sector, although these effects seem to be small (Bossler and Gerner, 2020; Bossler and Schank, 2020; Caliendo et al., 2018; Garloff, 2019). Regardless, the new wage floor has led to a notable wage compression slightly above the minimum wage (Bruttel, 2019) and spillover effects on higher wages.[33]

In contrast to the expected effects on the wage distribution, the employment effects of a minimum wage were less clear in advance. The predicted decline of approximately half a million jobs led to widespread concerns among the German population (Arni et al., 2014; Knabe et al., 2014). The actual decline appears to have been far less extensive. Almost all studies, however, confirm the expected significant negative effect on total employment (e.g., Bonin et al., 2018; Bossler et al., 2018; Bossler and Gerner, 2020; Caliendo et al., 2018; Garloff, 2019; Holtemöller and Pohle, 2020). Nevertheless, there might be some ambiguity left since a few studies report slightly positive effects (e.g., Ahlfeldt et al., 2018; Bruttel et al., 2018). In this regard, the type of employment relationship determines the extent to which employees have been afflicted by the minimum wage (Caliendo et al., 2018). Holtemöller and Pohle (2020, p. 108) 'find a robust negative effect of the minimum wage on marginal and a robust positive effect on regular employment'. Other studies also observe a sharp decline in the number of mini-jobs (e.g., Amlinger et al., 2016; Bruttel et al., 2018), whereas full-time and part-time employment remained almost unaffected (Caliendo et al., 2018). This decline in marginal employment has therefore largely determined the decline in overall employment. Moreover, the empirical literature is quite consistent in reporting that approximately half of the marginal employment was converted into regular employment as a result of the minimum wage introduction (Amlinger et al., 2016; Bonin et al., 2018; Bruttel, 2019; Caliendo et al., 2018;

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[33] Bossler and Schank (2020) observe that the minimum wage introduction had an impact on monthly salaries up to the 50th percentile, although the extent of wage spillover towards higher wage groups is ambiguous (Bruttel et al., 2018, Bruttel, 2019).

Caliendo et al., 2019). The other half of all marginally employed persons, however, left the labour market or became unemployed (Bruttel, 2019).

Despite the observed reduction in wage inequality, Bruttel (2019) concludes that – as frequently observed in other states – 'the minimum wage has not helped to reduce welfare dependency and the risk of poverty' in Germany (Bruttel, 2019; p. 11). This conclusion is derived from at least four reasons. First, the share of low-wage employees has not declined due to the minimum wage introduction (Grabka and Schröder, 2019). Second, 'many employees in the low-wage sector still do not generate adequate earned income and depend on wage-replacement benefits' (Grabka and Schröder, 2018, p. 120). This is explained by the fact that workers' previous incomes in the low-wage sector plus potential social benefits roughly correspond to the monthly income after minimum wage implementation. Third, the minimum wage is sufficient only for single full-time employees, which comprise only 3 % of all top-up payment recipients in Germany. For households with additional household members without income (e.g., partner, children), a monthly salary on a minimum wage basis is (still) not sufficient to cover basic costs (Bruttel, 2019). Thus, the vast majority of minimum wage earners continue to rely on social benefits. Fourth, unemployment effects are concentrated among low-wage families (Neumark and Wascher, 2002), which increases labour market segmentation.

3.2.3   Effects on Migrants

Regarding the expected effects of a minimum wage for migrants, opposing forces prevent an unambiguous prediction. Due to the worse labour market situation of migrants compared to natives, a minimum wage may contribute to closing the migrant-native wage gap in Germany. Since there is a strong overrepresentation of people with a migration background at the bottom of the wage distribution, their hourly wages would rise to a greater extent than those of native Germans would due to the minimum wage. However, at the same time, migrants' employment opportunities may also excessively deteriorate in response to the minimum wage (Zavodny, 2014). They may have trouble entering the labour market or keeping their jobs, and they benefit from higher wages only if they are in employment. Reasons for the lower average wages of migrants compared to natives are manifold, but their lower human capital endowment is the key to productivity disadvantages. The lower level of human capital results from a lower level of education and generally poorer language skills (Ingwersen and Thomsen, 2021). For migrants with their own migration experience

(first-generation migrants), the imperfect transferability of human capital (due to the limited compatibility of the home and host labour markets) leads to significantly lower returns compared to human capital acquired in Germany (Aldashev et al., 2009; Basilio et al., 2017). For migrants of successive generations, lower levels of human capital result partly from migrant-specific challenges in the German education system (Christl et al., 2018). However, wage differentials between migrants and natives cannot be attributed to productivity differences alone. They also exhibit less bargaining power vis-à-vis the (potential) employer than natives (Signorelli, 2020). Migrants also point to statistical discrimination, which (partly) arises from cultural differences (Ingwersen and Thomsen, 2021). Thus, an employer's reservations about hiring, retention, and promotion can lead to a preference for native-born workers (Kaas and Manger, 2012). Nevertheless, irrespective of the actual causes or their relevance, there is a clear selection of migrants into low-income occupations and sectors (Humpert, 2013).

Currently, very few studies analyse the effects of the minimum wage on migrants or different ethnic groups, and this research is limited exclusively to English-speaking countries. The available evidence thus refers to less institutionalized labour markets than in Germany. Wursten and Reich (2021) and Derenoncourt and Montialoux (2021) reveal that minimum wage policies in the U.S. have narrowed the wage gap between whites and African Americans and improved employment opportunities for black workers. The minimum wage even further reduces the racial wage gap among less-educated workers. Similar developments can be observed in the UK, where the introduction of the minimum wage has led to a wage gap reduction between ethnic minorities and white workers in the lower wage groups (Clark and Nolan, 2021). In addition, both the minimum wage in the UK (when it was introduced) and the national minimum wage in the U.S. were set comparatively low in relation to median income. In this regard, Edo and Rapoport (2019) observe that, in the U.S., high federal minimum wages preserve native-born workers from competition with migrants with similar qualifications. Consequently, the relative level of the minimum wage could affect the labour force participation of ethnic minorities and could thus influence wage inequality between migrants and natives. Nevertheless, it is unresolved whether the overall quite positive results can also be transferred to Germany and similar countries.

Even though the literature does not explicitly address migrants in Germany, some insights can be derived based on how migrants have fared after the introduction of the minimum wage. Caliendo et al. (2019) emphasize that low-skilled and marginal workers in

particular have benefited substantially from the introduction of the minimum wage, explicitly mentioning – but not analysing – people with a migration background. Nevertheless, low-wage earners face adverse consequences from the introduction of a minimum wage: Although they benefit from the hourly wage raise, they are exposed to an increased risk of job loss and a reduction in working hours (Neumark et al., 2004). Therefore, we conjecture that migrants are more strongly affected than natives by the introduction of the minimum wage in Germany, both positively and negatively. Migrants may tend to benefit more from the minimum wage due to their overrepresentation in the low-wage sector, and the average wage of migrants in the low-wage sector is slightly lower than that of natives, which should generate higher wage growth. On the other hand, imposed wage increases lead to budget adjustments by employers, which may result in job cuts. Migrants may be at a disadvantage in the increased competition for jobs if they are competing with native-born Germans with equal job qualifications. Hence, only workers who remain employed – with the same number of working hours – can truly benefit from the introduction of the minimum wage.

3.3   Data Description

3.3.1   Data and Sample Restrictions

For the empirical analysis, we use 2007 to 2018 survey data from the German Socio-Economic Panel (SOEP).[34] SOEP is a representative longitudinal panel study in which about 30,000 people in Germany are surveyed annually on issues of income, employment, education, living conditions and health (Goebel et al., 2019). This timeframe includes an appropriate period to account for wage developments prior and after to the minimum wage introduction. It further reduces possible bias due to anticipation effects. Simultaneously, (wage) changes in the first, second and third year of the minimum wage introduction can be included. A particular asset of these data is the identification of migration status beyond the concept of citizenship. In the analysis, we consider (1) persons with a migration background who were born in Germany but have at least one parent who immigrated to Germany (indirect migration background, second and subsequent generations of immigrants) or who immigrated themselves (direct migration background, first-generation immigrants) as

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[34] Migration samples from after 2013 are not included to minimize bias from refugee samples and immigrants immediately before the minimum wage introduction in 2015.

"migrants" and (2) persons who have no known migration history as "natives" (DIW-SOEP, n.d.).[35] In this regard, the group of migrants is characterized by some heterogeneity (origin, time of residence, language proficiency, place of educational acquisition, the reason for migration, etc.). Labour market barriers and lower upward mobility, however, apply equally to individuals from both direct and indirect migration backgrounds (Speckesser, 2013).

Our main variable of interest, "gross hourly wage", is obtained by dividing the individual gross monthly salary by the contractual working hours of the last week in the main job extrapolated to monthly hours.[36] Contractual working hours have the advantage over actual working hours in that a bias in hourly wages due to additional overtime pay is not included. Wages from side jobs are not considered. We assume that there are 4.35 weeks in each month for the calculation. We further apply symmetric trimming to the hourly wage growth rates by dropping the upper and lower one percent from the analysis to correct for outliers. Information on the individual's employment status is taken directly from the dataset. We consider the age range from 18 to 69 years. Based on these restrictions, the estimation sample comprises 134,525 observations with wages, subdivided into 19.9 % migrants (thereof 70.3 % with a direct migration background and 29.7 % with an indirect migration background) and 80.1 % natives on average. We use the provided survey weights at the individual level to counteract potential bias due to the overrepresentation of high-income households and immigrants in SOEP data.[37]

3.3.2 Sample Description

Migrants and natives differ significantly in most labour market characteristics: Table 3.1 shows the mean characteristics of these two groups in the period of 2012-2014 (pre-minimum wage) and their absolute and relative changes towards the period 2015-2017 (post-minimum wage introduction). We look at these two periods to capture the average differences between the two groups in terms of labour market characteristics directly before and in terms of the change immediately after the minimum wage introduction. The share of

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[35] The group "without migration background" also includes persons with German citizenship who were born in Germany and with missing information about their parents. Since some of them could also be descendants of migrants, the number of persons with a migration background group may be slightly underestimated (DIW-SOEP, n.d.).

[36] We disregard all workers who have no eligibility for the minimum wage: (1) workers in jobs that are not bound by the statutory minimum wage (self-employed, apprentices, interns, and handicapped workers in sheltered workshops). (2) Workers in industries with higher minimum wages than the statutory minimum wage. (3) Workers in an industry with a transitional period of minimum wage introduction.

[37] The official share of employed persons with a migration background was 18.5 % in 2014 (Federal Statistical Office, 2020).

low-skilled workers with a migration background is considerably higher than that of native workers, while the opposite is true for medium-skilled persons. The share of high-skilled workers is almost identical. Hence, migrants have, on average, a lower level of educational attainment than natives. Migrants are also more often employed in marginal employment (13 %), although this proportion decreased towards 2015-2017 compared to native workers (8 %). Women are between two to three times more likely than men to work in marginal employment depending on their migration background (see Table B.1 in the appendix for more detailed descriptive statistics). Both groups had significant gains in part-time employment, where the share of native employees (21 %) is slightly higher than among migrants (19 %). Similarly, migrants (68 %) were slightly less likely to work full-time in 2012-2014 than natives (70 %), and women (50 %), on the other hand, were much less likely to work full-time than men (88 %). However, there was no appreciable change in either group in 2015-2017, confirming the results of previous studies for migrants (see Section 3.2). The unemployment levels show a notable difference. Whereas the share of unemployed native workers decreased substantially by 12 % by the 2015-17 period, there was no significant change for migrants. The fact that migrants (and women) are less often full-time regularly employed, which tends to be associated with a lower wage level (see Figure 3.1), highlights the extent to which migrants (and women) are affected by the minimum wage. Meanwhile, the gender ratio among migrants in the labour market has changed in favour of women.

Table 3.1: Workers' characteristics by migration background 2012-2014 and changes towards 2015-2017

Characteristics of workers	Migrants			Natives		
	mean, 2012-2014	change towards 2015-2017		mean, 2012-2014	change towards 2015-2017	
		absolute	%		absolute	%
Labour force participation	0.73	0.02	3***	0.75	0.01	1***
… employed	0.88	0.00	0	0.93	0.01	1
… registered unemployed	0.13	0.00	1	0.07	-0.01	-12***
Salary						
gross hourly wage	15.54	1.61	10***	17.83	1.52	9***
Std. Dev.	8.82	1.12	13***	10.65	2.17	20***
p10	7.07	0.98	14***	8.05	0.92	11***
p15	7.66	0.96	13***	8.96	0.89	10***
p20	8.62	0.71	8***	9.96	0.93	9***
p50	13.79	1.15	8***	15.80	1.44	9***
gross monthly salary	2,277.32	270.99	12***	2,712.54	173.92	6***
Employment						
working hours (contractual)	33.24	-0.01	0	34.43	-0.39	-1***
full-time employment	0.68	0.00	0	0.70	-0.01	-2***
part-time employment	0.19	0.01	8**	0.21	0.02	10***
marginal employment	0.13	-0.01	-9**	0.08	0.00	-2
Qualification						
low-skilled	0.41	-0.03	-6***	0.24	-0.02	-7***
medium-skilled	0.34	0.01	2	0.49	0.00	0
high-skilled	0.25	0.02	9***	0.27	0.02	6***
labour market experience	14.40	0.44	3**	18.89	0.35	2***
job tenure	7.48	0.30	4**	12.05	0.11	1
Company						
firm size: <20 empl.	0.24	0.02	7**	0.20	-0.01	-3*
firm size: 20-199 empl.	0.26	-0.02	-8***	0.26	-0.02	-6***
firm size: 199-1999 empl.	0.21	0.00	-1	0.22	0.00	1
firm size: >2000 empl.	0.28	0.01	5*	0.29	0.03	10***
Personal information						
age	39.70	0.94	2***	44.17	0.79	2***
gender (male=1)	0.55	-0.02	-4***	0.51	-0.01	-1
No. of obs. (employed)	**8,048**	**6,738**		**26,786**	**21,762**	

Notes: Self-employed, apprentices, interns, handicapped workers in sheltered workshops, and branches with industrial wage floors above the statutory minimum wage are excluded from the sample. *Source*: SOEP v36 2012-2017, own calculations incl. survey weights.

A first look at wage developments reveals that both groups experienced a significant and comparable increase in the median gross hourly wage of nearly 10 % during the 2015-2017 period (Table 3.1). The relative increase was even greater at the 10th wage percentile for migrants (+14 %) than for natives (+11 %). Due to these considerable level differences, there was a slight convergence at the lower end of the wage distribution. Meanwhile, natives

made slightly larger gains in the higher wage groups. Thus, from the 20th decile onwards, there is a discernible wage spread and spillover effects of wages tend to differ between groups in consideration. In both groups, we observe a strong significant increase in wage dispersion. Due to the different employment status, the differences in monthly salaries are even more extensive. The differences between migrants and natives in the development of the average gross monthly salary are particularly noticeable: While migrants show a considerable increase of 12 %, this is only half as high for natives (6 %). In summary, these descriptive results indicate different patterns correlating with the introduction of the minimum wage for migrants and natives. We also observe considerable gaps in hourly wages by gender and migration background (Table B.1).

3.4   Econometric Methodology

In order to quantify how migrants and natives were affected by the introduction of the minimum wage, we use a causal effects analysis. The methodological framework refers to the approach used by Burauel et al. (2020) and Dustmann et al. (2022) and enables us to identify the effects of the minimum wage reform on three outcomes of interest, i.e. hourly wages, weekly working hours and monthly salaries. The effect of the minimum wage is estimated by using a "differential trend adjusted difference-in-differences" (DTADD) approach, in which the observed wage change in the treatment group is contrasted with the (counterfactual) wage change in the control group. Therefore, the treatment effect is represented by the difference between wage changes in the treatment group and the wage changes perceived in the control group. This identification strategy is based on the underlying assumption that wages below the minimum wage threshold (treatment group) would have developed identically to those just above the minimum wage threshold (control group) if the minimum wage was not introduced. To empirically support the plausibility of this assumption, we consider previous wage trends in the model. The analysis particularly focuses on the minimum wage effects on migrants compared to natives. To complement the causal evaluation, we additionally conduct comprehensive descriptive analyses for uncovering and discussing distributional shifts, such as potential squeeze and spillover effects.

For the causal effect analysis, we divide the employees into three groups based on their location in the wage distribution prior to the minimum wage introduction (t_0) (see also Burauel et al., 2020; Dustmann et al., 2022). In our application, the wage thresholds correspond to the rounded single (€10.32) and double standard deviations (€12.14) of the average hourly wage of the group under treatment. The first group includes workers who earned an hourly wage below the minimum wage threshold of €8.50 in 2013 and 2014.[38] These workers were directly affected by the introduction of the minimum wage in 2015 and therefore constitute the "treated group". Due to their close proximity to the minimum wage threshold, workers with hourly wages just above the minimum wage (€8.50 to €10.00/hour) form our "control group". However, this group may experience indirect effects of the minimum wage introduction. For example, there may be payment raises to maintain some distance between wage levels for different groups of workers (within firms) to reflect differences in skill demands or productivity. For subsequent robustness checks, we therefore implement a third group: The "peer group" comprises all workers *"higher up in the initial wage distribution"* (€10.00-12.00/hour) and should be (almost) unaffected by the introduction of the minimum wage (Dustmann et al., 2022, p. 284). Table 3.2 shows an outline of the treated group and both control groups. Our main interest lies in the comparison of the change in the hourly wages of the treated group (hourly wages below €8.50) and the control group (hourly wages €8.50-€10.00). Since the groups show no significant differences with regard to age, gender, educational level, and migration background, they are not too different to expect equal or at least largely comparable labour market perspectives (in the absence of a minimum wage).

Table 3.2: Treated group and control groups

group	wages in 2013/14	wage changes towards 2015/16
treated group	< €8.50	▪ (subordinate) overall wage trend ▪ wage increase above the threshold of €8.50
control group	€8.50 - €10.00	▪ overall wage trend ▪ small additional wage increase due to indirect effects of the minimum wage introduction (wage spillover)
peer group	€10.00 - €12.00	▪ overall wage trend ▪ (almost) unaffected by the minimum wage introduction

Source: Own illustration.

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[38] We choose a two-year baseline to reduce potential anticipation effects in the year prior to the minimum wage introduction.

We estimate three model variants with different time horizons to reflect immediate (one-year analysis, 2014-2015 vs. 2013-2014), robust (two-year analysis, 2014-2016 vs. 2012-2014) and medium-term effects (three-year analysis, 2014-2017 vs. 2011-2014). The total effect of the minimum wage can be considered in the longer time horizon only when the transition periods in certain industries have expired. Perceptible anticipation effects of the minimum wage implementation, e.g., higher hourly wage growth rates in the lower wage segment between 2013 and 2014 compared to previous years, suggest that a one-year analysis considering 2014 and 2015 only may have limited validity. We prefer the two-year analysis as it reduces the impact of short-term wage fluctuations, a lagged minimum wage implementation and an adjustment of the hiring behaviour. We use a regression analysis to control for different individual and job-specific characteristics of the treated group, the control group and the peer group influencing hourly wage changes. For the empirical model, we use the following main specification:

$$\Delta w_{it} = \beta_0 + \beta_1 T_{it} + \beta_2 T_{it} \times Y_{it} + \beta_3 T_{it} \times Y_{it-k} + \beta_4 X_{it} + \beta_5 Z_{it} + \alpha_t + \varepsilon_{it} \, . \quad (3.1)$$

where in the two-year analysis Δw_{it} represents the logarithmic change in individual hourly wage between t_0 and t_{+2} compared to the wage growth between t_{-2} and t_0. The treatment group indicator T_{it} takes the value of one if a worker earned an hourly wage below €8.50 in period t_0 and zero otherwise. Thus, β_1 depicts the average hourly wage growth of individuals in the treated group. The interaction term between the treatment group indicator T_{it} and the time vector Y_{it} indicates deviations from the average hourly wage growth of the treated group within a particular year. The corresponding coefficient β_2 therefore reveals hourly wage changes caused by the minimum wage introduction (minimum wage effect). The placebo estimate (β_3) is used to test our critical identification assumption of common trend wage growth in the treatment and the control group. We estimate wage growth in the pre-reference period k (2010-2012 in the two-year analysis). To allow a quantitative and causal interpretation of the minimum wage effect (β_2), β_3 should be zero. If this does not hold, confounding effects may bias the causal design. Since we can rule out any other systematic reforms affecting wage changes during the period of analysis, most likely are anticipation effects. The matrix X_{it} captures individual characteristics: age, gender, living in a partnership, (migration background), place of residence, educational level, and labour market experience. Matrix Z_{it} contains further job-specific characteristics: firm size, job tenure, time-limited contract, and economic sector. Finally, we consider year-

fixed effects, α_t, to capture general wage trends. All of these are relevant for the individual wage setting and regarded in the model to improve the precision of the estimated coefficients of interest.

Since we do not want to consider within-group effects, but rather emphasize the different effects of the minimum wage introduction on individuals with and without a migration background, we adjust the model for this purpose as follows. We form two separate treated groups: The first treated group contains only migrants, and the second treated group contains only natives. The control group remains unchanged in both cases and includes all workers regardless of their migration background. This model specification isolates comparable effects of minimum wage introduction depending on the migration background of the treated group, contrasted with the counterfactual case constellation approximated by the common control group of individuals not affected by the minimum wage introduction. Besides the estimation of effects in the whole sample as a reference for interpretation, we estimate effects for migrants and natives separately. Moreover, to allow more insights into underlying effect patterns, we complement all analyses with distinct estimations on selected socio-economic groups. For this purpose, we focus on the most relevant groups and provide results by gender, age cohorts and different qualification levels. The corresponding results enable revealing potential (socio-economic) effect heterogeneity.

3.5   Empirical Results

3.5.1   Effects on Hourly Wages

Table 3.3 summarizes the main estimation results for changes in contractual hourly wages for all workers eligible for the minimum wage. We present the results of the one-year analysis (columns 1-3), the two-year analysis (columns 4-6) and the three-year analysis (columns 7-9) and show the change in the hourly wage of the treated groups (hourly wage below €8.50) compared to the control group (hourly wages €8.50-€10.00).[39] Columns 1, 4 and 7 refer to the effects in the whole sample and provide reference levels for the more detailed estimations for the ethnic groups. Since the dependent variable is defined in logarithmic form, the coefficient estimates can be approximately interpreted as percentage changes. Three coefficients are of particular importance: (1) the coefficient estimate of the

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[39] The final empirical model specification was selected based on different specifications of eq. (1) regarding the covariates considered. Table B.2 in the appendix provides regression results of nine specifications.

treatment group indicator denotes the average wage trends of the treated group relative to the control group. (2) The coefficient estimate of the interaction term (DTADD) displays the additional wage increase of the treated group due to the minimum wage introduction, i.e. the causal effect of the minimum wage introduction. (3) The placebo interaction term controls for our key assumption, i.e., whether the wages of the treated group and the control group have evolved identically in the pre-minimum wage period.

We turn directly to the two-year analysis, which is our preferred time horizon and is supposed to reveal the most robust effect patterns. Hourly wages of workers earning less than €8.50 grew on average by 4.0 percentage points (ppts) faster than the control group (€8.50-€10.00) between 2010 and 2016 (column 4). The DTADD interaction term for 2014–2016 further signifies that the introduction of the minimum wage has caused an additional wage increase of 9.3 ppts. The placebo coefficient is insignificant, hence, the wages of the treated groups increased at the same rate before the introduction of the minimum wage as those of the control group, supporting our main identifying assumption. The estimated wage increases (DTADD) can thus be interpreted as a causal result of the minimum wage introduction (Table 3.3). The overall wage change of our estimation, wage trend plus minimum wage effect, is in line with the magnitude of Burauel et al. (2020) and Dustmann et al. (2022), but with a stronger minimum wage effect.

Table 3.3: Minimum wage effect on hourly wage growth by migration background-specific treated group

	One-Year Analysis			Two-Year Analysis			Three-Year Analysis		
	Total	**Migrants**	**Natives**	**Total**	**Migrants**	**Natives**	**Total**	**Migrants**	**Natives**
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
One-Year Analysis									
Hourly wage < €8.50[1]	0.025**	0.028	0.019						
$[T_{it}]$	(0.010)	(0.018)	(0.012)						
× DTADD 2014-2015[2]	0.093***	0.087*	0.096***						
$[T_{it} \times Y_{it}]$	(0.020)	(0.032)	(0.023)						
× Placebo 2012-2013[2]	-0.048**	-0.053	-0.043*						
$[T_{it} \times Y_{it-k}]$	(0.022)	(0.049)	(0.023)						
Two-Year Analysis									
Hourly wage < €8.50[1]				0.040***	0.044	0.039***			
$[T_{it}]$				(0.013)	(0.028)	(0.014)			
× DTADD 2014-2016[2]				0.093***	0.102***	0.087***			
$[T_{it} \times Y_{it}]$				(0.022)	(0.038)	(0.024)			
× Placebo 2010-2012[2]				-0.045	-0.095	-0.042			
$[T_{it} \times Y_{it-k}]$				(0.032)	(0.100)	(0.033)			
Three-Year Analysis									
Hourly wage < €8.50[1]							0.056***	0.096***	0.051***
$[T_{it}]$							(0.015)	(0.029)	(0.016)
× DTADD 2014-2017[2]							0.066**	0.010	0.078***
$[T_{it} \times Y_{it}]$							(0.026)	(0.051)	(0.027)
× Placebo 2008-2011[2]							-0.078**	-0.163	-0.083**
$[T_{it} \times Y_{it-k}]$							(0.037)	(0.216)	(0.037)
Control Variables									
Year fixed effects $[\alpha_t]$	yes	yes	yes	yes	yes	yes	yes	yes	yes
Socio-demographic info. $[X_{it}]$	yes	yes	yes	yes	yes	yes	yes	yes	yes
Job characteristics $[Z_{it}]$	yes	yes	yes	yes	yes	yes	yes	yes	yes
Constant	0.065**	0.097**	0.049	0.085**	0.112***	0.093**	0.173***	0.151***	0.217***
	(0.030)	(0.039)	(0.030)	(0.037)	(0.051)	(0.037)	(0.048)	(0.055)	(0.050)
Observations	2,106	1,066	1,710	2,387	1,155	2,046	2,450	1,139	2,158
Obs. treated group	1,436	396	1,040	1,573	341	1,232	1,603	292	1,311
Obs. control group	670	670	670	814	814	814	847	847	847
Adj. R[2]	0.078	0.057	0.080	0.115	0.085	0.112	0.135	0.121	0.140

Notes: The table shows the effect of the minimum wage introduction on the change in gross hourly wages. Self-employed, apprentices, interns, handicapped workers in sheltered workshops, and branches with industrial wage floors above the statutory minimum wage are excluded from the sample. 1) Treated group (<€8.50/hour): (1),(4),(7) all workers, (2),(5),(8) with migration background, (3),(6),(9) without migration background. Control group (€8.50-€10.00/hour): (1)-(9) all workers. 2) DTADD and placebo are the respective different interaction terms, depending on the treated group. *Source*: SOEP v36 2008-2017, own calculations. Robust standard errors, clustered at the individual level. Standard errors in parentheses. Significance levels: * p<0.1, ** p<0.05, *** p<0.01.

Our empirical estimates show different minimum wage effects for workers with and without a migration background. In the period from 2014 to 2016 (two-year analysis), the introduction of the minimum wage resulted in an additional 10.2 ppts wage increase for workers with a migration background compared to the control group, while native workers only experienced an increase of 8.7 ppts (Table 3.3).[40] As the underlying average wage trend between migrants and natives is almost the same (about 4 %), this indicates that the introduction of the minimum wage led, at least temporarily, to a slight wage convergence between natives and migrants.
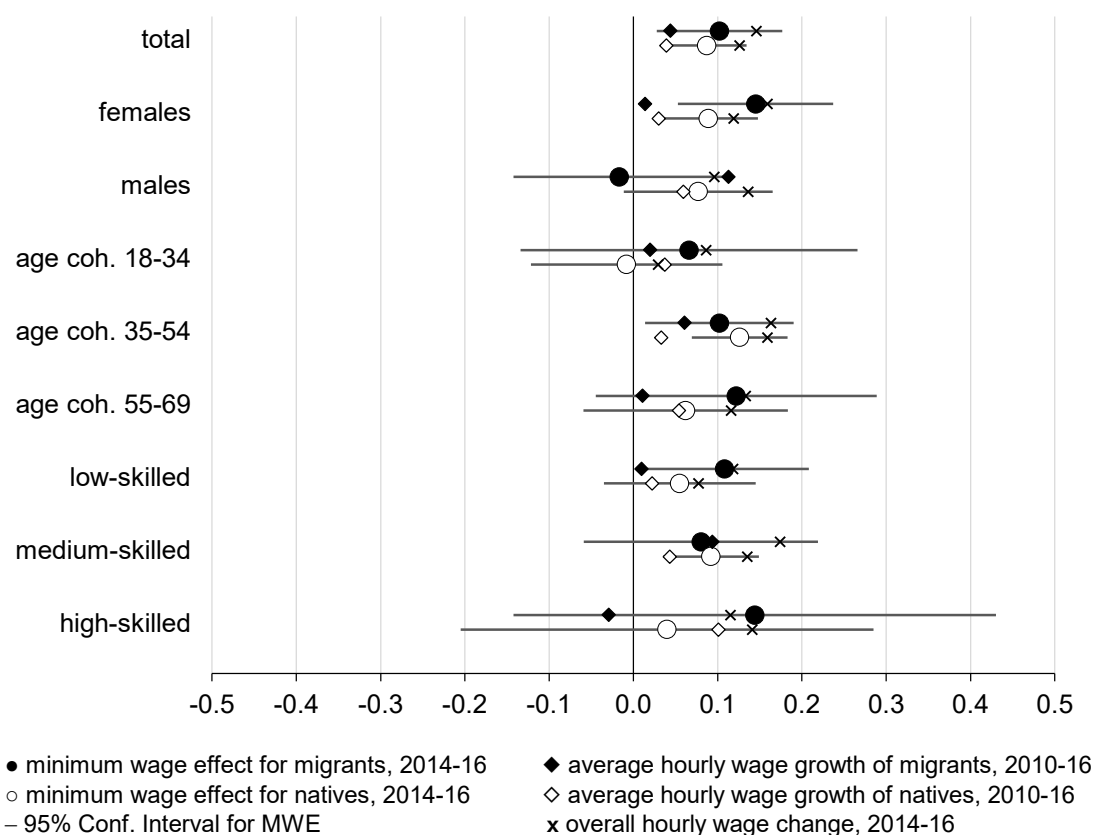
Figure 3.2: Minimum wage effect on hourly wage growth by migration background

Notes: The dependent variable is the logarithmic change in gross hourly wage between 2014 and 2016. Treated group according to migration background, control group comprises all workers. Robust standard errors, clustered at the individual level. Detailed regression results for migrants are in Table B.4 and for natives in Table B.5 in the appendix. Self-employed, apprentices, interns, handicapped workers in sheltered workshops, and branches with industrial wage floors above the statutory minimum wage are excluded from the sample. *Source*: SOEP v36 2010-2016, own calculations.

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[40] The minimum wage effect on hourly wages is only significant for migrants with a direct migration background (see Table B.3 in the appendix).

However, this trend in convergence is only temporary as revealed by the results of the one-year analysis and the three-year analysis. In the period from 2014 to 2015 (one-year analysis), the introduction of the minimum wage resulted in an additional 9.6 ppts wage increase for native workers compared to the control group, while workers with a migration background experienced an increase of 8.7 ppts. Nevertheless, these estimates should be interpreted with great care since the short-run may reflect some accompanying effects, e.g. due to potentially delayed implementation of the minimum wage. After three years (three-year analysis), the minimum wage effects are considerably smaller. The effect for migrants (1.0 ppts) has vanished mostly and is no longer statistically significant, but there is still a much stronger effect for native-born workers (7.8 ppts). Accordingly, the strong effects of the minimum wage tend to fade out in the longer term (Table 3.3). The declining effect is particularly important since it also comprises the minimum wage adjustment to €8.84 in 2017.[41]

The impact of the minimum wage introduction differs not only by migration background but also visibly by gender, age groups and qualification. Figure 2 shows the effect heterogeneity according to these characteristics obtained from separate model estimations. It visualizes the average wage trend, the minimum wage effect and the overall wage change differentiated by migration background for the two-year analysis. We consider the genders separately because women are much more likely to work part-time or in marginal employment than men and are therefore overrepresented in the treated group (Table B.1). Our empirical results show that the wage trend for women is only weakly positive, but that the minimum wage effect is even larger – for female migrants (14.5 ppts) distinctly stronger than for female natives (8.9 ppts). On the other hand, we observe a comparatively stronger average wage growth for men; while at the same time male migrants experience even a slightly negative minimum wage effect of -1.7 ppts (see also Table B.4 and Table B.5 in the appendix). This could be a consequence of increased job competition above the minimum wage threshold, in which migrants may have been outcompeted by natives.

In addition, we estimate age cohort-specific effects because primarily young workers may be affected by the introduction of the minimum wage (see Figure 3.1). The results in Figure 3.2 confirm that the minimum wage effects in the two-year analysis are also different

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[41] Due to industry-specific transition periods for the implementation of the minimum wage until the end of 2017, the two-year analysis and the three-year analysis additionally include employees from industries that had completed their transition periods. Table B.6 in the appendix provides the results excluding the industries in the transition period. As expected, the general wage increase as well as the minimum wage effects are smaller, as wages in these sectors were lower on average and wage gains tended to be higher.

by migration background and age cohorts. The minimum wage effect is comparatively small for young workers (18-34 years in 2014) and comparatively large for older workers (55-69 years in 2014). In both cases, the effect for migrants clearly exceeds that for natives while the previous wage trend for them is almost zero. The effect sizes in the middle age cohort (35-54 years in 2014) are in between, and comparable for both migrants and natives. Younger and older migrants thus benefited much more from the introduction of the minimum wage. Only through the minimum wage, overall wage growth has exceeded that of natives (see also Table B.4 and Table B.5 in the appendix). Besides female migrants, low-skilled migrants benefited strongly from the introduction of the minimum wage (Figure 3.2). Previously stagnant wages experienced an immediate increase of 10.8 ppts. In contrast, the effects were significantly smaller for low-skilled natives (5.5 ppts). The effects for medium-skilled workers are in line with the main effects. The small share of high-skilled workers in the low-wage sector, by contrast, does not allow for interpretable minimum wage effects. Overall, we find a consistently strong negative coherence between the previous average wage trend and the minimum wage effect. For female migrants, young and old workers, and low-skilled workers there are preceding wage trends close to zero, but the minimum wage effects are strongly positive (see also Table B.4 and Table B.5 in the appendix).

3.5.2 Effects on Working Hours

Rising hourly wages do not necessarily lead to higher monthly income. One possible response to the raised wages could be a reduction in weekly working hours, whether voluntarily or involuntarily. For example, employers have to bear higher costs and the upper earnings limit in marginal employment is reached with fewer working hours. Since only full-time employment at the minimum wage provides an adequate monthly income, adjusting work hours could cause workers to remain below this necessary monthly income threshold. Our data show a notable difference between migrants and natives: While the hours worked by native workers maintained the previous trend after the introduction of the minimum wage, working hours of treated migrants, which had previously risen sharply, suddenly dropped from this point in time (see Figure B.1 in the appendix).

● minimum wage effect for migrants, 2014-16   ◆ average growth in working hours of migrants, 2010-16
○ minimum wage effect for natives, 2014-16   ◇ average growth in working hours of natives, 2010-16
– 95% Conf. Interval for MWE   x overall change in working hours, 2014-16
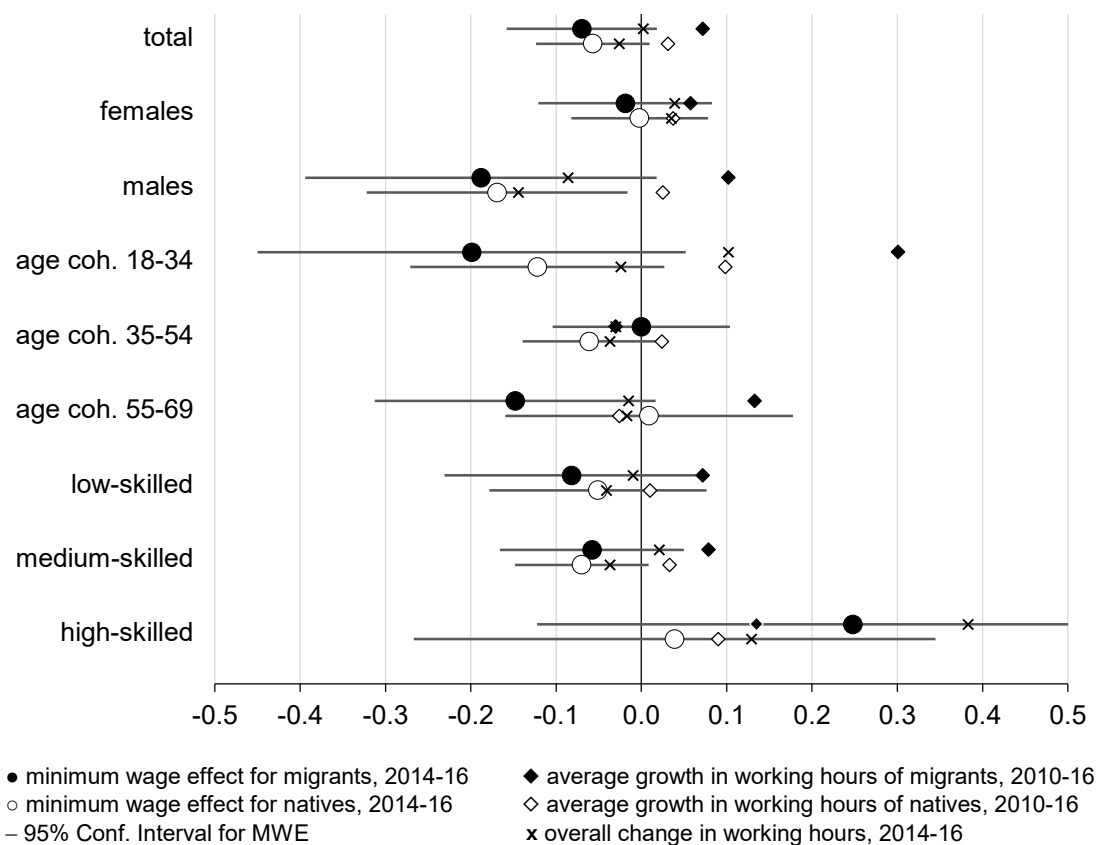
Figure 3.3: Minimum wage effect on the growth of weekly working hours by migration background

Notes: The dependent variable is the logarithmic change in weekly working hours between 2014 and 2016. Treated group according to migration background, control group comprises all workers. Robust standard errors, clustered at the individual level. Detailed regression results for migrants are in Table B.8 and for natives in Table B.9 in the appendix. Self-employed, apprentices, interns, handicapped workers in sheltered workshops, and branches with industrial wage floors above the statutory minimum wage are excluded from the sample. *Source*: SOEP v36 2010-2016, own calculations.

We estimate the causal changes in contractual weekly working hours for the treated group following the introduction of the minimum wage. The results of the two-year analysis show an overall positive trend in the development of weekly working hours of 3.1 to 7.2 ppts for the treated group compared to the control group from 2010 to 2016. However, the introduction of the minimum wage caused a reduction in weekly hours worked for migrants of -7.0 ppts and for natives of -5.7 ppts. Wage trend and minimum wage effect tend to equalise each other (see Figure 3.3 and Table B.7 in the appendix). Although insignificant, the minimum wage effect is evident only among migrants with a direct migration background, but not among those with an indirect migration background (see Table B.3 in the appendix).

Regarding the different socio-economic groups, there is some notable heterogeneity. While women have no significant change in weekly working hours, there are strongly pronounced decreases for men. Due to the minimum wage introduction both, migrant men (-18.8 ppts) and native men (-16.9 ppts) between 2014 and 2016 (two-year analysis), experienced a substantial decline in weekly working hours. Predominantly younger (-19.9 ppts) and older workers (-14.8 ppts) with a migration background had comparatively significant reductions in weekly working hours. Low-skilled and medium-skilled workers, meanwhile, show a comparable trend in weekly working hours, and both groups are similarly affected by the minimum wage-related decline.

3.5.3 Effects on Monthly Salary

Despite these partly opposing effects in hourly wages and weekly working hours, the monthly gross salaries from work of the treated group nevertheless increased (two-year analysis, see Figure 3.4 and Table B.10 in the appendix). In addition to the salary trend of 6.4 ppts of the treated group relative to the control group, the introduction of minimum wages caused a further increase in the monthly salary of 12.7 ppts. The positive effect on monthly salaries is solely attributable to migrants with a direct migration background (see Table B.3 in the appendix). Regarding the differences between migrants and natives, the positive trend was twice as large for migrants than for natives (both estimates are statistically highly significant) whereas the point estimate of the minimum wage is with 13.7 ppts distinctly higher for natives than that for migrants with 5.3 ppts. This implies that migrants benefited less from the minimum wage introduction also in terms of their monthly salary growth – widening the wage gap between the two groups even further.
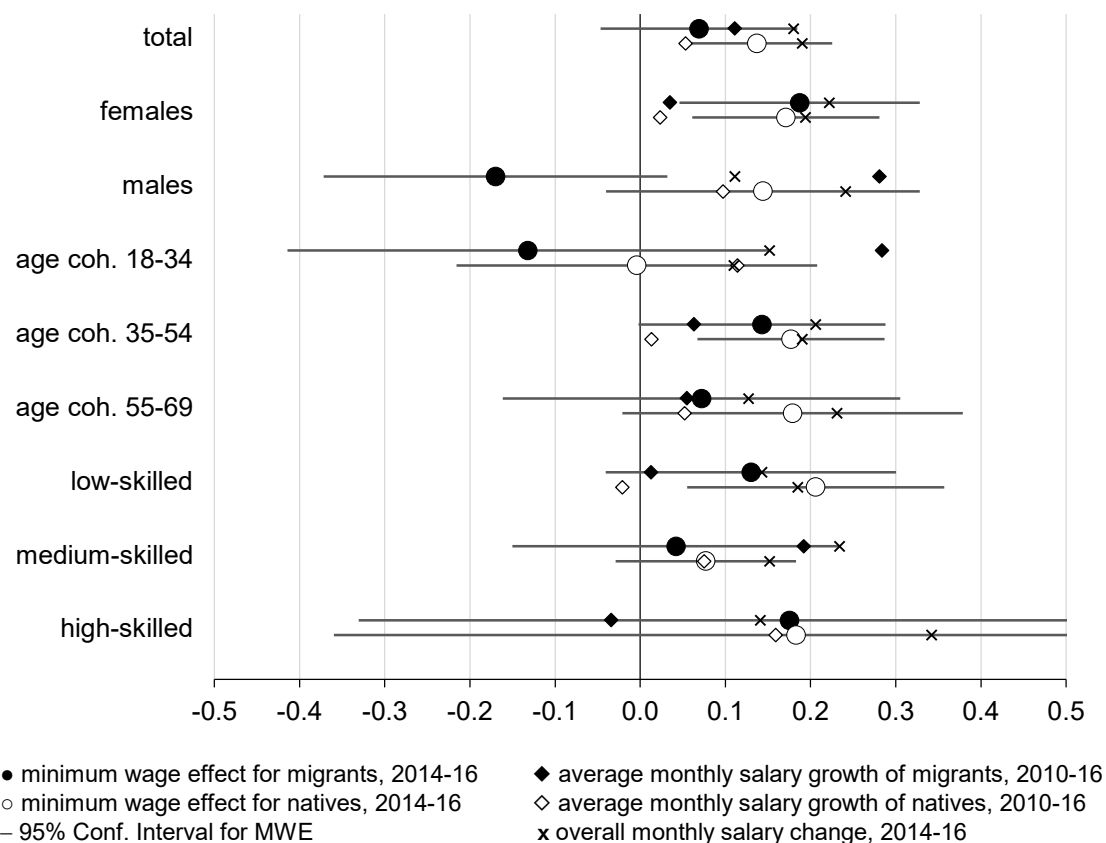
Figure 3.4: Minimum wage effect on monthly salary growth by migration background

Notes: The dependent variable is the logarithmic change in gross monthly salary between 2014 and 2016. Treated group according to migration background, control group comprises all workers. Robust standard errors, clustered at the individual level. Detailed regression results for migrants are in Table B.11 and for natives in Table B.12 in the appendix. Self-employed, apprentices, interns, handicapped workers in sheltered workshops, and branches with industrial wage floors above the statutory minimum wage are excluded from the sample. *Source*: SOEP v36 2010-2016, own calculations.

Consideration of different socio-economic groups again reveals a heterogeneous pattern (Figure 3.4). While there is only a slightly positive monthly salary trend for women of about 3 ppts, we observe simultaneously an extraordinarily strong positive minimum wage effect, both for female migrants (18.7 ppts) and native women (17.1 ppts). The introduction of the minimum wage also caused a significant monthly pay raise for low-skilled workers. In this group, women are overrepresented (Table B.1). Again, the effect is considerably higher for natives (20.6 ppts) than for migrants (13.0 ppts). In contrast, the effect is weaker for medium-skilled workers, with natives (7.7 ppts) benefiting more than migrants (4.2 ppts). For male migrants, on the other hand, the salary trend is much steeper, but the minimum wage effect is also strongly negative (-17.0 ppts) (Figure 3.4). One possible explanation for why male migrants did not explicitly benefit from the introduction of the minimum wage could be the strong positive monthly salary trend that had already caused a convergence of

wages between the treatment and control groups in the low-wage sector beforehand. With wages now roughly equal between these two groups, but productivity still different, cutbacks may predominantly hit male migrants, e.g., through layoffs or work hour reductions, who on average have lower human capital endowments than natives. This explains, among other things, the non-existent effect on hourly wages, the negative effect on hours worked, and finally, the negative effect on monthly salary. With 50 % of women in the low-wage sector working part-time or mini-jobs (men: 12 %), hourly and monthly pay cuts are less prevalent (Table B.1). The trend in monthly salary growth of about 6 ppts in the age cohorts 35-54 years and 55-69 years compared to their counterpart in the control group has multiplied by the minimum wage introduction (Figure 3.4). In the youngest age cohort 18-34 years, however, the minimum wage slowed down the previously strong monthly salary growth for migrants (28.4 ppts) by about 13 ppts.

3.5.4   Robustness Check: Spillover Effects

The empirical results of our main analysis show substantial effects on the hourly wage resulting from the minimum wage introduction (see Table 3.3 above). Nevertheless, possible spillover effects may affect the size of the estimated minimum wage effect. Burauel et al. (2020) mention that these spillover effects can occur in terms of negative spillovers, leading ta wage compression around the minimum wage threshold. However, presumably more likely are wage increases for workers just above the threshold if employers try to maintain the wage structure to a certain degree. To determine whether our control group is unaffected by the introduction of the minimum wage, we perform the following robustness check. We contrast the treated group with the peer group (€10.00-€12.00/hour) to identify potential differences in the size of the minimum wage effect compared to the control group. Due to the substantially higher wage level of the peer group than the minimum wage, we assume their wage development to be mostly unaffected by its introduction. Under this assumption, positive differences in the effect size suggest wage spillovers from the treated group to the control group.

The wage growth of the treated group in comparison to the peer group reveals an increase of hourly wages by 14.2 ppts in the second year due to the introduction of the minimum wage (see Table B.13 in the appendix). The estimated wage effect is thus higher than in the main analysis, i.e. compared to the control group (9.3 ppts, Table 3.3). The calculated spillover effect is approximately 4.9 ppts (14.2 ppts – 9.3 ppts). Consequently, if

there were no spillover effects on the control group, the wages of the treated group would have increased even stronger relative to the control group. Hence, the estimates of the main analysis may reflect some kind of lower bound of the true effects. Wage spillovers change the effect sizes of minimum wage introduction equally for both migrants and natives. Since we control for spillover effects on the control group, which is independent of migration background in all variants, the spillover sizes should be nearly identical with respect to migration background. A non-existing wage spillover effect on the control group would increase the estimated minimum wage effect for natives from 8.7 to 13.5 ppts and for migrants from 10.2 to 14.2 ppts. Thus, the calculated spillover effects of approximately 4.8 ppts and 4.0 ppts are close to the overall effect of 4.9 ppts (Table B.13). An additional comparison of the control group with the peer group adds further support to possible wage spillover effects, as we find small differences in effect sizes. If the control group was as unaffected by the minimum wage introduction as the peer group, the minimum wage effect between these two groups should be close to zero.

3.6 Elicitation of Potential Mechanisms

3.6.1 Development of Labour Market Participation

Without specific consideration of migrant-native differences, the related literature documents employment losses primarily in marginal employment, while employment in full-time and part-time remained almost unaffected (e.g., Bonin et al., 2018; Caliendo et al., 2018; Holtemöller and Pohle, 2020). Figure 3.5 illustrates the shifts in the proportions of employment statuses by indices presented separately for migrants and natives.[42] These descriptive patterns cannot necessarily be causally attributed to the introduction of the minimum wage, although a direct influence is obvious. As in the existing literature, we find no appreciable deviations from the previous trend with respect to the share of full-time employed persons among migrants or natives (Figure 3.5, tile a). Nevertheless, there is a small dip in the share of full-time employment prior to the minimum wage introduction, compensated only by natives afterwards, but not by migrants. As a result, the gap between these two groups has widened again since 2015.

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[42] Figure B.2 in the appendix gives an overview of yearly relative changes in the proportions of employment status. SOEP data do not allow to measure absolute changes in employment.

(a) Full-time employment

(b) Part-time employment

(c) Marginal employment
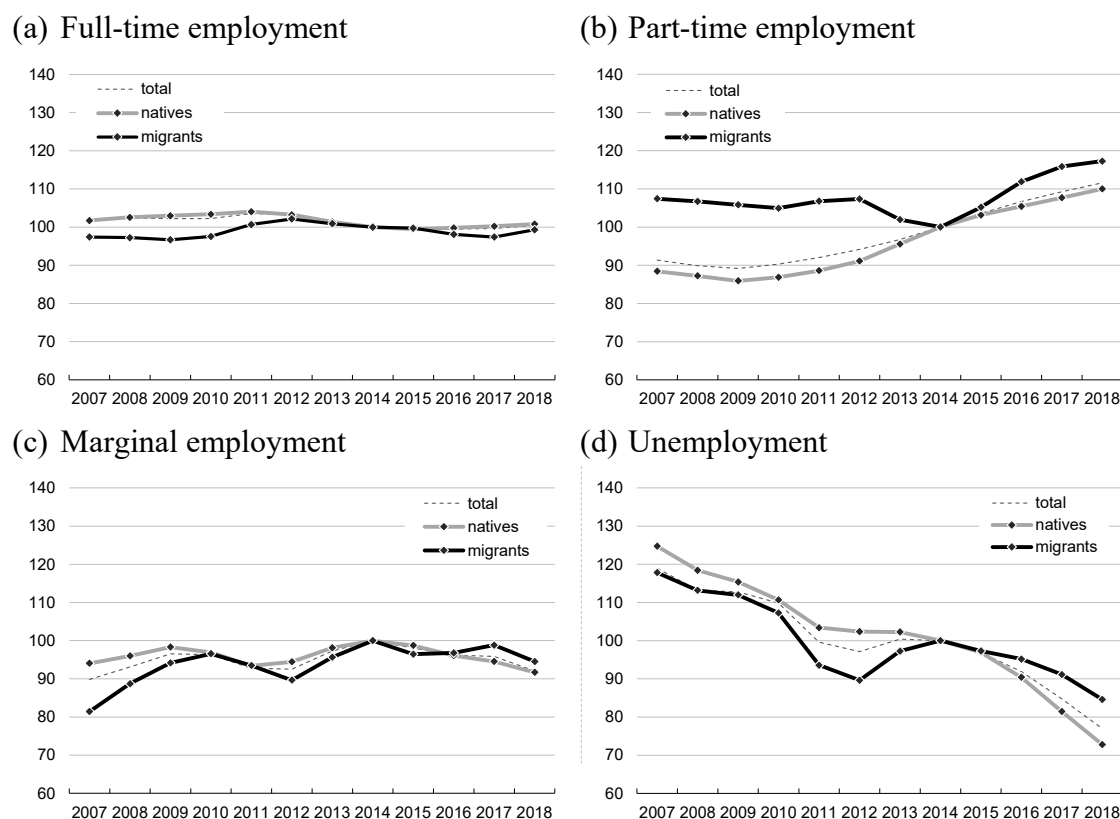
(d) Unemployment

Figure 3.5: Developments in employment status, 2007-2018

Notes: Index 2014=100. The index is smoothed with adjacent years. Self-employed, apprentices, interns, handicapped workers in sheltered workshops, and branches with industrial wage floors above the statutory minimum wage are excluded from the sample. *Source*: SOEP v36, 2007-2017. Own calculations incl. survey weights.

The average share of part-time employment has increased steadily since the economic crisis of 2008/09, mirroring the boom of the German economy for about a decade until 2019. In the years immediately preceding the minimum wage introduction in 2015, however, part-time employment among migrants experienced a brief drop (Figure B.2). During the implementation of the minimum wage, however, there was a noticeably higher growth rate in part-time employment for migrants than for natives. While the curve for natives has continued to rise unabated, the rate of increase for migrants following the introduction of the minimum wage was substantial (Figure 3.5, tile b). Related evidence shows the largest employment effects coinciding with the minimum wage introduction in marginal employment (mini-jobs). While there has been a flattening trend in the share of marginal employment before the minimum wage introduction, shares have fallen afterwards (Figure 3.5, tile c), but were less pronounced for migrants (Figure B.2). Thus, the introduction of the minimum wage did not coincide with a significant shift away from precarious employment. Nevertheless, trends tend to have slowed down. Given the slightly different

patterns of migrants and natives in marginal employment before the minimum wage introduction, it is difficult to determine to what extent migrants were more affected by the decline in mini-jobs. Based on the previous trend, however, it is plausible to perceive that the observed development would not have taken place without the introduction of minimum wages.

Finally, the share of unemployed persons has been steadily decreasing over the whole period in consideration (Figure 3.5, tile d). The drop in the unemployment share after the introduction of the minimum wage introduction, however, has not been as pronounced for migrants as it has been for natives. While the unemployment rate among natives has fallen sharply, it has declined only slightly among migrants (Figure B.2). This may be interpreted as an indication that natives have been less affected by job losses after the introduction of the minimum wage than migrants. Moreover, it supports the theoretical argument of intensified competition of the least productive (see Section 3.2). While part-time employment among migrants has increased at an above-average rate, full-time employment has declined more sharply, and the rates of mini-jobs and unemployment have fallen less substantially. Given all the reported patterns, the evidence suggests a worsened labour market position of migrants relative to natives with – or even due to – the introduction of the minimum wage.

3.6.2 Changes in the Wage Distribution

The introduction of the minimum wage implied above-average wage increases at the lower end of the wage distribution and further wage spillover effects into higher wage cohorts (see Section 3.5.4). Among low-wage earners, the share of migrants is disproportionately large. Accordingly, this group of workers should have received strong increases due to the minimum wage. To allow an understanding of the likely distributional effect, Figure 3.6 displays the ratios between the 10th, 20th and 50th wage percentiles of migrant employees versus native employees (reference=1) for the years 2007 to 2017. The smaller the gap to the reference, the closer the wage percentiles of migrants and natives. After a considerable narrowing of the migrant-native wage gap at each of the three chosen deciles from 2007 to 2009, the wage differences in the 10th, 20th and 50th percentile between natives and migrants increased significantly from 2009 to 2014. A particularly high increase in wage divergence can be observed in 2013 and 2014. Just before the introduction of the minimum wage, the

differences in the wage percentiles between migrants and natives were approximately 12 to 14 % (expressed in respective shares of 0.863 to 0.873).

Directly after the minimum wage introduction wages have converged across the lower wage distribution between both groups. The strongest wage convergence is observed at the 10th wage percentile, with a divergence in 2017 of only 8 % (0.917) which mirrors the estimated causal effects from Section 3.5.1. The 20th and 50th wage percentiles also show a reduction in differences. These differences, however, started to widen again two years after the introduction of the minimum wage. The wage divergence in 2017 between migrants and natives was 11 % (0.889) at the 20th wage percentile and 13 % (0.868) at the 50th wage percentile. Thus, migrant-native wage inequality in 2017 was larger than in the period from 2009 to 2012 (Figure 3.6).
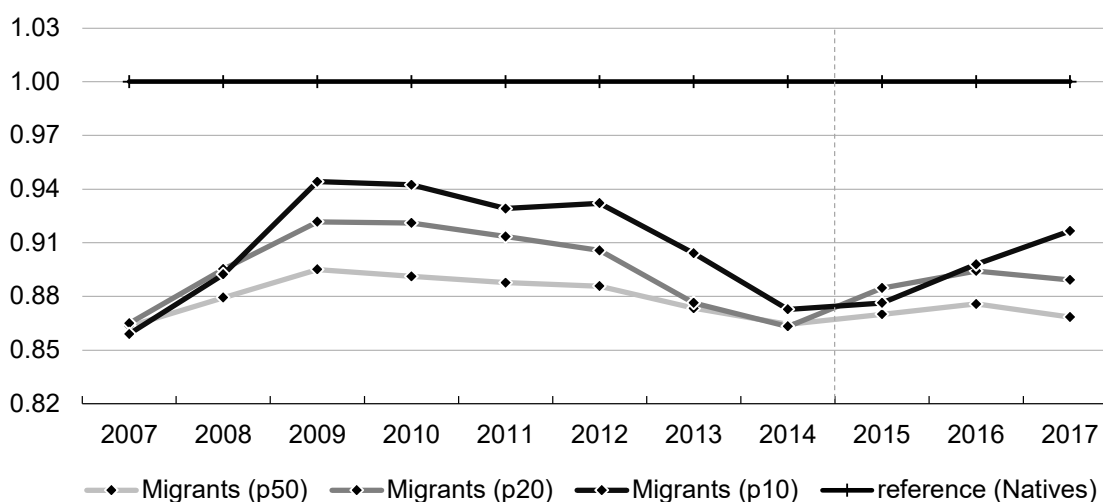
Figure 3.6: Wage convergence by selected wage percentiles, 2007-2017

Notes: The figure shows the ratio between the 10th, 20th and 50th wage percentiles of employees with a migration background to employees without a migration background (reference=1), 2017-2017. Wage ratios are smoothed with adjacent years. Self-employed, apprentices, interns, handicapped workers in sheltered workshops, and branches with industrial wage floors above the statutory minimum wage are excluded from the sample. *Source*: SOEP v36. Own calculations incl. survey weights.

The changes at the lower end of the wage distribution coinciding with the introduction of the minimum wage also had an impact on the overall wage distribution. The wage distribution of migrants has partly converged towards the wage distribution of natives. Figure 3.7 shows the deviation of the proportion of migrants within the wage deciles of natives for the periods 2012-2014 and 2015-2017.[43] For example, a deviation of 0.05 within a wage decile means that the share of migrants is 5 ppts higher than the share of natives.

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[43] Table B.14 in the appendix provides the underlying numbers for the figure.

The sum of all ten deviations is zero by definition. In the period 2012-2014, migrants over-proportionally fell into the first to third wage deciles of natives (+5.9 to +3.6 ppts). While both groups nearly corresponded to each other in the fourth to sixth wage decile (+1.0 to -1.4 ppts), migrants were strongly underrepresented in the seventh to tenth wage deciles (-2.3 to -4.6 ppts).
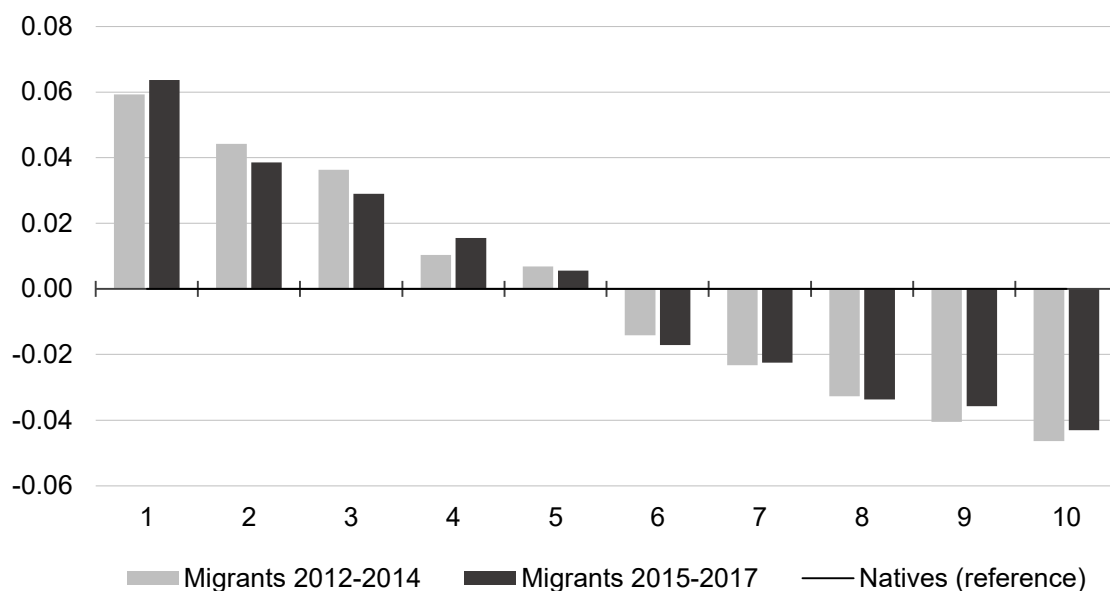
Figure 3.7: Deviation of migrants' wages by the wage deciles of natives

Notes: The figure shows the deviation of the proportion of employees with migration background within the wage deciles of employees without migration background, 2012-2014 and 2015-2017. Self-employed, apprentices, interns, handicapped workers in sheltered workshops, and branches with industrial wage floors above the statutory minimum wage are excluded from the sample. *Source*: SOEP v36. Own calculations incl. survey weights. Illustration based on Clark and Nolan (2021).

Since migrants are disproportionately overrepresented in the low-wage sector, they should have experienced more comprehensive wage increases than natives. In the period 2015-2017, however, we observe an increase in inequality in the first wage decile between natives and migrants compared to the period 2012-2014 (Figure 3.7). In the second and third wage deciles, the deviation between migrants and natives is mitigated but at the expense of the fourth wage decile. This finding indicates some wage compression slightly above minimum wage. Migrants remain strongly overrepresented in the lower wage deciles. Vice versa, their substantial underrepresentation in the higher wage deciles persisted (sixth to tenth), albeit with a slight decrease compared to 2012-2014 in the ninth and tenth wage decile (which does not result from the minimum wage introduction). In Figure B.3 in the appendix, we illustrate selected wage ratios. It gives further hints that the introduction of

the minimum wage has been accompanied by a slight wage convergence, mainly caused by wage increases in the lowest deciles.

Although not causally quantifiable, the introduction of the minimum wage led to shifts in the wage structure, thus changing the likelihood of working in the low-wage sector. We estimated linear probability models of working in the low-wage sector from 2009 to 2018 with 2014 (the year before the introduction of the minimum wage) as the reference (see Figure B.4 in the appendix). Unfortunately, the estimations lack statistical significance and should be interpreted carefully. Nevertheless, effects seem to differ for migrants and natives: For natives, the introduction of the minimum wage tended to lead to a reversal of the trend, so that with a time lag, the probability made an upward turn. Among migrants, a steady increase in the probability of working in the low-wage sector was initially observed until 2014. Immediately after the introduction of the minimum wage (2015/16), however, a significant decline in the probability becomes obvious – vice versa. Nevertheless, this potentially beneficial development is not persistent: The point estimates indicate an increase starting from 2017 onwards. A possible explanation for the negative turns for both groups could be the fact that the median wage increased more than the subsequent minimum wage raises in the first and third year (minimum wage increase) after its introduction, elevating the low-wage threshold.

3.7 Discussion

Our empirical analyses demonstrate that the introduction of the statutory minimum wage in Germany in 2015 led to excessive wage development of lower incomes and to shifts in employment status. For those covered by the minimum wage, we identified a large significant effect of 9.3 ppts on the hourly wages after two years of introduction compared to the control group (Table 3.3). Our estimated effect is thus a little higher than the findings of Dustmann et al. (2022) and Burauel et al. (2020). This difference is most likely due to a slightly different sample restriction and the use of additional control variables by Burauel et al. (2020), and the use of a different data set by Dustmann et al. (2022). Moreover, our findings reveal that there were heterogeneous effects for workers according to their ethnic background. In the two-year analysis, our preferred time horizon, the effect for migrants (10.2 ppts) exceeds those of the natives (8.7 ppts). Job cuts for lower-skilled workers may have promoted the minimum wage effect. We further observe a negative minimum wage

effect among male migrants. We assume that this could be a consequence of increased job competition above the minimum wage threshold, where migrants are at a disadvantage relative to natives. According to our estimations, the probability of remaining employed directly before the minimum wage introduction is lower for migrants than for natives. This suggests potential anticipation effects in employment relationships, which have slightly affected the estimated wage growth of migrants and natives. While no effects are discernible for migrants in the third year after introduction (1.0 ppts), they continue to be considerable for natives (7.8 ppts). One possible explanation may relate to the more positive medium-term wage trend for migrants than for natives, leading to smaller minimum wage effects for the former.

Moreover, the differences in monthly salaries between these two groups have substantially widened after the introduction of the minimum wage. This is most likely caused by a deterioration in employment status and a reduction in working hours, preventing higher hourly wages from translating into higher monthly salaries. Migrants experienced a comparatively high increase in part-time employment and, at the same time, a weaker decline in unemployment coinciding with the introduction of the minimum wage in 2015. These developments could reinforce labour market segmentation. Related to that, Butschek (2022) provides a possible explanation for why monthly salaries have fallen and unemployment rates have declined less among migrants. According to his findings, hiring standards have increased following the introduction of the minimum wage, as the 'demand for a higher quality of labour' has increased (Butschek, 2022, p. 121). Since migrants have comparatively less competitive labour market characteristics on average, this puts them in a worse position than natives when seeking employment. In the end, (too) high minimum wages – as in Germany – then protect native workers from competition with migrants with similar qualifications (Edo and Rapoport, 2019). This can also increase the wage inequality between those groups. It may further explain why the sharp decline in the number of hours worked per week is evident among migrants but not among natives.[44]

Women and low-skilled workers benefited from this clear interaction between weekly working hours and monthly salaries through rising monthly salaries. In contrast, the introduction of the minimum wage caused a decline in average working hours and monthly salaries for men and young workers. Our descriptive before-after comparison of the wage distribution confirms a growth in inequality in the lower wage deciles coinciding with the

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[44] Identified for the workforce also by Bonin et al. (2020).

introduction of the minimum wage. Taken together, our evidence points to a temporary wage convergence between migrants and natives of the previously perceptible wage divergence, due to or at least coinciding with the introduction of the minimum wage. Overall, the introduction of the minimum wage has helped to improve the hourly wage level of workers in the low-wage sector but partly at the cost of employment relationships – especially for migrants. The presented findings are thus consistent with those of Neumark et al. (2004) on minimum wage increases in the U.S.

Although not as pronounced, there is a trade-off between wage increases and potential employment losses. This raises doubts about the effectiveness of the minimum wage as an antipoverty tool. The overrepresented group of migrants benefited even less from the minimum wage, expressed by the smaller increase in monthly salary relative to the natives. Coinciding with the minimum wage introduction their share of full-time employment has declined slightly, while their share of part-time employment and unemployment has increased relative to natives. The minimum wage thus increased the hourly wage for migrant workers at the bottom of the wage distribution. At the same time, it seems to have reduced employment opportunities – at least for some of them.

Policy implications have to consider that all the results presented relate to the period of a booming German economy – both in terms of GDP and employment. The currently high inflation and the already started recession of the German economy, which is forecasted to persist during 2023, will further increase competition and make the situation even more difficult for the affected groups. Based on our findings, we expect that the rise in the statutory minimum wage in October 2022 will widen inequality at the cost of disadvantaged groups in the German labour market – and particularly so for migrants. Due to its substantially high increase from €9.82/hour (until June 2022) to €12.00/hour in October 2022, the minimum wage equals approximately 60 % of the median income in 2022. This is now a comparatively high level and will reduce the competitiveness of migrants relative to natives (see Edo and Rapoport, 2019). Given our findings on a much lower level of the minimum wage, we expect that negative effects for migrants will be exacerbated by this sharp minimum wage increase; further aggravated by the combination with the challenging general situation of the German economy as a whole. This comprises further wage divergence and a more adverse employment trend for migrants. Our analysis shows that the minimum wage – although intended as a holistic social protection measure – does not consider vulnerable groups, such as (ethnic) minorities or migrants in particular. The

intensified competitive situation can therefore lead to a reinforced allocation of workers by their productivity, which would further exacerbate labour market segregation. We therefore question whether the introduction of the "poverty-proof minimum wage" (Federal Ministry of Labour and Social Affairs, 2022) of €12.00 will be an effective means to help migrants and other minorities in the labour market. Answering this question empirically will be a task for future research.

3.8 Conclusion

We have analysed the development in wages and labour market participation of migrant and native workers in following the statutory minimum wage introduction in Germany in 2015. To the best of our knowledge, this is the first study that explicitly addresses the impact of the minimum wage introduction on migrants in Germany. We estimated the causal effect of the minimum wage introduction using a "differential trend adjusted difference-in-differences" (DTADD) approach, in which the observed wage change in the treated group is contrasted with the (counterfactual) wage change in a control group of presumably non-affected but economically similar individuals. To elicit further mechanisms and effects, we provided additional comprehensive descriptive evidence to evaluate changes in employment status and wage distribution. In combination with our causal estimates, this evidence allows to us draw a comprehensive picture of the impacts of the minimum wage on migrants.

The results of the causal effect analysis show that the introduction of the minimum wage caused different impacts on the hourly wages of natives and migrants. In the first year, the minimum wage effect for natives (9.6 %) exceeded that of migrants (8.7 %). In the second year, however, migrants in the treated group experienced considerable minimum-wage-related wage growth in the interim (10.2 %), which disappeared completely in the third year (1.0 %). Contrary to that, for natives, the effect remained high in both the second (8.7 %) and third year (7.8 %) after the introduction of the minimum. This alignment of hourly wages of migrants and natives was thus only temporary. Rising wage inequality caused by the minimum wage becomes evident from the third year after its introduction.

This widening wage inequality between migrants and natives is even more evident in terms of monthly wages. While we observe an effect-induced increase in monthly wages of 13.7 % for natives, we obtain only an insignificant effect of 6.9 % for migrants. This divergence can be attributed largely to a deterioration in migrants' employment status and

a decrease in working hours. Our complementary descriptive analyses provide indications that support the comparatively worse effects on migrants identified by our causal evaluation: The share of part-time employment among migrants has risen sharply after the introduction of the minimum wage, while the share of unemployed persons has fallen less than among native workers. In addition, the trends in full-time and marginal employment indicate a less beneficial outcome for migrants, coinciding with the minimum wage. We interpret this evidence as an indication of an increased risk of labour market segmentation in Germany due to the minimum wage, emphasizing the already pertinent labour market gaps between migrants and natives. Our evidence points to the fact that these shifts may have affected the distribution of wages. Immediately prior to the introduction of the minimum wage, we can establish a pattern of increasing divergence between migrants and natives in the lower wage deciles – at least temporally. This divergence is particularly pronounced in the 10th wage percentile, and to a smaller extent up to the 50th wage decile. Our descriptive analysis further implies a widening in the migrant-native wage gap in the first wage decile after the introduction of the minimum wage, while there is wage compression directly above the minimum wage threshold (second and third wage deciles). This descriptive finding mirrors the estimated wage spillover, affecting only parts of the wage distribution.

We emphasize that one of the main objectives of the minimum wage, the reduction of inequality, was not achieved – at least for the migrant-native inequality. Although the introduction of the minimum wage was associated with significant increases in hourly wage for earners of the lowest wages in the market, migrants benefitted from this only to a limited extent. Moreover, due to reduced weekly working hours, the increased hourly wages are not reflected in monthly salaries. Given this weaker wage development and a comparatively disadvantageous change in employment status, it is reasonable to suggest a decline in the labour market position of migrants after the minimum wage introduction of €8.50. Based on our evidence, we expect the minimum wage increase up to €12.00 in October 2022 – in combination with the current and prospective recession – to further aggravate the situation for disadvantaged groups, especially so for migrants. The substantial minimum wage increase will intensify competition between migrants and natives in Germany. Consequently, wages and employment between migrants and natives at the lower end of the wage distribution will presumably further diverge – at the cost of migrants.

Chapter 4

Workload Disparities and Their Role in the Health of Migrants and Natives in Germany [45]

with:
Stephan L. Thomsen

4.1 Introduction

Over the last more than six decades, immigrants and their children have become an important part of German society which is also reflected by a large and growing share of the labour force. However, differences remain: People with a migration background, i.e., immigrants and their descendants, still pursue, on average, occupations that demand lower qualifications, require higher physical strain, and are less well paid (Aldashev et al., 2012; Becker and Faller, 2019; Ingwersen and Thomsen, 2021; Rellstab et al., 2016). According to Aittomäki et al. (2006), workload directly contributes to socio-economic differences in health. The overall poorer health of this group may therefore relate to labour market segmentation (Becker and Faller, 2019; Brand et al., 2017; Brzoska et al., 2015). Nevertheless, there are also indications that even within the same occupation, persons with a migration background are exposed to a comparatively higher health burden (Oldenburg et al., 2010; Becker and Faller, 2019).

The population's health is important from an economic and political perspective. On the one hand, poor health and associated sickness cause different types of costs at the expense of the economy and the national budget. There are direct costs of sickness, including all expenses for healthcare and medical services. Further, the overall (health-related) economic loss of productivity – e.g., due to absenteeism or reduction of work performance – defines the indirect costs (Cottini, 2012b). And finally, so-called intangible costs describe non-monetary costs such as complaints and a general loss of quality of life (De Mello and Tiongson, 2009; Rasciute and Downward, 2010). It is therefore the government's central concern to reduce medical expenses for the treatment of diseases, the costs of sickness benefits and early retirement (RKI, 2015). On the other hand, good health contributes directly to reducing social inequalities and thus creating equal opportunities (Brzoska et al., 2015). Social inequality is also an economic problem because it weakens the economy and slows down economic growth in the long run (Islam and McGillivray, 2020). Work and working conditions are fundamental reasons for those (health) inequalities within and across generations (Burgard and Lin, 2013). For instance, as workers in precarious jobs are particularly affected by stressful working conditions that are detrimental to their health, their comparatively low pay for these jobs also limits the necessary investment in their health (Grossman, 1972; Schünemann et al., 2017). In addition to a low social status, a poorer state of health comes on top and reinforces social inequalities and segregation.

This study aims to determine whether migrants are exposed to higher workloads than native Germans even if they work in the same occupation and the same job position, and thus may have a worse health status. Given the overall poorer health of the migrant population, they might face systematic workload differences in the labour market in general. Since migrants are overproportionally found in precarious employment (Federal Statistical Office, 2019), they possess a higher risk of health, economic and social decline. Thus, it is in the interest of society and government to systematically reduce health inequalities of the population to strengthen both economic performance and social life.

To measure workload, we provide a careful description of occupations and related health complaints for migrants and native Germans in the German labour market using data from the 2012 and 2018 BIBB/BAuA Labour Force Survey. These data provide comprehensive information on individuals' health, work tasks, job requirements, and working conditions. To justify our choice of variables in the empirical model, we embed the selection into theoretical considerations. Following the literature, we model health as a durable good (initiated by Grossmann, 1972; and extended by several researchers since then) which can be consumed and invested in. In this view, consumption and investment in health are mutually dependent, and work implies health consumption but also the necessary foundation for health investment by the income earned. In this respect, besides ageing (which leads to a loss of initial health), socio-economic and work-related aspects (can) accelerate or delay this process. The individual level of health, therefore, depends on the initial health stock and the composition of these factors and their positive and negative effects. Specific population groups may differ in these three aspects. Despite the theoretical foundations, our empirical analysis allows a reduced form estimation only, where we can fix the individual environment but cannot identify the initial stock of health. We therefore estimate the influence of a wide set of occupational and socio-economic factors on individual health at work. To approximate differences in the effects of these factors, we take the two subdomains "physical health" and "mental health" into account for a more detailed consideration. While comparing migrants and natives as the main distinction, we differentiate further by gender, as men and women have different perceptions of health and workload.

Our results show a different impact of work tasks, work conditions and job requirements on the general health status of migrants and native Germans. In contrast to native Germans, the level of vocational education and job position is hardly relevant for the health of migrants, indicating unequal treatment at work. There is even a stronger heterogeneity in

the effect size between these two groups with regard to our subdomains of health. In addition to an unequal workload (health consumption), we infer that differences in general health status between migrants and native Germans may be also due to differences in health investment. The lower utilization of healthcare among migrants has been revealed in several studies (Brand et al., 2017; Klein and von dem Knesebeck, 2018). The results suggest that our theoretical model of work-related health consumption should always be interpreted in the context of health investments. Increased perceptions of workload and related health complaints among migrants may suggest that differences in workload are also due to behavioural differences or unequal perceptions of workload.

The remainder of this paper is organised as follows: Section 2 provides a short review of the literature focusing on the theoretical background. The operationalization of the theoretical model with regard to the work-related influencing factors of health is made in section 3. In section 4, the data used in the empirical analysis and selected descriptive statistics on health status and occupational characteristics are presented. The main analysis is given in section 5, presenting the empirical strategy and the main findings. The last section 6 gives a brief discussion of the results and a conclusion.

4.2   Literature Review

Individual health has played a focal role in numerous economic studies for many decades. As part of human capital, health is fundamental to being able to exert acquired qualifications optimally, exploit potential productivity and influence economic growth (see Corray, 2013). As a pioneer, Grossman (1972) drafted the first coherent economic theory of individual health behaviour. He proposed a model in which health is a durable good that can be consumed and invested in. In addition to ageing, health consumption takes place through work, leisure activities or an exhausting lifestyle. The health capital stock can be enhanced through investments in preventive healthcare, convalescence or the use of medical services (Breyer et al., 2013; Muurinen, 1982). However, consumption and investment in health are mutually dependent: While health is consumed by work, work is also required to generate income, which is necessary for health investment to maintain an adequate level of health. In that sense, physically demanding work requires a higher consumption of health. To maintain employability and productivity, health investments of the same magnitude are necessary. However, occupations with predominantly high physical demands often yield

only a small income. This implies a stronger depreciation of health capital (Cottini, 2012b; Giannoni et al., 2016; Pérez et al., 2012), as investments in health are limited by low income. Since poor health and a small income reduce the quality of life and limit social participation, people of low socio-economic status, which, e.g., migrants often possess, are particularly threatened by social decline and work-related health difficulties. Therefore, reducing health gaps within the population will lead to convergence in income distribution (Weil, 2007) and less social inequality.

However, Grossman's approach has raised questions due to the latent form of health capital. The model has thus motivated numerous researchers to provide elaborations. A recent extension is suggested by Schünemann et al. (2017), who design a model of health deficit accumulation. This model employs health depreciation over the course of a lifetime and explicitly captures gender-specific preferences and health behaviour. According to the model, it can be assumed that stressful work and working conditions lead to a greater accumulation of health impairments. While the ageing process inevitably leads to a loss of initial health, socio-economic and workplace-related factors can accelerate or delay this process. A similar approach is taken with the "Effort-Recovery Model" by Meijman and Mulder (1998), which focuses on the recovery process from work-related stress.

Empirical studies provide several health-influencing factors that directly result from work: Job tasks, special work requirements that include the working conditions, and the working climate have been shown to be relevant. According to Bellmann and Hübler (2021), however, detailed job characteristics are all too often disregarded in the empirical health literature. Thus, occupational characteristics, decision-making competence, physical effort, environmental conditions, time pressure and multitasking all influence individuals' health. In contrast, a higher wage allows individuals to take advantage of health services and preventive healthcare (Bender and Habermalz, 2008; Cottini, 2012a; Giannoni et al., 2016; Rellstab et al., 2016). Furthermore, the relationship between education and health is well depicted by Burgard and Lin (2013): Low-skilled workers are comparatively more often confronted with physically demanding jobs, which can cause both physical and psychological complaints. For well-educated people, physical demands are usually lower, however, higher educated workers are also more exposed to the risk of psychosocial stress, which – due to a high degree of permeability – also increases the risk of a negative spillover into private life (Burgard and Lin, 2013). In addition, the level of education attained not

only influences the job and the tasks to be performed but also has an indirect effect on health and risk behaviours and how to deal with stress (Bellmann and Hübler, 2021).

In the private environment, there are health-promoting but also health-endangering factors: Studies by Cottini (2012a) and Giannoni et al. (2016) show that living with a partner is positively related to health, whereas the presence of children worsens the condition due to increased load and brought in diseases.

Although the health system in Germany ensures general medical care for everyone, access is not equal for all. In particular, healthcare utilisation for migrants can be more difficult due to cultural and language barriers (Brand et al., 2017). For instance, being able to speak German, has a positive effect on health via two channels: first, access to certain occupations and, second, access to medical care (Wengler, 2011). Other reasons for divergent health investments of migrants are fundamental differences in behaviour, which are reflected in preventive healthcare or the lower frequency of visiting a doctor. Both work-related and individual factors lead to the fact that people with lower levels of education, in physically demanding jobs with lower job positions – usually people with a low social status – tend to be more exposed to a health-impairing environment. This includes in particular migrants, who are disproportionately often part of this social stratum. A relatively higher workload for an already disadvantaged group may promote health disparities as well as social inequality and segregation. Empirical analyses of Oldenburg et al. (2010) and Becker and Faller (2019) state that employees with a migration background in Germany are more frequently exposed to physical stress. Wengler (2011) confirms the worse health status of immigrants from Turkey in Germany. However, if socio-economic and individual characteristics are taken into account, the differences in health between immigrants and native Germans disappear. Hence, differences in workload and healthcare utilization between migrants and native Germans are to be expected.

4.3   Approach and Operationalization

While the available literature focuses on certain aspects, our approach is to bring together the different strands of health-influencing factors into an integrated analysis. We present a framework that depicts the relationship between workload and associated health. We examine the extent to which workplace-related stress affects individuals' health, taking relevant socio-demographic characteristics into account. The derivation of the framework

is based on findings on workload shown in the literature. Figure 4.1 shows the framework in its key references. Our empirical analysis initially focuses solely on the direction of the effect of workload on associated health. We are aware that the state of health of a person itself has an impact on the occupation and the tasks related to it. In a dynamic context, therefore, both directions of impact should be considered.

In this section, we further explain and justify each of the components of the framework and describe how they are operationalized. The type of workload is determined by the occupation performed with its tasks, requirements, and working conditions, while the strength of workload is determined by the scope of work. Moreover, socio-demographic characteristics affect the health of a working person in two ways: On the one hand, a person's socio-demographic characteristics have a significant influence on his or her occupational choice (e.g., educational level), on the other hand, these characteristics are the fundamental determinants of occupational choice and the associated workload (see Figure 4.1). As there are differences in health perception and reporting (Anson et al., 1993) and differences in workload assessment between men and women (Hancock et al., 1993), we differentiate by gender in our analyses. Women rate tasks as more demanding than their male counterparts, which is also reflected in a gender-specific attitude toward specific tasks (Hancock et al., 1993). Based on this approach, differences in workload determinants can be identified according to gender and migration background, as well as their effects on health.
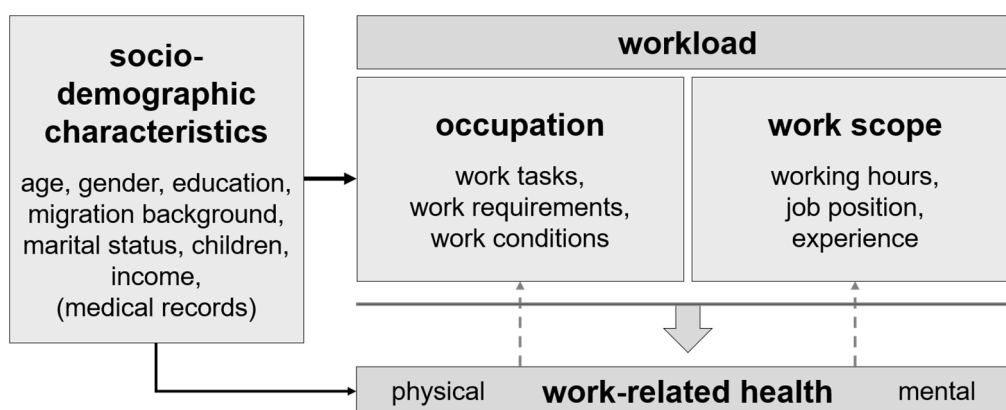
Figure 4.1: Schematic outline of the factors influencing work-related health
Source: Own illustration.

In order to transfer our approach into an empirical analysis, operationalization of the work-related determinants and health is necessary. Generally, 'health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity'

(World Health Organization, 2020). Since the individual's state of health can usually only be described indirectly by the presence of ailments or complaints and accordingly provides only a limited picture of true health, we use self-reported health of workers. Self-reporting on health is a common and validated procedure in a large number of scientific papers, see besides others Cottini (2012a, b), Dunn and Dyck (2000) or Giannoni et al. (2016). Nonetheless, population groups may assess health slightly differently, resulting in group-specific health patterns. For this reason, we will use both self-reported health status and an approach with the level of work-related complaints to allow for a comprehensive depiction of health.

Table 4.1: A comprehensive characterisation of health-related job aspects

Job requirements	*Work tasks*	*Working conditions*
Performance specifications - Prescribed work implementation - Prescribed minimum performance - work fast	**Non-routine manual** - repairing, refurbishing - entertaining, accommodating, preparing food - nursing, caring, healing - protecting, guarding, patrolling, directing traffic	**Physical activities** - Working standing up - Lifting heavy loads - Working in a stooped or kneeling position
Performance requirements - familiarize with new tasks - improve existing procedures - things you have not learned or you do not master	**Routine manual** - manufacturing, producing goods and commodities - monitoring, control of machines, plans, technical processes - transporting, storing, shipping - cleaning, removing waste, recycling	**Environmental conditions** - Smoke and dust, cold, heat, wetness, dirt, bright light or darkness, noise **Working hours** - Shift work
Repeating operations - same operations are repeated in every detail		**Workplace atmosphere** - Part of the working community - Help and support from colleagues/direct superiors
Coordination effort - strong deadline or performance pressure - disturbed or interrupted at work - keep an eye on different processes simultaneously	**Routine cognitive** - measuring, testing, quality control - purchasing, producing, selling - gathering information, investigating, documenting	**Poor information flow** - You do not receive all the information you need to carry out your job properly - Not being informed in time about far-reaching decisions, changes or plans for the future
Performance limit - push themselves to the performance limit	**Non-routine interactive** - advertising, marketing, public relations - training, instructing, teaching, educating - providing advice and information	**Self-determination** - Plan and schedule work yourself - Influence on the assigned workload - Decide when to take a break
	Non-routine analytic - organizing, planning and preparing work processes (not own) - developing, researching, constructing	

Notes: Allocation of tasks according to Spitz-Oener (2006).
Source: Federal Institute for Vocational Education and Training, BIBB (2012, 2018). Own allocation.

Furthermore, occupations differ considerably in their health demands, so a detailed consideration is essential for our empirical analysis. Kroll et al. (2011, p. 2) note that 'work-related stress results from environmental stress, physical stress, and psychological and

social stress'. We follow this distinction and subdivide the job characteristics into three central groups of factors (see Table 4.1 for an overview): (1) *work tasks* are the activities performed within the job, (2) *job requirements* depict specifications and work performance, and (3) *working conditions* describe the work environment and the working atmosphere. With regard to the "Job demands-resources model" (JD-R model) by Demerouti et al. (2001) and a special focus on psychological health problems, it is appropriate to divide working conditions into factors that put a strain on work demands (e.g., job pressure) and work resources that cushion negative influences (e.g., support and autonomy, career prospects) (Bellmann and Hübler, 2021; Pérez et al., 2012).

In the first group, we distinguish five categories of performed wo*rk tasks* according to Spitz-Oener (2006): non-routine manual, routine manual, routine cognitive, non-routine interactive and non-routine analytic (Table 4.1). The individual task composition of these five categories reflects the work activities. It therefore points to different potential health complaints; e.g., a high share of manual tasks may imply physical complaints, while being requested to perform non-routine interactive tasks may be psychologically stressful. In the second group, the *job requirements*, we separate performance from demand: Performance comprises prescribed work implementation and the minimum performance requirements. In addition, we consider whether there are increased performance requirements, such as making improvements or being confronted with new tasks. We further regard requirements that demand parallel management of different processes with a high degree of distraction (multitasking), working towards strict deadlines and performance pressure, and how often individuals have to push their performance limits at work. We assume that a high content of challenging job requirements has a negative impact on both physical and mental health. The last group comprises the *working conditions*. These include information about physical exertion and aspects of environmental influences under which work is carried out. Physically stressful work and the work environment can impact an individual physically but also psychologically. The working atmosphere constitutes an important part of the working conditions. We capture it by focusing on teamwork in the workplace, mutual support and permanent exchange of information. The degree of self-determination in the workplace is measured by the possibility of determining the workload individually (Table 4.1).

4.4   Data and Descriptive Statistics

4.4.1   Data

For the empirical analysis, we use the BIBB/BAuA Labour Force Survey provided by the Federal Institute for Vocational Education and Training (BIBB) and the Federal Institute for Occupational Safety and Health (BAuA). The survey gathers data on working conditions and requirements as well as the acquisition and exploitation of occupational knowledge in the German labour market every 6 to 7 years since 1979. The core labour force is defined as employed persons from the age of 15 years without apprentices and marginally employed persons (paid work for at least 10 hours a week). However, we have to restrict our analysis to the recent two waves of 2012 and 2018 since only these waves provide consistent information on both work characteristics and health status.[46] Each wave contains approximately 20,000 individuals, and the data sets are merged into a single database for empirical analysis.

We will examine whether there are differences in work tasks, job requirements and working conditions between migrants and native Germans within an occupation. The data provides information on citizenship and mother tongue only. We therefore define individuals' migration background according to Oldenburg et al. (2010): (1) *Foreigners* are individuals without German citizenship, whereas (2) *Germans with a migration background* have a second foreign citizenship in addition to German citizenship, or they are in possession of German citizenship but learned a foreign mother tongue during childhood. (3) *Native Germans* (or Germans without a migration background) are persons with German citizenship, and no further foreign mother tongue was learned during childhood or no second citizenship is in place. The distinction between migrants and native Germans approximates the official definition of persons with a migration background by the Federal Statistical Office (2019). A distinction between direct (first-generation) and indirect (second-generation) migration background is not possible due to the lack of information on individual migration history. As classified by the Federal Statistical Office (2019), we combine *Foreigners* and *Germans with a migration background* into *persons with a migration background* (hereafter: migrants) for further analysis. In the following analyses, only persons of labour force age (15 to 64 years) who are not employed by the military are

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[46] The data provide a subjective assessment of the work requirements, the working conditions and the individual health status.

considered. We conduct wage trimming at both ends of the hourly wage distribution by 1 % each to exclude highly incomprehensible combinations of wage and actual working time. Based on this, our estimation sample contains 38,187 observations, of which 35,364 are *native Germans* (92.6 %) and 2,823 are *migrants* (7.4 %). Relative to the official numbers, migrants are underrepresented in our data.[47] The deviations in comparison with the micro-census are compensated for by weighting factors based on the characteristics of gender, age, education, and German/non-German, among others (Federal Institute for Vocational Education and Training, 2012). Integrated survey weights minimize selection bias and correct for deviations from the previous year's micro-census, thus obtaining a representative sample of the economically active population aged 15 and over in Germany.

4.4.2   Descriptive Statistics

Health

The general health condition is reported on a 5-point Likert scale, which we reversed from poor (0), not so well (0.25), well (0.5), very good (0.75), to excellent (1) for better interpretation. Women report an overall worse state of health than men (see the lower end of Table 4.3). The overall health status is rated slightly higher by migrant men (0.584) than by native men (0.573), while it does not differ significantly between native women (0.553) and migrant women (0.545). Furthermore, information is considered on whether physical and mental health complaints have occurred during work or on working days in the last 12 months. Although the frequency of symptoms is comparable, women consistently report symptoms more often than men; and migrants consistently report symptoms more frequently than native Germans do (Figure 4.2). Only knee complaints and hearing deterioration occur more frequently among men than among women. The most common symptoms mentioned are complaints in the neck and shoulder, as well as in the lower back, general fatigue and headaches. Strong relative differences between migrants and native Germans can be found in naming physical complaints during work (as an aggregate of afflictions of the lower back, neck and shoulder, hip, arms, hands, knees, legs or feet) which occur significantly more frequently among migrants, both for women (+15 %) and men

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[47] In the years 2012 and 2018, the official share of employed *persons with a migration background* in Germany was 17.4 % respectively 21.9 % (Federal Statistical Office, 2013, 2019). In 2018, the unemployment rate of *persons with a migrations background* (5.8%) was twice as high as that of native Germans (2.6%) (Federal Statistical Office, 2019) so the share of this group in the BIBB/BAuA Labour Force Survey must inevitably be lower.

(+21 %).[48] The relative differences between migrants and native Germans are even greater for mental health problems in the form of emotional exhaustion, both for women (+19 %) and men (+27 %). The disproportionate mention of complaints by migrants compared to native Germans is also apparent in almost all other categories (see Table C.1 in the appendix).
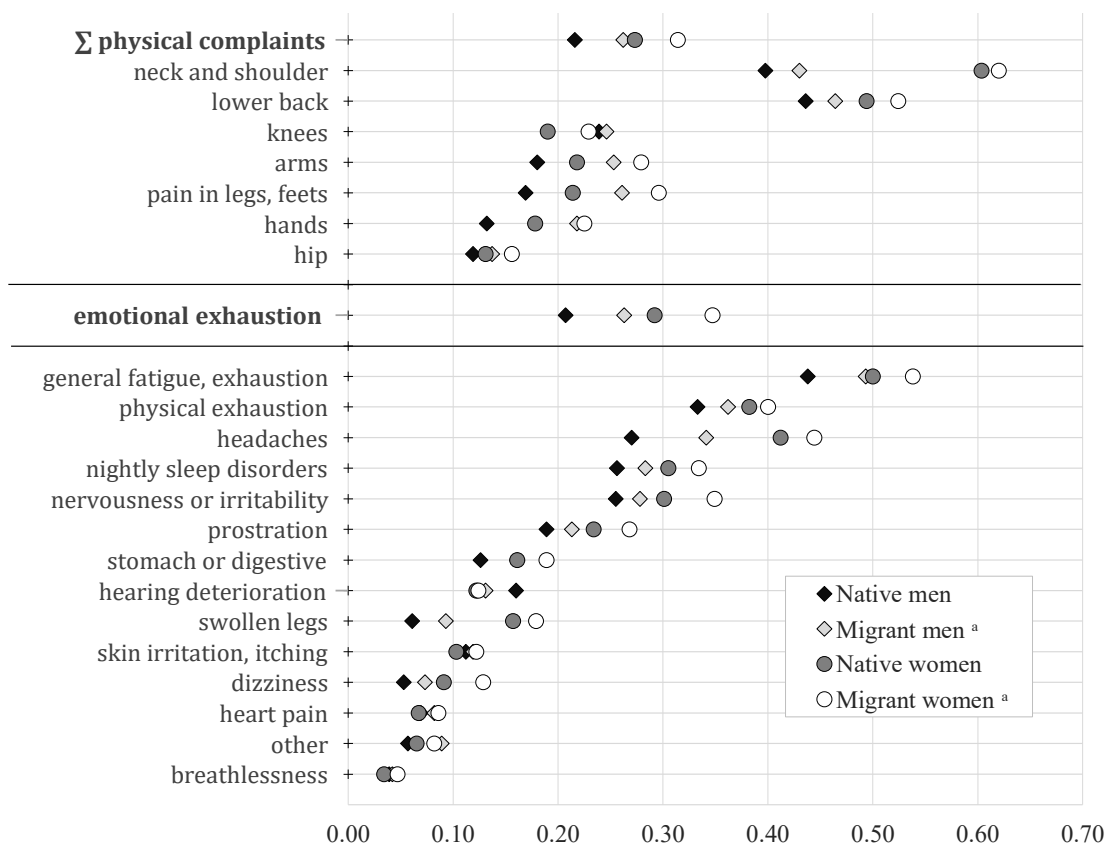
Figure 4.2: Means of physical and mental complaints by gender and migration background (2012, 2018)

Notes: Survey weights are considered to counteract sample bias. Sorted by weighted mean. Persons in labour force age only. Average number of observations: 17,020 male native Germans, 1,420 male migrants, 18,290 female native Germans, 1,390 migrant women.
Physical complaints are an aggregate of afflictions of the lower back, neck and shoulder, hip, arms, hands, knees, legs or feet (musculoskeletal disorders). Emotional exhaustion is used as a proxy for mental health.
a) Foreigners and Germans with migration background.
Source: Federal Institute for Vocational Education and Training (2012, 2018). Own calculations.

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[48] The aggregation of eight afflictions results in a discrete distribution in nine values.

Occupation

Occupations are primarily characterised by performed work tasks and required qualifications. The survey participants were asked about a number of different *tasks* and how often they perform these activities at work: frequently, sometimes or never. A task is included in the participants' job description if it is performed "frequently". The standardized values (i.e. with mean 0 and standard deviation normalized to 1) for work tasks differ between migrants and native Germans: Independent of gender, migrants carry out significantly more routine and tendentially more non-routine manual tasks as well as non-routine analytic tasks than native Germans do. In contrast, native Germans perform significantly more non-routine interactive tasks, while there were no significant differences in routine cognitive tasks (Table 4.2). These differences may point to a relatively low degree of substitutability in interactive tasks for migrants and native Germans, on average, due to different labour market-relevant skills. Potential reasons may be differences in language skills (Aldashev et al., 2009) and/or qualifications obtained abroad (Haas et al., 2013).

Table 4.2: Work-related descriptive statistics by gender and migration background (2012, 2018)

Standardized Variables	Native men	Migrant [a] men	Diff. M-N men	Native women	Migrant [a] women	Diff. M-N women
Tasks						
Non-routine manual	0.00	0.15	0.15 ***	0.05	0.14	0.09 ***
Routine manual	0.31	0.38	0.07 **	-0.01	0.01	0.02
Routine cognitive	0.00	-0.01	-0.01	-0.06	-0.08	-0.02
Non-routine interactive	-0.22	-0.28	-0.06 **	0.03	-0.12	-0.15 ***
Non-routine analytic	-0.03	0.13	0.16 ***	-0.11	-0.02	0.09 ***
Job requirements						
Quantity performance	0.05	0.25	0.20 ***	0.02	0.12	0.10 ***
Performance requirements	0.02	-0.04	-0.06 **	-0.14	-0.26	-0.12 ***
Coordination efforts	-0.07	-0.20	-0.13 ***	-0.07	-0.39	-0.32 ***
Working at performance limit	-0.02	-0.01	0.01	-0.05	-0.25	-0.20 ***
Repeating operations	-0.02	0.08	0.10 ***	0.14	0.20	0.06 **
Working conditions						
Physical activities	0.26	0.29	0.03	0.03	0.07	0.04
Environmental conditions	0.48	0.43	0.05	-0.17	-0.16	0.01
Shift work	0.13	0.29	0.16 ***	0.00	0.07	0.07 ***
Working climate	-0.01	-0.24	-0.23 ***	0.01	-0.08	-0.09 ***
Insuf. information transfer	0.05	0.05	0.00	-0.08	-0.16	-0.08 ***
Self-determination	-0.03	-0.13	-0.10 ***	-0.15	-0.19	-0.04 *
Obs.	17,046	1,427		18,318	1,396	

Notes: * p<0.1, ** p<0.05, *** p<0.01 – Survey weights are considered to counteract sample bias. Persons in the labour force age only.
a) Foreigners and Germans with a migration background.
Source: Federal Institute for Vocational Education and Training (2012, 2018). Own calculations.

We further use standardized values for *job requirements* and *working conditions* originally surveyed by 4-point Likert scales, with respondents reporting whether certain conditions occur "frequently" (4), "sometimes" (3), "rarely" (2) or "never" (1). Regarding *job requirements,* migrants are significantly more often confronted with quantity specifications, monotonous assignments and/or repetitive operations. In contrast, migrants are less often entrusted with tasks that have demanding performance requirements or a high degree of coordination and responsibility. These are even rarer for migrant women (Table 4.2). The *working conditions* of migrants and native Germans do not differ significantly in terms of physically stressful environmental influences and physical activities. This is not surprising given the high level of work safety regulations in Germany. However, migrants perform their work significantly more often in shift work. There are also clear differences in the way migrants and native Germans evaluate the workplace atmosphere. Migrants rate the working climate significantly worse in the sense that they feel less involved in the working community, and migrants are also less likely to state that they are allowed to determine their workflow (Table 4.2).[49] In view of these descriptions, there is evidence of significant differences in tasks, (perceived) requirements and (perceived) conditions at work between migrants and native Germans.

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[49] Further descriptive statistics on individual and work-related characteristics can be found in Table C.3 in the appendix.

4.5 Multivariate Analysis

4.5.1 Empirical Strategy

To empirically analyse how much the state of health can be attributed to the individual labour market situation, we specify an empirical model and regress work-related health on a set of variables characterising work tasks, work requirements, working conditions and the socio-economic situation of the individual. The theoretical considerations in section 2 imply the estimation of separate models by gender and migration background for each of our self-reported health indicators: general health (SRH), physical health (MSD), and mental health (EMX). The econometric notation used for all three indicators and model variations is the following (exemplary for SRH):

$$\boldsymbol{SRH} = \alpha + \boldsymbol{SOCIO}\beta_1 + \boldsymbol{WORK}\beta_2 + \boldsymbol{TASK}\beta_3 + \boldsymbol{REQ}\beta_4 + \boldsymbol{COND}\beta_5 + \boldsymbol{FSY}\beta_6 + \mu , \quad (4.1)$$

where $\boldsymbol{SRH}$ represents a vector of the standardized self-reported general health status. $\boldsymbol{SOCIO}$ is a matrix of socio-demographic characteristics (e.g., age, age squared, [gender], vocational education level, [migration background], marital status and the presence of children in the household). The variables contained in $\boldsymbol{WORK}$ capture the individual scope of work and occupational status: real working hours, real working hours squared, job position, hourly wage, firm size dummies (5 size categories), and occupational dummies using the German Classification of Occupations 2010 (KldB) at the 2-digit level (see Table C.2 in the appendix for further information). Based on our characterisation of job contents, we consider the three groups of factors: The matrix $\boldsymbol{TASK}$ contains five standardized task categories according to Spitz-Oener (2006). $\boldsymbol{REQ}$ represents a set of job requirements regarding different work performance specifications, while $\boldsymbol{COND}$ includes a set of the working conditions to which the employees are exposed (see section 3). The matrices $\boldsymbol{REQ}$ and $\boldsymbol{COND}$ comprise a set of standardized survey questions further compiled to standardized summary indicators. The compositions of the indicators for job requirements and working conditions are given in Table C.2 in the appendix. To take differences in the share of migrants across regions and over time into consideration, we control for federal states and survey years ($\boldsymbol{FSY}$). β_1 to β_6 denote the corresponding coefficient vectors, μ is the i.i.d. vector of the error terms. We specify the estimation models on work-related physical and mental complaints analogously. Physical complaints represent a set of musculoskeletal disorders (MSD). Mental health describes emotional exhaustion (EMX).

4.5.2 Estimation Results

a) General Health Status

Table 4.3 shows the estimation results with regard to individuals' general health status. When considering socio-economic characteristics only (specifications 1 to 4), the relationships between individual characteristics the self-reported general health status (SRH) are comparable independent of gender and migration background. In line with theory, age has the expected significant negative correlation with health, whereas a higher level of vocational education shows a strong positive correlation with health status. A partnership is also positively related to general health.

However, the addition of work attributes and controls for regional and time trends (specifications 5 to 8) mitigates the relationship between individual characteristics and health status. The statistical significance of the difference between the respective coefficients is indicated by the p-values from Chi-squared tests. The test can be used to examine if coefficients in two multivariate regression estimations differ. Based on the fact that we compare migrants and native Germans within the same occupation and socio-economic status, the influence of work-related factors on general health should be nearly the same; but obviously it is not. Individuals' age remains significant only for native Germans, which indicates that socio-demographic and work characteristics may have stronger impacts on migrants' than on native Germans' health. The level of vocational education and the job position are more conducive to health for native Germans and less for migrants. Moreover, the workers' occupational status indicates a substantial explanation for general health status only for female native Germans whereas no significant influence can be identified for the other groups. Contrasting this evidence with the theoretical models discussed above shows that our empirical findings confirm the implications of the theory only for native Germans but not for migrants. For migrants, the coefficients even have opposite signs of those for natives.

Table 4.3: Regression results on general health conditions

Ordinary least squares (OLS):	Men		Women		Men			Women		
Depended variable:	Migrant [a]	Native	Migrant [a]	Native	Migrant [a]	Native	Prob>chi2	Migrant [a]	Native	Prob>chi2
Self-reported health (z-values)	(1)	(2)	(3)	(4)	(5)	(6)	(5)/(6)	(7)	(8)	(7)/(8)
Individual characteristics										
Age	-0.047*	-0.057***	-0.047*	-0.043***	-0.026	-0.050***	0.391	-0.026	-0.034***	0.781
Age squared	0.000	0.000***	0.000	0.000***	0.000	0.000***	0.416	0.000	0.000**	0.932
Education: Vocational training	0.037	0.031	-0.032	0.207***	-0.035	-0.002	0.779	-0.137	0.127**	0.049
Education: Advanced training	0.034	0.152***	0.134	0.345***	-0.160	0.010	0.346	-0.059	0.179**	0.227
Education: University degree	0.306***	0.386***	0.330***	0.470***	-0.081	0.060	0.344	-0.117	0.208**	0.034
Partnership-Dummy	0.111	0.070***	0.097	0.107***	0.036	0.008	0.767	-0.017	0.068***	0.353
Children in the household	-0.053	0.010	-0.285***	0.015	-0.062	-0.004	0.540	-0.270***	0.002	0.005
Work characteristics										
Real working hours					-0.023	0.005	0.139	-0.048***	-0.005	0.004
Real working hours, squared					0.000	-0.000	0.330	0.001***	0.000	0.009
Job pos.: skilled worker					0.015	0.045	0.768	0.026	0.027	0.994
Job pos.: highly qualified empl.					0.022	0.099**	0.593	0.016	0.112***	0.369
Job pos.: specialist					0.270	0.085	0.393	0.622	0.115	0.092
Hourly wage					0.002	0.009***	0.225	0.011*	0.007***	0.505
Firm size, 5 categories					X	X		X	X	
KldB, 2-digit level					X	X		X	X	
Work tasks (z-values)										
Non-routine manual					-0.011	0.014	0.587	0.033	0.015	0.726
Routine manual					-0.018	0.004	0.619	-0.128**	-0.002	0.014
Routine cognitive					0.057	-0.000	0.184	0.022	-0.016	0.349
Non-routine interactive					-0.067	0.004	0.135	-0.052	0.027**	0.061
Non-routine analytic					-0.025	-0.008	0.692	0.056	0.008	0.265
Job requirements (z-values)										
Performance requirements					0.076	0.014	0.197	0.022	0.010	0.809
Repeating operations					-0.018	-0.033***	0.744	-0.050	-0.016	0.416
Coordination efforts					-0.027	-0.044***	0.701	-0.094**	-0.019	0.123
Quantity performance					0.017	-0.008	0.537	-0.029	-0.019	0.843
Working at performance limit					-0.072*	-0.108***	0.380	-0.102**	-0.148***	0.361
Working conditions (z-values)										
Physical activities					0.011	-0.019	0.589	-0.075	-0.071***	0.995
Environmental conditions					-0.134**	-0.077***	0.282	0.005	-0.115***	0.063
Shift work					-0.059*	0.012	0.021	-0.012	0.003	0.687
Working climate					0.114***	0.122***	0.836	0.078**	0.120***	0.237
Insuf. information transfer					-0.078**	-0.093***	0.684	-0.023	-0.076***	0.215
Self-determination					0.125***	0.081***	0.315	0.038	0.053***	0.726
Control										
Federal states					X	X		X	X	
Survey years					X	X		X	X	
Constant	1.309***	1.518***	1.066**	0.890***	0.826	1.260***		0.202	1.025***	
Obs.	1,416	16,953	1,387	18,227	1,122	13,915		1,078	15,249	
adj. R²	0.051	0.077	0.072	0.059	0.202	0.175		0.190	0.185	
Means										
Self-reported health (0-1)					0.584	0.573		0.545	0.553	
Self-reported health (z-values)					0.064	0.044		-0.100	-0.043	

Notes: * p<0.1, ** p<0.05, *** p<0.01 − Survey weights are considered to counteract sample bias. Persons in labour force age only.
a) Foreigners and Germans with migration background.
Source: Federal Institute for Vocational Education and Training (2012, 2018). Own calculations.

Our standardized work-related factors allow a direct comparison between the influence of *work tasks*, *work requirements* and *working conditions on the general state of health*. The estimated effects reveal notable differences in the magnitude of influence of the three central groups of work-related factors between migrants and native Germans. *With* regard to *job requirements*, we observe that working frequently at the performance limit has the strongest significant negative impact on individuals' health status of all regarded work-related factors: An increase of one standard deviation (SD) decreases the general health status by 0.07 (migrant men) to 0.15 SD (native women), on average. The strength of this impact is highly plausible, as it can negatively influence all other job requirements. Native Germans show an even stronger burden of working at the performance limit when job requirements are considered separately (Table C.4 in the appendix). Moreover, performing repeated operations is significantly stressful only for native Germans (-0.03 SD), performance requirements tend to show a positive (but not significant) relationship with health, whereas coordination efforts (0.09 SD for migrant women) and quantity performance negatively correlate with individuals' general health condition (Table 4.3). *Work tasks* have at best a small impact on health. Although not significant, the influence relating to the work tasks performed is consistently higher for migrants, indicating a higher relevance for this group Table 4.3). The more negative influence of non-routine interactive tasks on migrants' health is emphasized by the statistically significant differences (p-values of Chi-squared tests). Beyond that, if work tasks are regarded separately, it is confirmed that non-routine interactive tasks are tendentially more burdensome for migrants which might be due to language-based interactions (Table C.4 in the appendix).

According to our estimation results, *working conditions* are the group of work-related factors with the overall strongest influence on health. While we generally find little difference between the groups, working conditions appear to have a greater impact on women's health. Working in a stressful environment significantly leads to poorer health of 0.08 to 0.13 SD, except for migrant women. The results also confirm the negative association between a high level of physical burden and health status but to a lesser extent than expected. In the same way, information asymmetries approximated by insufficient information transfer within the firm are detrimental to employee health (-0.04 SD for migrant women, -0.09 SD for native men). In contrast, positive interpersonal interactions in the workplace increase the likelihood of good health. Hence, a good workplace atmosphere has the strongest positive and group-independent impact on the health of all work-related

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factors: an increase of one SD improves the general health status by between 0.08 SD (migrant women) and 0.12 SD (native Germans). This is supported by a significant positive impact of self-determination at work (from 0.04 SD for native women to 0.13 SD for migrant men) (Table 4.3). Overall, the health of native Germans seems to benefit more from their educational level and job position than that of migrants. Significant differences between migrants and native Germans are predominantly among women.

b) Physical Complaints

To allow a better understanding of whether factors affect certain subdomains of health differently, we present the results of separate models using the same specifications as in the basic model. A constituent part of general health in the labour market is *physical health*. In our case, physical complaints comprise musculoskeletal disorders – here, as an aggregate of afflictions of the lower back, neck and shoulder, hip, arms, hands, knees, legs or feet. Physical complaints during work occur comparatively more frequently among migrants than among native Germans, and women report a higher exposure than men (see Figure 4.2 above).

No less surprisingly, physical health problems are strongly promoted by physical activities (circa 0.045 SD) as well as physically stressful environmental conditions at work (0.03 to 0.07 SD). However, migrant men are more physically burdened by the environmental conditions than native Germans, whereas among women it is the exact opposite (Table C.5). Furthermore, the frequent performance of routine manual and non-routine analytic tasks promotes musculoskeletal disorders among migrants more strongly than among native Germans. While job requirements such as repeated operations place a significant health burden on native Germans, quantity performances affect the physical health of migrant men more negatively than those of native men. On the other hand, an overall good working atmosphere (indirectly) not only enhances general health conditions but also diminishes physical health problems. However, migrant women's physical health is not significantly influenced by indicators of working conditions at all. In addition, the individual skills and work characteristics of migrants transfer less to their physical health than to those of native Germans. It is noticeable that a higher job position of native Germans comes – at least in tendency – with a lower occurrence of physical health problems. Besides, among men, a higher professional degree is associated with fewer physical complaints only among native Germans, but not among migrants (Table C.5). This circumstance indicates

that the level of occupational education of migrants is less strongly reflected in their physical health than that of natives.

c) Emotional Exhaustion

Emotional exhaustion occurs comparatively more often among migrants than among native Germans, and women report a higher exposure than men (see Figure 4.2 above). With regard to the triggering factors, Table C.6 shows the estimation results of our preferred linear probability model specification for the years 2012 and 2018. The most important factor promoting emotional exhaustion in all groups is the frequent working at the performance limit: An increase of one SD raises the occurrence of emotional exhaustion by 5.4 to 8.6 ppts. At this, the psychological burden of quantity performances and performing non-routine manual tasks (for women) as well as coordination efforts and performing non-routine interactive tasks (for men) is clearly higher for migrants than for native Germans. Non-routine tasks generally seem to be more conducive to emotional exhaustion. On the other hand, a good working atmosphere significantly reduces emotional exhaustion. This positive impact is more pronounced for native Germans than for migrants (-5.7 to -6.7 ppts) and thus has an equally large but opposite impact as working at the performance limit. For migrants, the impact is only about -3 ppts. Furthermore, adverse working conditions, such as a physically stressful work environment, have a significant negative influence on mental health for all individuals (about 3 ppts), but especially for migrant women (8 ppts). In contrast, self-determined work shows no influence on the emotional exhaustion of women, but the impact is particularly strong for migrant men (-5 ppts). The major differences between migrants and native Germans in terms of impact on mental health are that a higher job position makes emotional exhaustion less likely for native Germans but not for migrants. We observe almost no impact for migrants. Overall, working conditions and job requirements seem to have less influence on the mental health of migrant women (Table C.6).

4.6 Discussion and Conclusion

This study examines the unequal workload and its role in the health status of migrants and natives in Germany by using a unique model of work tasks, job requirements and working conditions. We incorporate a detailed characterisation of work-related factors and their influence on the self-reported health of employees. The results of our conceptualized model add new and detailed empirical evidence to the established literature (Bellmann and Hübler, 2021; Burgard and Lin, 2013; Cottini, 2012a; Giannoni et al., 2016) as they show different health impacts among migrants and native Germans by gender. The circumstance that age has no significant impact on migrants' health when work characteristics are taken into account indicates an unequal health burden due to work. The plausibility of this interpretation is further strengthened by a weaker influence of the occupational education level and the job position on migrants' health compared to native Germans. This contradicts the theoretical explanations by Burgard and Lin (2013) of a decreasing health burden with higher education and occupational status and raises the issue of potentially unequal treatment of workers.

Our detailed empirical model of socio-economic and workplace characteristics is able to depict the different work-related health consumption of individuals. We contrast comparable groups within particular working circumstances, where the consumption of health should be approximately the same. Differences in the effect size of work-related factors on health between migrants and native Germans within the same delimitation indicate a different consumption of health. A possible reason for this could be the unequal treatment of migrants and native Germans in the workplace.

Differences in workload between migrants and native Germans lie predominantly in the tasks and working conditions, but less in the job requirements themselves. The health burden of the tasks performed at work is considerably more severe on the health of migrants than on native Germans. However, of all the work-related factors, the influence of working frequently at the performance limit is the most negative health burden. Its importance should not be underestimated, as it can severely affect mental and physical health in the long run if there is not enough recovery (see "Effort-Recovery Model" by Meijman and Mulder, 1998). On the other hand, with regard to the "Job demands-resources model" (Demerouti et al. 2001), the strong positive influence of working conditions should also be given equal consideration in order to preserve workers' health. The fact, that working conditions in

general have a much weaker impact on the health of migrant women could be due to their less sensitive perception of these influences.

In terms of physical health, our findings confirm that physical activities and physically stressful environmental conditions at work promote musculoskeletal disorders. In contrast to physical health, mental health is predominantly facilitated by working at the performance limit. Differences in mental health between migrants and native Germans are mainly reflected in the perception of the working climate. Our empirical results further confirm a much more susceptibility to emotional exhaustion of women, the reasons being discussed in several studies, e.g. by Posig and Kickul (2004).

Since the basic parameters in occupational health and safety as well as in healthcare are basically the same for all workers, it is therefore not necessarily possible to argue that there is an unequal burden. As migrants show an enhanced perception of workload and related health afflictions, this indicates that differences in workload may also be caused by behavioural differences or unequal perceptions of workload. Furthermore, gaps in general health status between migrants and native Germans may additionally be driven by differences in their health investments in their recovery. The lower utilization of healthcare among migrants is recognized in a number of studies. Migrants should be enabled to make greater use of health services and thus reduce the risk of social decline, for which barriers to accessing healthcare must be removed. The identified differences in health investments should be interpreted as an incentive for better communication and promotion of the use of healthcare by migrants. Differences in health status could be countered by customized company health management and adequate preventive health measures to reduce workplace stress. However, measures to improve the working conditions of migrants or other disadvantaged (ethnic) groups must not lead to overcompensation or affirmative action.

On the health consumption side, efforts should continue to reduce the burden of working at performance limits and improve the conditions of the working environment, as improvements in workload are expected to reduce socio-economic inequalities in health (Aittomäki et al., 2006). Alongside improvements in employment and working conditions and health services, there is also the general need to improve investments in human capital as a precondition to strengthen income security, social protection, and living conditions and for reducing income and health inequalities (World Health Organization, 2019).

Our empirical analysis focuses solely on the direction of the effect of workload on associated health. It is therefore necessary to refine the framework in the dynamic context

of health formation. Additional considerations may provide further explanations with regard to the heterogeneity of the groups. Comprehensive socio-economic characteristics should be included in the model, as a low socio-economic status is generally associated with lower levels of physical activity, more smoking, less healthy nutrition, and lower use of preventive health services (RKI, 2015). Moreover, additional aspects that affect health might be supplemented to the model, e.g., work engagement and work attitudes (behaviour), or health-influencing activities in the private sphere.

Chapter 5

Conclusion

This study addresses the labour market performance of immigrants in the German labour market. Migrants are an important part of the labour force in the German labour market, with a share of 26.1 % in 2021 (Federal Statistical Office, 2022). However, the labour market success of immigrants is on average considerably lower than that of natives (Bartolucci, 2014; Lehmer and Ludsteck, 2011). The causes for the lower labour market performance of immigrants compared to natives are manifold but mostly attributable to their lower human capital endowments, such as education and language skills, as well as different cognitive competence (Aldashev et al., 2012; Coulombe et al., 2014; Lang, 2005). This difference in workers' endowments is further reinforced by the limited transferability of qualifications and skills acquired in the home country and the non-recognition of vocational qualifications in Germany. Beyond differences in human capital endowments, culture and behaviour as well as prejudice and discrimination in the workplace also directly affect immigrants' labour market success (Aldashev et al., 2012; Bartolucci, 2014; Basilio et al., 2017). The consequences of a comparatively lower level of appreciation of an individual or group in the context of hiring, salary, workload, or interpersonal dealings lead to social disparities (Nolte and Hradil, 1984). Social inequality is also an economic problem as it weakens economic performance (Stiglitz, 2016).

The objective of this study was to identify unequal treatment of immigrants in the German labour market. This study has focused on three main aspects of immigrants' labour market performance. Firstly, the immigrant-native wage gap during the period from 1994 to 2015 was examined. The purpose of studying the wage gap was to reveal the extent to which wage differentials between immigrants and natives were due to differences in endowments and whether there may have been a pay disadvantage. A detailed decomposition of the wage gap was performed using unconditional quantile regression models by employing a regression of the (recentered) influence function (RIF) of gross

hourly wages (Chapter 2). The investigation of the wage gap between immigrants and natives was followed by an evaluation of the introduction of the minimum wage in 2015. The question was whether the minimum wage introduction was able to improve the labour market situation of immigrants. For this purpose, a "differential trend adjusted difference-in-differences estimator" (DTADD) was used to estimate the causal effects of the introduction of the minimum wage with regard to hourly wages, working hours, and monthly wages. The results were completed with descriptive analyses regarding changes in employment status and wage distribution (Chapter 3). Finally, to trace unequal treatment in the workplace, an in-depth look was taken at the requirements and conditions of work within occupations. In addition to a comprehensive descriptive comparison, a self-developed framework of working conditions was used to operationalise the influence of workload on work-related health. The analyses intended to demonstrate how unequal work-related stress within specific occupations leads to health differences between immigrants and natives (Chapter 4).

The results of the three investigations demonstrate a clear disadvantage for immigrants in the German labour market due to unequal treatment. The results of the wage gap decomposition indicate a significantly growing gap, with higher wages for both foreigners (13.6 % to 17.6 %) and naturalised immigrants (10.0 % to 16.4 %) towards native Germans. The findings further show that the wage gap in the low-wage deciles can hardly be explained by differences in endowments, which is even more pronounced within immigrant subgroups, such as citizens of Turkey, citizens of the former Yugoslavia, and ethnic German repatriates. This indicates powerful disadvantages among these immigrant groups in the low-wage sector. Apart from that, new indicators make a significant contribution to explaining the immigrant-native wage gap. Cultural and economic distances each correlate strongly with wages. A lower appreciation of foreign educational qualifications, however, widens the wage gap substantially. Moreover, there is an indication of deterioration of immigrants' human capital endowments over time relative to those of native Germans.

Contrary to expectations, the introduction of the minimum wage has weakened the position of migrants in the low-wage sector compared to their native counterparts. There was an increase in part-time employment, a less pronounced decline in unemployment and a greater reduction in weekly working hours among migrants. The introduction of the minimum wage caused only a temporary convergence in hourly wages between migrants and natives, which subsequently turned into a wage divergence. Migrant men in the low-

wage sector have been particularly negatively affected by the introduction of the minimum wage. Moreover, increasing hourly wages have not translated into higher monthly salaries, thus widening wage inequality between migrants and natives.

Considering the requirements and conditions of work, migrants are more likely to perform manual tasks, with higher quantity requirements and comparatively more demanding working conditions. The empirical results show an enhanced perception of workload and related health afflictions among migrants. Working at one's performance limit has a particularly strong impact on health, which can be countered by a positive working atmosphere that is beneficial to health. Native Germans are more heavily burdened by high job requirements than migrants, both physically and mentally. However, as job-related factors show a similar influence of health status in both groups, the poorer health status of migrants might be attributed to a lower utilization of health services or an unequal perceptions of workload.

The results of the three investigations indicate that there is unequal treatment of migrants in the German labour market. To counter this unequal treatment, it is essential to strengthen migrants' competitiveness with natives in the German labour market; this can be achieved by enhancing the immigrants' integration into the market. To prevent immigrants from working in jobs below their real qualification level—which is often associated with lower wages and lower socio-economic status—early and targeted support for immigrants is necessary. Subsequent upward mobility from this disadvantageous labour market position is difficult to achieve. The integration process should be optimised to reduce labour market entry barriers for immigrants. An improvement in immigrants' labour market prospects could be achieved by adjusting vocational training, which so far has been predominantly oriented towards labour market entry rather than the activation of individual performance potential. A successful labour market entry requires selective language support, and immediate and unbureaucratic verification and recognition of vocational qualifications.

Given the demand for skilled workers in Germany, insufficient labour market integration of migrants can also be a competitive disadvantage for the country, as 'the under-usage of migrant skills raises the opportunity cost of competing internationally for those skilled individuals, adding to the economic costs of their skill wastage' (Tani, 2020, p. 52). The best possible labour market access for immigrants demands more upfront effort but also increases immigrants' labour market success as well as reduces the risk of labour market segregation and social inequality. Only once the prerequisites for successful labour market

access are in place can immigrants utilise their real performance potential. Improved recognition of achievements can also have positive effects on attitudes towards migrants, which in turn strengthens social cohesion.

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Appendix A: Chapter 2

Appendix A.1: Figures and Tables
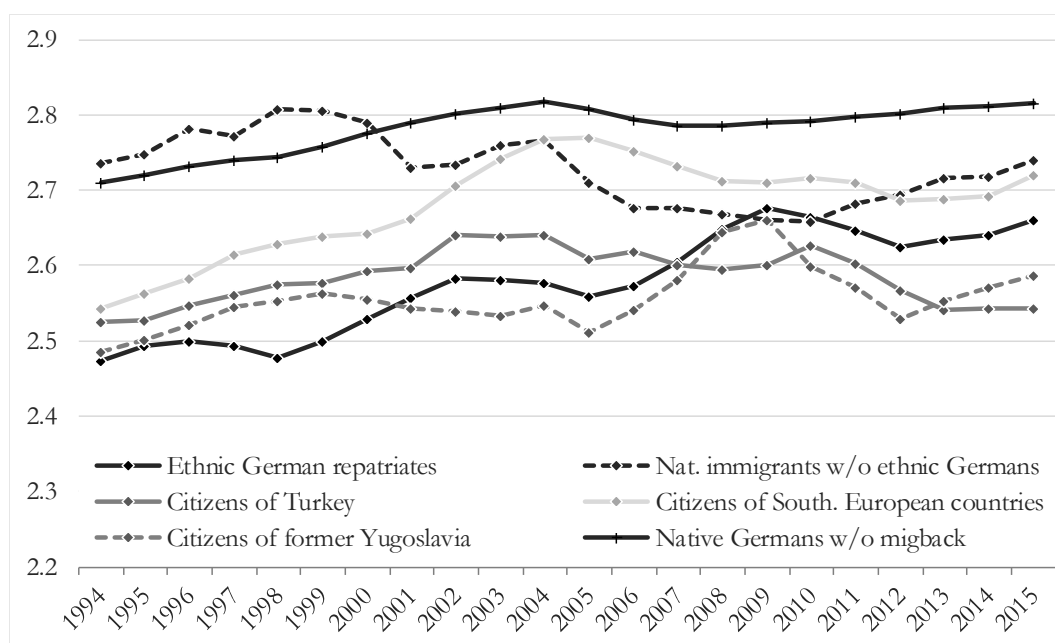
Figure A.1: Median log hourly wage by immigrant groups

Notes: Survey weights are integrated to counteract sample bias. Mean wages are smoothed with adjacent years.
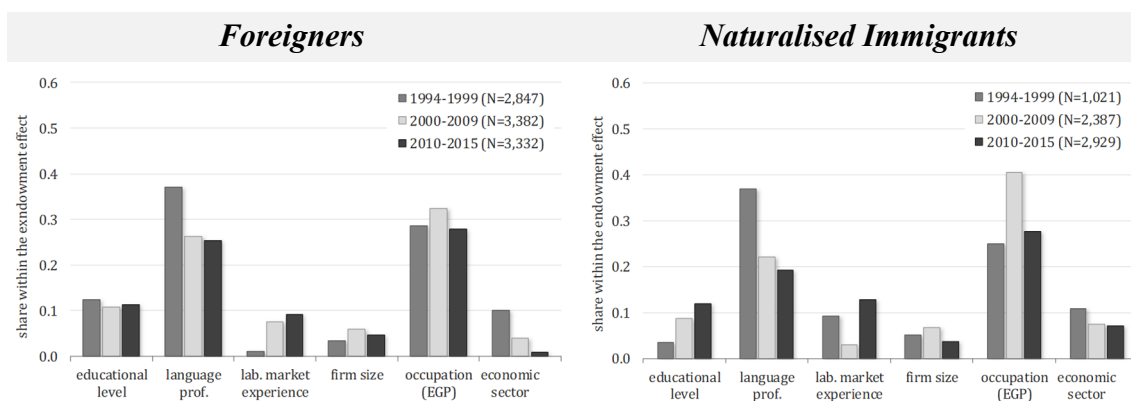
Figure A.2: Blinder-Oaxaca wage decomposition for UQR – segmentation of the endowment effect

Notes: The reference group is "Native Germans without migration background". Decompositions also include regional fixed effects, year fixed effects, regional type, regional share of foreign population, regional real GDP per capita, and regional unemployment rate. Source: SOEP (2017). Own calculations.
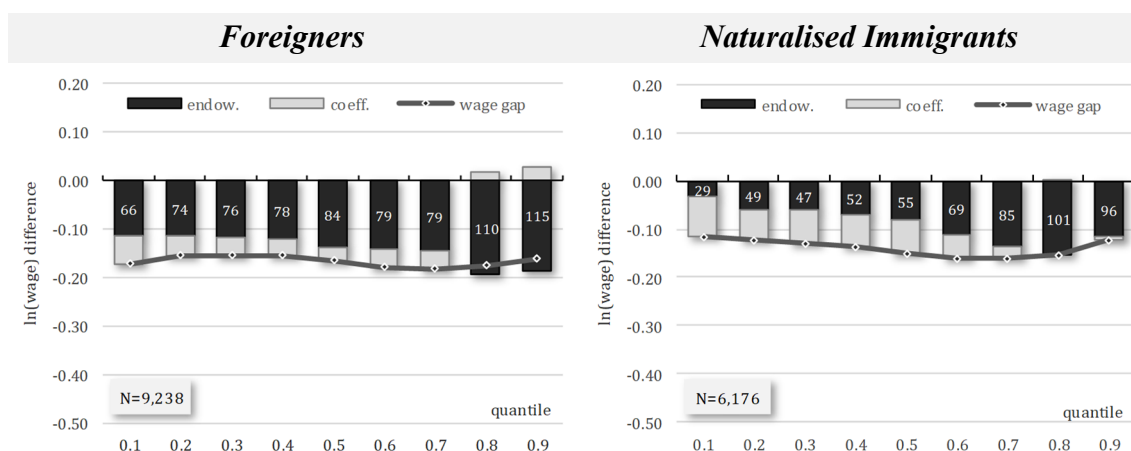
Figure A.3: Blinder-Oaxaca wage decomposition for UQR – full-time & part-time

Notes: The reference group is "Native Germans without migration background". The dark grey line shows the wage gap along the wage distribution, the dark bars represent the "endowment effect" of the wage decomposition, and the light bars show the "coefficient effect" of the wage decomposition. The numbers display the share of the endowment effect. Survey weights are considered to counteract sample bias. Covariates considered in the estimation are labour market experience, labour market experience squared, marital status, three skill levels, dummy variables for firm size, dummy variables for occupational class, dummy variables for industry, regional fixed effects, year fixed effects, regional type, regional share of foreign population, regional real GDP per capita, and regional unemployment rate. Source: SOEP (2017). Own calculations.

Figure A.4: Blinder-Oaxaca wage decomposition for UQR – Age cohorts of Foreigners

Notes: The reference group is "Native Germans without migration background". The dark grey line shows the wage gap along the wage distribution, the dark bars represent the "endowment effect" of the wage decomposition, and the light bars show the "coefficient effect" of the wage decomposition. The numbers display the share of the endowment effect. Survey weights are considered to counteract sample bias. Covariates considered in the estimation are labour market experience, labour market experience squared, marital status, three skill levels, German writing skills, dummy variables for firm size, dummy variables for occupational class, dummy variables for industry, regional fixed effects, year fixed effects, regional type, regional share of foreign population, regional real GDP per capita, and regional unemployment rate. We exclude *Foreigners* who immigrated in the later course. Source: SOEP (2017). Own calculations.

Figure A.5: Blinder-Oaxaca wage decomposition for UQR – Age cohorts of Naturalised Immigrants

Notes: The reference group is "Native Germans without migration background". The dark grey line shows the wage gap along the wage distribution, the dark bars represent the "endowment effect" of the wage decomposition, and the light bars show the "coefficient effect" of the wage decomposition. The numbers display the share of the endowment effect. Survey weights are considered to counteract sample bias. Covariates considered in the estimation are labour market experience, labour market experience squared, marital status, three skill levels, German writing skills, dummy variables for firm size, dummy variables for occupational class, dummy variables for industry, regional fixed effects, year fixed effects, regional type, regional share of foreign population, regional real GDP per capita, and regional unemployment rate. We exclude *Foreigners* who immigrated in the later course. Source: SOEP (2017). Own calculations.

Table A.1: Description of defined variables

variable lable	variable explanation
log(wage)	Gross wages per month divided by real working hours per week; extrapolated to monthly hours (365.25 days/year = 30.44 days/month = 4.35 weeks/month)
time of residence	"year of survey" minus "year of immigration" to Germany.
age	"year of survey" minus "year of birth".
labour market experience	Labour market experience "full time" + 0.625*labour market experience "part time". Part-time generally can be divided into "near to full-time" (ca. 30h/week) and "far from full-time" (ca. 20h/week).
cohabitation	Dummy: 0=living without partner, 1=living in a partnership
low-skilled	CASMIN educational classification: (1a) inadequately completed, (1b) general elementary school, (1c) basic vocational qualification, (2b) intermediate general qualification
medium-skilled	CASMIN educational classification: (2a) intermediate vocational qualification, (2c_gen) general maturity certificate, (2c_voc) vocational maturity certificate, (3a) lower tertiary education
high-skilled	CASMIN educational classification: (3b) higher tertiary education
education abroad	Vocational degree or school-leaving degree outside Germany
German writing skills	Self-assessment of the writing skills for non-native Germans via scores from 1 (not at all) to 5 (very good). The survey of language proficiency is implemented every two years between 1984 and 2005, and annually since 2006. The missing years estimated by linear interpolation therefore comprise about 30 %.
Cultural distance	Adopted by Kaasa et al. (2016) and classified into five groups.
Economics distance	Distances based on per Capita GDP at constant 2010 prices in US Dollars. Logarithmic function of home country's percentage GDPpc in terms of Germany's GDPpc, each subtracted by logarithm of Germany's percentage itself
< 20 empl.	Firm with less than 20 employees
20-199 empl.	Firm with 20 to 199 employees
200-1999 empl.	Firm with 200 to 1,999 employees
> 2,000 empl.	Firm with more than 2,000 employees
job tenure	Job tenure, in years
Manufacturing	Economic sector: Manufacturing
Construction	Economic sector: Construction
Wholesale & retail trade	Economic sector: Wholesale and retail trade
Transportation & storage	Economic sector: Transportation and storage
Finance, insurance, real estate	Economic sector: Finance and insurance & real estate
high service	EGP-classification 2 (occupations according to social status)
low service	EGP-classification 3 (occupations according to social status)
rout. non-manual	EGP-classification 4 (occupations according to social status)
rout. services-sales	EGP-classification 5 (occupations according to social status)
skilled manual	EGP-classification 6 (occupations according to social status)
semi-/unsk. manual	EGP-classification 7 (occupations according to social status)
farm labour	EGP-classification 8 (occupations according to social status)
urban	Dummy: 1=urban region, 0=rural region
share of foreign pop.	Share of foreign population at federal state level, 31.12.
real GDPpc	Real gross domestic product per capita at federal state level, annual average (prices of 2010)
unempl. rate	Unemployment rate at federal state level, annual average

Table A.2: Number of observations by population group and years

	Natives		Nat. Immigrants		Foreigners				Total
	Native Ger. without migration backgr.	Native Ger. with migration backgr.	Ethnic German repatriates	Naturalised Immigrants without eth. Germans	Citizens of Turkey	Citizens of southern European countries	Citizens of the former Yugoslavia	Remaining Foreigners	Total
1994	1,430	86	59	52	189	204	112	16	2,148
1995	1,461	86	117	53	180	194	107	34	2,232
1996	1,439	97	122	53	155	182	90	29	2,167
1997	1,476	104	123	65	158	181	86	36	2,229
1998	1,682	104	122	65	158	178	71	35	2,415
1999	1,650	115	117	63	144	165	64	25	2,343
2000	3,158	158	186	113	188	195	75	75	4,148
2001	2,816	161	170	109	163	169	61	64	3,713
2002	2,886	172	149	113	148	136	56	67	3,727
2003	2,717	163	142	96	130	133	55	56	3,492
2004	2,546	157	141	106	117	116	50	49	3,282
2005	2,397	177	128	91	105	112	45	40	3,095
2006	2,441	190	128	86	98	90	34	37	3,104
2007	2,322	190	124	81	89	83	38	32	2,959
2008	2,145	198	116	80	85	78	29	28	2,759
2009	2,195	200	97	97	68	74	27	36	2,794
2010	3,085	311	210	176	115	100	46	93	4,136
2011	3,255	368	244	160	99	91	50	101	4,368
2012	3,046	373	232	155	91	80	52	110	4,139
2013	2,898	441	437	240	173	186	129	303	4,807
2014	2,553	377	356	197	129	158	111	235	4,116
2015	2,361	332	339	186	107	184	118	442	4,069
Total	51,959	4,560	3,859	2,437	2,889	3,089	1,506	1,943	72,242
%	71.9	6.3	5.3	3.4	4.0	4.3	2.1	2.7	100.0

The sample comprises prime-aged men in full-time employment. Source: SOEP (2017). Own calculations.

Table A.3: Means of personality (Big Five) by groups

	Native Germans without mig.back	Naturalised immigrants	Foreigners [b]	Naturalised immigrants w/o ethn. Germans	Ethnic German repatriates	Citizens of Turkey	Cit. of southern European countries	Citizens of the former Yugoslavia
Personality (Big Five)								
Openness	0.625	0.629	0.597***	0.626	0.630	0.554***	0.590***	0.630
Conscientiousness	0.834	0.852***	0.847***	0.837	0.862***	0.842	0.848**	0.870***
Extraversion	0.672	0.642***	0.685**	0.650***	0.636***	0.679	0.699***	0.672
Agreeableness	0.740	0.767***	0.740	0.737	0.786***	0.768***	0.762***	0.732
Neuroticism	0.506	0.523***	0.529***	0.523*	0.524***	0.511	0.554***	0.519
no. of obs.	20,072	1,657	1,366	656	1,101	481	437	176

a) Stars refer to t-tests conducted on the equality of means for native Germans and respective immigrant groups; significant differences are indicated at the 1 % (***), 5 % (**), and 10 % (*) levels. Survey weights are integrated to counteract sample bias.
b) *Foreigners* also include remaining foreigners who are not regarded as citizens from guest-worker countries.
Source: SOEP (2017). Own calculations.

Table A.4: Unconditional quantile regression on log wages: Native Germans

wage decile	1	2	3	4	5	6	7	8	9
labour market experience	0.031***	0.029***	0.026***	0.025***	0.027***	0.028***	0.029***	0.033***	0.036***
	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)
labour market *experience* (sq.)	-0.001***	-0.001***	-0.000***	-0.000***	-0.000***	-0.001***	-0.001***	-0.001***	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
cohabitation	0.066***	0.072***	0.071***	0.054***	0.053***	0.047***	0.050***	0.053***	0.057***
	(0.009)	(0.007)	(0.006)	(0.005)	(0.006)	(0.006)	(0.006)	(0.007)	(0.009)
education (Ref.: low-skilled)									
medium-skilled	-0.061**	-0.037**	-0.014	0.004	0.011	0.028***	0.039***	0.044***	0.067***
	(0.024)	(0.016)	(0.013)	(0.012)	(0.011)	(0.011)	(0.010)	(0.011)	(0.013)
high-skilled	0.022	0.058***	0.095***	0.126***	0.155***	0.213***	0.265***	0.3635**	0.439***
	(0.028)	(0.019)	(0.015)	(0.014)	(0.014)	(0.014)	(0.013)	(0.013)	(0.017)
German writing skills	0.181***	0.181***	0.156***	0.141***	0.145***	0.131***	0.116***	0.116***	0.082***
	(0.035)	(0.023)	(0.018)	(0.015)	(0.014)	(0.014)	(0.013)	(0.013)	(0.017)
firm size (Ref.: less than 20 employees)									
20-199 empl.	0.185***	0.148***	0.107***	0.076***	0.052***	0.038***	0.030***	0.002	-0.038***
	(0.016)	(0.011)	(0.009)	(0.008)	(0.007)	(0.007)	(0.007)	(0.009)	(0.010)
200-1999 empl.	0.257***	0.217***	0.177***	0.148***	0.117***	0.083***	0.063***	0.033***	-0.021*
	(0.016)	(0.011)	(0.009)	(0.008)	(0.008)	(0.008)	(0.008)	(0.009)	(0.011)
> 2,000 empl.	0.309***	0.272***	0.233***	0.205***	0.186***	0.158***	0.149***	0.136***	0.111***
	(0.015)	(0.011)	(0.009)	(0.008)	(0.008)	(0.008)	(0.008)	(0.009)	(0.012)
economic sector (Ref.: Manufacturing)									
Construction	0.089***	0.019	-0.023**	-0.046***	-0.072***	-0.086***	-0.082***	-0.103***	-0.092***
	(0.017)	(0.013)	(0.011)	(0.010)	(0.009)	(0.009)	(0.009)	(0.010)	(0.011)
Wholesale and retail trade	-0.178***	-0.208**	-0.196***	-0.191***	-0.206***	-0.199***	-0.190***	-0.183***	-0.158***
	(0.021)	(0.014)	(0.011)	(0.009)	(0.009)	(0.009)	(0.009)	(0.010)	(0.012)
Transportation and storage	-0.223***	-0.182***	-0.165***	-0.152***	-0.157***	-0.138***	-0.140***	-0.161**	0.168***
	(0.027)	(0.018)	(0.015)	(0.013)	(0.013)	(0.012)	(0.012)	(0.013)	(0.015)
Finance and insurance & real estate	0.066***	0.058***	0.053***	0.067***	0.078***	0.084***	0.067***	0.050***	0.053**
	(0.013)	(0.011)	(0.010)	(0.010)	(0.011)	(0.013)	(0.015)	(0.019)	(0.027)
Other	-0.053***	-0.070***	-0.069***	-0.083***	-0.103***	-0.111***	-0.128***	-0.151***	-0.163***
	(0.010)	(0.007)	(0.006)	(0.006)	(0.006)	(0.006)	(0.007)	(0.008)	(0.011)
occupational class (Ref.: semi-/unskilled manual)									
high service	0.360***	0.327***	0.304***	0.313***	0.357***	0.376***	0.375***	0.365***	0.299***
	(0.020)	(0.014)	(0.011)	(0.010)	(0.010)	(0.010)	(0.010)	(0.013)	(0.015)
low service	0.354***	0.305***	0.268***	0.259***	0.265***	0.256***	0.209***	0.162***	0.104***
	(0.020)	(0.013)	(0.011)	(0.010)	(0.009)	(0.009)	(0.009)	(0.011)	(0.013)
rout. non-manual	0.047	0.102***	0.116***	0.133***	0.161***	0.164***	0.166***	0.172***	0.166***
	(0.039)	(0.025)	(0.019)	(0.017)	(0.016)	(0.016)	(0.016)	(0.019)	(0.025)
rout. services-sales	0.246***	0.186***	0.151***	0.133***	0.133***	0.129***	0.115***	0.096***	0.058***
	(0.023)	(0.015)	(0.012)	(0.011)	(0.010)	(0.010)	(0.010)	(0.011)	(0.013)
skilled manual	0.284***	0.172***	0.129***	0.099***	0.087***	0.066***	0.023***	-0.020**	-0.045***
	(0.018)	(0.013)	(0.010)	(0.009)	(0.008)	(0.008)	(0.007)	(0.008)	(0.009)
farm labour	-0.028	-0.011	-0.050	-0.052**	-0.021	0.014	0.045**	0.051**	0.036***
	(0.065)	(0.042)	(0.032)	(0.024)	(0.021)	(0.019)	(0.019)	(0.021)	(0.014)
regional characteristics									
urban	0.040***	0.035***	0.037***	0.046***	0.049***	0.050***	0.037***	0.050***	0.053***
	(0.012)	(0.008)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.008)	(0.010)
share of foreign pop.	-0.016	0.001	0.007	0.010*	0.013**	0.011*	0.009	0.002	-0.005
	(0.010)	(0.007)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.007)	(0.009)
unempl. rate	0.015*	-0.001	-0.011**	-0.007	-0.003	-0.001	0.001	0.009	0.011
	(0.009)	(0.006)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.006)	(0.008)
real GDP p.c.	-0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
constant	1.468***	1.571***	1.795***	1.846***	1.810***	1.841***	2.029***	2.011***	2.131***
	(0.261)	(0.192)	(0.163)	(0.150)	(0.152)	(0.155)	(0.160)	(0.186)	(0.243)
no. of obs.	51,390	51,390	51,390	51,390	51,390	51,390	51,390	51,390	51,390
R^2	0.14	0.21	0.25	0.27	0.29	0.30	0.28	0.24	0.16

Displayed are coefficient estimates and estimated standard errors in parentheses below. Significant differences are indicated at the 1 % (***), 5 % (**), and 10 % (*) levels. The model is estimated by pooled OLS for the years 1994-2015. Additional regressors are year dummies and regional fixed effects. See text for further details. Survey weights are integrated to counteract sample bias. Source: SOEP (2017). Own calculations.

Table A.5: Unconditional quantile regression on log wages: Naturalised Immigrants

wage decile	1	2	3	4	5	6	7	8	9
labour market experience	0.009	0.015***	0.018***	0.018***	0.019***	0.023***	0.024***	0.042***	0.046***
	(0.005)	(0.005)	(0.004)	(0.003)	(0.003)	(0.003)	(0.004)	(0.005)	(0.005)
labour market experience (sq.)	-0.000	-0.000**	-0.000***	-0.000***	-0.000***	-0.000***	-0.000***	-0.001***	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
cohabitation	0.119***	0.094***	0.043**	0.047**	0.022	0.034*	0.043**	0.059**	0.016
	(0.034)	(0.028)	(0.021)	(0.018)	(0.017)	(0.019)	(0.020)	(0.027)	(0.035)
education (Ref.: low-skilled)									
medium-skilled	0.0733***	0.030	0.061***	0.055**	0.064***	0.084***	0.081***	0.121***	0.059**
	(0.026)	(0.022)	(0.017)	(0.015)	(0.015)	(0.017)	(0.018)	(0.026)	(0.028)
high-skilled	0.109***	0.058*	0.060***	0.085***	0.109***	0.130***	0.159***	0.2871***	0.386***
	(0.033)	(0.030)	(0.022)	(0.021)	(0.020)	(0.024)	(0.027)	(0.039)	(0.056)
German writing skills	0.023*	0.022*	0.014*	0.024***	0.020***	0.033***	0.037***	0.046***	0.034***
	(0.011)	(0.010)	(0.007)	(0.006)	(0.006)	(0.006)	(0.006)	(0.008)	(0.009)
firm size (Ref.: less than 20 employees)									
20-199 empl.	0.029	0.032	0.43*	0.059***	0.068***	0.053***	0.015	-0.000	-0.023
	(0.036)	(0.032)	(0.024)	(0.021)	(0.018)	(0.019)	(0.018)	(0.025)	(0.027)
200-1999 empl.	0.101***	0.165***	0.165***	0.179***	0.182***	0.163***	0.117***	0.078***	-0.005
	(0.034)	(0.030)	(0.023)	(0.020)	(0.019)	(0.021)	(0.022)	(0.030)	(0.033)
> 2,000 empl.	0.086**	0.156***	0.176***	0.213***	0.240***	0.251***	0.256***	0.357***	0.290***
	(0.039)	(0.032)	(0.025)	(0.022)	(0.021)	(0.023)	(0.024)	(0.035)	(0.046)
economic sector (Ref.: Manufacturing)									
Construction	0.066*	0.053	0.016	0.000	-0.007	-0.026	-0.069***	-0.091***	-0.117***
	(0.037)	(0.036)	(0.029)	(0.026)	(0.023)	(0.023)	(0.022)	(0.028)	(0.025)
Wholesale and retail trade	-0.155***	-0.197***	-0.131***	-0.101***	-0.123***	-0.131***	-0.148***	-0.193***	-0.197***
	(0.047)	(0.044)	(0.032)	(0.027)	(0.023)	(0.026)	(0.028)	(0.038)	(0.034)
Transportation and storage	-0.188***	-0.199***	-0.176***	-0.168***	-0.140***	-0.126***	-0.136***	-0.133***	-0.086**
	(0.060)	(0.043)	(0.031)	(0.028)	(0.026)	(0.029)	(0.028)	(0.039)	(0.042)
Finance and insurance & real estate	-0.041	0.031	0.044	0.081***	0.078**	0.124***	0.101	-0.070	-0.052
	(0.050)	(0.040)	(0.032)	(0.030)	(0.031)	(0.044)	(0.064)	(0.103)	(0.124)
Other	-0.109***	-0.076***	-0.044**	-0.031*	-0.039**	-0.060***	-0.071***	-0.112***	-0.132***
	(0.032)	(0.027)	(0.020)	(0.019)	(0.018)	(0.021)	(0.022)	(0.030)	(0.037)
occupational class (Ref.: semi-/unskilled manual)									
high service	0.234***	0.316***	0.277***	0.307***	0.351***	0.440***	0.521***	0.729***	0.711***
	(0.039)	(0.032)	(0.025)	(0.024)	(0.023)	(0.028)	(0.032)	(0.050)	(0.068)
low service	0.247***	0.282***	0.243***	0.257***	0.291***	0.323***	0.332***	0.450***	0.301***
	(0.041)	(0.036)	(0.027)	(0.025)	(0.024)	(0.028)	(0.030)	(0.044)	(0.058)
rout. non-manual	0.085	0.080	0.085	0.120***	0.199***	0.251***	0.223***	0.295***	0.243***
	(0.077)	(0.070)	(0.054)	(0.046)	(0.042)	(0.048)	(0.049)	(0.071)	(0.069)
rout. services-sales	0.179***	0.191***	0.170***	0.158***	0.202***	0.192***	0.174***	0.175**	0.057*
	(0.042)	(0.038)	(0.031)	(0.031)	(0.031)	(0.037)	(0.042)	(0.052)	(0.034)
skilled manual	0.157***	0.139***	0.104***	0.104***	0.099***	0.079***	0.069***	0.043*	0.025
	(0.032)	(0.027)	(0.020)	(0.018)	(0.016)	(0.017)	(0.017)	(0.023)	(0.024)
farm labour	-0.188	-0.233*	-0.139	-0.061	-0.084*	-0.040	-0.006	0.002	0.024
	(0.197)	(0.137)	(0.094)	(0.080)	(0.043)	(0.047)	(0.047)	(0.059)	(0.059)
regional characteristics									
urban	-0.074***	-0.017	0.064***	0.059***	0.049***	0.056***	0.027	0.016	0.067*
	(0.027)	(0.027)	(0.021)	(0.018)	(0.016)	(0.017)	(0.018)	(0.025)	(0.032)
share of foreign pop.	-0.015	-0.008	-0.010	-0.019	-0.013	-0.005	-0.008	0.010	-0.049
	(0.030)	(0.027)	(0.021)	(0.021)	(0.020)	(0.024)	(0.028)	(0.044)	(0.044)
unempl. rate	-0.025	-0.005	0.013	-0.013	-0.010	-0.013	-0.005	-0.016	0.020
	(0.024)	(0.022)	(0.016)	(0.016)	(0.014)	(0.016)	(0.017)	(0.025)	(0.031)
real GDP p.c.	-0.000	-0.000**	-0.000	-0.000	-0.000	-0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
constant	2.974***	3.128***	2.460***	2.797***	2.743***	2.745***	2.278***	1.278*	1.592*
	(0.741)	(0.636)	(0.483)	(0.459)	(0.441)	(0.525)	(0.547)	(0.734)	(0.853)
no. of obs.	6,234	6,234	6,234	6,234	6,234	6,234	6,234	6,234	6,234
R^2	0.10	0.15	0.20	0.25	0.30	0.32	0.34	0.35	0.30

Displayed are coefficient estimates and estimated standard errors in parentheses below. Significant differences are indicated at the 1 % (***), 5 % (**), and 10 % (*) levels. The model is estimated by pooled OLS for the years 1994-2015. Additional regressors are year dummies and regional fixed effects. See text for further details. Survey weights are integrated to counteract sample bias. Source: SOEP (2017). Own calculations.

Table A.6: Unconditional quantile regression on log wages: Foreigners

wage decile	1	2	3	4	5	6	7	8	9
labour market experience	0.033***	0.023***	0.020***	0.016***	0.016***	0.013***	0.015***	0.017***	0.021***
	(0.006)	(0.004)	(0.003)	(0.002)	(0.002)	(0.002)	(0.003)	(0.004)	(0.005)
labour market experience (sq.)	-0.001***	-0.000***	-0.000***	-0.000***	-0.000***	-0.000**	-0.000***	-0.000**	-0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
cohabitation	0.027	0.063***	0.055***	0.044***	0.045***	0.044***	0.018	0.021	0.115***
	(0.031)	(0.022)	(0.017)	(0.014)	(0.013)	(0.014)	(0.015)	(0.020)	(0.028)
education (Ref.: low-skilled)									
medium-skilled	0.016	0.038*	0.038*	0.050***	0.045***	0.032**	0.017	0.041*	-0.030
	(0.032)	(0.021)	(0.017)	(0.015)	(0.014)	(0.017)	(0.018)	(0.023)	(0.029)
high-skilled	0.056	0.089***	0.117***	0.105***	0.131***	0.141***	0.175***	0.264***	0.313***
	(0.040)	(0.026)	(0.020)	(0.018)	(0.018)	(0.021)	(0.026)	(0.038)	(0.060)
German writing skills	0.034***	0.035***	0.036***	0.034***	0.034***	0.035***	0.031***	0.034***	0.035***
	(0.008)	(0.006)	(0.004)	(0.004)	(0.003)	(0.004)	(0.004)	(0.006)	(0.009)
firm size (Ref.: less than 20 employees)									
20-199 empl.	0.212***	0.141***	0.115***	0.090***	0.097***	0.076***	0.074***	0.059***	-0.047*
	(0.041)	(0.027)	(0.021)	(0.017)	(0.016)	(0.016)	(0.017)	(0.021)	(0.026)
200-1999 empl.	0.286***	0.237***	0.217***	0.191***	0.196***	0.175***	0.171***	0.135***	-0.027
	(0.040)	(0.026)	(0.021)	(0.018)	(0.017)	(0.017)	(0.019)	(0.025)	(0.033)
> 2,000 empl.	0.325***	0.284***	0.268***	0.252***	0.271***	0.271***	0.280***	0.274***	0.119***
	(0.040)	(0.026)	(0.021)	(0.018)	(0.017)	(0.018)	(0.021)	(0.028)	(0.038)
economic sector (Ref.: Manufacturing)									
Construction	0.099***	0.067***	0.047**	0.012	-0.014	-0.028	-0.057***	-0.063***	-0.064*
	(0.032)	(0.026)	(0.022)	(0.019)	(0.018)	(0.019)	(0.020)	(0.024)	(0.036)
Wholesale and retail trade	-0.062	-0.042	-0.023	-0.068***	-0.048**	-0.044*	-0.079***	-0.102***	-0.129***
	(0.045)	(0.033)	(0.028)	(0.024)	(0.023)	(0.025)	(0.027)	(0.033)	(0.038)
Transportation and storage	-0.115**	-0.180***	-0.185***	-0.147***	-0.119***	-0.124***	-0.147***	-0.148***	-0.160***
	(0.057)	(0.044)	(0.033)	(0.026)	(0.023)	(0.025)	(0.028)	(0.36)	(0.043)
Finance and insurance & real estate	-0.234*	-0.106	-0.066	-0.039	0.017	-0.076	-0.149***	-0.123	0.017
	(0.128)	(0.077)	(0.057)	(0.045)	(0.044)	(0.051)	(0.058)	(0.085)	(0.162)
Other	-0.176***	-0.135***	-0.099***	-0.083***	-0.051***	-0.049***	-0.053***	-0.042*	-0.098***
	(0.031)	(0.021)	(0.016)	(0.013)	(0.013)	(0.015)	(0.018)	(0.023)	(0.033)
occupational class (Ref.: semi-/unskilled manual)									
high service	0.273***	0.286***	0.289***	0.279***	0.336***	0.387***	0.465***	0.654***	0.962***
	(0.044)	(0.029)	(0.023)	(0.020)	(0.019)	(0.024)	(0.031)	(0.046)	(0.081)
low service	0.309***	0.266***	0.246***	0.243***	0.276***	0.290***	0.340***	0.405***	0.454***
	(0.042)	(0.029)	(0.023)	(0.020)	(0.020)	(0.024)	(0.029)	(0.041)	(0.059)
rout. non-manual	0.204***	0.262***	0.289***	0.322***	0.355***	0.381***	0.426***	0.482***	0.561***
	(0.069)	(0.047)	(0.039)	(0.032)	(0.034)	(0.038)	(0.047)	(0.068)	(0.103)
rout. services-sales	0.064	0.064*	0.048*	0.069***	0.074***	0.061***	0.081***	0.076**	-0.001
	(0.056)	(0.037)	(0.027)	(0.022)	(0.021)	(0.022)	(0.024)	(0.032)	(0.035)
skilled manual	0.136***	0.157***	0.160***	0.139***	0.157***	0.141***	0.108***	0.060***	0.039**
	(0.031)	(0.021)	(0.016)	(0.013)	(0.013)	(0.013)	(0.014)	(0.017)	(0.019)
farm labour	-0.173	-0.020	-0.013	0.023	0.071	0.118**	0.092**	0.131**	0.085
	(0.163)	(0.095)	(0.065)	(0.053)	(0.051)	(0.055)	(0.040)	(0.059)	(0.064)
regional characteristics									
urban	-0.001	0.059*	0.072***	0.054***	0.043***	0.034*	0.036*	0.044*	0.040
	(0.037)	(0.026)	(0.020)	(0.017)	(0.016)	(0.018)	(0.021)	(0.026)	(0.041)
share of foreign pop.	-0.046	0.008	0.007	0.014	0.011	0.024	0.026	0.024	0.028
	(0.028)	(0.019)	(0.016)	(0.014)	(0.013)	(0.015)	(0.017)	(0.023)	(0.036)
unempl. rate	-0.026	-0.013	-0.015	-0.013	-0.022**	-0.008	-0.003	0.003	-0.057**
	(0.030)	(0.018)	(0.014)	(0.011)	(0.011)	(0.012)	(0.013)	(0.018)	(0.024)
real GDP p.c.	0.000	0.000	-0.000	-0.000	0.000	0.000	0.000*	0.000**	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
constant	1.494**	1.337***	2.013***	2.226***	2.146***	1.551***	1.293***	1.023*	2.481***
	(0.733)	(0.493)	(0.378)	(0.322)	(0.309)	(0.345)	(0.401)	(0.528)	(0.757)
no. of obs.	9,344	9,344	9,344	9,344	9,344	9,344	9,344	9,344	9,344
R^2	0.14	0.20	0.25	0.29	0.32	0.31	0.31	0.32	0.29

Displayed are coefficient estimates and estimated standard errors in parentheses below. Significant differences are indicated at the 1 % (***), 5 % (**), and 10 % (*) levels. The model is estimated by pooled OLS for the years 1994-2015. Additional regressors are year dummies and regional fixed effects. See text for further details. Survey weights are integrated to counteract sample bias. Source: SOEP (2017). Own calculations.

Table A.7: UQR-decomposition of log real gross hourly wages

MAIN GROUPS

Foreigners — No. Obs. 9,345

wage decile	1	2	3	4	5	6	7	8	9
(ln)wage: Germans	2.324***	2.487***	2.601***	2.691***	2.779***	2.867***	2.965***	3.082***	3.255***
	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)
(ln)wage: Migrants	2.169***	2.345***	2.458***	2.541***	2.617***	2.691***	2.786***	2.905***	3.100***
	(0.011)	(0.008)	(0.007)	(0.006)	(0.006)	(0.006)	(0.007)	(0.009)	(0.012)
Predicted difference	0.155***	0.141***	0.143***	0.150***	0.162***	0.176***	0.179***	0.177***	0.155***
	(0.012)	(0.008)	(0.007)	(0.006)	(0.006)	(0.006)	(0.007)	(0.009)	(0.013)
Endowment effect	0.099***	0.100***	0.110***	0.114***	0.134***	0.137***	0.145***	0.198***	0.202***
	(0.017)	(0.012)	(0.009)	(0.008)	(0.007)	(0.008)	(0.010)	(0.013)	(0.020)
	64 %	71 %	76 %	76 %	83 %	78 %	81 %	112 %	130 %
Coefficient effect	0.057**	0.042**	0.033**	0.035***	0.029**	0.039***	0.034**	-0.021	-0.047
	(0.018)	(0.013)	(0.0110)	(0.009)	(0.009)	(0.011)	(0.013)	(0.017)	(0.027)

Naturalised Immigrants — No. Obs. 6,255

wage decile	1	2	3	4	5	6	7	8	9
(ln)wage: Germans	2.324***	2.487***	2.601***	2.691***	2.779***	2.867***	2.965***	3.082***	3.255***
	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)
(ln)wage: Migrants	2.222***	2.379***	2.475***	2.557***	2.629***	2.704***	2.801***	2.924***	3.122***
	(0.010)	(0.009)	(0.007)	(0.007)	(0.007)	(0.008)	(0.008)	(0.011)	(0.014)
Predicted difference	0.102***	0.108***	0.126***	0.134***	0.150***	0.162***	0.164***	0.158***	0.133***
	(0.011)	(0.010)	(0.008)	(0.007)	(0.007)	(0.008)	(0.009)	(0.012)	(0.014)
Endowment effect	0.050***	0.065***	0.061***	0.076***	0.084***	0.114***	0.136***	0.164***	0.123***
	(0.013)	(0.012)	(0.010)	(0.009)	(0.009)	(0.010)	(0.011)	(0.017)	(0.020)
	49 %	60 %	48 %	57 %	56 %	70 %	83 %	104 %	92 %
Coefficient effect	0.052***	0.043**	0.065***	0.058***	0.066***	0.048***	0.028*	-0.006	0.011
	(0.016)	(0.015)	(0.012)	(0.011)	(0.011)	(0.012)	(0.014)	(0.021)	(0.026)

SUBGROUPS

Naturalised Immigrants without ethnic Germans										No. Obs.	2,451
wage decile	1	2	3	4	5	6	7	8	9		
(ln)wage: Germans	2.324***	2.487***	2.601***	2.691***	2.779***	2.867***	2.965***	3.082***	3.255***		
	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)		
(ln)wage: Migrants	2.251***	2.432***	2.527***	2.615***	2.716***	2.805***	2.905***	3.051***	3.228***		
	(0.019)	(0.014)	(0.012)	(0.012)	(0.013)	(0.013)	(0.014)	(0.017)	(0.019)		
Predicted difference	0.073***	0.055***	0.074***	0.076***	0.064***	0.062***	0.060***	0.030	0.0271		
	(0.020)	(0.014)	(0.013)	(0.013)	(0.014)	(0.013)	(0.014)	(0.017)	(0.019)		
Endowment effect	0.053*	0.038*	0.019	0.034*	0.031*	0.038**	0.037*	0.034	-0.027		
	(0.023)	(0.017)	(0.015)	(0.013)	(0.014)	(0.013)	(0.015)	(0.018)	(0.020)		
	72 %	69 %	26 %	45 %	49 %	60 %	61 %	112 %	-101 %		
Coefficient effect	0.021	0.017	0.054**	0.042*	0.033	0.025	0.024	-0.004	0.054*		
	(0.025)	(0.020)	(0.018)	(0.017)	(0.018)	(0.018)	(0.020)	(0.025)	(0.026)		

Ethnic German repatriates										No. Obs.	3,804
wage decile	1	2	3	4	5	6	7	8	9		
(ln)wage: Germans	2.324***	2.487***	2.601***	2.691***	2.779***	2.867***	2.965***	3.082***	3.255***		
	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)		
(ln)wage: Migrants	2.200***	2.340***	2.444***	2.521***	2.588***	2.649***	2.720***	2.814***	3.003***		
	(0.013)	(0.011)	(0.009)	(0.008)	(0.008)	(0.007)	(0.009)	(0.011)	(0.017)		
Predicted difference	0.125***	0.146**	0.157***	0.170***	0.192***	0.218***	0.245***	0.268***	0.252***		
	(0.014)	(0.012)	(0.009)	(0.009)	(0.008)	(0.008)	(0.009)	(0.011)	(0.018)		
Endowment effect	0.006	0.060**	0.072***	0.087***	0.070***	0.084***	0.133***	0.143***	0.202***		
	(0.026)	(0.021)	(0.017)	(0.016)	(0.015)	(0.015)	(0.017)	(0.020)	(0.036)		
	5 %	41 %	46 %	51 %	36 %	39 %	54 %	53 %	80 %		
Coefficient effect	0.118***	0.086***	0.085***	0.083***	0.122***	0.134***	0.112***	0.125***	0.050		
	(0.029)	(0.023)	(0.019)	(0.018)	(0.016)	(0.016)	(0.019)	(0.023)	(0.040)		

| **Citizens of Turkey** | | | | | | | | | **No. Obs.** | **2,874** |

wage decile	1	2	3	4	5	6	7	8	9
(ln)wage: Germans	2.324***	2.487***	2.601***	2.691***	2.779***	2.867***	2.965***	3.082***	3.255***
	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)
(ln)wage: Migrants	2.163***	2.337***	2.450***	2.538***	2.605***	2.671***	2.758***	2.8546**	2.950***
	(0.018)	(0.013)	(0.011)	(0.008)	(0.008)	(0.009)	(0.009)	(0.009)	(0.010)
Predicted difference	0.162***	0.150***	0.151***	0.153***	0.174***	0.196***	0.207***	0.235***	0.305***
	(0.018)	(0.013)	(0.011)	(0.009)	(0.008)	(0.009)	(0.010)	(0.010)	(0.011)
Endowment effect	-0.004	0.058	0.084*	0.078***	0.079***	0.080***	0.073***	0.086***	0.155***
	(0.047)	(0.030)	(0.025)	(0.020)	(0.019)	(0.020)	(0.022)	(0.023)	(0.029)
	-3 %	39 %	55 %	51 %	45 %	41 %	35 %	37 %	51 %
Coefficient effect	0.166***	0.092**	0.067**	0.076***	0.096***	0.116***	0.133***	0.149***	0.150***
	(0.049)	(0.031)	(0.026)	(0.021)	(0.020)	(0.021)	(0.023)	(0.026)	(0.032)

| **Citizens of southern European countries** | | | | | | | | | **No. Obs.** | **3,085** |

wage decile	1	2	3	4	5	6	7	8	9
(ln)wage: Germans	2.324***	2.487***	2.601***	2.691***	2.779***	2.867***	2.965***	3.082***	3.255***
	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)
(ln)wage: Migrants	2.294***	2.421***	2.510***	2.577***	2.647***	2.719***	2.813***	2.943***	3.115***
	(0.014)	(0.012)	(0.010)	(0.009)	(0.009)	(0.011)	(0.013)	(0.014)	(0.016)
Predicted difference	0.0305	0.066***	0.091***	0.114***	0.133***	0.148***	0.152***	0.139***	0.140***
	(0.014)	(0.012)	(0.010)	(0.009)	(0.010)	(0.011)	(0.013)	(0.014)	(0.017)
Endowment effect	0.034	0.034	0.058***	0.085***	0.089***	0.120***	0.137***	0.162***	0.141***
	(0.024)	(0.019)	(0.016)	(0.014)	(0.014)	(0.017)	(0.020)	(0.020)	(0.024)
	111 %	51 %	63 %	74 %	67 %	81 %	90 %	117 %	101 %
Coefficient effect	-0.003	0.031	0.033	0.029	0.044**	0.028	0.015	-0.023	-0.001
	(0.026)	(0.021)	(0.018)	(0.016)	(0.016)	(0.019)	(0.022)	(0.024)	(0.029)

| **Citizens of the former Yugoslavia** | | | | | | | | | **No. Obs.** | **1,478** |

wage decile	1	2	3	4	5	6	7	8	9
(ln)wage: Germans	2.324***	2.487***	2.601***	2.691***	2.779***	2.867***	2.965***	3.082***	3.255***
	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)
(ln)wage: Migrants	2.137***	2.312***	2.410***	2.492***	2.550***	2.612***	2.693***	2.779***	2.946***
	(0.029)	(0.018)	(0.015)	(0.013)	(0.011)	(0.011)	(0.012)	(0.014)	(0.024)
Predicted difference	0.188***	0.175***	0.191***	0.199***	0.229***	0.255***	0.272***	0.303***	0.309***
	(0.029)	(0.019)	(0.015)	(0.013)	(0.011)	(0.011)	(0.013)	(0.015)	(0.024)
Endowment effect	0.012	0.124**	0.118***	0.102***	0.146***	0.170***	0.215***	0.262***	0.399***
	(0.066)	(0.039)	(0.030)	(0.028)	(0.024)	(0.026)	(0.029)	(0.039)	(0.059)
	6 %	71 %	62 %	51 %	64 %	67 %	79 %	86 %	129 %
Coefficient effect	0.176*	0.051	0.073*	0.097**	0.083**	0.085**	0.057	0.0413	-0.090
	(0.072)	(0.042)	(0.033)	(0.030)	(0.026)	(0.028)	(0.031)	(0.043)	(0.068)

Reference group: Native Germans. Displayed are group's difference in (ln)wage, the explained and unexplained part of the UQR-decomposition with estimated standard errors. Significance level is indicated at the 1 % (***), 5 % (**), and 10 % (*) levels. The model is estimated by pooled decomposition for the years 1994-2015. See text for model composition. Survey weights are integrated to counteract sample bias. Source: SOEP (2017). Own calculations.

Table A.8: Decomposition of log real gross hourly wages at the mean

	Foreigners	Naturalised immigrants	Naturalised immigrants w/o ethnic Germans	Ethnic German repatriates	Citizens of Turkey	Citizens of southern European countries	Citizens of the former Yugoslavia
Mean (ln)wage: Germans	2.78***	2.78***	2.78***	2.78***	2.78***	2.78***	2.78***
Mean (ln)wage: Migrants	2.63***	2.65***	2.72***	2.59***	2.59***	2.68***	2.55***
Predicted difference	0.154***	0.130***	0.055***	0.188***	0.195***	0.107***	0.230***
Endowment effect	0.138***	0.091***	0.017*	0.147***	0.168***	0.106***	0.222***
	90 %	70 %	31 %	79 %	86 %	99 %	96 %
Coefficient effect	0.017*	0.039***	0.038***	0.040***	0.027*	0.001	0.009
	10 %	30 %	69 %	21 %	14 %	1 %	4 %
no. of obs.	60,734	57,624	53,806	55,208	54,261	54,456	52,877

Reference group: Native Germans. Displayed are group's difference in (ln)wage, the explained and unexplained part of the UQR-decomposition with estimated standard errors. Significance level is indicated at the 1 % (***), 5 % (**), and 10 % (*) levels. The model is estimated by pooled decomposition for the years 1994-2015. See text for model composition. Survey weights are integrated to counteract sample bias. Source: SOEP (2017). Own calculations.

Table A.9: Number of observations by wage deciles and immigrant groups – full sample

wage decile	1	2	3	4	5	6	7	8	9	10	SUM
Native Germans	4,576	4,572	4,669	4,599	4,607	4,804	5,005	5,415	5,415	7,227	51,390
Nat. Immigrants	1,013	965	871	768	575	574	419	376	363	310	6,234
Native Germans	4,373	4,485	4,553	4,610	4,581	4,787	5,058	5,482	6,072	7,389	51,390
Foreigners	1,652	1,385	1,345	1,083	871	768	668	563	503	506	9,344
Native Germans	4,742	4,688	4,800	4,675	4,667	4,762	4,918	5,291	5,842	7,005	51,390
N.I. w/o ethn. Ger.	330	285	273	252	215	239	178	203	221	220	2,416
Native Germans	4,622	4,600	4,721	4,586	4,606	4,751	5,020	5,341	5,948	7,195	51,390
Ethn. Ger. repatriates	702	685	605	503	381	321	231	168	141	81	3,818
Native Germans	4,637	4,659	4,719	4,621	4,617	4,715	4,930	5,300	5,980	7,212	51,390
Citizens of Turkey	511	452	465	361	277	272	234	154	89	56	2,871
Native Germans	4,759	4,675	4,755	4,603	4,654	4,742	4,959	5,294	5,847	7,102	51,390
Cit. Southern Europe	424	422	443	384	323	279	197	210	208	176	3,066
Native Germans	4,705	4,651	4,744	4,673	4,618	4,748	4,984	5,304	5,861	7,102	51,390
Cit. Form. Yugoslav.	296	248	257	188	144	113	73	79	60	29	1,487

Survey weights are integrated to counteract sample bias. Source: SOEP (2017). Own calculations.

Table A.10: Economic distances (selected countries and years)

	Country	1956	1961	1966	1971	1976	1981	1986	1991	1996	2001	2006	2011	2016
1	Turkey	-0.6	-0.6	-0.7	-0.7	-0.6	-0.7	-0.7	-0.7	-0.7	-0.7	-0.6	-0.6	-0.5
2	Greece	-0.1	-0.1	-0.2	-0.1	-0.1	-0.1	-0.2	-0.2	-0.2	-0.2	-0.2	-0.3	-0.3
3	Italy	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1
4	Spain	-0.1	-0.1	-0.2	-0.2	-0.1	-0.2	-0.2	-0.2	-0.2	-0.1	-0.1	-0.2	-0.2
5	Portugal	-0.4	-0.4	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3
6	Yugoslavia (Former)	-0.7	-0.7	-0.6	-0.6	-0.6	-0.5	-0.6	-0.7	-1.0	-0.9	-0.8	-0.8	-0.8
7	Croatia	-0.6	-0.6	-0.5	-0.5	-0.5	-0.4	-0.5	-0.6	-0.6	-0.6	-0.5	-0.5	-0.5
8	Slovenia	-0.4	-0.4	-0.3	-0.3	-0.3	-0.2	-0.3	-0.4	-0.4	-0.3	-0.2	-0.3	-0.3
9	Bosnia and Herzegovina	-1.5	-1.5	-1.5	-1.4	-1.4	-1.4	-1.4	-1.6	-1.3	-1.1	-1.0	-1.0	-0.9
10	Serbia	-0.8	-0.8	-0.8	-0.8	-0.7	-0.7	-0.7	-0.9	-1.1	-1.0	-0.9	-0.9	-0.9
11	Montenegro	-0.8	-0.7	-0.7	-0.7	-0.7	-0.6	-0.7	-0.8	-0.9	-0.9	-0.8	-0.8	-0.8
12	Kosovo	-0.9	-0.9	-0.9	-0.8	-0.8	-0.8	-0.8	-1.0	-1.2	-1.2	-1.2	-1.1	-1.1
13	TFYR of Macedonia	-1.0	-1.0	-0.9	-0.9	-0.9	-0.8	-0.9	-1.0	-1.1	-1.1	-1.0	-1.0	-0.9
14	Poland	-0.6	-0.6	-0.6	-0.6	-0.6	-0.7	-0.6	-0.8	-0.7	-0.7	-0.6	-0.5	-0.5
15	Czech Republic	-0.4	-0.4	-0.4	-0.4	-0.3	-0.3	-0.3	-0.4	-0.4	-0.4	-0.3	-0.3	-0.3
16	Slovakia	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.6	-0.6	-0.6	-0.5	-0.4	-0.4
17	Hungary	-0.6	-0.6	-0.6	-0.5	-0.5	-0.5	-0.5	-0.6	-0.6	-0.6	-0.5	-0.5	-0.5
18	Romania	-1.2	-1.1	-1.0	-0.9	-0.7	-0.7	-0.7	-0.9	-0.8	-0.9	-0.7	-0.7	-0.7
19	Republic of Moldova	-1.3	-1.2	-1.2	-1.2	-1.2	-1.1	-1.1	-1.2	-1.6	-1.6	-1.5	-1.5	-1.4
20	Eastern Europe	-0.9	-0.8	-0.8	-0.8	-0.7	-0.7	-0.7	-0.8	-0.9	-0.9	-0.8	-0.7	-0.7
21	Estonia	-0.7	-0.6	-0.6	-0.6	-0.6	-0.5	-0.5	-0.6	-0.7	-0.6	-0.4	-0.4	-0.4
22	Latvia	-0.7	-0.7	-0.6	-0.6	-0.6	-0.6	-0.5	-0.6	-0.8	-0.7	-0.5	-0.6	-0.5
23	Lithuania	-0.7	-0.7	-0.6	-0.6	-0.6	-0.6	-0.5	-0.6	-0.8	-0.7	-0.6	-0.5	-0.5
24	Russian Federation	-0.7	-0.7	-0.6	-0.6	-0.6	-0.6	-0.5	-0.6	-0.8	-0.8	-0.6	-0.6	-0.6
25	Kazakhstan	-0.9	-0.8	-0.8	-0.8	-0.8	-0.7	-0.7	-0.8	-1.0	-0.9	-0.7	-0.7	-0.6
26	Ukraine	-1.0	-0.9	-0.9	-0.9	-0.9	-0.8	-0.8	-0.9	-1.3	-1.3	-1.1	-1.1	-1.2
27	Belarus	-1.2	-1.1	-1.1	-1.1	-1.1	-1.0	-1.0	-1.0	-1.2	-1.1	-0.9	-0.8	-0.9
28	Kyrgyzstan	-1.7	-1.7	-1.6	-1.6	-1.6	-1.6	-1.5	-1.5	-1.8	-1.8	-1.7	-1.7	-1.6
29	Uzbekistan	-1.7	-1.7	-1.6	-1.6	-1.6	-1.6	-1.5	-1.5	-1.7	-1.7	-1.6	-1.5	-1.4
30	Turkmenistan	-1.1	-1.1	-1.0	-1.0	-1.0	-1.0	-0.9	-1.0	-1.2	-1.2	-1.1	-0.9	-0.8
31	Tajikistan	-1.6	-1.5	-1.5	-1.5	-1.5	-1.4	-1.4	-1.5	-2.0	-1.9	-1.8	-1.8	-1.7
32	Armenia	-1.4	-1.4	-1.3	-1.3	-1.3	-1.3	-1.2	-1.3	-1.5	-1.4	-1.1	-1.1	-1.0
33	Azerbaijan	-1.2	-1.1	-1.1	-1.1	-1.1	-1.0	-1.0	-1.0	-1.5	-1.3	-1.0	-0.9	-0.9
34	Georgia	-1.2	-1.1	-1.1	-1.1	-1.1	-1.0	-1.0	-1.1	-1.5	-1.4	-1.3	-1.2	-1.1
35	Netherlands	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.1	0.1	0.1	0.1	0.1
36	Belgium	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
37	Luxembourg	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.4	0.4	0.4	0.4
38	France	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
39	United Kingdom	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1	-0.1	0.0	0.0	0.0	-0.1	0.0
40	Austria	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
41	Switzerland	0.5	0.5	0.4	0.4	0.3	0.3	0.3	0.3	0.2	0.2	0.3	0.2	0.2
42	Denmark	0.2	0.2	0.2	0.2	0.2	0.1	0.2	0.1	0.2	0.2	0.2	0.1	0.1
43	Sweden	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.1	0.1	0.1	0.1
44	Finland	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
45	Norway	0.1	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
46	Afghanistan	-1.2	-1.2	-1.3	-1.3	-1.4	-1.5	-1.4	-1.7	-2.0	-2.0	-2.0	-1.9	-1.9
47	Iraq	-0.9	-0.9	-0.9	-0.9	-0.8	-0.8	-0.9	-1.5	-1.2	-1.0	-1.1	-1.0	-0.9
48	Syrian Arab Republic	-1.3	-1.3	-1.2	-1.2	-1.1	-1.1	-1.2	-1.3	-1.2	-1.2	-1.2	-1.2	-1.4

Source: Own calculations based on United Nations Statistics Division (2017).

Appendix A.2: Germany's History as an Immigration Country

Germany has experienced large waves of immigration in the recent past. Each of these immigration waves were based on different migration motives and altogether, they brought a great variety of cultures from different regions of origin to Germany. We distinguish between six immigration waves since the Second World War.

The **first movement** took place in the last months of the war as well as in the post-war period and was characterised by war refugees and displaced persons from Eastern Europe towards Germany. Around 12.5 million citizens from Eastern provinces of the German Reich (*Reichsdeutsche*) and ethnic Germans living in Eastern and South-Eastern Europe (Volksdeutsche) succeeded escaping to Germany's "*heartland*". A large part of another 10-12 million displaced persons residing in the Western zones at the end of 1945 were able to return to their home country until 1946 (Federal Agency for Civic Education, 2005).

The **second movement** was economically driven. Starting in the mid-1950s, West Germany (Federal Republic of Germany, FRG) experienced a strong economic boom associated with a shortage of low-skilled labour. The German Federal Government consequently initiated an immigration policy targeting the recruitment of temporary workers from Turkey, southern European and northern African countries (*Anwerbeabkommen*).

Due to an economic slowdown at the end of the 1960s and the economic crisis in the early 1970s, Germany's government imposed a recruitment ban in 1973.[50] At this time, around 2.5 million guest-workers were working in Germany (4 % of the population). Integration measures have de facto not taken place for guest-workers. The succeeding family reunification led to a reverse population movement and compensated emigration of guest-workers. This **third movement** of post-war immigration was characterised by the emigration of men and the immigration of low-skilled women and children. As a result, the labour force participation of the foreign population diminished (Federal Agency for Civic Education, 2012).[51]

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[50] After the economic boom of the 1950s, the average annual GDP growth rate in West Germany fell progressively from 8.2 % to 4.4 % (1960s), 3.1 % (1970s) and then to 2.0 % (1980s). In the early 70s and early 80s, there were even partially negative GDP growth rates (Federal Bureau of Statistics, 2017b).

[51] See Schmidt (1997) for further detailed information.
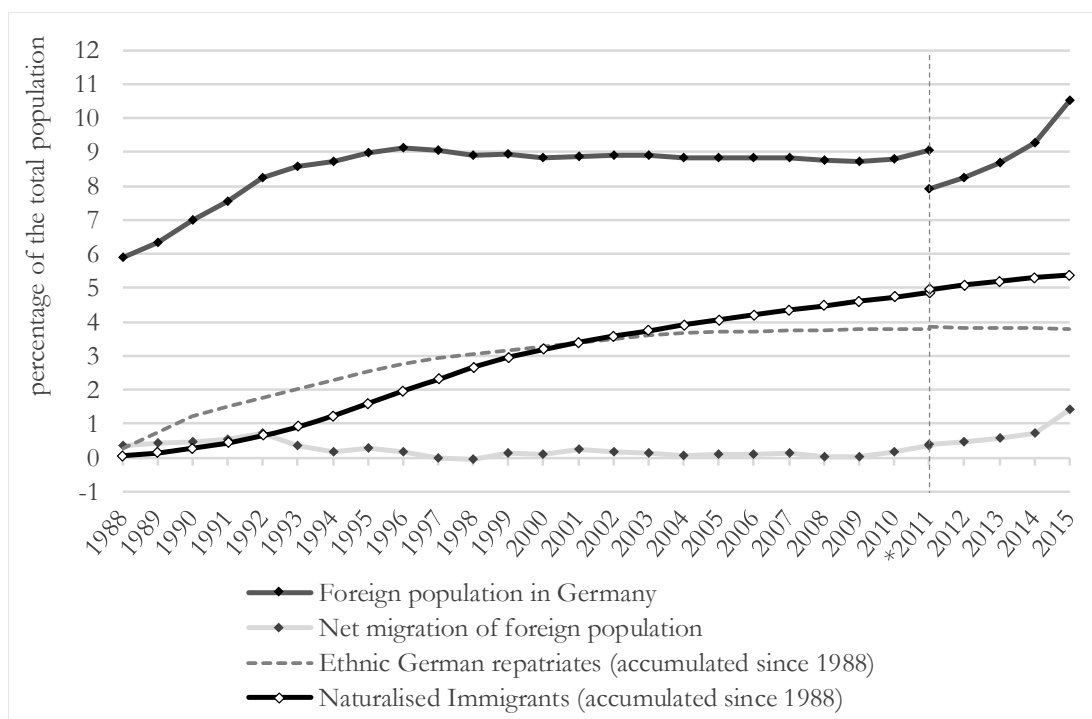
Figure A.6: Foreigners and naturalised immigrants in Germany (1988 to 2015)

Notes: * Break in series for population data from 2011 to 2015 based on 2011 census. Sources: Federal Statistical Office (2017a) and Federal Office of Administration (2017).

At the time of downfall of the Iron Curtain in 1989/1990, around 7 percent (5m) of the population living in West Germany (FRG) were people with foreign citizenship, while only 1 percent (0.2m) were registered in the German Democratic Republic (GDR). In the subsequent years, the share of foreigners in the reunited Germany increased immediately due to immigration from (South)Eastern Europe and Central Asia (**forth movement**). Figure A.6 shows immigration movements since the easing of travel restriction in 1988.[52] At the beginning of the 1990s, immigration was even stronger than at time of the highest influx of guest-workers.[53] Refugees from the first phase of Yugoslav Wars (1991-1995) caused an additional unexpected inflow of foreigners to Germany.[54] Until 1996, the number of foreigner rose by about 3 million persons since 1988/1989 so that the share of foreign population reached 9 percent (7.5m).

After the period of enormous immigration movement, the net migration of foreigners to

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[52] The unrestricted freedom of travel was introduced in Hungary on January 1st, 1988 that enticed the citizens of the GDR to escape across the Hungarian-Austrian border (German Bundestag, 2014).

[53] The net-migration reached its peak in 1993 with +600.000 persons (0.7 % of the population). In 1969 and 1970, the net-migration was +540.000 persons each (Federal Bureau of Statistics, 2017b).

[54] First phase of Yugoslav Wars: Ten-Day War in Slovenia (1991), Croatian War of Independence (1991-1995), Bosnian War (1992-1995). Second phase of Yugoslav Wars: Kosovo War (1998-1999), insurgency in the Republic of Macedonia (2001).

Germany between 1997 and 2010 was close to zero (immigration equals emigration).[55] Caused by the free movement law for citizens of the Eastern European EU member states since 2007 (**fifth movement**) and especially due a large quantity of refugees from war zones in the Middle East and African countries since 2014 (**sixth movement**), a notable inflow of foreigners again happens since 2011.[56] In this context, the share of resident foreigners in Germany rose to 10.5 percent (8.7m) in 2015 (Eurostat, 2018; Federal Statistical Office, 2017b).[57] In 2016, roughly 23.5 percent (19.5 million) of the German population had a so-called migration background, i.e., a personal migration experience or recent migration ancestry (Federal Statistical Office, 2017a).

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[55] Three possible reasons for lower net migration between 1997 and 2010 are conceivable: (1) a new German law of asylum in 1993 with e.g. the implementation of "*Drittstaatenregelung*" that reduced the number of countries of origin those citizens have a right of asylum for Germany. (2) The *Dublin Regulation* (1997) states that the responsible member state will be the state through which the asylum seeker first entered the EU. (3) High unemployment rates in Eastern Germany (15-20 %) and Western Germany (6-12 %) (Federal Bureau of Statistics, 2017b).

[56] The main regions of origin currently are war stricken countries like Syria, Afghanistan and Iraq, but also eastern EU states and non-EU countries from Balkan (Federal Bureau of Statistics, 2017b). In 2014, 2015 and 2016 overall 1.6 million refugees more immigrated from Syria, Afghanistan and Iraq to Germany than between 1994 and 2013 on average. The civil war in Syria started in 2011.

[57] Except from Luxemburg (46.7 %), only the EU-15-countries Austria (14.6 %), Belgium (11.8 %) and Ireland (11.6 %) had higher shares of foreign population than Germany in 2015 (Eurostat, 2018).

Appendix B: Chapter 3
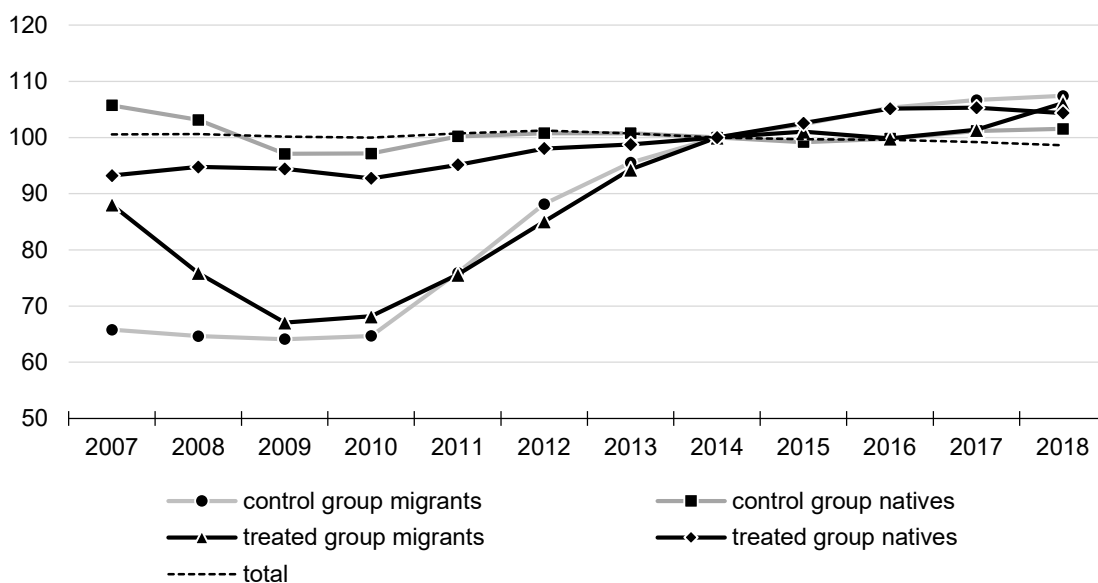
Figure B.1: Development of contractual working hours by migration background

Notes: This figure shows the development of contractual weekly working hours of the treatment and control group with regard to the migration background. Index 2014=100. Index is smoothed with adjacent years Self-employed, apprentices, interns, handicapped workers in sheltered workshops, and branches with industrial wage floors above the statutory minimum wage are excluded from the sample. Hourly wage of the treated group (<€8.50) and the control group (€8.50-10.00) in 2013/14. *Source*: SOEP v36, 2007-2017. Own calculations incl. survey weights.

(a) Full sample

full-time empl.   part-time empl.   marginal empl.   unemployed

(b) Migrants

full-time empl.   part-time empl.   marginal empl.   unemployed

(c) Natives

full-time empl.   part-time empl.   marginal empl.   unemployed
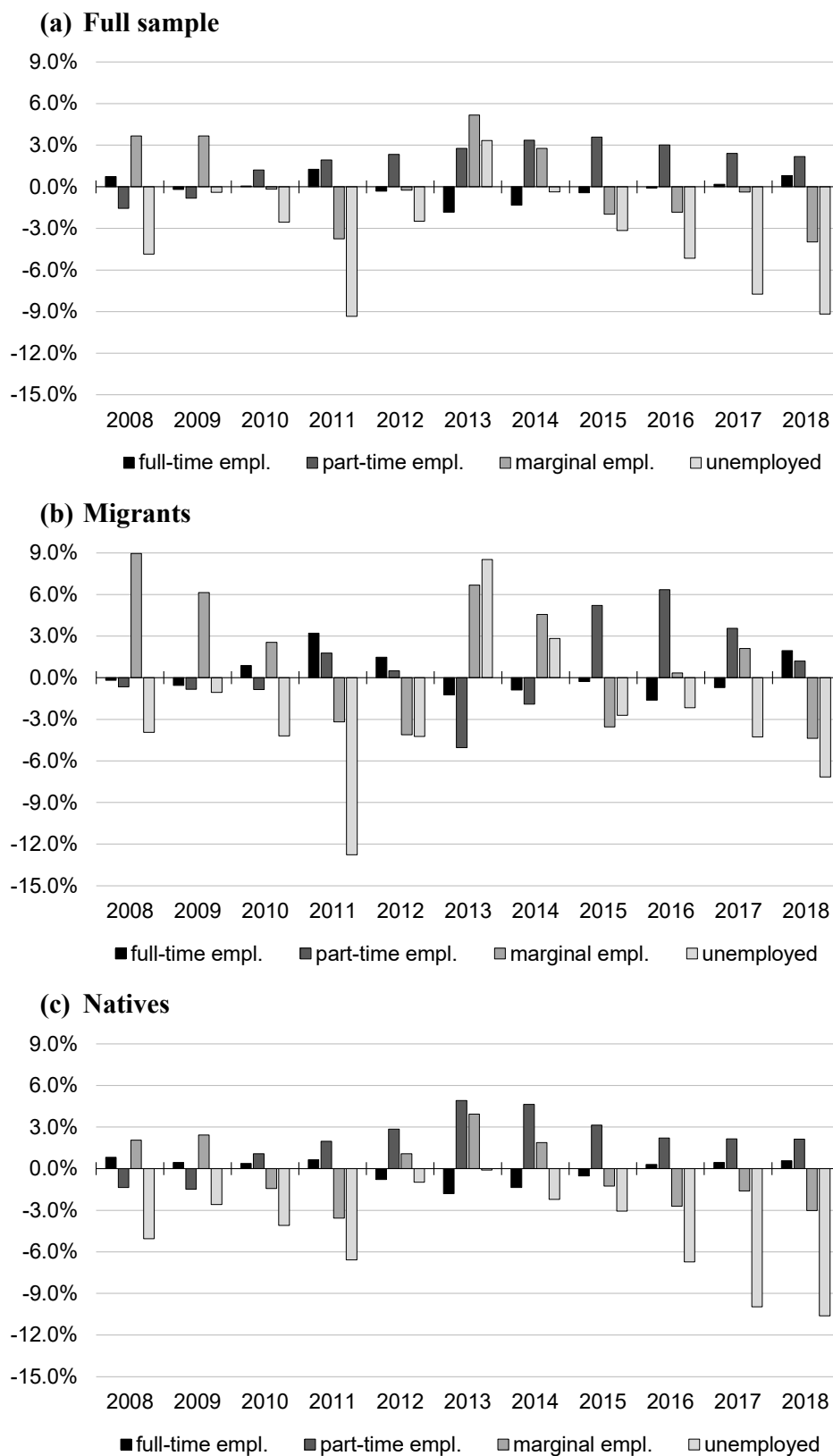
Figure B.2: Changes in the proportions of employment statuses by migration background

Notes: This figure shows the changes in the proportions of employment statuses by migration background. Self-employed, apprentices, interns, handicapped workers in sheltered workshops, and branches with industrial wage floors above the statutory minimum wage are excluded from the sample. *Source*: SOEP v36, 2007-2018. Own calculations incl. survey weights.

(a) 90 to 10 percentile ratio

(b) 90 to 50 percentile ratio

(c) 50 to 10 percentile ratio

(d) 50 to 20 percentile ratio
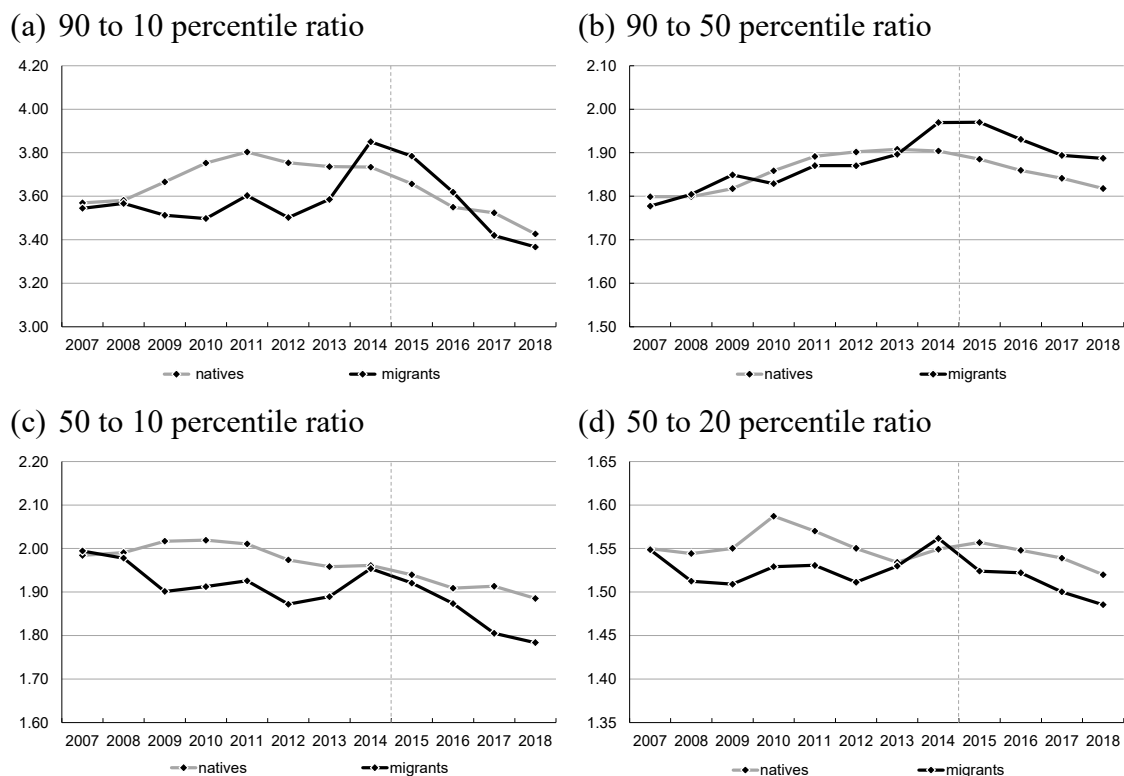
Figure B.3: Wage ratios by migration background

Notes: The figure shows the ratios between selected wage percentiles for employees with migration background and without migration background. Wage ratios are smoothed with adjacent years. Self-employed, apprentices, interns, handicapped workers in sheltered workshops, and branches with industrial wage floors above the statutory minimum wage are excluded from the sample. *Source*: SOEP v36 2007-2017. Own calculations incl. survey weights.

(a) Migrants

(b) Natives
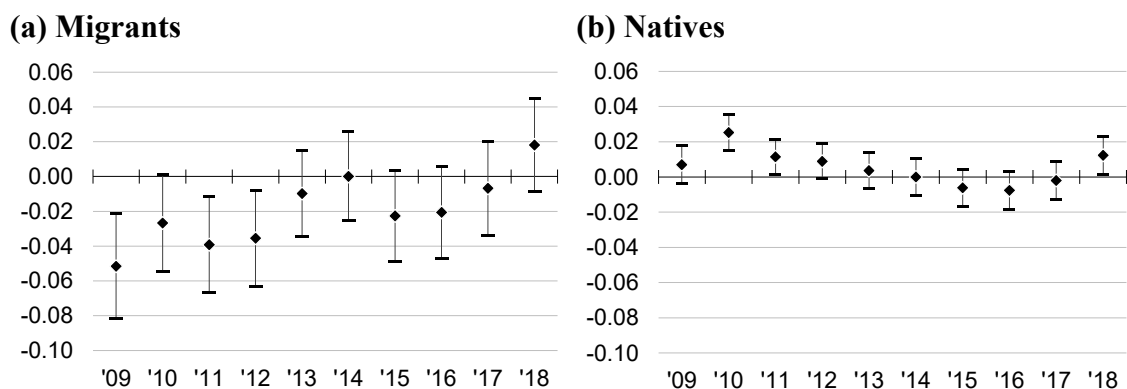
Figure B.4: Probability of working in the low-wage sector by migration background

Notes: This figure shows the probability of working in the low-wage sector by migration background. Linear Probability Model (LPM), 2014 = 0. Self-employed, apprentices, interns, handicapped workers in sheltered workshops, and branches with industrial wage floors above the statutory minimum wage are excluded from the sample. *Source*: SOEP v36, 2009-2018. Own calculations.

Table B.1: Workers' mean characteristics by gender and migration background, 2012-2014

Characteristics of workers	Mig.BG		Gender		Males		Females		Total
	Migrants	Natives	Males	Females	Migrants	Natives	Migrants	Natives	
labour force participation	0.73	0.75 ***	0.80	0.70 ***	0.80	0.80	0.65	0.71 ***	0.75
… employed	0.64	0.70 ***	0.73	0.64 ***	0.70	0.74 ***	0.57	0.66 ***	0.69
… registered unemployed	0.09	0.05 ***	0.07	0.06 ***	0.10	0.06 ***	0.08	0.05 ***	0.06
Salary									
gross hourly wage	15.54	17.83 ***	19.40	15.25 ***	17.23	19.97 ***	13.43	15.64 ***	17.39
Std. Dev.	8.82	10.65 –	11.17	8.93 –	9.57	11.49 –	7.25	9.21 –	10.36
p10	7.07	8.05 –	8.96	7.05 –	8.21	9.20 –	6.47	7.30 –	7.82
p50	13.79	15.80 –	17.24	13.79 –	14.94	17.91 –	11.94	14.08 –	15.33
gross monthly salary	2,277.32	2,712.54 ***	3,225.29	1,991.14 ***	2,827.76	3,327.70 ***	1,605.67	2,075.42 ***	2,628.73
Employment									
working hours (contractual)	33.24	34.43 ***	37.85	30.31 ***	37.72	37.89	27.62	30.89 ***	34.20
full-time employment	0.68	0.70 ***	0.88	0.50 ***	0.88	0.88	0.43	0.51 ***	0.70
part-time employment	0.19	0.21 ***	0.06	0.36 ***	0.06	0.06	0.35	0.36	0.20
marginal employment	0.13	0.08 ***	0.05	0.13 ***	0.06	0.05 ***	0.21	0.11 ***	0.09
Qualification									
low-skilled	0.41	0.24 ***	0.31	0.24 ***	0.47	0.27 ***	0.35	0.22 ***	0.28
medium-skilled	0.34	0.49 ***	0.41	0.51 ***	0.29	0.44 ***	0.39	0.53 ***	0.46
high-skilled	0.25	0.27 ***	0.28	0.25 ***	0.24	0.29 ***	0.26	0.25	0.27
labour market experience	14.40	18.89 ***	20.12	15.80 ***	16.38	21.08 ***	11.99	16.63 ***	18.03
job tenure	7.48	12.05 ***	12.06	10.20 ***	8.11	13.10 ***	6.71	10.96 ***	11.16
Company									
firm size: <20 empl.	0.24	0.20 ***	0.15	0.27 ***	0.19	0.14 ***	0.30	0.26 ***	0.21
firm size: 20-199 empl.	0.26	0.26	0.27	0.25 ***	0.26	0.27	0.25	0.26	0.26
firm size: 199-1999 empl.	0.21	0.22 ***	0.24	0.20 ***	0.23	0.24	0.18	0.20 ***	0.22
firm size: >2000 empl.	0.28	0.29 ***	0.32	0.25 ***	0.30	0.33 ***	0.24	0.25 **	0.29
Personal information									
Age	39.70	44.17 ***	43.59	43.01 ***	39.95	44.53 ***	39.38	43.80 ***	43.31
gender (male=1)	0.55	0.51 ***	-	-	-	-	-	-	0.52
No. of obs. (employed)	**8,048**	**26,786**	**16,522**	**18,312**	**4,240**	**12,282**	**3,808**	**14,504**	**34,834**

Notes: Self-employed, apprentices, interns, handicapped workers in sheltered workshops, and branches with industrial wage floors above the statutory minimum wage are excluded from the sample. *Source*: SOEP v36 2008-2017, own calculations incl. survey weights. Significance levels: * $p<0.1$, ** $p<0.05$, *** $p<0.01$.

Table B.2: Minimum wage effect on hourly wage growth – different model specifications

	Dependent variable: Logarithmic change in gross hourly wage								
	One-Year Analysis			Two-Year Analysis			Three-Year Analysis		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
One-Year Analysis									
Hourly wage < €8.50	0.021**	0.023**	0.025**						
$[T_{it}]$	(0.010)	(0.010)	(0.010)						
× DTADD 2014-2015	0.102***	0.101***	0.093***						
$[T_{it} \times Y_{it}]$	(0.020)	(0.020)	(0.020)						
× Placebo 2012-2013	-0.046**	-0.047**	-0.048**						
$[T_{it} \times Y_{it-k}]$	(0.021)	(0.021)	(0.022)						
Two-Year Analysis									
Hourly wage < €8.50				0.043***	0.044***	0.040***			
$[T_{it}]$				(0.012)	(0.013)	(0.013)			
× DTADD 2014-2016				0.093***	0.091***	0.094***			
$[T_{it} \times Y_{it}]$				(0.022)	(0.022)	(0.022)			
× Placebo 2010-2012				-0.050	-0.048	-0.045			
$[T_{it} \times Y_{it-k}]$				(0.031)	(0.031)	(0.032)			
Three-Year Analysis									
Hourly wage < €8.50							0.059***	0.057***	0.056***
$[T_{it}]$							(0.013)	(0.014)	(0.015)
× DTADD 2014-2017							0.081***	0.079***	0.066**
$[T_{it} \times Y_{it}]$							(0.026)	(0.026)	(0.026)
× Placebo 2008-2011							-0.095*	-0.091**	-0.087**
$[T_{it} \times Y_{it-k}]$							(0.035)	(0.035)	(0.037)
Control Variables									
Year fixed effects	yes	yes	yes	yes	yes	yes	yes	yes	yes
Socio-demographic info.		yes	yes		yes	yes		yes	yes
Job characteristics			yes			yes			yes
Constant	0.022*	0.065***	0.063**	0.035*	0.118***	0.099**	0.039*	0.162***	0.171***
	(0.012)	(0.023)	(0.031)	(0.018)	(0.029)	(0.038)	(0.021)	(0.037)	(0.049)
Observations	2,206	2,199	2,106	2,507	2,498	2,387	2,590	2,581	2,450
Obs. treated group	684	681	670	836	832	814	876	872	847
Obs. control group	1,522	1,518	1,436	1,671	1,666	1,573	1,714	1,709	1,603
Adj. R^2	0.080	0.083	0.078	0.110	0.120	0.115	0.116	0.130	0.134

Notes: The table shows the effect of the minimum wage introduction on the change in gross hourly wages. Self-employed, apprentices, interns, handicapped workers in sheltered workshops, and branches with industrial wage floors above the statutory minimum wage are excluded from the sample. *Source*: SOEP v36 2008-2017, own calculations. Robust standard errors, clustered at the individual level. Standard errors in parentheses. Significance levels: * $p<0.1$, ** $p<0.05$, *** $p<0.01$.

Table B.3: Minimum wage effects separated by migrants with direct and indirect migration background

|	Gross hourly wage			Weekly working hours			Gross monthly salary		
	All Migrants	**Direct Mig.BG**	**Indirect Mig.BG**	**All Migrants**	**Direct Mig.BG**	**Indirect Mig.BG**	**All Migrants**	**Direct Mig.BG**	**Indirect Mig.BG**
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Two-Year Analysis									
Hourly wage < €8.50[1]	0.044	0.044	0.075	0.072**	0.073*	0.105*	0.111***	0.069	0.301***
$[T_{it}]$	(0.028)	(0.030)	(0.063)	(0.036)	(0.043)	(0.056)	(0.041)	(0.046)	(0.070)
$\times$ DTADD 2014-2016	0.102***	0.093**	0.125	-0.070	-0.085	-0.001	0.069	0.097	-0.019
$[T_{it} \times Y_{it}]$	(0.038)	(0.042)	(0.076)	(0.045)	(0.052)	(0.079)	(0.059)	(0.063)	(0.127)
$\times$ Placebo 2010-2012	-0.095	-0.053	-0.278***	-0.119	-0.104	-0.180	-0.304**	-0.206	-0.718***
$[T_{it} \times Y_{it-k}]$	(0.100)	(0.119)	(0.090)	(0.111)	(0.135)	(0.156)	(0.152)	(0.173)	(0.173)
Control Variables									
Year fixed effects	yes	yes	yes	yes	yes	yes	yes	yes	yes
Socio-demographic info.	yes	yes	yes	yes	yes	yes	yes	yes	yes
Job characteristics	yes	yes	yes	yes	yes	yes	yes	yes	yes
Constant	0.112**	0.138***	0.090*	0.227***	0.183**	0.169**	0.344***	0.262***	0.294***
	(0.051)	(0.049)	(0.049)	(0.083)	(0.085)	(0.067)	(0.106)	(0.099)	(0.101)
Observations	1,155	1,085	884	1,188	1,109	901	1,246	1,165	932
Obs. treated group	341	271	70	366	287	79	395	314	81
Obs. control group	814	814	814	822	822	822	851	851	851
Adj. R^2	0.085	0.089	0.065	0.049	0.048	0.052	0.058	0.042	0.090

Notes: The table shows the effect of the minimum wage introduction on the change in gross hourly wages, weekly working hours, and monthly salaries. Self-employed, apprentices, interns, handicapped workers in sheltered workshops, and branches with industrial wage floors, and branches in a transition period are excluded from the sample. 1) Treated group (<€8.50/hour): (1),(4),(7) with migration background, (2),(5),(8) with direct migration background, (3),(6),(9) with indirect migration background. Control group (€8.50-€10.00/hour): (1)-(9) all workers. *Source*: SOEP v36 2008-2017, own calculations. Robust standard errors, clustered at the individual level. Standard errors in parentheses. Significance levels: * p<0.1, ** p<0.05, *** p<0.01.

Table B.4: Minimum wage effect on hourly wage growth of migrants

Migrants	(1) Total	(2) Females	(3) Males	(4) Age coh. 18-34 y.	(5) Age coh. 35-54 y.	(6) Age coh. 55-69 y.	(7) Low-skilled	(8) Medium-skilled	(9) High-skilled
	Dependent variable: Logarithmic change in gross hourly wage								
Two-Year Analysis									
Hourly wage <€8.50[1]	0.044	0.014	0.113**	0.020	0.061*	0.011	0.010	0.094*	-0.029
$[T_{it}]$	(0.028)	(0.033)	(0.056)	(0.068)	(0.035)	(0.066)	(0.038)	(0.050)	(0.110)
× DTADD 2014-2016	0.102***	0.145***	-0.017	0.066	0.102**	0.122	0.108**	0.080	0.144
$[T_{it} \times Y_{it}]$	(0.038)	(0.047)	(0.064)	(0.102)	(0.045)	(0.085)	(0.051)	(0.071)	(0.146)
× Placebo 2010-2012	-0.095	-0.102	0.103	0.000	-0.142	-0.117	-0.028	-0.142*	-0.789***
$[T_{it} \times Y_{it-k}]$	(0.100)	(0.112)	(0.065)	(.)	(0.092)	(0.233)	(0.149)	(0.085)	(0.206)
Constant	0.112**	0.073	0.192**	0.084	0.211**	-0.199	0.158*	0.084	0.380
	(0.051)	(0.064)	(0.087)	(0.170)	(0.097)	(0.393)	(0.081)	(0.072)	(0.319)
Observations	1,155	770	385	215	715	225	495	572	88
Obs. treated group	814	770	385	215	715	225	495	572	57
Obs. control group	341	259	82	75	204	62	187	123	31
Adj. R²	0.085	0.079	0.114	0.116	0.090	0.077	0.079	0.097	0.200

Notes: The table shows the effect of the minimum wage introduction on the change in gross hourly wages of migrants (Two-Year Analysis). Self-employed, apprentices, interns, handicapped workers in sheltered workshops, and branches with industrial wage floors above the statutory minimum wage are excluded from the sample. 1) Treated group (<€8.50/hour): with migration background. Control group (€8.50-€10.00/hour): all workers. *Source*: SOEP v36 2010-2016, own calculations. Robust standard errors, clustered at the individual level. Standard errors in parentheses. Significance levels: * p<0.1, ** p<0.05, *** p<0.01.

Table B.5: Minimum wage effect on hourly wage growth of natives

Natives	(1) Total	(2) Females	(3) Males	(4) Age coh. 18-34 y.	(5) Age coh. 35-54 y.	(6) Age coh. 55-69 y.	(7) Low-skilled	(8) Medium-skilled	(9) High-skilled
	Dependent variable: Logarithmic change in gross hourly wage								
Two-Year Analysis									
Hourly wage <€8.50	0.039***	0.030*	0.059**	0.037	0.033*	0.054	0.022	0.043***	0.101
$[T_{it}]$	(0.014)	(0.015)	(0.030)	(0.030)	(0.018)	(0.035)	(0.027)	(0.016)	(0.069)
× DTADD 2014-2016	0.087***	0.089***	0.077*	-0.008	0.126***	0.062	0.055	0.092***	0.040
$[T_{it} \times Y_{it}]$	(0.024)	(0.030)	(0.045)	(0.058)	(0.029)	(0.062)	(0.046)	(0.029)	(0.125)
× Placebo 2010-2012	-0.042	-0.039	-0.020	-0.173	0.002	-0.087	-0.029	-0.055	-0.034
$[T_{it} \times Y_{it-k}]$	(0.033)	(0.038)	(0.066)	(0.139)	(0.041)	(0.064)	(0.067)	(0.039)	(0.139)
Constant	0.093**	0.059	0.170**	0.031	0.142**	-0.012	0.132**	0.112**	-0.337*
	(0.037)	(0.041)	(0.070)	(0.134)	(0.064)	(0.220)	(0.061)	(0.049)	(0.174)
Observations	2,046	1,518	528	384	1,198	459	687	1,220	139
Obs. treated group	814	511	303	140	511	163	308	449	57
Obs. control group	1,232	1,007	225	244	687	296	379	771	82
Adj. R²	0.112	0.112	0.100	0.084	0.107	0.097	0.092	0.132	0.121

Notes: The table shows the effect of the minimum wage introduction on the change in gross hourly wages of natives (Two-Year Analysis). Self-employed, apprentices, interns, handicapped workers in sheltered workshops, and branches with industrial wage floors above the statutory minimum wage are excluded from the sample. 1) Treated group (<€8.50/hour): without migration background. Control group (€8.50-€10.00/hour): all workers. *Source*: SOEP v36 2010-2016, own calculations. Robust standard errors, clustered at the individual level. Standard errors in parentheses. Significance levels: * p<0.1, ** p<0.05, *** p<0.01.

Table B.6: Minimum wage effect on hourly wage growth without branches in a transition period

	Dependent variable: Logarithmic change in gross hourly wage								
	One-Year Analysis			Two-Year Analysis			Three-Year Analysis		
	Total	**Migrants**	**Natives**	**Total**	**Migrants**	**Natives**	**Total**	**Migrants**	**Natives**
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
One-Year Analysis									
Hourly wage $< $€8.50[1]	0.025**	0.040***	0.056***						
$[T_{it}]$	(0.010)	(0.013)	(0.015)						
$\times$ DTADD 2014-2015[2]	0.093***	0.096***	0.072***						
$[T_{it} \times Y_{it}]$	(0.021)	(0.023)	(0.026)						
$\times$ Placebo 2012-2013[2]	-0.048*	-0.053	-0.044*						
$[T_{it} \times Y_{it-k}]$	(0.022)	(0.048)	(0.023)						
Two-Year Analysis									
Hourly wage $< $€8.50[1]				0.027	0.044	0.094***			
$[T_{it}]$				(0.018)	(0.028)	(0.029)			
$\times$ DTADD 2014-2016[2]				0.087***	0.105***	0.029			
$[T_{it} \times Y_{it}]$				(0.034)	(0.038)	(0.050)			
$\times$ Placebo 2010-2012[2]				-0.045	-0.096	-0.042			
$[T_{it} \times Y_{it-k}]$				(0.032)	(0.100)	(0.033)			
Three-Year Analysis									
Hourly wage $< $€8.50[1]							0.019	0.039***	0.050***
$[T_{it}]$							(0.012)	(0.014)	(0.016)
$\times$ DTADD 2014-2017[2]							0.097***	0.094***	0.079***
$[T_{it} \times Y_{it}]$							(0.024)	(0.025)	(0.027)
$\times$ Placebo 2008-2011[2]							-0.088**	-0.161	-0.083**
$[T_{it} \times Y_{it-k}]$							(0.037)	(0.214)	(0.037)
Control Variables									
Year fixed effects	yes	yes	yes	yes	yes	yes	yes	yes	yes
Socio-demographic info.	yes	yes	yes	yes	yes	yes	yes	yes	yes
Job characteristics	yes	yes	yes	yes	yes	yes	yes	yes	yes
Constant	0.068**	0.097**	0.055*	0.080*	0.110**	0.087**	0.171***	0.159***	0.213***
	(0.030)	(0.040)	(0.030)	(0.038)	(0.051)	(0.037)	(0.048)	(0.055)	(0.050)
Observations	2,065	1,049	1,675	2,352	1,141	2,015	2,422	1,127	2,133
Obs. treated group	659	659	659	804	804	804	838	838	838
Obs. control group	1,406	390	1,016	1,548	337	1,211	1,584	289	1,295
Adj. R[2]	0.079	0.056	0.080	0.114	0.085	0.112	0.136	0.131	0.141

Notes: The table shows the effect of the minimum wage introduction on the change in gross hourly wages. Self-employed, apprentices, interns, handicapped workers in sheltered workshops, and branches with industrial wage floors, and branches in a transition period are excluded from the sample. 1) Treated group (<€8.50/hour): (1),(4),(7) all workers, (2),(5),(8) with migration background, (3),(6),(9) without migration background. Control group (€8.50-€10.00/hour): (1)-(9) all workers. 2) DTADD and placebo are the respective different interaction terms, depending on the treated group. *Source*: SOEP v36 2008-2017, own calculations. Robust standard errors, clustered at the individual level. Standard errors in parentheses. Significance levels: * p<0.1, ** p<0.05, *** p<0.01.

Table B.7: Minimum wage effect on the growth of weekly working hours by migration background

	Dependent variable: Logarithmic change in weekly working hours								
	One-Year Analysis			Two-Year Analysis			Three-Year Analysis		
	Total	**Migrants**	**Natives**	**Total**	**Migrants**	**Natives**	**Total**	**Migrants**	**Natives**
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
One-Year Analysis									
Hourly wage < €8.50[1]	0.032**	0.053**	0.026						
$[T_{it}]$	(0.016)	(0.024)	(0.020)						
× DTADD 2014-2015[2]	-0.033	-0.045	-0.028						
$[T_{it} \times Y_{it}]$	(0.027)	(0.042)	(0.031)						
× Placebo 2012-2013[2]	-0.025	-0.103**	-0.008						
$[T_{it} \times Y_{it-k}]$	(0.027)	(0.048)	(0.031)						
Two-Year Analysis									
Hourly wage < €8.50[1]				0.039**	0.072**	0.031*			
$[T_{it}]$				(0.018)	(0.036)	(0.019)			
× DTADD 2014-2016[2]				-0.056*	-0.070	-0.057*			
$[T_{it} \times Y_{it}]$				(0.030)	(0.045)	(0.034)			
× Placebo 2010-2012[2]				-0.055	-0.119	-0.047			
$[T_{it} \times Y_{it-k}]$				(0.045)	(0.111)	(0.047)			
Three-Year Analysis									
Hourly wage < €8.50[1]							0.023	0.059	0.016
$[T_{it}]$							(0.021)	(0.038)	(0.022)
× DTADD 2014-2017[2]							-0.029	-0.042	-0.031
$[T_{it} \times Y_{it}]$							(0.036)	(0.055)	(0.039)
× Placebo 2008-2011[2]							-0.071	-0.085	-0.061
$[T_{it} \times Y_{it-k}]$							(0.057)	(0.063)	(0.058)
Control Variables									
Year fixed effects	yes	yes	yes	yes	yes	yes	yes	yes	yes
Socio-demographic info.	yes	yes	yes	yes	yes	yes	yes	yes	yes
Job characteristics	yes	yes	yes	yes	yes	yes	yes	yes	yes
Constant	0.150***	0.142***	0.130***	0.296***	0.227***	0.262***	0.320***	0.293***	0.292***
	(0.042)	(0.053)	(0.044)	(0.064)	(0.083)	(0.062)	(0.075)	(0.091)	(0.080)
Observations	2,180	1,095	1,760	2,506	1,188	2,140	2,576	1,174	2,260
Obs. treated group	1,505	420	1,085	1,684	366	1,318	1,718	316	1,402
Obs. control group	675	675	675	822	822	822	858	858	858
Adj. R[2]	0.022	0.038	0.013	0.042	0.049	0.036	0.045	0.061	0.040

Notes: The table shows the effect of the minimum wage introduction on the change in weekly working hours. Self-employed, apprentices, interns, handicapped workers in sheltered workshops, and branches with industrial wage floors above the statutory minimum wage are excluded from the sample. 1) Treated group (<€8.50/hour): (1),(4),(7) all workers, (2),(5),(8) with migration background, (3),(6),(9) without migration background. Control group (€8.50-€10.00/hour): (1)-(9) all workers. *Source*: SOEP v36 2008-2017, own calculations. Robust standard errors, clustered at the individual level. Standard errors in parentheses. Significance levels: * p<0.1, ** p<0.05, *** p<0.01.

Table B.8: Minimum wage effect on the growth of weekly working hours of migrants

Migrants	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Total	Females	Males	Age coh. 18-34 y.	Age coh. 35-54 y.	Age coh. 55-69 y.	Low-skilled	Medium-skilled	High-skilled
Two-Year Analysis									
Hourly wage <€8.50[1] $[T_{it}]$	0.072**	0.058	0.102	0.301***	-0.030	0.133*	0.072	0.079	0.135
	(0.036)	(0.037)	(0.083)	(0.104)	(0.040)	(0.072)	(0.052)	(0.053)	(0.118)
× DTADD 2014-2016 $[T_{it} \times Y_{it}]$	-0.070	-0.019	-0.188*	-0.199	0.000	-0.148*	-0.082	-0.058	0.248
	(0.045)	(0.052)	(0.105)	(0.128)	(0.053)	(0.084)	(0.076)	(0.055)	(0.189)
× Placebo 2010-2012 $[T_{it} \times Y_{it-k}]$	-0.119	-0.145	0.034	0.000	-0.022	-0.021	-0.116	0.006	-1.213***
	(0.111)	(0.130)	(0.184)	(.)	(0.128)	(0.191)	(0.165)	(0.146)	(0.218)
Constant	0.227***	0.187**	0.244*	0.400	0.200	0.289	0.443***	0.041	0.156
	(0.083)	(0.093)	(0.126)	(0.276)	(0.150)	(0.440)	(0.150)	(0.095)	(0.583)
Observations	1,188	790	398	231	729	228	514	581	93
Obs. treated group	822	516	306	144	515	163	213	453	57
Obs. control group	366	274	92	87	214	65	202	128	36
Adj. R²	0.049	0.034	0.078	0.097	0.056	0.025	0.087	0.034	0.141

Notes: The table shows the effect of the minimum wage introduction on the change in weekly working hours of migrants (Two-Year Analysis). Self-employed, apprentices, interns, handicapped workers in sheltered workshops, and branches with industrial wage floors above the statutory minimum wage are excluded from the sample. 1) Treated group (<€8.50/hour): with migration background. Control group (€8.50-€10.00/hour): all workers. *Source*: SOEP v36 2010-2016, own calculations. Robust standard errors, clustered at the individual level. Standard errors in parentheses. Significance levels: * p<0.1, ** p<0.05, *** p<0.01.

Table B.9: Minimum wage effect on the growth of weekly working hours of natives

Natives	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Total	Females	Males	Age coh. 18-34 y.	Age coh. 35-54 y.	Age coh. 55-69 y.	Low-skilled	Medium-skilled	High-skilled
Two-Year Analysis									
Hourly wage <8.50 $[T_{it}]$	0.031*	0.037	0.025	0.098*	0.024	-0.026	0.010	0.033	0.090
	(0.019)	(0.023)	(0.037)	(0.054)	(0.024)	(0.043)	(0.031)	(0.026)	(0.074)
× DTADD 2014-2016 $[T_{it} \times Y_{it}]$	-0.057*	-0.002	-0.169**	-0.122	-0.061	0.009	-0.051	-0.070*	0.039
	(0.034)	(0.041)	(0.078)	(0.076)	(0.040)	(0.086)	(0.065)	(0.040)	(0.156)
× Placebo 2010-2012 $[T_{it} \times Y_{it-k}]$	-0.047	-0.060	-0.032	-0.289*	-0.076	0.070	-0.008	-0.044	-0.214
	(0.047)	(0.057)	(0.127)	(0.173)	(0.062)	(0.063)	(0.090)	(0.055)	(0.167)
Constant	0.262***	0.311***	0.121	0.696***	0.227***	0.628	0.356***	0.172**	0.412
	(0.062)	(0.083)	(0.086)	(0.242)	(0.087)	(0.447)	(0.110)	(0.076)	(0.249)
Observations	2,140	1,581	559	414	1,252	469	731	1,265	144
Obs. treated group	822	516	306	144	515	163	312	453	57
Obs. control group	1,318	1,065	253	270	737	306	419	812	87
Adj. R²	0.036	0.036	0.024	0.067	0.040	0.049	0.050	0.031	0.140

Notes: The table shows the effect of the minimum wage introduction on the change in weekly working hours of natives (Two-Year Analysis). Self-employed, apprentices, interns, handicapped workers in sheltered workshops, and branches with industrial wage floors above the statutory minimum wage are excluded from the sample. 1) Treated group (<€8.50/hour): without migration background. Control group (€8.50-€10.00/hour): all workers. *Source*: SOEP v36 2010-2016, own calculations. Robust standard errors, clustered at the individual level. Standard errors in parentheses. Significance levels: * p<0.1, ** p<0.05, *** p<0.01.

Table B.10: Minimum wage effect on monthly salary growth by migration background

| | One-Year Analysis | | | Two-Year Analysis | | | Three-Year Analysis | | |
	Total	Migrants	Natives	Total	Migrants	Natives	Total	Migrants	Natives
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
One-Year Analysis									
Hourly wage < €8.50[1]	0.047**	0.075	0.036						
$[T_{it}]$	(0.019)	(0.028)	(0.023)						
✕ DTADD 2014-2015[2]	0.096***	0.043	0.122***						
$[T_{it} \times Y_{it}]$	(0.035)	(0.056)	(0.041)						
✕ Placebo 2012-2013[2]	-0.084**	-0.115*	-0.072*						
$[T_{it} \times Y_{it-k}]$	(0.036)	(0.068)	(0.040)						
Two-Year Analysis									
Hourly wage < €8.50[1]				0.064***	0.111***	0.053**			
$[T_{it}]$				(0.024)	(0.041)	(0.025)			
✕ DTADD 2014-2016[2]				0.127***	0.069	0.137***			
$[T_{it} \times Y_{it}]$				(0.041)	(0.059)	(0.045)			
✕ Placebo 2010-2012[2]				-0.103*	-0.304**	-0.084			
$[T_{it} \times Y_{it-k}]$				(0.057)	(0.152)	(0.059)			
Three-Year Analysis									
Hourly wage < €8.50[1]							0.091***	0.144***	0.086***
$[T_{it}]$							(0.027)	(0.046)	(0.029)
✕ DTADD 2014-2017[2]							0.095*	-0.038	0.127**
$[T_{it} \times Y_{it}]$							(0.049)	(0.080)	(0.052)
✕ Placebo 2008-2011[2]							-0.174**	-0.492**	-0.148**
$[T_{it} \times Y_{it-k}]$							(0.069)	(0.246)	(0.069)
Control Variables									
Year fixed effects $[\alpha_t]$	yes	yes	yes	yes	yes	yes	yes	yes	yes
Socio-demographic info. $[X_{it}]$	yes	yes	yes	yes	yes	yes	yes	yes	yes
Job characteristics $[Z_{it}]$	yes	yes	yes	yes	yes	yes	yes	yes	yes
Constant	0.230***	0.266***	0.161***	0.348***	0.344***	0.300***	0.434***	0.515***	0.413***
	(0.055)	(0.080)	(0.053)	(0.075)	(0.106)	(0.074)	(0.086)	(0.107)	(0.092)
Observations	2,240	1,124	1,798	2,647	1,246	2,252	2,770	1,250	2,425
Obs. treated group	1,588	422	1,116	1,796	395	1,401	1,865	345	1,520
Obs. control group	682	682	682	851	851	851	905	905	905
Adj. R²	0.037	0.030	0.037	0.057	0.058	0.052	0.081	0.095	0.079

Notes: The table shows the effect of the minimum wage introduction on the change in gross monthly salary. Self-employed, apprentices, interns, handicapped workers in sheltered workshops, and branches with industrial wage floors above the statutory minimum wage are excluded from the sample. 1) Treated group (<€8.50/hour): (1),(4),(7) all workers, (2),(5),(8) with migration background, (3),(6),(9) without migration background. Control group (€8.50-€10.00/hour): (1)-(9) all workers. *Source*: SOEP v36 2008-2017, own calculations. Robust standard errors, clustered at the individual level. Standard errors in parentheses. Significance levels: * p<0.1, ** p<0.05, *** p<0.01.

Table B.11: Minimum wage effect on monthly salary growth of migrants

Migrants	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Total	Females	Males	Age coh. 18-34 y.	Age coh. 35-54 y.	Age coh. 55-69 y.	Low-skilled	Medium-skilled	High-skilled
Two-Year Analysis									
Hourly wage <€8.50[1] $[T_{it}]$	0.111***	0.035	0.281***	0.284***	0.063	0.055	0.013	0.192***	-0.034
	(0.041)	(0.044)	(0.094)	(0.104)	(0.051)	(0.104)	(0.053)	(0.066)	(0.117)
× DTADD 2014-2016 $[T_{it} \times Y_{it}]$	0.069	0.187***	-0.170	-0.132	0.143*	0.072	0.130	0.042	0.175
	(0.059)	(0.072)	(0.103)	(0.144)	(0.074)	(0.119)	(0.087)	(0.098)	(0.258)
× Placebo 2010-2012 $[T_{it} \times Y_{it-k}]$	-0.304**	-0.244*	-0.430	0.000	-0.355	-0.053	-0.216	-0.180	-1.960***
	(0.152)	(0.145)	(0.567)	(.)	(0.220)	(0.146)	(0.209)	(0.185)	(0.301)
Constant	0.344***	0.288***	0.428**	0.614*	0.331*	0.334	0.700***	0.061	0.822
	(0.106)	(0.107)	(0.174)	(0.329)	(0.189)	(0.495)	(0.192)	(0.131)	(0.535)
Observations	1,246	821	425	246	755	245	541	608	97
Obs. treated group	851	531	321	148	531	172	321	472	58
Obs. control group	395	290	105	98	224	73	220	136	39
Adj. R^2	0.058	0.039	0.109	0.029	0.048	0.051	0.097	0.057	0.285

The table shows the effect of the minimum wage introduction on the change in gross monthly salary above the statutory minimum wage are excluded from the sample. 1) Treated group (<€8.50/hour): with migration background. Control

Notes: The table shows the effect of the minimum wage introduction on the change in gross monthly salary of migrants (Two-Year Analysis). Self-employed, apprentices, interns, handicapped workers in sheltered workshops, and branches with industrial wage floors above the statutory minimum wage are excluded from the sample. 1) Treated group (<€8.50/hour): with migration background. Control group (€8.50-€10.00/hour): all workers. *Source*: SOEP v36 2010-2016, own calculations. Robust standard errors, clustered at the individual level. Standard errors in parentheses. Significance levels: * p<0.1, ** p<0.05, *** p<0.01.

Table B.12: Minimum wage effect on monthly salary growth of natives

Natives	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Total	Females	Males	Age coh. 18-34 y.	Age coh. 35-54 y.	Age coh. 55-69 y.	Low-skilled	Medium-skilled	High-skilled
Two-Year Analysis									
Hourly wage <€8.50[1] $[T_{it}]$	0.053**	0.023	0.097**	0.114	0.013	0.052	-0.021	0.075**	0.159
	(0.025)	(0.029)	(0.049)	(0.074)	(0.034)	(0.048)	(0.044)	(0.032)	(0.118)
× DTADD 2014-2016 $[T_{it} \times Y_{it}]$	0.137***	0.171***	0.144	-0.004	0.177***	0.179*	0.206***	0.077	0.183
	(0.045)	(0.056)	(0.094)	(0.108)	(0.056)	(0.102)	(0.077)	(0.054)	(0.277)
× Placebo 2010-2012 $[T_{it} \times Y_{it-k}]$	-0.084	-0.098	-0.014	-0.335	-0.074	-0.025	-0.015	-0.111	-0.205
	(0.059)	(0.072)	(0.122)	(0.225)	(0.076)	(0.081)	(0.107)	(0.076)	(0.253)
Constant	0.300***	0.348***	0.232**	0.357	0.290**	0.395	0.420***	0.241**	0.274
	(0.074)	(0.095)	(0.116)	(0.280)	(0.119)	(0.484)	(0.119)	(0.099)	(0.372)
Observations	2,252	1,662	590	431	1,315	500	770	1,327	155
Obs. treated group	851	531	320	148	531	172	321	472	58
Obs. control group	1,401	1,131	270	283	784	328	449	855	97
Adj. R^2	0.052	0.041	0.127	0.096	0.027	0.099	0.058	0.047	0.053

Notes: The table shows the effect of the minimum wage introduction on the change in gross monthly salary of natives (Two-Year Analysis). Self-employed, apprentices, interns, handicapped workers in sheltered workshops, and branches with industrial wage floors above the statutory minimum wage are excluded from the sample. 1) Treated group (<€8.50/hour): without migration background. Control group (€8.50-€10.00/hour): all workers. *Source*: SOEP v36 2010-2016, own calculations. Robust standard errors, clustered at the individual level. Standard errors in parentheses. Significance levels: * p<0.1, ** p<0.05, *** p<0.01.

Table B.13: Minimum wage effect on hourly wage growth relating to the peer group

	(1) Total	(2) Females	(3) Males	(4) Migrants	(5) Female migrants	(6) Male Migrants	(7) Natives	(8) Female Natives	(9) Male Natives
				Dependent variable: Logarithmic change in gross hourly wage					
Two-Year Analysis									
Hourly wage <€8.50[1]	0.023*	0.007	0.060**	0.048	0.022	0.120**	0.019	0.008	0.037
$[T_{it}]$	(0.012)	(0.014)	(0.027)	(0.030)	(0.037)	(0.059)	(0.013)	(0.014)	(0.030)
× DTADD 2014-2016	0.142***	0.166***	0.074*	0.142***	0.198***	-0.007	0.135***	0.152***	0.103**
$[T_{it} \times Y_{it}]$	(0.021)	(0.024)	(0.040)	(0.037)	(0.044)	(0.066)	(0.023)	(0.026)	(0.046)
× Placebo 2010-2012	-0.065**	-0.082**	0.017	-0.123	-0.148	0.128**	-0.059*	-0.078**	0.025
$[T_{it} \times Y_{it-k}]$	(0.030)	(0.035)	(0.059)	(0.100)	(0.112)	(0.062)	(0.030)	(0.035)	(0.062)
Constant	0.100***	0.047	0.161**	0.097**	0.023	0.152**	0.106***	0.065	0.133**
	(0.037)	(0.043)	(0.063)	(0.046)	(0.057)	(0.068)	(0.037)	(0.043)	(0.065)
Observations	2,845	2,111	734	1,613	1,104	509	2,504	1,852	652
Obs. treated group	1,272	845	427	1,272	845	427	1,272	845	427
Obs. peer group	1,573	1,266	307	341	259	82	1,232	1,007	225
Adj. R²	0.093	0.095	0.116	0.067	0.072	0.114	0.081	0.084	0.089

Notes: The table shows the effect of the minimum wage introduction on the change in gross hourly wages (Two-Year Analysis). Self-employed, apprentices, interns, handicapped workers in sheltered workshops, and branches with industrial wage floors above the statutory minimum wage are excluded from the sample. 1) Treated group (<€8.50/hour): (1),(2),(3) all workers, (4),(5),(6) with migration background, (7),(8),(9) without migration background. Peer group (€10.00-€12.00/hour): (1)-(9) all workers. 2) DTADD and placebo are the respective different interaction terms, depending on the treated group. *Source*: SOEP v36 2008-2017, own calculations. Robust standard errors, clustered at the individual level. Standard errors in parentheses. Significance levels: * p<0.1, ** p<0.05, *** p<0.01.

Table B.14: Number, share and deviation of migrants' wages by the wage deciles of natives

2012-2014							
decile	wage decile cap, in Euro	number of natives	number of migrants	share of natives	share of migrants	deviation migrants to natives
1	8.05	3,089	1,407	0.114	0.174	0.059
2	10.23	2,565	1,128	0.095	0.139	0.044
3	12.26	2,772	1,126	0.103	0.139	0.036
4	14.08	2,639	876	0.098	0.108	0.010
5	15.80	2,423	783	0.090	0.097	0.007
6	17.82	2,507	638	0.093	0.079	-0.014
7	20.31	2,490	559	0.092	0.069	-0.023
8	23.65	2,649	530	0.098	0.065	-0.033
9	30.06	2,879	536	0.107	0.066	-0.041
10	max.	2,970	516	0.110	0.064	-0.046
sum		**26,983**	**8,099**	**1.000**	**1.000**	**0.000**
2015-2017							
decile	wage decile cap, in Euro	number of natives	number of migrants	share of natives	share of migrants	deviation migrants to natives
1	8.97	2,184	1,069	0.102	0.162	0.060
2	11.03	2,169	912	0.101	0.138	0.037
3	13.24	2,205	868	0.103	0.131	0.028
4	15.09	2,059	740	0.096	0.112	0.016
5	17.24	2,321	759	0.108	0.115	0.007
6	19.36	1,730	425	0.081	0.064	-0.016
7	21.98	2,060	495	0.096	0.075	-0.021
8	25.54	2,055	415	0.096	0.063	-0.033
9	32.02	2,232	459	0.104	0.069	-0.035
10	max.	2,418	467	0.113	0.071	-0.042
sum		**21,433**	**6,609**	**1.000**	**1.000**	**0.000**

Notes: Number, share and deviation of the proportion of employees with migration background within the wage deciles of employees without migration background, 2012-2014 and 2015-2017. Self-employed, apprentices, interns, handicapped workers in sheltered workshops, and branches with industrial wage floors above the statutory minimum wage are excluded from the sample. *Source*: SOEP v36. Own calculations incl. survey weights.

Appendix C: Chapter 4

Table C.1: Means of health complaints by gender and migration background (2012, 2018)

	Men			**Women**		
	Native	Migrant [a]	Diff.	Native	Migrant [a]	Diff.
general health status	0.57	0.58	0.01 *	0.55	0.55	-0.01
Σ **physical complaints**	0.22	0.26	0.05 ***	0.27	0.31	0.04 ***
neck and shoulder	0.40	0.43	0.03 **	0.60	0.62	0.02
lower back	0.44	0.46	0.05 **	0.49	0.52	0.03 **
knees	0.24	0.25	0.01	0.19	0.23	0.04 ***
arms	0.18	0.25	0.07 ***	0.22	0.28	0.06 ***
pain in legs, feets	0.17	0.26	0.09 ***	0.21	0.30	0.08 ***
hands	0.13	0.22	0.09 ***	0.18	0.23	0.05 ***
hip	0.12	0.14	0.02 **	0.13	0.16	0.03 ***
general fatigue, exhaustion	0.44	0.49	0.06 ***	0.50	0.54	0.04 ***
physical exhaustion	0.33	0.36	0.03 **	0.38	0.40	0.02
headaches	0.27	0.34	0.07 ***	0.41	0.44	0.03 **
nightly sleep disorders	0.26	0.28	0.03 **	0.31	0.33	0.03 **
nervousness or irritability	0.26	0.28	0.02 *	0.30	0.35	0.05 ***
emotional exhaustion	0.21	0.26	0.06 ***	0.29	0.35	0.05 ***
prostration	0.19	0.21	0.02 **	0.23	0.27	0.03 ***
stomach or digestive	0.13	0.16	0.03 ***	0.16	0.19	0.03 ***
hearing deterioration	0.16	0.13	-0.03 ***	0.12	0.12	0.00
swollen legs	0.06	0.09	0.03 ***	0.16	0.18	0.02 ***
skin irritation, itching	0.11	0.12	0.01	0.10	0.12	0.02 **
dizziness	0.05	0.07	0.02 ***	0.09	0.13	0.04 ***
heart pain	0.07	0.08	0.01 *	0.07	0.09	0.02 ***
other	0.06	0.09	0.03 ***	0.07	0.08	0.02 **
breathlessness	0.04	0.04	0.00	0.03	0.05	0.01 **
Average No. of Obs.	17,022	1,423		18,290	1,391	

Notes: Survey weights are considered to counteract sample bias. Sorted by weighted mean. Persons in labour force age only. The general health status is expressed by a self-reported health scale (0-1). Physical complaints are an aggregate of afflictions of the lower back, neck and shoulder, hip, arms, hands, knees, legs or feet (musculoskeletal disorders). Emotional exhaustion is used as a proxy for mental health.
a) Foreigners and Germans with migration background.
Source: Federal Institute for Vocational Education and Training, BIBB (2012, 2018). Own calculations.

Table C.2: Definition of variables

Variable	Definition
Dependent variables	
General health status	- self-reported health: poor (1), not so well (2), good (3), very good (4), excellent (5)
Physical complaints	- Mean of the frequent occurrence (yes=1, no=0) of the following "musculoskeletal disorders" in the last 12 months during work or on workdays: (1) lower back, (2) neck and shoulder, (3) arms, (4) hands, (5) hip, (6) knee, (7) swollen legs, (8) pain in legs or feets
Mental health	- Frequent occurrence (yes=1, no=0) of "emotional exhaustion" (2012, 2018) in the last 12 months during work or on workdays.
Independent variables	
Individual characteristics	
Age	- Age at time of survey (starting from 15 years of age)
Labour force age	- Yes=1 (age from 15 to 64 years) - No=0 (age below 15 or 65 years and older)
Partnership	- Yes=1 (married, civil partnership) - No=0 (single, divorced, widow)
Children	- Yes=1 (children in the household) - No=0 (no children in the household)
Origin	
Foreigners	- Individuals without a German citizenship
Germans with migration background	- German citizens with a second foreign citizenship; or - German citizens but learned a language other than German as a mother tongue during childhood.
Native Germans	- Individuals with German citizenship and no further foreign mother tongue than German was learned during childhood and no second citizenship is in place.
Education	
Educational level (Dummy)	(1) Without professional qualification (2) Vocational training (3) Advanced training (4) University degree
Occupational status	
Job Position (Dummy)	(1) Labourer, freelancer, lower level civil servants (2) Skilled worker, journeyman, middle level civil servants (3) Highly qualified employee, upper-level civil servants (4) Foreman, self-employed, senior-level civil servants
Real working hours	- Average actual weekly working hours, including regular overtime, additional work, standby duty
Hourly wage	- $\frac{\text{Gross monthly earnings from work}}{\text{Actual weekly working hours} * 4.35} = \text{gross hourly wage}$ Weeks per month $= \frac{365.25/12}{7} = 4.35$
Firm size (Dummy)	(1) Micro: 0-9 employees (2) Small: 10-49 employees (3) Medium: 50-249 employees (4) Large: 250-999 employees (5) Huge: 1000+ employees
KldB	- German classification of occupations (Klassifikation der Berufe 1992, KldB), 2-digits

Continuation of Table C.2

Job requirements	
Quantity specification	In your work, how often does it happen that … … you are required to carry out your work in every detail? [a] … you are prescribed a certain minimum performance or time to do a certain job? [a] … you have to work very quickly? [a]
Performance requirement	In your work, how often does it happen that … … you are confronted with new tasks, which you first have to think about and get used to? [a] … you improve existing procedures or try something new? [a] … things are demanded of you which you have not learned or which you have not mastered? [a]
Repeating operations	In your work, how often does it happen that … … that one and the same operation is repeated in every detail? [a]
Coordination effort	In your work, how often does it happen that … … you have to work under strong deadline or performance pressure? [a] … you are disturbed or interrupted at work? [a] … you have to keep an eye on different types of work or processes at the same time? [a]
Performance limit	In your work, how often does it happen that … … you have to go to the limits of your ability to perform? [a]
Work tasks	
According to Spitz-Oener (2006, 2008)	Only if the activity is performed "frequently", then the mean value of the assigned tasks is calculated taking into account the number of assigned tasks (Range: 0-1). [b] <u>non-routine manual</u> - repairing, refurbishing | entertaining, accommodating, preparing food | nursing, caring, healing | protecting, guarding, patrolling, directing traffic <u>routine manual</u> - manufacturing, producing goods and commodities | monitoring, control of machines, plans, technical processes | transporting, storing, shipping | cleaning, removing waste, recycling <u>routine cognitive</u> - measuring, testing, quality control | purchasing, producing, selling | gathering information, investigating, documenting <u>non-routine interactive</u> - advertising, marketing, public relations | training, instructing, teaching, educating | providing advice and information <u>non-routine analytic</u> - organizing, planning and preparing work processes (not own) | developing, researching, constructing
Working conditions	
Physically stressful working conditions	- Working while standing [a] - Lifting and carrying loads [a] - Working in a stooped, squatting, kneeling position or working overhead [a]
Shift work	- Yes=1 (working in shifts) - No=0 (no shift work)
Physically stressful environmental conditions	- Work in smoke, dust or under gases, vapours [a] - Work in cold, heat, wet, damp or draughty conditions [a] - Working with oil, grease, dirt, grime [a] - Work in bright light or in poor or weak lighting [a] - Working under noise [a]
Working atmosphere	How often … … does it happen that you feel part of a community at your workplace? [a] … do you find the cooperation between you and your work colleagues to be good? [a] … do you get help and support for your work from colleagues when you need it? [a] … do you get help and support for your work from your direct supervisor when you need it? [a]
Poor information flow	How often does it happen that … … you are not informed in time about drastic decisions, changes or plans for the future? [a] … you do not receive all the information you need to carry out your work properly? [a]
Self-determination	How often does it happen that … … you can plan and schedule your own work yourself? [a] … you have influence on the amount of work assigned to you? [a] … you can decide for yourself when to take a break? [a]

a) frequently (1), sometimes (0.25), rarely (0.1), never (0).
b) frequently (1), sometimes (0), never (0) – Use only if the value is "frequently".
Source: Federal Institute for Vocational Education and Training, BIBB (2012, 2018).

Table C.3: Descriptive statistics on individual and work-related characteristics (2012, 2018)

	Native men	Migrant [a] men	Diff. M-N men	Native women	Migrant [a] women	Diff. M-N women
Individual characteristics						
Age	43.67	40.37	-3.30 ***	43.63	39.65	-3.98 ***
Partnership	0.56	0.62	0.06 ***	0.55	0.57	0.02
Children in the household	0.59	0.62	0.03 **	0.68	0.66	0.02
Education						
Education: No occupational training	0.06	0.19	0.13 ***	0.08	0.19	0.11 ***
Education: Vocational training	0.59	0.47	-0.12 ***	0.62	0.46	-0.16 ***
Education: Advanced training	0.11	0.05	-0.06 ***	0.05	0.02	-0.03 ***
Education: University degree	0.24	0.28	0.04 ***	0.25	0.32	0.07 ***
Work-related characteristics						
Real working hours	43.16	41.75	-1.41 ***	33.92	32.15	-1.77 ***
Job position	2.29	2.13	-0.16 ***	2.02	1.88	-0.16 ***
Job tenure	13.54	10.02	-3.52 ***	12.03	7.75	-4.28 ***
Hourly wage	18.00	18.11	0.11	15.29	14.32	-0.97 ***
Firm size						
Firm size: micro	0.18	0.18	0.00	0.21	0.24	0.03 **
Firm size: small	0.22	0.22	-0.01	0.29	0.31	0.02
Firm size: medium	0.25	0.25	-0.01	0.24	0.21	-0.03 ***
Firm size: large	0.17	0.14	-0.03 ***	0.14	0.13	-0.01
Firm size: huge	0.18	0.22	0.04 ***	0.11	0.11	0.00
Obs.	17,046	1,427		18,318	1,396	

Notes: * p<0.1, ** p<0.05, *** p<0.01 – Survey weights are considered to counteract sample bias. Persons in labour force age only.
a) Foreigners and Germans with migration background.
Source: Federal Institute for Vocational Education and Training, BIBB (2012, 2018). Own calculations.

Table C.4: Regression results on general health status separated by work tasks, job requirements and working conditions (2012, 2018)

Depended variable:	Men		Women		Men		Women		Men		Women	
Self-reported health (z-values)	Migrant [a]	Native	Migrant [a]	Native	Migrant [a]	Native	Migrant [a]	Native	Migrant [a]	Native	Migrant [a]	Native
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Individual characteristics												
Age	-0.029	-0.064***	-0.044	-0.047***	-0.025	-0.060***	-0.036	-0.041***	-0.035	-0.051***	-0.031	-0.038***
Age² squared	0.000	0.000***	0.000	0.000***	0.000	0.000***	0.000	0.000***	0.000	0.000***	0.000	0.000**
Education: Vocational training	0.018	-0.008	-0.111	0.172***	0.058	-0.026	-0.086	0.176***	-0.042	0.019	-0.086	0.125**
Education: Advanced training	0.023	0.018	-0.028	0.232***	-0.007	0.009	0.001	0.251***	-0.113	0.015	-0.054	0.183***
Education: University degree	0.155	0.112**	0.028	0.277***	0.169	0.080	0.088	0.285***	-0.093	0.077	-0.006	0.214***
Partnership-Dummy	0.100	0.033	0.062	0.083***	0.090	0.028	0.065	0.081***	0.028	0.008	0.040	0.063**
Children in the household	-0.131	0.006	-0.216**	0.010	-0.104	0.015	-0.244***	0.029	-0.037	-0.013	-0.258**	-0.007
Work characteristics												
Real working hours	0.006	0.002	-0.035***	-0.012***	0.007	0.008**	-0.031**	-0.004	-0.028	0.003	-0.049***	-0.009**
Real working hours, squared	-0.000	0.000	0.000***	0.000***	-0.000	-0.000	0.000***	0.000**	0.000	-0.000	0.001***	0.000*
Job pos.: skilled worker	-0.029	0.048	-0.011	0.051*	-0.040	0.073**	0.008	0.082***	0.011	0.027	-0.001	0.009
Job pos.: highly qual. employee	0.024	0.144***	0.001	0.157***	-0.003	0.177***	0.015	0.206***	0.025	0.073*	0.033	0.077*
Job pos.: specialist	0.134	0.150***	0.533***	0.198***	0.082	0.185***	0.478***	0.187***	0.292	0.055	0.537	0.080
Hourly wage	0.006	0.012***	0.014**	0.010***	0.007	0.013***	0.015***	0.011***	0.002	0.008***	0.010	0.007***
Firm size, 5 categories	x	x	x	x	x	x	x	x	x	x	x	x
KldB, 2-digit level	x	x	x	x	x	x	x	x	x	x	x	x
Work tasks (z-values)												
Non-routine manual	-0.035	-0.020	-0.013	-0.029**								
Routine manual	-0.076*	-0.030**	-0.170***	-0.058***								
Routine cognitive	0.070*	0.002	-0.010	-0.024**								
Non-routine interactive	-0.024	0.005	-0.049	0.015								
Non-routine analytic	-0.003	-0.009	0.062	0.009								
Job requirements (z-values)												
Performance requirements					0.120***	0.021*	0.004	0.014				
Repeating operations					-0.041	-0.038***	-0.074*	-0.022**				
Coordination efforts					-0.072	-0.066***	-0.078*	-0.047***				
Quantity performance					-0.033	-0.038***	-0.063	-0.053***				
Working at performance limit					-0.101**	-0.142***	-0.121***	-0.184***				
Working conditions (z-values)												
Physical activities									0.002	-0.032*	-0.124**	-0.095***
Environmental conditions									-0.154***	-0.093***	-0.087	-0.138***
Shift work									-0.057*	0.013	-0.014	-0.001
Working climate									0.121***	0.130***	0.079**	0.133***
Insuf. information transfer									-0.086**	-0.118***	-0.070*	-0.106***
Self-determination									0.137***	0.085***	0.017	0.063***
Control												
Federal states	x	x	x	x	x	x	x	x	x	x	x	x
Survey years	x	x	x	x	x	x	x	x	x	x	x	x
constant	0.422	1.641***	1.111	1.162***	-0.061	1.254**	0.693	0.633***	1.363*	1.474***	0.418	1.272***
Obs.	1,330	16,251	1,253	17,084	1,318	16,188	1,252	17,5017	1,140	14,087	1,108	15,477
adj. R²	0.111	0.094	0.154	0.089	0.119	0.128	0.177	0.135	0.200	0.158	0.157	0.162

Notes: * p<0.1, ** p<0.05, *** p<0.01 – Survey weights are considered to counteract sample bias.
a) Foreigners and Germans with migration background.
Source: Federal Institute for Vocational Education and Training, BIBB (2012, 2018). Own calculations.

Table C.5: Regression results on physical complaints (2012, 2018)

Ordinary least squares (OLS)	Men			Women		
Depended variable:	Migrant [a]	Native	Prob>chi2	Migrant [a]	Native	Prob>chi2
Musculoskeletal disorders (MSD)	(1)	(2)	(1)/(2)	(3)	(4)	(3)/(4)
Means (z-values)	*-0.092*	*0.103*		*0.146*	*0.315*	
Individual characteristics						
Age	-0.003	0.003**	0.326	0.011	-0.001	0.087
Age squared	0.000	-0.000	0.279	-0.000	0.000***	0.051
Education: Vocational training	-0.032	-0.002	0.316	-0.021	-0.017	0.904
Education: Advanced training	0.026	-0.023	0.242	0.010	-0.041***	0.371
Education: University degree	0.035	-0.017	0.153	-0.026	-0.035***	0.821
Partnership-Dummy	0.007	0.014**	0.753	-0.010	-0.005	0.808
Children in the household	0.023	0.005	0.458	0.012	-0.003	0.550
Work characteristics						
Real working hours	0.006	-0.001	0.051	0.009**	0.003***	0.104
Real working hours, squared	-0.000	0.000	0.077	-0.000*	-0.000***	0.200
Job pos.: skilled worker	-0.049**	-0.016**	0.185	-0.050*	-0.023***	0.307
Job pos.: highly qualified employee	-0.044	-0.010	0.285	-0.049	-0.028***	0.567
Job pos.: specialist	0.037	-0.001	0.531	-0.045	-0.014	0.594
Hourly wage	-0.004**	-0.002***	0.170	-0.001	-0.002***	0.445
Firm size, 5 categories	x	x		x	x	
KldB, 2-digit level	x	x		x	x	
Work tasks (z-values)						
Non-routine manual	0.000	-0.005	0.598	0.012	-0.003	0.255
Routine manual	0.019*	0.002	0.105	0.039**	0.009**	0.039
Routine cognitive	-0.011	-0.005*	0.508	-0.017	-0.002	0.183
Non-routine interactive	0.008	0.003	0.686	0.010	-0.001	0.303
Non-routine analytic	0.014	-0.000	0.121	-0.021*	-0.001	0.049
Job requirements (z-values)						
Performance requirements	-0.001	0.000	0.923	0.003	0.001	0.843
Repeating operations	0.015	0.013***	0.876	0.004	0.010***	0.619
Coordination efforts	-0.004	0.007**	0.335	0.023**	0.002	0.074
Quantity performance	0.024*	0.011***	0.247	0.020	0.013***	0.583
Working at performance limit	0.031***	0.025***	0.620	0.021*	0.034***	0.230
Working conditions (z-values)						
Physical activities	0.047***	0.045***	0.910	0.043***	0.043***	0.960
Environmental conditions	0.069***	0.033***	0.006	0.027*	0.047***	0.211
Shift work	-0.003	0.003	0.496	-0.016	0.007**	0.064
Working climate	-0.006	-0.017***	0.200	-0.009	-0.018***	0.378
Insuf. information transfer	0.018**	0.020***	0.905	0.011	0.017***	0.562
Self-determination	-0.009	-0.004	0.632	-0.017	-0.009***	0.518
Control						
Federal states	x	x		x	x	
Survey years	x	x		x	x	
constant	0.130	0.052		-0.056	0.126**	
Obs.	1,131	14,051		1,093	15,304	
adj. R^2	0.325	0.258		0.273	0.287	

Notes: * p<0.1, ** p<0.05, *** p<0.01 – Survey weights are considered to counteract sample bias. Persons in labour force age only.
a) Foreigners and Germans with migration background.
Source: Federal Institute for Vocational Education and Training, BIBB (2012, 2018). Own calculations.

Table C.6: Regression results on emotional exhaustion (2012, 2018)

Linear Probability Model	Men			Women		
Depended variable:	Migrant [a]	Native	Prob>chi2	Migrant [a]	Native	Prob>chi2
Emotional Exhaustion (EMX)	(1)	(2)	(1)/(2)	(3)	(4)	(3)/(4)
Means (Dummy)	*0.263*	*0.207*		*0.347*	*0.292*	
Individual characteristics						
Age	0.014	0.012***	0.881	0.004	0.006	0.882
Age˙ squared	0.000*	-0.000***	0.772	-0.000	-0.000	0.852
Education: Vocational training	-0.039	0.028	0.157	0.028	-0.022	0.404
Education: Advanced training	0.090	0.048**	0.609	0.192	-0.014	0.099
Education: University degree	-0.013	0.035	0.435	0.121*	-0.004	0.075
Partnership-Dummy	-0.099**	-0.026**	0.063	0.002	-0.037***	0.351
Children in the household	0.029	-0.005	0.410	-0.025	-0.003	0.625
Work characteristics						
Real working hours	-0.003	-0.002	0.880	-0.003	0.003*	0.369
Real working hours, squared	0.000	0.000	0.809	0.000	-0.000	0.237
Job pos.: skilled worker	-0.053	-0.003	0.234	-0.061	-0.004	0.251
Job pos.: highly qualified employee	-0.097*	-0.016	0.167	-0.080	-0.004	0.250
Job pos.: specialist	-0.086	0.024	0.405	-0.131	0.005	0.463
Hourly wage	0.006*	-0.001	0.027	0.000	-0.002**	0.469
Firm size, 5 categories	x	x		x	x	
KldB, 2-digit level	x	x		x	x	
Work tasks (z-values)						
Non-routine manual	-0.020	0.004	0.182	0.038	0.017***	0.399
Routine manual	0.010	-0.021***	0.073	-0.004	-0.003	0.962
Routine cognitive	0.009	-0.004	0.472	-0.015	0.008	0.280
Non-routine interactive	0.037*	0.017***	0.322	0.034	0.009	0.267
Non-routine analytic	0.015	0.008	0.721	0.009	0.004	0.814
Job requirements (z-values)						
Performance requirements	0.004	0.009*	0.770	0.005	0.006	0.997
Repeating operations	0.035**	0.006	0.091	-0.013	-0.020***	0.735
Coordination efforts	0.073***	0.031***	0.019	-0.003	0.007	0.644
Quantity performance	0.012	0.015***	0.859	0.048**	0.014***	0.152
Working at performance limit	0.075***	0.059***	0.379	0.055**	0.086***	0.158
Working conditions (z-values)						
Physical activities	-0.008	-0.015**	0.772	-0.016	-0.010	0.836
Environmental conditions	0.025	0.026***	0.954	0.079***	0.033***	0.091
Shift work	-0.020	0.005	0.063	0.010	0.005	0.809
Working climate	-0.022	-0.057***	0.017	-0.020	-0.067***	0.010
Insuf. information transfer	0.031*	0.035***	0.782	0.034*	0.047***	0.522
Self-determination	-0.050***	-0.018***	0.081	0.014	-0.015***	0.145
Control						
Federal states	x	x		x	x	
Survey years	x	x		x	x	
constant	0.266	-0.041		0.714	0.036	
Obs.	1,120	13,903		1,078	15,239	
adj. R^2	0.173	0.132		0.128	0.162	

Notes: * p<0.1, ** p<0.05, *** p<0.01 – Survey weights are considered to counteract sample bias. Persons in labour force age only.
a) Foreigners and Germans with a migration background.
Source: Federal Institute for Vocational Education and Training, BIBB (2012, 2018). Own calculations.