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# The immigrant-native wage gap in Germany revisited

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## Abstract

This study provides new evidence on the levels of economic integration experienced by foreigners and naturalised immigrants relative to native Germans from 1994 to 2015. We decompose the wage gap using the method for unconditional quantile regression models by employing a regression of the (recentered) influence function (RIF) of the gross hourly wage on a rich set of explanatory variables. This approach enables us to estimate contributions made across the whole wage distribution. To allow for a detailed characterisation of labour market conditions, we consider a comprehensive set of socio-economic and labour-related aspects capturing influences of, e.g., human capital quality, cultural background, and the personalities of immigrants. The decomposition results clearly indicate a significant growing gap with higher wages for both foreigners (13.6 to 17.6%) and naturalised immigrants (10.0 to 16.4%). The findings further display a low explanation for the wage gap in low wage deciles that is even more pronounced within immigrant subgroups. Cultural and economic distances each correlate strongly with wages. A different appreciation of foreign educational qualifications, however, widens the wage gap substantially by 4.5%points on average. Moreover, we observe an indication of deterioration of immigrants' human capital endowments over time relative to those of native Germans.

**Keywords** Immigration · Wage gap · Unconditional quantile regression · Germany · SOEP

**JEL classification** J61 · J31 · J15

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# 1 Introduction

The recent inflow of migrants into Europe has reinforced the opposing currents in the societies of European countries. In many countries of 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<sup>1</sup> 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).<sup>2</sup> 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 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.<sup>3</sup> 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 (Federal Government 2016; Kosyakova and Sirries 2017).<sup>4</sup> 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).

<sup>1</sup> For further information on German migration history, see Appendix C.

<sup>2</sup> 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).

<sup>3</sup> For further details on direct and indirect discrimination see OECD (2013).

<sup>4</sup> See, e.g., Thomsen and Walter (2010) and Thomsen et al. (2013) for corresponding programme evaluations.

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 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*<sup>5</sup> 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<sup>6</sup> for the 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 3 provides information on the data used for the

<sup>5</sup> 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.

<sup>6</sup> 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).

empirical analysis, which is followed with a presentation of selected descriptive statistics (section 4). We introduce the econometric approach of the decomposition method in section 5. The empirical results are illustrated and evaluated in section 6. The final section provides conclusions.

## 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 for 1996 to 2005 (Bartolucci 2014).<sup>7</sup> For the same period, Lehmer and Ludsteck (2011) identify a heterogeneous pattern of immigrant wage disadvantages depending on the country of origin (1995–2006).<sup>8</sup> Here, even lower wages can be observed for second-generation immigrants (Algan et al. 2010).<sup>9</sup> Further results provided by Aldashev et al. (2012) reveal significant wage gaps for both foreigners (25%) and naturalised immigrants (19%) based on SOEP data for 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 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

<sup>7</sup> Bartolucci (2014) uses matched employer-employee data (LIAB) from the Institute for Employment Research (IAB).

<sup>8</sup> Lehmer and Ludsteck (2011) use employment register data (BEH) of the German Federal Employment Agency.

<sup>9</sup> Algan et al. (2010) use data from German Mircocensus 2005/2006.

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 (1985:465) 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 & Davidov (2014, p. 352) confirm that proficiency in the host country's language is central to immigrants' labour market achievements. The 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.

### 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 socio-demographic 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 sub-groups covering the main regions of origin of guest-workers: 'citizens of Turkey',

- ‘citizens of the former Socialist Federal Republic of Yugoslavia (SFRY)’<sup>10</sup> 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<sup>11</sup> or from Eastern Europe<sup>12</sup> and arriving in Germany after 1987.<sup>13</sup>
  - 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 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 Bureau of Statistics (2017b). The incorporated regional information includes, among other, the share of

<sup>10</sup> The group also includes SFR Yugoslavia’s successor states: Slovenia, Croatia, Bosnia and Herzegovina, Serbia (incl. Kosovo), Montenegro and Macedonia.

<sup>11</sup> Russia, Ukraine, Moldavia, Belarus, Kazakhstan, Tadzhikistan, Turkmenistan, Kirgizstan, Uzbekistan, Estonia, Latvia, Lithuania, Georgia, Armenia, and Azerbaijan.

<sup>12</sup> Poland, the Czech Republic and Slovakia (formerly Czechoslovakia), Hungary, and Romania but not Bulgaria (earlier repatriation).

<sup>13</sup> 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.

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.

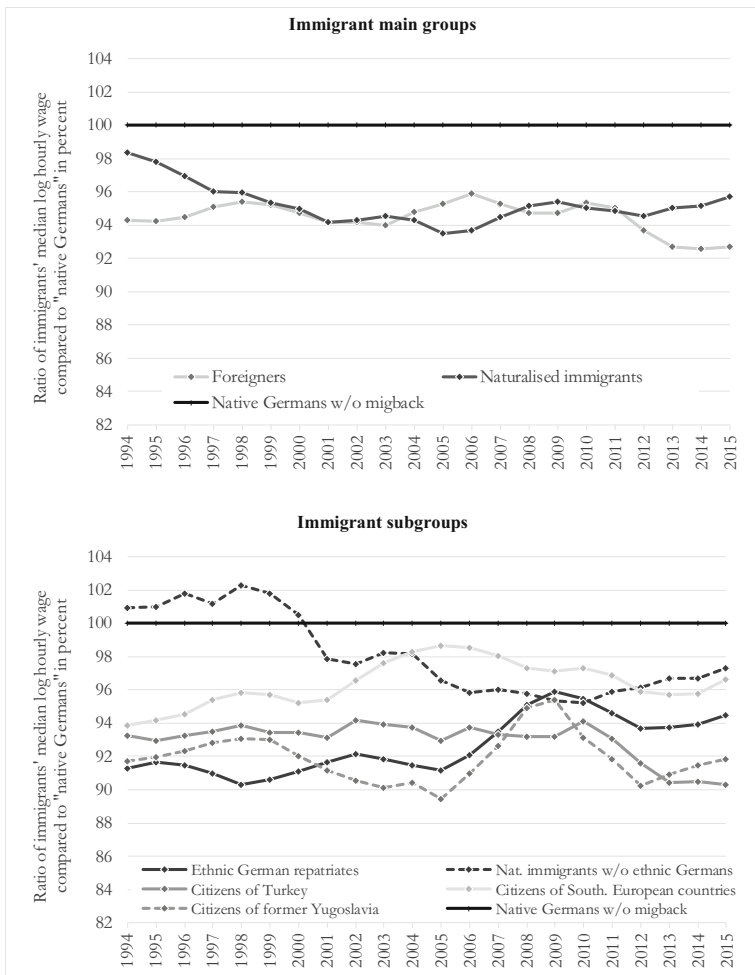
For homogeneity reasons, we impose a number of restrictions on the estimation sample. We only consider first generation immigrants living in western Germany (incl. Berlin) – which means persons who were born abroad and who have immigrated to Germany. To ensure a reliable comparison of groups, we concentrate 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 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.

## 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 B.1 in the appendix), we illustrate the wage development of immigrant groups through wage divergences (Fig. 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



**Fig. 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

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 ( $\pm 6$  pts). 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). 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 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,<sup>14</sup> 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 German repatriates* have significant less experience (16 years each).

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 former Yugoslavia*. On the other hand, the distance for *southern European countries* is relatively small (see section 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.

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 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

<sup>14</sup> 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.

**Table 1** Means of select characteristics (pooled for 1994 to 2015)

<i>Dependent variable</i>	Native Germans without mig.back	Naturalised immigrants	Foreigners d	Naturalised immigrants w/o ethn. Germans	Ethnic German repatriates	Citizens of Turkey	Cit. of southern European countries	Citizens of the former Yugoslavia
<i>log(wage)</i>	2.78	2.65	2.63	2.73	2.59	2.59	2.68	2.55
<i>Independent variables</i>								
age	40.5	40.0	39.0	42.2	38.3	37.3	40.0	39.5
age at immigration <sup>a</sup>	-	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 <sup>a</sup>	-	19.2	21.8	26.4	13.8	22.6	27.1	19.9
log(cultural distance) <sup>a</sup>	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
<i>Education</i>								
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) <sup>a</sup>	-	0.75	0.46	0.67	0.81	0.58	0.09	0.71
German writing skills (1-5) <sup>a</sup>	4.79	3.97	3.47	4.15	3.82	3.30	3.48	3.41
<i>Occupational class</i>								
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
rou. non-manual	0.03	0.03	0.04	0.05	0.01	0.05	0.05	0.04
rou. 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
<i>Economic sector</i>								
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

Table 1 (continued)

	Native Germans without mig.back	Naturalised immigrants	Foreigners <sup>d</sup>	Naturalised immigrants w/o ethn. Germans	Ethnic German repatriates	Citizens of Turkey	Cit. of southern European countries	Citizens of the former Yugoslavia
other	0.38	0.22	0.25	0.27	0.19	0.22	0.24	0.19
<i>Firm size</i>								
< 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
> 2000 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
<i>Regional information<sup>b</sup></i>								
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	6296	9427	2437	3859	2889	3089	1506

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

<sup>a</sup> Calculated for immigrant groups only; no tests are provided

<sup>b</sup> Regional information refers to the federal state level (NUTS 1)

<sup>c</sup> *Foreigners* also include remaining foreigners who are not regarded as citizens from guest-worker countries

Source: SOEP (2017). Own calculations

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 Germans 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.<sup>15</sup> 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 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.

## 5 Econometric methodology

### 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

<sup>15</sup> 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.

individuals  $i$  of group  $j \in \{A, B\}$ . The mean difference  $R$  between groups A and B can be formulated as follows:

$$R = \bar{Y}_A - \bar{Y}_B = \bar{X}_A' \hat{\beta}_A - \bar{X}_B' \hat{\beta}_B, \quad (1)$$

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),  $\beta^j$  is the vector of regression coefficients, and  $\varepsilon_i^j$  is random error (Jann 2008). The decomposition method divides the outcome difference of the wage equation into two components:

$$R = (\bar{X}_A - \bar{X}_B)' \hat{\beta}_A + \bar{X}_B' (\hat{\beta}_A - \hat{\beta}_B). \quad (2)$$

The first term  $(\bar{X}_A - \bar{X}_B)' \hat{\beta}_A$  represents the “endowment effect” attributable to mean differences in background characteristics (e.g., education and experience). The second term  $\bar{X}_B' (\hat{\beta}_A - \hat{\beta}_B)$  denotes the “coefficient effect” and represents differences in returns to similar characteristics.<sup>16</sup> 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., 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 Pereira 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  $\tau^{\text{th}}$  quantile is given by the following expression (Galego and Pereira 2014, p. 2516):

$$RIF(Y, q_\tau) = q_\tau + \frac{\tau - I(Y \leq q_\tau)}{f_Y(q_\tau)}. \quad (3)$$

It is computed by estimating the marginal density  $f_Y(q_\tau)$  of  $Y$  for each sample quantile  $q_\tau$ . 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  $q_\tau$  (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).<sup>17</sup> In the last step, we estimate the Blinder-Oaxaca decomposition for each  $q_\tau$  as the unconditional quantile regression model.

<sup>16</sup> We use twofold decomposition because the additional “interaction effect” of threefold decomposition has no relevance to our study purpose.

<sup>17</sup> Nicole M. Fortin provides a Stata package *rifreg* to perform RIF-regressions and package *oaxaca8* for enhanced Blinder-Oaxaca decompositions (Fortin, 2009).

## 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 (Nopo 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).

## 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.<sup>18</sup> 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 6.2 below). We present the results for the two immigrant main groups of *Foreigners* and *Naturalised*

<sup>18</sup> The even distribution of all observations among deciles may lead to different ratios between immigrant groups and native Germans within the respective deciles.

*Immigrants* and supplement them with results for the subgroups. The derivation of the model specification precedes the respective results.

## 6 Estimation results

### 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).<sup>19</sup> 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%).

For the period 1994 to 2015, we find substantial wage gaps for both main groups relative to *Native Germans (without migration background)* (Fig. 2). *Naturalised Immigrants'* wage gaps relative to *Native Germans* reach 10.0 to 16.4%, rising with higher wage deciles (mean: 13.0%).<sup>20</sup> 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 Fig. 2)<sup>21</sup> 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 B.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

<sup>19</sup> For the number of observations for each wage decile, see Table A.9 in the appendix.

<sup>20</sup> 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.

<sup>21</sup> 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.

hand, we find a greater wage disadvantage for low wage deciles that would otherwise have not been discovered.<sup>22</sup>

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 (Fig. 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.

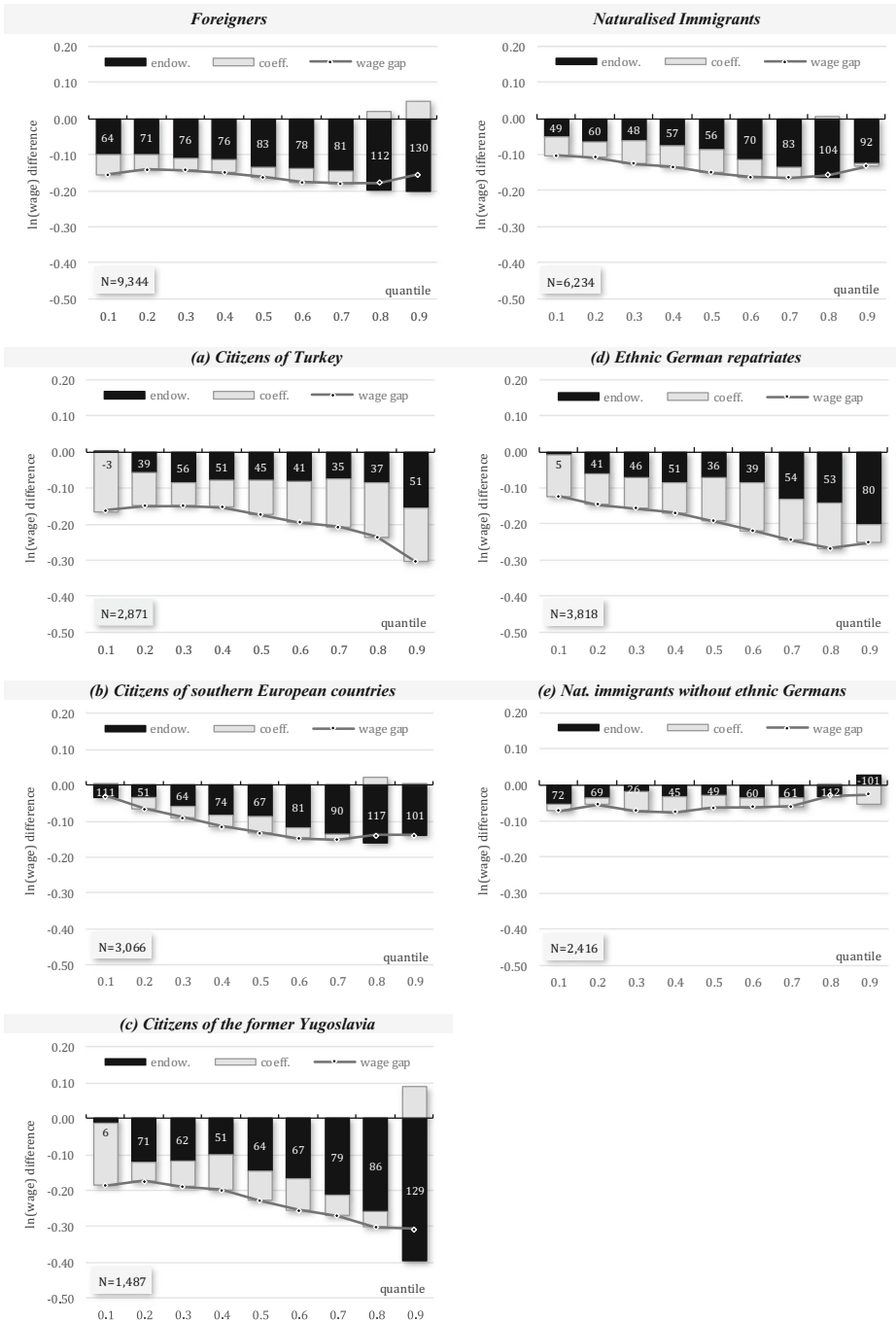
These results may indicate selectivity in naturalisation, i.e., those who are more integrated into the German labour market are more likely to be naturalised. In this respect, von Haaren-Giebel and Sandner (2016) mention higher levels of integration and language proficiency and higher probabilities of 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 B.3 in the appendix).<sup>23</sup> 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.

## 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

<sup>22</sup> For the lower wage deciles, wage gaps may be bounded by social security benefits and minimum wages.

<sup>23</sup> 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%.



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

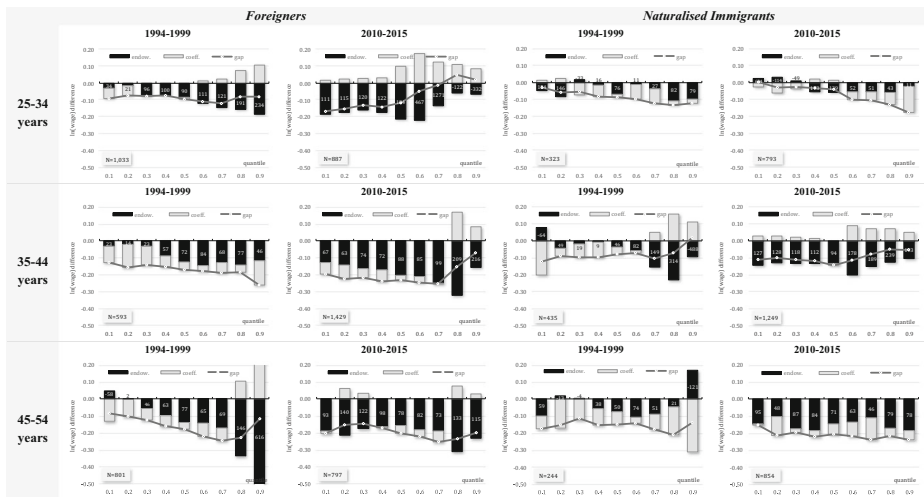
◀ **Fig. 2** Blinder-Oaxaca wage decomposition for UQR by immigrant groups (1994–2015). *Notes:* The reference group is “Native Germans without migration background”. The dark grey line shows the wage gap along the wage distribution, the dark bars represent the “endowment effect” of the wage decomposition, 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 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

*citizenship*” (*Geburtsortsprinzip*) and “*naturalisation based on a legal entitlement*” (*Anspruchs-einbürgerung*). (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.

### 6.2.1 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 Fig. 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 Fig. 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  $-17\%$ ).

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  $75\%$ .



**Fig. 3** Blinder-Oaxaca wage decomposition for UQR - age groups (1994–1999 and 2010–2015). *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 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

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 B.2 in the appendix).

## 6.2.2 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 B.4 and Figure B.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.

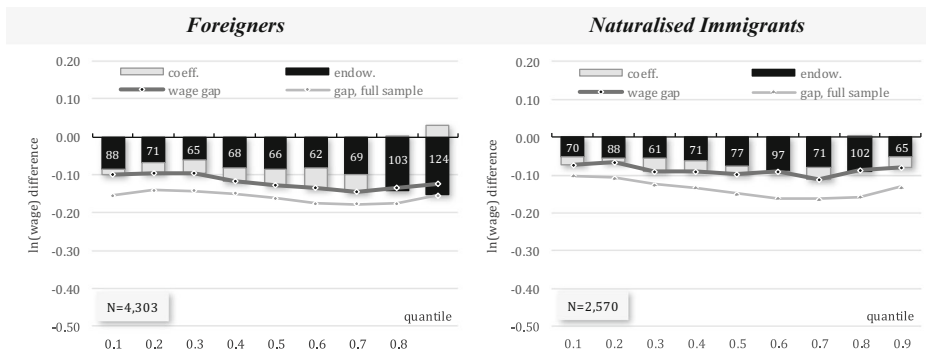
The growth of the wage gap observed towards the second period of each age cohort and especially for *Foreigners* is worrying. It implies that wage disadvantages persist over time and even intensify with age and job tenure. On the other hand, wage gaps of *Naturalised Immigrants* tend to narrow for later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

### 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 Fig. 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 German*, 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.

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 with the



**Fig. 4** Blinder-Oaxaca wage decomposition for UQR (1994–2015) – educational degree completed in Germany. *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 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

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.

## 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:

$$EcoDist_i = \log\left(\frac{GDPpc_i}{GDPpc_{GER}} * 100\right) - 2 \quad (4)$$

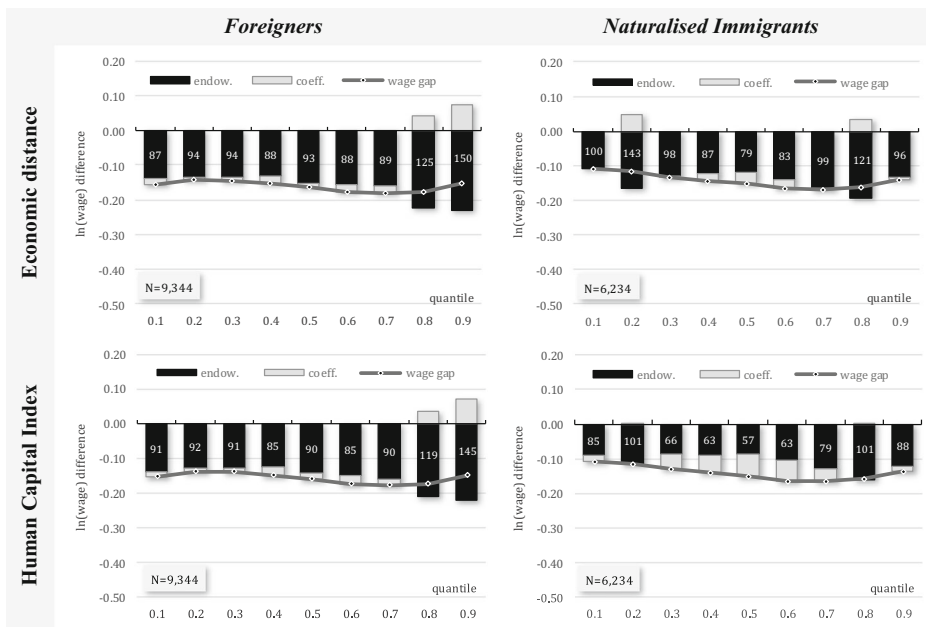
The logarithm of GDP p.c. is used to denote the marginal return of countries’ levels of economic performance on its human capital endowment. The indicator range runs from  $-2$  to infinity whereas values of greater than 0.5 can be classified as a large economic distance.

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 Fig. 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.

## 6.5 Personality traits

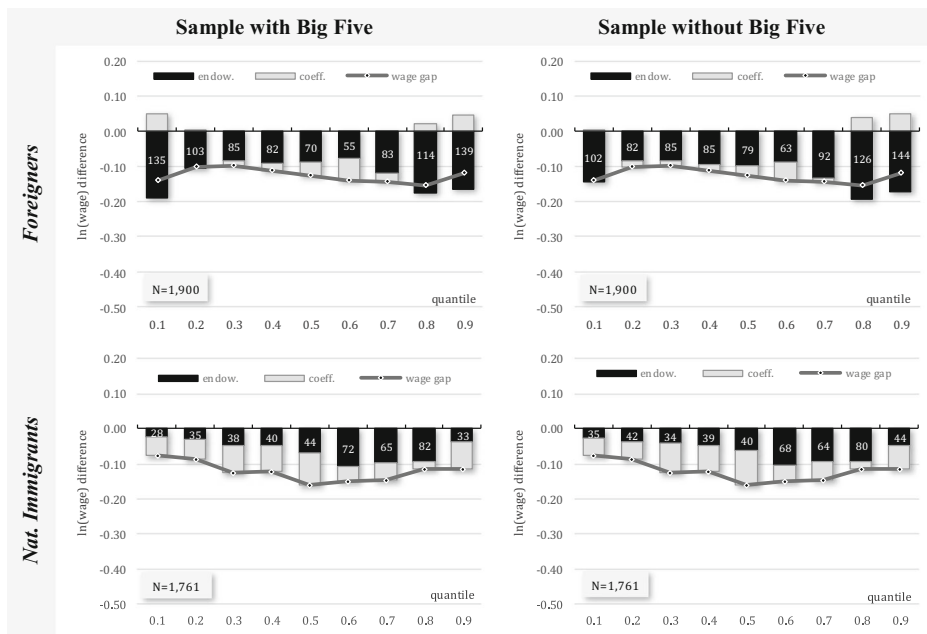
Personality traits of the individual are complementary to their cognitive and non-cognitive abilities and thus determine their success on the labour market. To investigate potential differences in personality composition, we consider the 5-factor model of personality (Big Five) in our analysis for 2005 to 2015. This approach defines personality comprehensively



**Fig. 5** Blinder-Oaxaca wage decomposition for UQR (1994–2015) – Human Capital Quality. *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 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

based on five independent domains. John & 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.

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 Fig.; 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



**Fig. 6** Blinder-Oaxaca wage decomposition for UQR (2005–2015) – Personality Traits. *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 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

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.

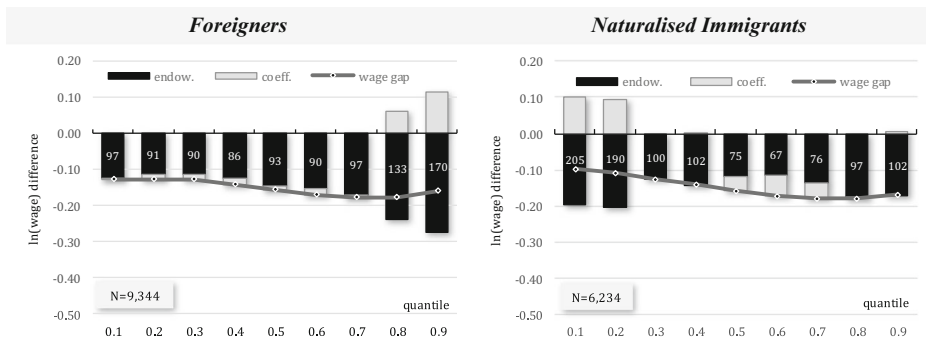
## 6.6 Cultural distance

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.

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 Fig. 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.

## 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



**Fig. 7** Blinder-Oaxaca wage decomposition for UQR (1994–2015) – Cultural Distance. *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 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

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 towards the activation of 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.

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