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Downward drifting Sticky Floors? - Evidence on the Development of Wage Inequality Among Foreigners in Germany

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Downward Drifting Sticky Floors? – Evidence on the Development of Wage Inequality Among Foreigners in Germany

Preliminary and incomplete – Do not quote

Johannes Ludsteck and Florian Lehmer*

February 28, 2013

Abstract

We employ the German social security register data to analyze the development of wage inequality among foreigners in Germany. The data show a sharp increase of wage inequality which exceeds the size observed for natives. The decomposition methods proposed by DiNardo et al. (1996) are employed to investigate whether the increase in wage inequality can be explained by the composition of work force characteristics. Our results show that observable characteristics play a significant role in the period 1984–1993. In later years the effect is important for the upper tail of the wage distribution only. This suggests that the valuation of foreign workers' characteristics must have changed rapidly in the last 15 years.

Keywords: Migration, Wage Inequality

JEL classifications: J31, J24, J15

1 Introduction

The significant increase of wage inequality in western Germany in the last two decades is documented and analysed in several studies (see e.g. see e.g. Fitzenberger 1999, Möller 2005, Kohn 2006, Dustmann et al. 2009 or Antonczyk et al. 2009). The empirical evidence collected in these studies favors explanations based on skill-biased technical change (SBTC) but suggests also other possible causes as e.g. changes in labor market institutions (mainly the decline of unionization rates). Little is known,

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however, regarding the effects of recent economic developments on the wages of foreigners. An obvious reason is that the observation numbers in the available data sets (the GSOEP and the IABS or SIAB) are too small to obtain reliable information in the wage distribution of foreigners and its changes across time. We fill this gap using the German employment register data. They cover all dependent workers liable to social security contributions and therefore provide sufficiently large observation numbers.

Our descriptive results show that the recent development of wage inequality observed for German workers is considerably intensified for foreigners. Whereas the changes of the upper part of the foreigner wage distribution are similar to those for Germans, the 20th percentile of foreign (full-time male) workers dropped by almost 20 percent in the period 1984–2010. (In the same period the 20th percentile of the German wage distribution has remained at its start-of-period level!) Clearly, the foreigners are an interesting subject already through the sheer size of these effects. Besides that, the foreigner sample may enable us to gather further insights regarding the causes of wage inequality and to evaluate theories of wage inequality *in general*: Though foreign workers differ clearly from German workers in several respects (language skills and formal qualification), they work in the same economic environment and the same firms and should be therefore be subject to the same or similar economic forces and native workers. We will try to exploit this in future versions of our study. The current version of the manuscript contains descriptive statistics of our sample and first results from decompositions which show that the increase of wage inequality among foreigners can be explained by observable characteristics in the period 1984–1993 but afterwards only for a small fraction of the upper part of the wage distribution.

The rest of the paper is organized as follows. We start with a short description of the data in the next section. Then we report some descriptive statistics on the characteristics of foreign workers in Germany and their development in the period 1984–2010. This is followed by a short outline of the methods and the decomposition results. We conclude with a short summary and a list of tasks to be done in future steps of the project.

2 Data

Our analysis is based on the the German employment register (BEH) of the German Federal Employment Agency. It covers all dependent workers liable to social security contributions. This amounts to almost 80 percent of the German work force and is therefore clearly representative for dependent workers. Since investigations considering the entire distribution of wages rely on sufficiently large observation numbers also at the tails of the distribution, this data set seems to be clearly the best choice for our application. The data contain reliable information on gross monthly and daily wages, unique identifiers for persons, establishments, regional units (at the local authority level) and industries, and important personal characteristics as e.g. age, gender, occu-

pation, formal education, and the nationality.

Some deficiencies of our data require several further sample restrictions. First, our sample includes only workers employed in western Germany. (Though the development in eastern Germany may be interesting too, the analysis of these regions is hampered by distortions through the transition of the former socialist economies to the German market economy.) Second, we consider prime-age (20-59 years) male workers in full-time jobs only. The restriction to prime-age workers is applied to avoid possible distortions caused by early retirement policies, and the restriction to full-time employees accounts for the fact that the daily working time is available in three categories only (full-time and part-time with less than and at least half of the full-time working hours, respectively). Whereas the daily working time varies considerably for part-time work, deviations from the standard working time are seldom for full-time employees. Of course, the restriction to full-time workers may be problematic in the face of increasing importance of part-time and minor jobs. We will inspect that in future versions of the paper.

Our data suffer from some further deficiencies (as most other real data set). These seem to be not severe or can be solved, however. First, the information on the formal education of workers is notoriously unreliable for foreigners for two important reasons. First, many foreigners seem to be overqualified (compared to the skill requirements of their jobs). This may induce underreporting of the true qualification if employers infer the worker's qualification based on the required qualification of his task or job. Second, most migrants enter Germany after completing their general education. Then it is difficult to sort grades and qualifications acquired in the home country into the German educational classification system, especially since the German highly regulated vocational training system is exceptional from an international perspective. This seems to be the main cause for the considerably large share of missings (roughly 20 percent of all foreigner observations) in the education variable. Education is coded in 6 categories in the register data which are customarily recoded into three broad categories: Persons with at least a completed apprenticeship training, persons with technical college or a university degree, and the complement (less than completed apprenticeship). To improve the quality of the education variable, we impute missing information by looking (for every spell) whether valid information is available in preceding or subsequent spells and replace the missing with this information.¹ This reduces the share of missing entries to roughly 7 percent. We do not drop the observations which lack valid education information after this procedure but code them as a separate category and use them in our estimation samples.

A second approach to tackle the missings in the education variable is to use the occupational qualification as a proxy. The quality of this proxy seems to be better since

¹The procedure is applied recursively if the education is missing in two or more adjacent spells. Our procedure is a simplified version of the approach proposed by Fitzenberger et al. (2006).

the occupational classification in the register data is quite detailed (roughly 330 categories) and most occupations can be characterised by narrow sets of qualifications.²We obtain this proxy by aggregating the 330 occupations into 18 groups.³

The second non-negligible problem in our data regards the nationality variable. First, we observe some back-and-forth changes of the nationality. They clearly point to reporting errors. Second, most ethnic German repatriates are not visible in our data since the most of them are declared as Germans when they enter Germany. Third, though foreigners who grew up in Germany are clearly different from migrants, we cannot separate them from migrants if they did not take German citizenship. This is especially a problem for foreigners from Turkey, Italy and Portugal where the second generation is considerable in size. Consequently our data and results refer to a mix of migrants and persons with migration background for these nationalities.

3 Descriptive statistics

The relevance of our issue becomes clear after a glance at Figure 3. It shows wage growth rates (compared to base year 1984) for the 20th, 50th and 80th percentiles of the wage distributions of Germans (left hand side) and foreigners (right hand side).⁴ As is well known from earlier contributions (see e.g. Fitzenberger 1999, Kohn 2006 Möller 2005 or Dustmann et al. 2009) wage inequality has increased considerably for Germany since the nineties. Whereas the 80th percentile has increased by 30 percent between 1984 and 2010, the 20th percentile has stuck roughly at its 1984 level.

Until now, no related information was available for foreigners in Germany, however. The right hand side panel of the figure makes clear that things are even worse for in the lower part of the wage distribution of foreigners. Whereas the 80th percentile has fared better than the German median, the 20th percentile plummeted by roughly 20 percent, compared to 1990 by even 25 percent.

Table 3 reveals additional heterogeneity within foreigners by listing annualized growth rates for some important subgroups.⁵ To account for the fact that the development of wage inequality has changed crucially in the mid- 1990s and that the fall of the iron curtain produced large inflows of migrants from the eastern European

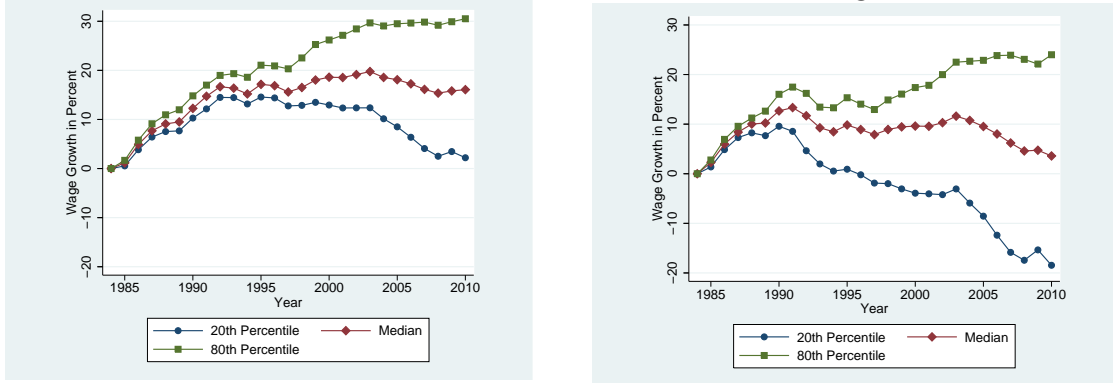
²The occupation variable shows missings and erroneous information too. The share of missings is, however less than 5 percent.

³Our aggregation scheme is based on Fitzenberger (1985).

⁴We consider the 80th percentile instead of the more common 90th percentile to avoid problems due to censoring at the (upper) social security contribution threshold. This threshold affects roughly 10-15 percent of German full-time workers and roughly 5-10 percent of foreign full time workers.

⁵Readers interested in further details are referred to the respective Figures in the Appendix.

Figure 1: Wage Growth of Prime Age Full-Time Workers 1984–2010
 Germans Foreigners



countries, the growth rates are computed separately for the periods 1984–1994 and 1994–2010 and annualized. For Germans we observe the 20th, 50th and 80th percentiles to evolve similarly between 1984 and 1994, with the highest wage growth for the 80th percentile. A wage growth over this time period for all three observed percentiles is also obvious for all foreigners taken together, but to a much smaller extent. Taking the heterogeneity of foreigners into account, it becomes clear that this result is driven by the subgroups of Italians, Greeks and Portugues, other western Europeans and Turks. The picture looks different for the other observed subgroups. For Eastern Europeans, for instance, the 20th percentile decreased annually by more than 0.5 percent already in the eighties and early nineties. The median and the 80th percentile, however, also increased, even though at a smaller rate than for western Europeans, Turks or Germans.

Focusing on the development in 1994-2010 we get for Germans the well-known result from the literature (see Dustmann et al. 2009) that wage inequality has increased especially since the mid-nineties. The 20th percentile decreased by 0.6 percent annually, whereas the 50th percentile remained almost unchanged and the 80th percentile increased annually by 0.6 percent.

Turning to the foreigner sub groups we see that the wages of other western Europeans grew at higher rates than those of Germans across all considered percentiles whereas the 20th percentile for migrants from the eastern European countries and Turkey faced landslide decreases. It is worth noting that also the medians for Eastern Europeans and Turks decrease substantially since the mid nineties. Altogether we observe for the aggregated foreigner sample that wage inequality increased to a larger extent than for Germans over this time period.

To assess whether these highly disturbing stylized facts may be explained by artifacts or extraordinary and episodic events, we start with an description of the development of foreigners' characteristics in the considered period. Figure 3 shows the

Table 1: Annualized Real Wage Growth 1984–2010 for the 20th, 50th and 80th Percentile.

Nationality Group	1984–1994			1994–2010		
	Percentile			Percentile		
	20th	50th	80th	20th	50th	80th
Germans	1.24	1.43	1.72	-0.63	0.05	0.60
All Foreigners	0.12	0.85	1.28	-1.23	-0.22	0.60
Italy,Greece,Portugal	0.20	1.04	1.38	-0.80	-0.03	0.65
Other Western European	0.81	1.43	2.18	0.08	0.85	1.10
Eastern Europe	-0.56	0.35	0.87	-1.61	-0.81	0.02
Turkey	0.79	1.08	1.32	-1.43	-0.28	0.37
Asia	-1.15	0.04	0.04	0.26	0.75	1.78
Africa	-1.01	-0.30	0.39	-1.70	-1.55	-0.87
Other	-1.74	-0.54	-0.40	-1.33	-1.09	-0.35

Note: the group of foreigners from other advanced countries is omitted here since the 80th percentile is censored in both periods.

Sample: foreign full-time workers, western Germany. Source: German Employment Register (BEH)

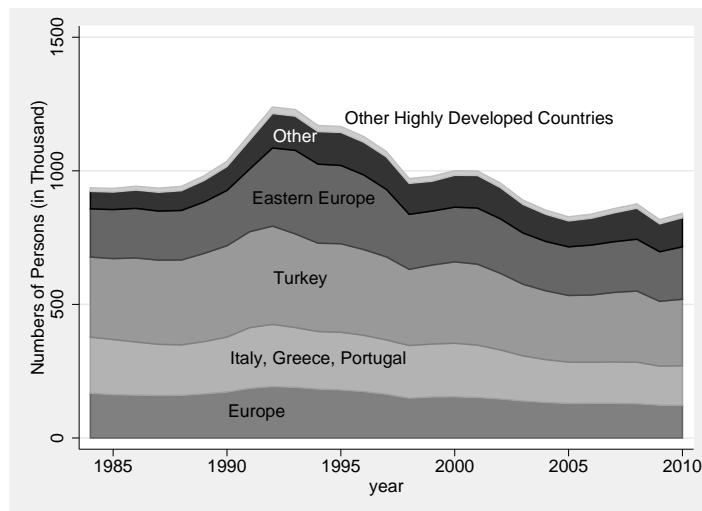
numbers of male full-time workers. To account for the above mentioned heterogeneity with respect to the countries of origin, the foreigners are classified in 9 homogenous groups.⁶ The figure shows a noteworthy increase of foreigner employment in the course of the German reunification-boom and significant inflows of migrants from the eastern European countries. Since 2000 we find, however, slight but uniform decreases of full time employment.

An obvious explanation for sizeable average wage decreases of migrant groups may be found in large inflows of migrants. As is well known from the related empirical literature since Chiswick (1978), migrants start with very low entry wages but experience considerable wage growth in subsequent years. With time spent in the host country, immigrants acquire language skills, accumulate other general human capital and become acquainted with the host country's labour market. The duration of stay in the host country is therefore and for other reasons an important⁷ determinant of

⁶Though the number of foreigners from highly developed countries like the U.S., Australia, and Japan is rather low, they are separated from the other groups because of their extraordinary wage level and wage growth.

⁷Dustmann (1993) emphasises that temporary migrants envisaging the date of their return to their home country might invest less in host country-specific human capital

Figure 2: Development of Foreign Male Full-Time Workers in Germany, 1984–2010



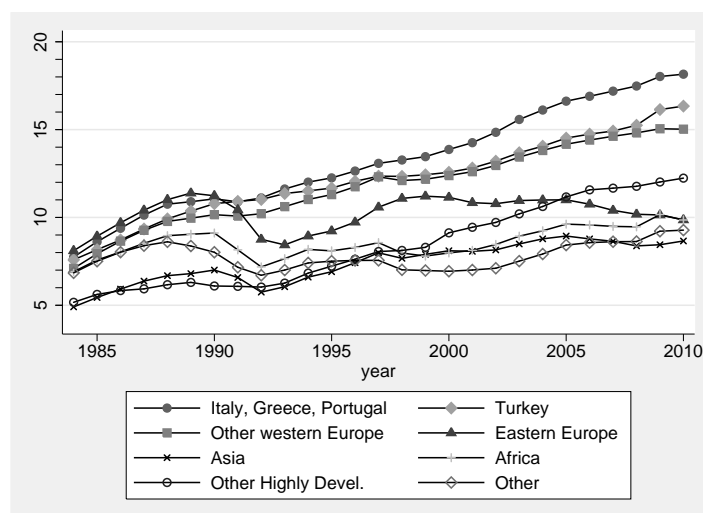
wage growth. Therefore we next consider the average duration of stay in Germany by country group. Figure 3 clearly shows considerable differences of the levels and development of this indicator. In the late 1980s, Turks as well as Italians, Greeks or Portuguese stayed on average already more than ten years in Germany, which reflects the recruitment of guest-workers from these countries especially in the 1970s.⁸ Somewhat surprisingly, we observe the highest average duration of stay in the first years of our observation period for Eastern Europeans. While the durations increased almost monotonically for Turks, Italians, Greeks and Portuguese as well as for other western Europeans, this is not the case for Eastern-Europeans. Here, we find a significant decrease of the average duration of stay indicating that the sample composition has dramatically changed with huge inflows from the eastern European countries since the fall of the iron curtain.

Since the qualification of workers has to be considered as an important determinant of productivity, we next check whether the divergence within and between the countries of origin can potentially be explained by differences and differential developments of the average formal qualification. Figure 3 visualizes the the share of medium and highly skilled workers by nationality group. Clearly, these numbers can be at least crude indicators because of the well-known data quality problems regarding the formal qualification of foreigners. Considerable differences of education levels emerge, for instance, between Turks on the one hand (20 percent share of medium and highly

and hence, have lower wage growth.

⁸The history of labor immigration to Germany after world war II is nicely summarized by Kalter and Granato (2007).

Figure 3: Average Duration of Stay in Germany of Foreign Full-Time Male Workers in Germany, 1984–2010



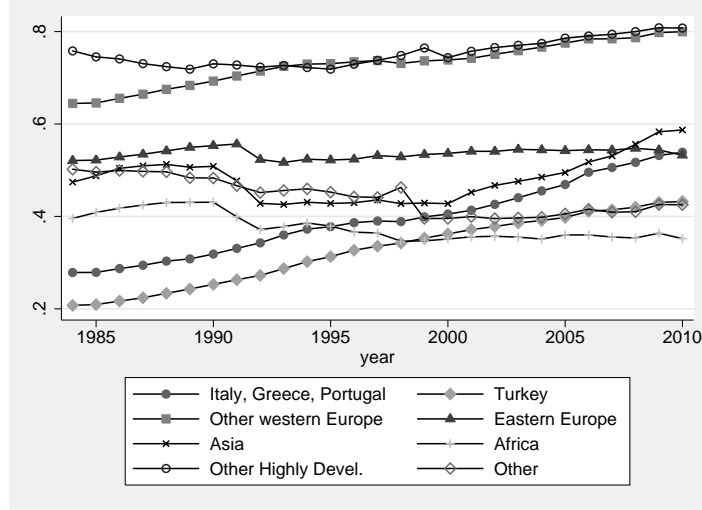
skilled workers in 1984) and other western Europeans on the other hand (about 65 percent respectively). The development, however, is similar for both groups, indicating an educational upgrading over time. This is also evident for foreigners from the classical guest worker countries Italy, Greece and Portugal. Contrarily, the share of medium and highly skilled Eastern Europeans even decreases to some extent from 1991 to 1992 and remains stable thereafter. One can conclude from this descriptive evidence that there are actually important differentials between foreigner subgroups regarding human capital endowments and its evolution.

4 Methods

Considering the huge size of the increase of wage inequality within rather short periods, it is interesting to evaluate whether it can be explained by changes of the composition of worker characteristics. Composition changes suggest themselves as obvious sources of heterogeneity especially for the pool of migrants that is subject to variations by immigration as well as back-migration. We provide a first explorative assessment of this issue using the decomposition technique proposed by DiNardo et al. (1996).

Following DiNardo et al. (1996) we assume that the distribution of wages can be decomposed into a (implicit) price function $f(w|x, p(t_x))$ representing the density of wage w for given characteristics x and prices (valuations) $p(t_x)$ assigned to these characteristics in year t_x , and an endowment function $h(x|t_x)$ representing the density

Figure 4: Share of Medium and Highly Skilled Full-Time Male Workers by Country Group, 1984–2010



of characteristics x in year t_x . This allows us to write the wage density in the form

$$f(w|t_p, t_x) = \int g(w|x, p(t_p)) h(x|t_x) dx.$$

$f(w|t_p, t_x)$ can be interpreted as the wage density resulting if the valuation of worker characteristics is as in period t_p and the distribution of characteristics is taken from period t_x . Clearly, $f(w|t_p = 0, t_x = 0)$ and $f(w|t_p = 1, t_x = 1)$ represent the *actual* wage densities in periods 0 and 1, respectively. To evaluate the change of the wage distribution between periods 0 and 1 that would result if the worker characteristics remained constant, we have to compute the counterfactual density $f(w|t_p = 1, t_x = 0)$ and compare it with $f(w|t_p = 1, t_x = 1)$

? show that counterfactual distributions can be computed using reweighted kernel density estimates by defining $\Omega := \frac{h(x|t_x=1)}{h(x|t_x=0)}$. Then $f(w|t_p = 0, t_x = 1)$ can be rewritten as

$$f(w|t_p = 0, t_x = 1) = \int g(w|x, t_p = 0) \Omega h(x|t_x = 0) dx.$$

Application of Bayes' law yields

$$h(x|t_x = 0) = \frac{h(t_x = 0|x) h(t_x)}{P(t_x = 0)}.$$

Performing the same transformation for $h(x|t_x = 1)$ and substitution into Ω yields

$$\Omega = \frac{h(t_x = 1|x) h(x)/P(t_x = 1)}{h(t_x = 0|x) h(x)/P(t_x = 0)} = \frac{h(t_x = 1|x) P(t_x = 0)}{h(t_x = 0|x) P(t_x = 0)}.$$

$h(t_x = 0|x)$ and $h(t_x = 1|x)$ can be estimated using Logit or Probit models and the probabilities $P(t_x = 0)$ and $P(t_x = 1)$ are simply the shares of period 0 and period 1 observations in the total sample comprising both periods. With these estimates at hand, we obtain $f(w|t_p = 0, t_x = 1)$ as weighted kernel density estimate with (scalar) weighting factor Ω . To ease the visual inspection of the results, we first compute the respective distribution functions by integrating over the densities. Then the distribution of the log wage changes between period 0 and period 1 is obtained by subtracting the $t = 0$ -quantiles from the respective $t = 1$ -quantiles.

We note that the application of the decomposition to real data is based on the assumption that changes of the characteristics do not induce direct price (valuation) effects. This assumption matches the partial equilibrium approach in economic theory and is clearly heroic, especially if sizeable changes over longer periods are considered.⁹ If no additional information that allows to obtain quasi-experimental evidence is available in the data, we have to rely on this assumption, however. As a consequence, all evidence obtained based on it should be considered only as an approximation and can give only raw indications regarding the causes of wage changes.

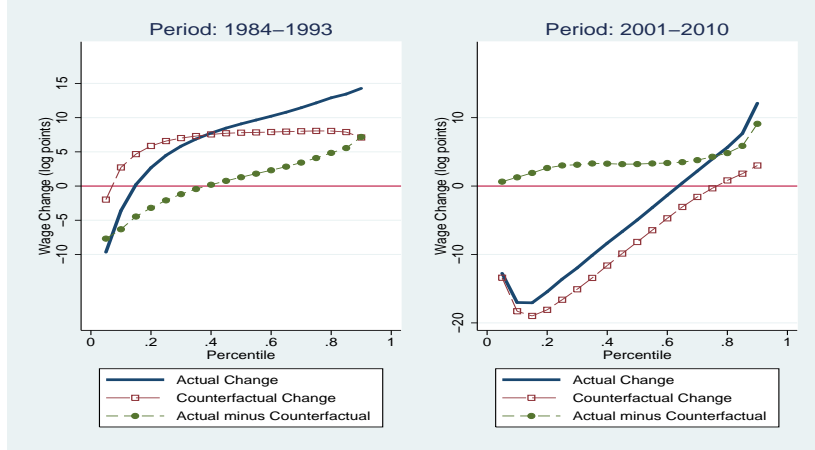
5 Decomposition results

To assess whether the increasing wage inequality among foreigners can be explained by changes of the composition of characteristics, we compute counterfactual wage distributions holding the composition of one or several characteristics at their begin-of-period levels.

To start with, consider Figure 5. It shows both the actual and the composition-constant wage changes for the periods 1984–1993 and 2001–2010 along the wage distribution ranging from the 5th to the 90th percentile. (We stop at the 90th percentile to avoid problems due to censoring). The second period 1993–2001 is omitted since the graphs are highly similar to period 2001–2010. The *actual* change distributions match the information drawn from the wage growth figures above. We find an increase of wage inequality (represented by positively sloped solid *actual* change graphs) in both

⁹Glitz (2012) provides evidence supporting this assumption by evaluating the effects of the inflow of ethnic Germans to German regions on regional wages. He finds that the inflows which were sizeable in some regions did not create significant wage effects. It is, however, unclear whether this piece of evidence which focussing on the ethnic composition of the work force can be generalized to other periods markets and characteristics.

Figure 5: Observed versus Composition-Constant Change of Wage Inequality: Holding the Average Duration of Stay, the Occupational Qualification and the Nationality Composition at their Begin-of-Period Levels.



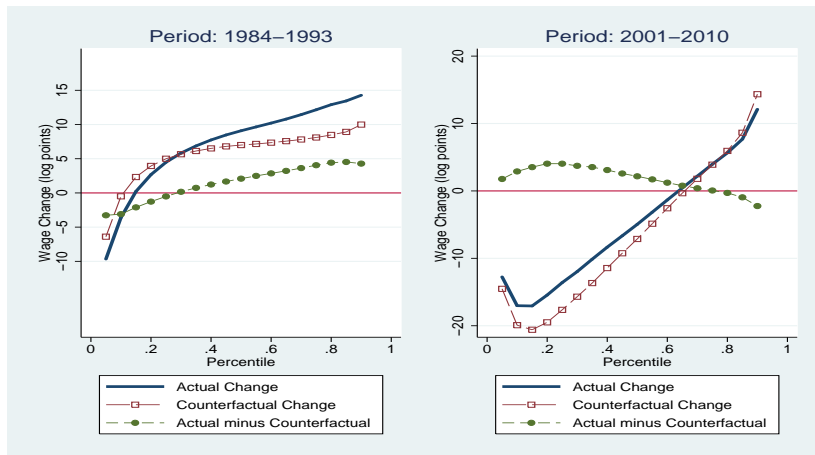
periods. Inequality increases to a greater extent in the second period and wage growth is uniformly smaller then, however. Whereas the 10th percentile decreased by roughly 5 log points (amounting to roughly 10 percent) in 1984-1993, the corresponding decrease amounts to roughly 15 log points in 2001-2010. Growth has been positive in both periods at the upper tail of the wage distribution (about 12 log points at the 80th percentile in 1984-1993 and about 5 log points in 2001-2010) but smaller in 2001-2010.

To assess whether observed characteristics can explain the increase in inequality in both periods, we start by considering counterfactual distributions holding all relevant characteristics of the work force constant: The average duration of stay in Germany, the occupational composition and the nationality composition of the pool of foreigners.¹⁰ This counterfactual distribution (represented by the dashed line with square markers) is compared to the actual wage changes (represented by fat solid lines) in the respective periods. In the first period (1984-1993) we see that the lower wage quantiles were decreased considerably whereas the quantiles above the median gained from these composition changes. For example, wage growth at the 5th quantile would have been roughly -2 log points if all considered characteristics had remained constant. The actual change was, however about -10 log points. On the contrary, the wage growth amounted to almost 15 log points in this period, but would have been only about 7 percent if the composition were held constant. Consequently, the work force composition changes explain a good deal of the increase in wage inequality in this period, roughly half of

¹⁰The occupational composition is used instead of the formal education as it seems to be a better proxy of the skill level.

the increase in the lower part of the distribution and almost the entire increase in the upper part (as the graph of the composition-corrected change distribution is almost horizontal there). Things are completely different in the period 2001–2010. Then the change of the characteristics was favorable as it increased wages at all quantiles of the distribution. But the effects were roughly equal everywhere and thus had no effect on the dispersion (except for the small fraction of workers above the 80th quantile). In Summary, we find that the composition of the work force played an important role in the period 1984–1993 whereas other mechanisms must have been at work in the period 2001–2010.

Figure 6: Observed versus Composition-Constant Change of Wage Inequality: Holding the **Average Duration of Stay** Constant.

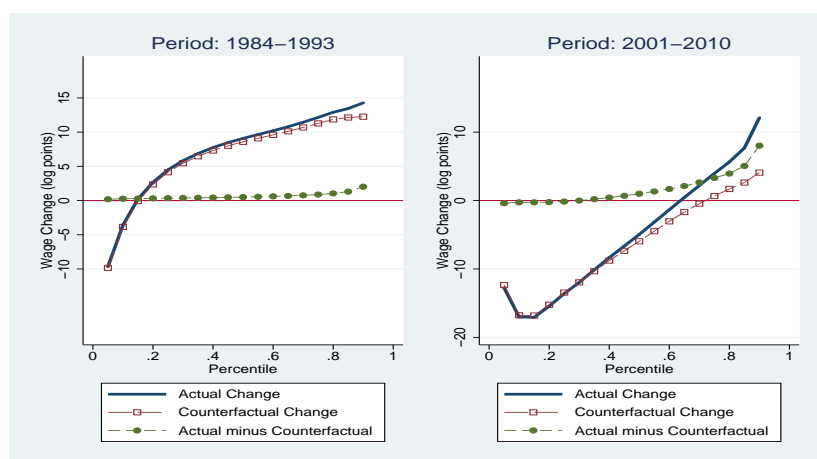


To assess the relative importance of the considered factors or to find their partial effects, we repeat the decompositions by holding only one characteristic constant. As mentioned above, the duration of stay in the destination country is of great importance for the wages of migrants since their productivity seems to be hampered by language barriers or missing experience with the technologies in the host country. When comparing the actual wage changes (solid line) with the wage changes that would result if the average duration of stay in Germany remained at its start-of-period levels (dashed graph with square markers), we see that the lower quantiles lost slightly in the first period¹¹ whereas all quantiles above the median gained significantly from the increase in the duration of stay. This appears plausible since the development of specific human capital plays a more important role for the better-paid jobs. Consequently, the highly-skilled high-wage workers should be able to a greater extent to transform experience

¹¹These losses are likely insignificant. We will check this in future versions by complementing the point estimates with estimates of their variances.

into wage gains. In the period 2001–2010, things are reversed, however. Now only the wages below the median gain from the average increase in the duration of stay. Clearly, the argument based on human capital which predict reverse effects cannot apply here. This suggests that either other mechanisms or further heterogeneity may be at work here. For example, the increase of the average duration is not uniform across countries. It decreases for migrants from the eastern European countries. To account for that, the analysis should be conducted separately for the groups deviating from the common trend. This task has to be shifted, however, to future versions of the paper. In summary we find that changes in the average duration of stay can explain a small share of the increase in wage inequality in 1984–1993. Things are different in 2001–2010 where the increase of the average duration had moderating effects on the wage distribution.

Figure 7: Observed versus Composition-Constant Change of Wage Inequality: Holding **Formal Education** Constant



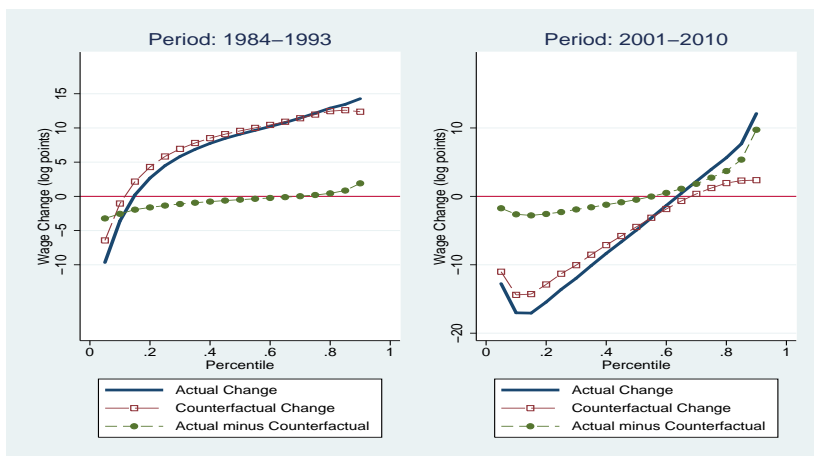
Next we consider the role of formal education which plays a prominent role in the explanation of wage inequality for Germany.¹² Already a first glance at Figure 5 makes clear that it does not matter. An obvious explanation for this fact comes from the observation (stressed in the data section above) that the formal education conveys less information on the qualification and skills of foreigners.

Therefore we replace it by the occupational qualification. It is measured by aggregating the occupation variable in the register data into 18 groups. When holding this qualification proxy constant, we find that changes of the qualification have no explanatory power in the period 1984–1993 whereas it contributed somewhat to the increase of inequality in the period 2001–2010 and seems to play a significant role for the quantiles

¹²See e.g. Fitzenberger 1999, Kohn 2006 Möller 2005 or Dustmann et al. 2009

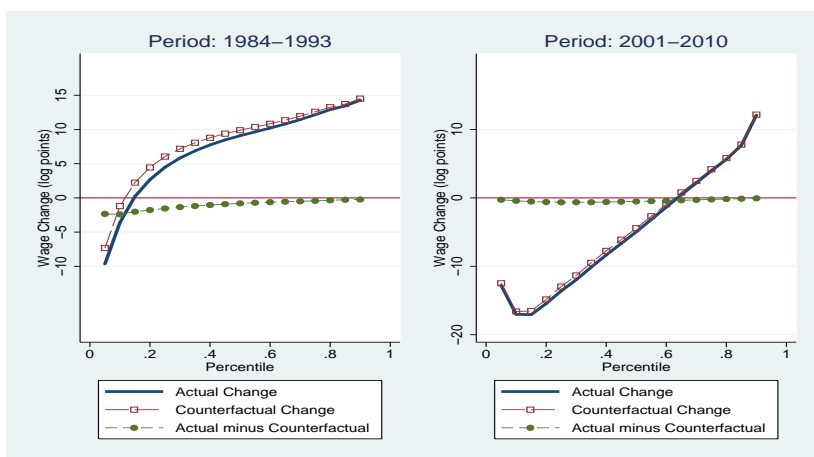
70-90 where the counterfactual change graph is almost horizontal whereas the factual change graph increases considerably.

Figure 8: Observed versus Composition-Constant Change of Wage Inequality: Holding the **Occupational Qualification** Constant.



Finally we inspect the contribution of the composition of countries of origin. It may be significant due to large inflows of migrants from the eastern countries in the nineties. Again a first glance at Figure 5 indicates that this variable has no explanatory power.

Figure 9: Observed versus Composition-Constant Change of Wage Inequality: Holding the **Composition of Countries of Origin** Constant.



In summary we find that the experience in the German market (proxied by the average duration of stay in Germany) and the skill composition (proxied by a coarse occupational grouping) contribute significantly to the increase of wage inequality in the period 1984–1993 but cannot explain even larger increases afterwards. These results differ considerably from Dustmann et al. (2009) which find that observable characteristics (formal education and age) explain a good deal of the observed increases in inequality across the entire distribution.¹³ The vanishing explanatory power of observable characteristics for foreigners suggests that the valuation of their productive characteristics must have changed significantly in the last 10-15 years.

6 Conclusion and plans for further research

We employ large extracts from the German employment register data to investigate the development of wage inequality among foreigners in Germany. Descriptive statistics show that the dispersion of wages has increased considerably more for foreigners. For instance, the 20th percentile of the real wage distribution returned to its start-of-period level at the end of the considered period (1984–2010) for German males. The 20th percentile of foreigners dropped by almost 20 percent in the same period. Descriptive statistics of the data reveal considerable further heterogeneity among foreigners, both with respect to the development of wages as well as regarding their observable characteristics. Since inflows and outflows may induce more sizeable changes of the composition of the characteristics among foreign workers, we apply the decomposition methodology proposed by DiNardo, Fortin and Lemieux (1996) to investigate whether such changes can explain the increase in wage inequality.

Since the composition of the characteristics among foreign workers is more volatile due to inflows and outflows of workers, we investigate whether such changes can explain the increase in wage inequality using the robust semiparametric decomposition methodology proposed by DiNardo et al. (1996). Our results suggest that a good deal of the increase in wage inequality can be explained for the period 1984–1993 by observable characteristics (mainly the occupational qualification and the average duration of stay in Germany) whereas they apparently do not contribute to the even greater changes in the period 2001–2010. This calls for an in-depth search for further possible sources of heterogeneity and indicates that the valuation of foreign workers' characteristics seems to have changed rapidly in the last 10-15 years.

These results are clearly preliminary and crude and therefore call for further investigation and checks along several dimensions. A first issue regards the composition of the nationality groups. Though the groups differ considerably regarding their observable characteristics and were affected differentially by inflows and outflows of new cohorts, we find only negligible effects of the nationality composition in our pooled

¹³See e.g. table II on page 858 in Dustmann et al. (2009).

samples. Since the insignificance of these effects could be caused by countervailing developments which neutralize each other, further insights may be gained from doing the decompositions separately for homogenous groups of nationalities or even single nationalities. Second, we hope to gather additional insights on the causes of wage inequality *in general* by comparing foreign workers with native workers showing similar skills, working biographies and wages. This will be done by complementing the foreigner sample with native workers.

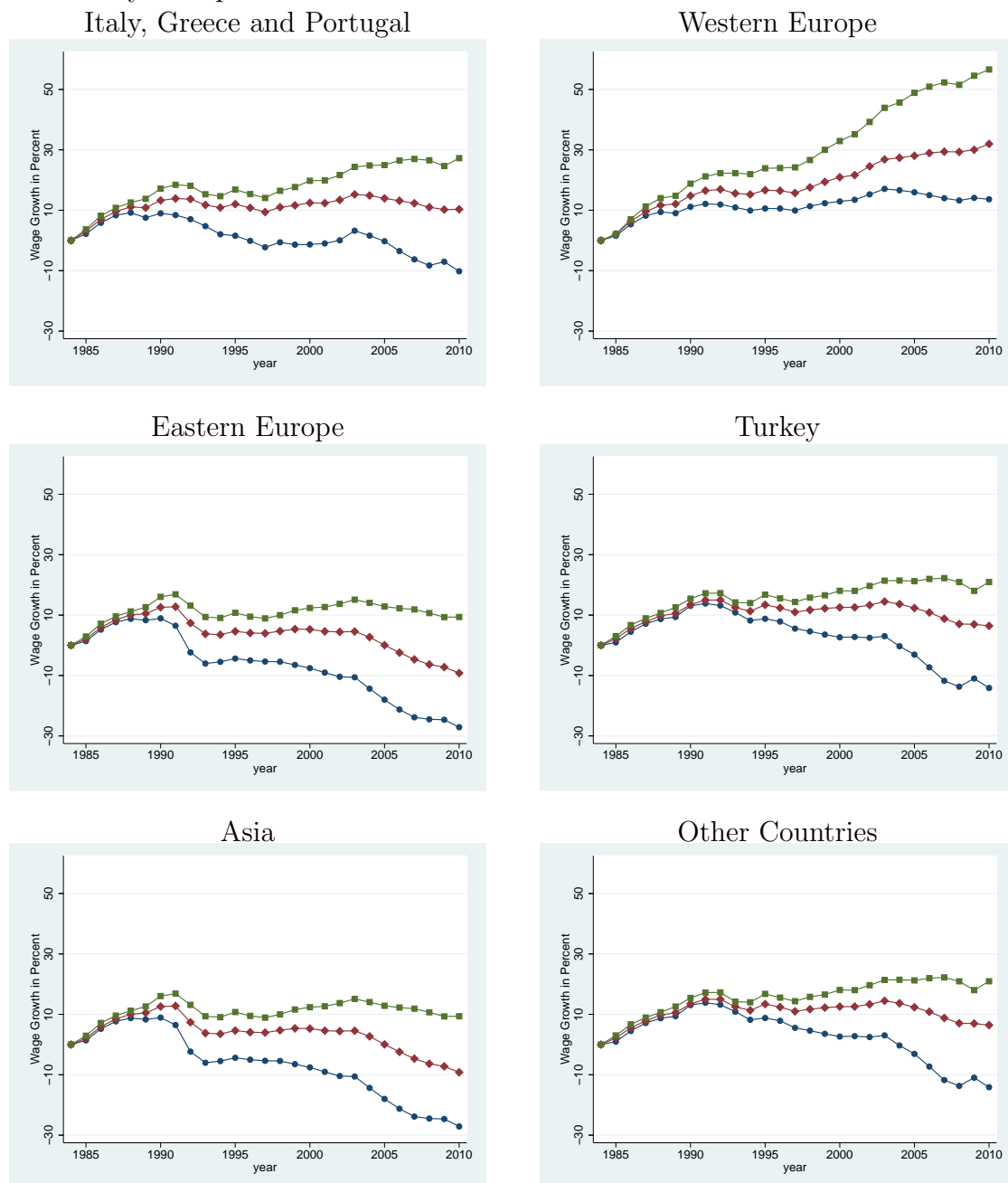
Third, we will have to pay more attention to several fine points. For example, we will have check whether the skills of foreigners can be proxied reliably by using occupation groupings and inspect the sensitivity of the decomposition results with respect to the choice of the grouping. Finally we will have to check the nationality variable for possible errors which are indicated by back-and-forth changes of the nationality codes for a subsample of persons, and we will carefully check whether our results are influenced by the acquisition of the German citizenship.

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Figure 10: Real Wage Growth of Prime Age Full-Time Workers 1984–2010 for several Nationality Groups



Note: ‘Other Countries’ excludes highly developed countries (e.g. USA, Australia, Japan).