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Welcome back! The impact of ‘return initiatives’ on return migration to rural regions*

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Abstract

This paper studies the effect of return initiatives in rural regions of Germany on interregional return migration. The initiatives aim to increase return migration by, amongst other things, providing information on local employment opportunities and personal support to workers who are interested in returning to find a job in the former rural region of residence. Analysing administrative data on individual labour market biographies through survival analysis and difference-in-difference estimation, we find that return initiatives, on average, promote interregional return migration. Among the considered workers, particularly those at the top of the wage distribution are more likely to return.

Keywords: Rural areas, return migration, return initiatives, labour market frictions, internal migration
JEL classifications: C31, R23, R58

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1 Introduction

Demographic change leads to a significant decline in the supply of labour in many remote regions of OECD countries (OECD, 2020). One driver of this development is that in particular young, high ability workers tend to leave rural areas and move to agglomerated local labour markets (see, e.g., Costa and Kahn, 2000; Combes et al., 2008; Glaeser and Resseger, 2010; Behrens and Robert-Nicoud, 2015; De la Roca, 2017; Simon, 2019; OECD, 2020).¹ Several scholars argue that this net out-migration and the associated sorting of workers with different skill-levels across space diminishes the future prospects of peripheral regions, as the endowment with human capital is thought to be a crucial factor for regional development (see, e.g., Chen and Rosenthal, 2008; Faggian and McCann, 2009; Rodríguez-Pose and Ketterer, 2012; Gennaioli et al., 2012). Recent results by Fajgelbaum and Gaubert (2020) for the U.S. indicate that also aggregate welfare might be reduced by a too high concentration of economic activity across space and too few high skilled workers in smaller cities, from which the lower skilled may benefit due to spillover effects.

Against this background, this paper studies – based on administrative microdata – the impact of a regional policy measure, so-called return initiatives, on return migration to rural regions in Germany. These return initiatives have been established by local stakeholders in several peripheral regions in the last two decades to address declining local labour supply and associated shortages of skilled labour (Stiller and Ohlhoff, 2021). Specifically, a return initiative aims to promote interregional return migration of former inhabitants to the region, in which the initiative is situated.² A key instrument is typically publishing information on local employment opportunities, such as vacancies and potential employers on their website. Furthermore, the initiatives often provide additional personal support to workers, who are interested in returning, to find a job in the former rural region of residence, among other things.

By analysing whether the existence of a return initiative in a former region of residence increases the probability of return migration, our study is, to our knowledge, the first to provide insights on the effect of this kind of policy intervention, even though the first return initiatives in Germany were established about 20 years ago. More generally, our analysis also contributes to the increase in literature on the role of spatial search frictions for interregional labour migration by providing new suggestive evidence. We presume that an important mechanism underpinning the positive effect of return initiatives on return migration, which we detect, is a reduction of the search frictions that workers likely face, when looking for a job in the former rural region of residence, and which would discourage them from moving back if the frictions were not reduced.

Recent studies indicate that labour market frictions significantly impact internal migration of workers. For instance, based on French data, Schmutz and Sidibé (2018) find that mobility cost estimates are smaller by one order of magnitude, if spatial search frictions are taken into account. Similarly, Bal-

¹ We use the terms 'rural regions', 'peripheral regions' and 'remote regions' interchangeably throughout the paper to improve readability.

² Potential reasons for return migration discussed in the literature refer to a correction of a previous migration decision, an optimised individual life-cycle plan and migration as signal for skills unobservable by firms before hiring (Borjas and Bratsberg, 1996; De la Roca, 2017; Knauth and Wrona, 2018).

gová (2019; 2022) estimates that in the U.S. it is even for employed college educated workers about 1.5 times harder to search for a job in another region than locally, despite the fact that this group of workers face the lowest spatial search frictions compared to other types of labour in the U.S.³ Furthermore, according to her model, a reduction of spatial search frictions specifically increases non-speculative migration, that is, migration with a position already secured. The reason is that lower frictions facilitate archiving a good job-match in another region without *ex ante* moving there.⁴ Interestingly, these types of non-speculative moves might be of particular importance for migration to peripheral rural areas, including return migration. By contrast, speculative migration is likely to be relatively unattractive for at least some workers due to the rather low probability of achieving a (high-quality) match in a small local labour market even after moving there (see, e.g., Duranton and Puga, 2004; Di Addario, 2011; Fontagné and Santoni, 2018), which diminishes the expected return of speculative migration to a rural region. This paper contributes to the literature on spatial search frictions and labour migration by providing robust evidence on the impact of regional policy interventions, that aim to foster return migration by increasing the chance that workers, who are interested in returning, achieve a sufficiently acceptable job-match in the respective former region of residence, so that they indeed return.

Our results indicate that the considered return initiatives, on average, promote return migration. However, the estimates also point to heterogeneous effects across workers. For individuals who moved to another local labour market immediately after the end of vocational training, we do not observe any significant impact. The same applies to workers at the bottom of the wage distribution, who arguably possess rather low abilities and less specialised skills. For higher ability workers, we, in contrast, observe a statistically and economically significant impact of return initiatives on the likelihood to return. The estimated average treatment effect on the treated (ATT) in the case of workers in the middle of the wage distribution is about 25%. For those workers with the highest wages in our sample, it is about 30%. The increase in return migration, however, seems to occur not immediately in the year in which a return initiative is established, but with a time-lag of two to three years.

For our analysis, we merge administrative information on individual labour market biographies from the Integrated Employment Biographies (IEB) of the Institute for Employment Research (IAB) with novel data on the establishment and existence of return initiatives in German regions provided by Stiller and Ohlhoff (2021). We consider the universe of all workers who completed vocational training in Germany in the period 2000 to 2014 and moved to another local labour market in the years thereafter. Based on this sample of 405,320 workers, we examine the likelihood of return migration to the local labour market in which vocational training was completed, and whether it is positively affected by the existence of a return initiative at the former residential location.

Our identification strategy rests on exploiting the spatio-temporal variation in the establishment of return

³ Further recent studies that emphasise the significance of spatial search frictions and information about employment opportunities for labour mobility are Schluter and Willeme (2019), Wilson (2021), and Ransom (2022).

⁴ Balgová (2022) points out that in some models of interregional migration, like the ones by Harris and Todaro (1970), Kennan and Walker (2011), and Kline and Moretti (2013), it is assumed that workers can only search for a job after moving (see also De la Roca, 2017). In contrast, in other models, for instance those by Beaudry et al. (2014), Lutgen and Van der Linden (2015), Amior (2015), and Epifani and Gancia (2005), it is assumed that workers only move given they achieve a match in another region (*ibid.*). Balgová (2022) herself develops a theoretical model in which workers can move with and without a job. Furthermore, she detects that about two third of interstate moves in the U.S. are associated with cross-regional job match (non-speculative migration) and only about one third of the mobile workers move to search.

initiatives at NUTS 3-level and information on individual return migration decisions. Specifically, we combine event history analysis and difference-in-difference estimation in a panel event study framework. In this setup, we estimate the effect of a return initiative on the individual likelihood to return conditional on indicators for the ability level of a worker and the individual labour market success prior to and after initial migration. Furthermore, we control for important time-varying regional characteristics, which likely determine migration decisions such as skill-level and occupation specific regional labour market conditions and (positive) local labour demand shocks caused by newly founded establishments. To confirm the robustness of our results, we, among other things, combine a matching approach and entropy balancing (Hainmueller, 2012) to generate a synthetic control group which is as similar to the treatment group as possible.

The paper proceeds as follows. In Section 2 we describe the data and provide information about the return initiatives examined in this analysis. In Section 3 we explain our empirical strategy and in Section 4 we present and discuss the results of our analyses. Finally, in Section 5 we set out our conclusions.

2 Data and descriptive analysis of return migration

For our empirical analyses, we mainly use two data sources. The first is the Integrated Employment Biographies (IEB), which captures individual labour market biographies, including annual information on individual places of residence. We merge this data with novel information about return initiatives in Germany provided by Stiller and Ohlhoff (2021). The combination of both data sets enables us to study individual decisions of return migration, depending on the existence of a return initiative in the former residential region. Furthermore, we use the IEB to generate important control variables referring to the individual labour market biography and to precisely measure regional labour market conditions.

2.1 Construction of an annual worker panel

The IEB covers microdata on employment, unemployment, job searches, benefit receipt, and participation in measures of active labour market policy on a daily basis for the universe of all labour market participants in Germany, as long as the workers are not exempt from social security contributions, such as civil servants and self-employed persons (about 12% of the labour force). Because the IEB is constructed from administrative records, including health, pension and unemployment insurance notifications, it contains very reliable information on all periods of labour market participation.⁵

From 1999 onward, the individual spells (observations covering a span of time) in the IEB provide information on the municipality of residence.⁶ The employment spells contain precise information on a range of areas, including employment status, occupation, gross daily wage, and the location of employment

⁵ For a more detailed description of the IEB see Frodermann et al. (2021).

⁶ Information on place of birth is not available in the IEB.

at municipality level, in addition. Based on the individual employment and unemployment spells, we construct an annual worker panel, which captures information on individual labour market participation and remuneration (both lagged by one year) as well as the last residential information per worker and per year.

Our analysis, and thus the annual worker panel, is restricted to medium-skilled workers, i.e. workers who completed dual vocational training that comprises (i) practical training in a firm and (ii) vocational education at a vocational school.⁷ We focus on these workers because for this group, we observe all residential locations, starting with the take-up of vocational training (provided a worker remains in the labour market). In Germany, workers with a vocational training degree represent by far the largest group of employees.⁸ The share of former apprentices in regional employment in many rural local labour markets is particularly high. At the same time there is a lack of medium skilled labour in Germany such as craftsmen, or agricultural, technical, medical and nursing professionals (Cedefop, 2016; Bossler and Popp, 2022).

Specifically, we consider all medium skilled workers who finished the apprenticeship between 2000 and 2014 in Germany. Among these workers, we focus on those who moved from the local labour market of residence during vocational training to another part of Germany in subsequent years (until 2014).⁹ After imposing some additional restrictions on the sample (see Online Appendix, Section B.1), the number of individuals in our annual worker panel amounts to 405,320 potential return migrants. For them, the panel comprises all worker-year observations between initial migration after the completion of vocational training, and the year in which a worker drops out of the sample at risk, because she (a) returns, (b) is not observed in the IEB for at least 2 years, e.g., because the person (temporarily) leaves the German labour market or (c) the end of the observation period (end of 2017) is reached. The number of these observations is 2,532,971.

Return migration is defined as moving back to the local labour market of residence during vocational training. More precisely, we consider all workers who move to a municipality that is less than 50 km apart from the municipality of residence during vocational training (until December 31, 2017) to be return migrants.¹⁰ This amounts to 92,639 people. More than 50% even move back to the municipality they lived in during vocational training.¹¹ The 75th percentile of the distance between the locations of residence during vocational training and after return migration at municipality level is 15 km and the 90th percentile is 35 km.

Based on the individual spells in the IEB, we generate additional variables that contain time-invariant

⁷ See Online Appendix, Section A for some key facts about the German dual apprentice system. For a more detailed description of vocational education and training (VET) in Germany, please refer to Deissinger (2015) and Cedefop (2020).

⁸ The share of these workers in total employment (with known level of qualification) is 69% (June 30, 2017; own calculation). Similarly, the share of VET occupations in total employment in Germany was 62.4% in 2020, according to Cedefop (2022) (see Figure A.1 in the Online Appendix).

⁹ To define the local labour market in which a worker was living as apprentice, we trace a circle with a radius of 50 km around the geographic centre of the municipality of residence during vocational training. This radius is in line with findings by Manning and Petrongolo (2017) for the size of local labour markets using data for the UK. Furthermore, Dauth and Haller (2018), who provide evidence on commuting distances in Germany, find that less than 10% of them exceed 50 km (driving distance by car).

¹⁰ As a robustness check, we define return migration as moving back to the NUTS 3 region (county) of residence during vocational training.

¹¹ 75% of all municipalities in Germany are at most 40 km² large and the maximum size is 894 km² (Berlin), which corresponds to a radius of 3.6 km, and 16.9 km, respectively if the municipalities were circular.

information on each worker in our sample (e.g., municipality of residence during vocational training, degree level and average wage between the end of vocational training and initial migration) and annual information on occupation-specific local labour market conditions (e.g., wage level, unemployment rate and local labour demand shocks caused by newly founded establishments) respectively. We merge this information with the annual worker panel.¹²

Finally, to study heterogeneous effects of return initiatives on return migration, we define different groups of workers. For the human capital endowment of a region, the skill level of (return) migrants is of particular importance. Therefore, we use information on (full-time) wages to define distinct groups of workers (cf., Matano and Naticchioni, 2016).¹³ Specifically, we follow De la Roca (cf., 2017) and estimate the individual ability level by the average worker wage before initial migration (see Online Appendix, Section B.2 for details).

2.2 Frequency and spatial pattern of return migration

In this section, we provide some descriptive information on return migration in Germany based on the sample of workers as defined above. Figure 1 indicates that about 30% of all former apprentices, who moved to another local labour market after the completion of vocational training for at least two years¹⁴, return in subsequent years. In line with results by De la Roca (2017) for Spain, workers with higher wages prior to initial migration – arguably those with relatively high abilities – tend to return less often than workers with lower wages. Furthermore, we also observe a slightly smaller proportion of return migrants within this for whom a (full-time) wage prior to initial migration is not observed. Quantitatively, however, the differences in return migration rates between the groups considered are rather small.

[Figure 1 about here]

Figure 2 focuses on the spatial pattern of initial and return migration. By comparing the distributions of the origin and destination of initial migration across local labour markets, we observe a similar pattern to De la Roca (2017) for Spain; initial migration typically occurs at the expense of rural labour markets, while return migration is primarily associated with moving down the urban hierarchy. Figures A.2a and A.2b in the Online Appendix indicate that the high number of return migrants from agglomerated to rather rural labour markets is primarily due to the high absolute number of initial migrants from lower to higher density regions. The share of return migrants amongst initial migrants varies only modestly between regions with high and low labour market density.

[Figure 2 about here]

¹² To differentiate occupations, we use the two-digit occupational group level of the German Classification of Occupations (2010) which is similar to the international ISCO-08 classifications and contains 36 occupations in our case. For a complete list of all control variables, definitions and summary statistics, see Tables A.2 and A.3 in the Online Appendix.

¹³ As a robustness check, we also use information on the individual school-leaving diploma distinguishing between *Abitur* (higher education entrance qualification) and lower degrees.

¹⁴ We exclude very short temporal migration, that is, workers, who return within the first year after initial migration (see Online Appendix, Section B.1).

2.3 Return initiatives

The second data source we use is the study by Stiller and Ohlhoff (2021), which provides information on the establishment and existence of different types of return initiatives in Germany. In our analysis, we focus on return initiatives that operate at the level of NUTS 3-regions and that are maintained throughout the whole year.¹⁵ We consider all return initiatives that were established until the end of our observation period (the year 2017). This amounts to 39 initiatives. However, they cover 65 out of 401 German NUTS 3-regions (see Figure 3) since some neighbouring regions cooperate.

[Figure 3 about here]

In general, the return initiatives aim to promote the return of former inhabitants. However, no uniform definition of a return initiative exists. One key element is that return initiatives provide information on vacancies and firms located in the region on a website. Furthermore, the initiatives typically offer consulting services for people interested in returning, and some send newsletters to firms with information about potential return migrants seeking a job in the former region of residence. This may facilitate matches between workers and firms, even if the firm had not advertised a role. In addition, return initiatives also provide information on housing, infrastructure, public services, etc.

The first return initiatives were established in East Germany to address the significant outflow of workers from East to West Germany in years after unification in 1990.¹⁶ However, in more recent years, a significant number of return initiatives has been established in rather peripheral regions in West Germany as well. Nevertheless, regions with return initiatives are still over-represented in East Germany. Furthermore, they are characterised on average by a relatively low wage level and low employment density (see Table 1 in Section 3.2). Compared to regional conditions in previous years, return initiatives were typically established in years with low regional unemployment rates, but high employment density and high median wage levels (see Table A.6 in the Online Appendix).

3 Empirical strategy and identification

3.1 Regression model

To study the effect of return initiatives on return migration, we take into account that “duration analysis is useful for the study of treatment effects in non-experimental settings” since “the timing of events [e.g., return migration] conveys useful information on the treatment effect” (van den Berg, 2001, p. 3449). Specifically, we follow De la Roca (2017) and apply a discrete single-exit duration model, which can be regarded as a sequence of discrete choice binary models (see Jenkins, 1995 for details).

¹⁵ Table A.5 in the Online Appendix lists all the initiatives and their specifications we consider. In few NUTS 3-regions, more than one initiative has been established in the observation period that aims at fostering return migration. In these rare cases, the earlier return initiative defines the treatment in our analysis. There also exist other types of return initiatives in Germany. We do not consider those which focus on the return of former inhabitants to a certain municipality nor return initiatives that exist at the NUTS 3-level, but are occasionally active within a year only. For instance, in some regions a so-called “returnee-day” is organised once a year like a job fair. Finally, we do not consider related programs of East German *Länder* (NUTS 1-regions).

¹⁶ See, e.g., Hunt (2006) for an analysis of the East-West migration in the 1990th.

Our units of observation are individual worker-year observations. Exit is defined as moving back to the local labour market, which has been left following vocational training.¹⁷ Hence, at the time when an individual returns, she drops out of the population at risk. By applying a discrete model, we address the fact that the information on residential locations and return initiatives is only available annually. Thus, the data has an interval-censored structure and our failures are heavily tied (multiple exits at the same time).¹⁸

Our analysis of return migration is based on the assumption that after initial migration individuals maximise their utility by choosing to stay away from the former residential location or to moving back to it. Specifically, we follow De la Roca (2017) and assume that the hazard rate, the probability of migrating at time t given the individual did not return to the region of vocational training up to time t , h_{it} , is given by (see also Jenkins, 1995):

$$h_{it} = P(T_i = t | T_i \geq t; Z_{it}) = F(\beta_t + Z_{it}) \quad (1)$$

T_i is a discrete, random variable representing the year worker i returns to the labour market which they left after vocational training (possibly never). $F(\cdot)$ is assumed to be a logistic cumulative probability function and β_t “is a duration specific parameter that captures duration at t in an additive and unrestricted way” (De la Roca, 2017, p. 37). Z_{it} captures that the probability to return depends on individual and regional characteristics that may vary over time. Specifically, we assume Z_{it} to be given by:

$$\begin{aligned} Z_{it} = & \gamma X_{i,t-1} + \delta M_{r(i),t-1} + \phi N_{s(i,t),t-1} + \mu_{r(i)} + \theta_{s(i,t)} \\ & + v_t^e I(r(i) \in \text{East}) + v_t^w I(r(i) \in \text{West}) + RI_{r(i),t} \end{aligned} \quad (2)$$

where $X_{i,t-1}$ is a set of (time varying and constant) individual characteristics of worker i lagged by one year (e.g., wage, sex, education, occupation). $M_{r(i),t-1}$ and $N_{s(i,t),t-1}$ are one year lagged regional characteristics referring to the local labour markets of residence during vocational training, $r(i)$, and the one in year t , $s(i,t)$, respectively. v_t^e and v_t^w represent year fixed effects for East and West Germany, respectively. $I(\cdot)$ denotes an indicator function capturing whether the residential location during vocational training, r , is in East or West Germany. We consider separate year fixed effects for both parts of the country to account for potentially different time-patterns in East and West Germany caused by the significant East-West migration in the aftermath of the German reunification discussed by, e.g., Hunt (2006). $\mu_{r(i)}$ and $\theta_{s(i,t)}$ are NUTS 3-region fixed effects for the labour market of residence during vocational training and the region where the worker lives in year t . $RI_{r(i),t}$ is the treatment. Specifically, it captures the effect of a return initiative in the NUTS 3-region that was left after vocational training. We estimate three different specifications (see Equations (3) to (5)).

¹⁷ As a robustness check, we also estimate a discrete multiple-exit model and differentiate between (i) return migration, (ii) staying in the destination of initial migration and (iii) onward migration to a third region.

¹⁸ Chalita et al. (2002) suggest using the proportion of ties as a guide for the decision whether a discrete or a continuous model should be applied. The results indicate that the estimation of discrete models is appropriate, although they do not clearly reject the estimation of continuous ones (see Table A.7 in the Online Appendix).

In all specifications, we apply difference-in-difference estimation and use the spatio-temporal variation in the establishment of return initiatives and return migration events. For a causal interpretation of the estimated effect of a return initiative on the probability of returning, two major requirements have to be met (Abbring and van den Berg, 2003). First, the treatment must not be anticipated, which is a substantial informational and behavioural assumption. In our case, it requires that individuals either have no access to information on the implementation of a return initiative up to its implementation, or individuals do not act on that information. However, we presume that this assumption is met in our case, since even a premonition about a return initiative does not lead to any benefits for individuals. The initiative itself provides information that can lead to a return and this information is only provided following implementation of the return initiative.

The second requirement is the randomised treatment assignment or the standard econometric selection problem. To address this issue, we build on the assumption that all selection effects are captured by related observed covariates and fixed effects. At individual level, we, amongst other things, control for the individual ability level and individual labour market success prior to and after initial migration, since these factors affect return migration as shown by De la Roca (2017). To account for regional characteristics that may affect the probability of return and the establishment of a return initiative, we consider time varying occupation and skill specific labour market conditions (wage and unemployment rate), local labour demand shocks related to the establishment of new firms, and unobserved changes in the regional attractiveness over time as reflected in the skill specific net migration rate. Another argument for causal interpretation is the multilevel data structure, which reduces the risk of reverse causality. We observe individuals who are affected by a treatment on a regional level. It is quite unlikely that individual workers, who plan to return, but have not yet done so, influence the implementation of a return initiative in the region they previously left.

In the first specification, we define the treatment, RI , as

$$RI_{rt} = \gamma D_{rt} \quad (3)$$

where D_{rt} is equal to one if a return initiative exists at time t in region r , that is the residential region during vocational training, and zero otherwise. This is a typical difference-in-differences setup and γ is the causal effect of interest, indicating whether the average likelihood to return across all years after the establishment of a return initiative differs from the average likelihood that we would expect based on non-treated regions, given that the return initiative had not been established.

For the second specification, we set up our model as a panel event study similar to e.g. McHale et al. (2022). We are especially interested in the evolution of the likelihood to return to a treated region (relative to return to a non-treated region) over time. The treatment specification is given by:

$$RI_{rt} = \sum_{\tau=2}^J \gamma_{-\tau} I(t = t_0(r) - \tau) + \sum_{\tau=0}^K \gamma_{+\tau} I(t = t_0(r) + \tau) \quad (4)$$

where $t_0(r)$ denotes the year in which the return initiative is implemented in region r . Here, the last year prior to the establishment of a return initiative, $t_0 - 1$, serves as reference. Hence, the probability of return migration is normalised such that the probability of returning to a treated region one year before the treatment equals – conditional on covariates – the average probability of return migration to the non-treated regions (across all years). $\gamma_{+\tau}$ is the average treatment effect on the treated (ATT) τ years after a return initiative has been established. It is expected to be significantly larger than zero if return initiatives positively affect return migration. The estimates for $\gamma_{-\tau}$ indicate whether the (conditional) likelihood of return migration follows a different pattern over time in treated regions prior to treatment in comparison to untreated regions (cf. Angrist and Pischke, 2009).

In our third specification, we add a (linear) time trend for each NUTS 3-region, λ_{rt} , to capture potential region specific patterns of return migration over time. To determine the trends and the treatment effect, we pool individual years prior to and after treatment. Specifically, based on the results from Equation (4), we distinguish three different time phases: (i) the pre-treatment phase capturing the years without initiatives in the former region of residence, (ii) the implementation phase (*imp*) comprising the year of establishment, $t_0(r)$, and ε years thereafter and (iii) the medium time phase (*med*) which covers all years following the implementation phase. The specification is given by:

$$RI_{rt} = \gamma^{imp} I(t_0(r) \leq t \leq t_0(r) + \varepsilon) + \gamma^{med} I(t > t_0(r) + \varepsilon) + \lambda_{rt}. \quad (5)$$

In contrast to Equation (3), we also allow for a time lag in the effect of return initiatives on return migration by distinguishing the immediate effect γ^{imp} and the medium term effect γ^{med} . One advantage over the second treatment specification (Equation 4) is that we now test whether the different parameters $\gamma_{+\tau}$ in the implementation and the medium time phase, respectively, are jointly significant. Estimating the treatment effect separately for each year after the implementation might result in rather imprecise estimates due to the comparatively low number of potential return migrants per year. This might particularly be an issue if subsamples of workers are considered (see Table A.4 in the Online Appendix).

3.2 Matching and entropy balancing

Since return initiatives have not been established randomly across regions, we apply a two-step procedure to generate a synthetic control group of workers for a robustness check. In the first step, we define a reduced control group. Specifically, we focus on workers, who – during vocational training – lived in all non-treated regions that share similar characteristics to the treated regions, which, on the one hand, are correlated with the establishment of a return initiative, and might be important determinants of (return) migration on the other. For this, we use panel data for German NUTS 3-regions generated based on the IEB and covering the years 2000–2017. Specifically, we consider the following characteristics: unemployment rate, net migration rate and regional wage level (all referring to medium skilled workers with completed vocational training), employment density, an indicator variable for East/West Germany as well as an indicator for large cities (*kreisfreie Städte*). In the second step, we generate the synthetic control group by weighting the observations in the reduced control group with region-specific weights

determined by applying entropy balancing (see Hainmueller, 2012).

For our matching algorithm, all considered metric variables are transformed into categorical variables using the year-specific quartiles as thresholds. Considering these categorical variables, we apply exact matching based on region-year observations and identify all regions that are similar to the treated regions in the year prior to the establishment of a return initiative. Specifically, we consider two regions to be a match in a certain year if (i) the expressions of all four categorised variables coincide, (ii) they are located in the same part of Germany (East or West) and (iii) both regions are a large city or neither of them. Based on this definition, we identify that 133 of the 336 non-treated German NUTS 3-regions match with at least one treated region in the last year before the respective return initiative was established.¹⁹ 12 out of the 65 treated regions are not matched. We exclude all workers (13.8%), who lived in these regions during vocational training from the analysis if we only consider the reduced control group.

As intended, considering only workers from the selected 133 non-treated regions results in a considerable similarity between the treated and the control group (compare Columns (1)-(3) of Table 1). On average, both groups show a lower employment density, a lower wage level and a higher unemployment rate than the other regions of Germany. Furthermore, the share of workers from East Germany and large cities, respectively, is more similar compared to the non-restricted control group.²⁰

[Table 1 about here]

Despite the similarity of the treatment group and the reduced control group, the sample means of the regional characteristics still deviate to some extent (compare Columns (1) and (3) in Table 1). For this reason, we, in the second step, apply entropy balancing using the code provided by Hainmueller and Xu (2013) to determine region-specific weights for the creation of a synthetic control group, such that the moments of the aforementioned regional characteristics are as equal as possible in the treatment and the control group. For the treated regions, we consider the respective last region-year observation before the treatment. For the regions in the reduced control group, we use the region-year observations matched in step one. All selected region-year observations are weighted by the number of observations in our individual level data set when applying entropy balancing.²¹ Considering the results of the entropy balancing, a synthetic control group is created that represents a virtually perfect image of the treatment group with respect to the considered regional characteristics one year before the return initiatives have been established (compare Columns (1) and (2) with Columns (5) and (6) in Table 1).

¹⁹ For example, for a region that was treated in 2012, we identify all non-treated regions that match with respect to all considered regional characteristics in 2011.

²⁰ In the non-restricted control group, 33% of the considered workers lived during vocational training in Eastern Germany and 22% lived in a large city.

²¹ Since we consider different (sub-)samples of the individual level data set (see Section 2.1), we determine the region-specific weights separately for each (sub-)sample.

4 Results

4.1 Heterogeneous effects of return initiatives across workers

Table 2 summarises the results of our first treatment specification given by Equation (3) considering different (sub)samples of medium-skilled workers. The first column refers to the entire sample and, thus denotes the average effect across all considered workers. The effect is significant at the five percent level and indicates that the likelihood that workers, who moved from regions where a return initiative exists (treated regions), are on average 5% more likely to return compared to a (hypothetical) scenario without a return initiative.

[Table 2 about here]

The first subsample comprises only workers who were not employed full-time prior to initial migration. Most of these workers left the local labour market immediately after completing their vocational training.²² For this subsample, we neither detect a statistically significant nor a size-relevant effect. Hence, workers who moved to another local labour market quite rapidly after the completion of vocational training and are arguably less tied to the region are not more likely to return if a return initiative is established.

In Columns (3) to (6) we only consider workers, who were employed full-time between the end of vocational training and initial migration. On average, these workers initially migrated about 5 years after the completion of vocational training and are therefore more likely attached to the local labour market, in which they lived during vocational training, than the workers considered in Column (2). For the full sample of workers with employment prior to initial migration (Column (3)), the effect of the return initiatives is slightly larger than the one for the entire sample and statistically significant at the one percent level. With regards the subsamples in Columns (4)-(6), we use the (average) individual wage prior to initial migration as a proxy variable for the individual ability level (cf., Matano and Naticchioni, 2016; De la Roca, 2017) and distinguish workers at the bottom, middle and top of the wage distribution. Columns (4) to (6) indicate that the significant effect in Column (3) is driven by workers in the middle and at the top of the wage distribution. While the odds ratio for workers at the bottom of the wage distribution is virtually one, we observe larger effects for the other two groups. Accordingly, workers in the middle of the wage distribution are 1.131 times more likely to return if a return initiative exists. For workers with high wages the odds ratio is almost identical to the one reported in Column (3), but estimated less precisely – the standard error in Column (3) is more than twice as large as the one in Column (6) – which is likely due to the lower number of workers in the latter subsample (see also Table A.4).

One potential explanation for the heterogeneous effects of return initiatives across wage groups is that workers in the middle and the top of the wage distribution likely possess higher abilities and more specialised skills than individuals with low wages. Therefore, workers with a medium or high wage level in

²² More than 75% of the workers in this subsample moved to another local labour market until the end of the calendar year in which vocational training ended. At least 95% stayed in the local labour market for at most 3 years after the end of vocational training (see Online Appendix, Section B.2).

particular arguably suffer from a small local labour market in a rural area with regard to the chance of finding a match that makes a return attractive (see discussion of heterogeneous gains from agglomeration by, e.g., Kim, 1990; Behrens and Robert-Nicoud, 2015). A return initiative might help to find the few employment opportunities that are available for workers with relatively high abilities in their previous region of residence.

4.2 Patterns of return migration prior to and after the establishment of a return initiative

Figure 4 illustrates the results of the event study treatment specification described by Equation (4) that allows us to take a closer look at the timing of the increase in the likelihood to return relative to the establishment of a return initiative. Here, we focus on workers in the middle and the top of the wage distribution, because they drive the significant effects observed in Table 2.²³

[Figure 4 about here]

Until the implementation of a return initiative (Year 0 in the figure), the average probability of returning to the local labour market of residence during vocational training is not systematically higher or lower for the treated regions than for the non-treated regions conditional on covariates. This is true for both medium and high wage workers. Even in the year in which the return initiatives were implemented and the first few years thereafter, there are no significant differences between the treated and non-treated regions. However, for the medium wage group, the likelihood to return increases significantly by about 20% two years after the establishment of the return initiatives and it remains on a higher level in subsequent years. Such a time-delayed positive effect is quite plausible. After the introduction of a return initiative, it likely takes time to collect and disseminate relevant information about local employment opportunities and to build relevant networks.

For the high wage group, we observe a similar pattern as for workers with medium wages, but the higher probability to return sets in one year later. One reasonable explanation for the greater time lag is that workers at the upper end of the wage distribution might have more special skills and specialised knowledge. Supporting them to find a suitable job may therefore require being able to draw on a large network and a large pool of vacancies that take more time to be created.²⁴ The point estimate indicates that the likelihood increases by slightly over 20% in the fourth year. However, the confidence intervals are much larger compared to workers with medium wages and the odds ratios are thus not statistically different from one at conventional levels of significance. Again, it is important to note that the sample of workers with high wages is comparatively small (see Table A.4 in the Online Appendix). Furthermore, in this specification, the estimate for one particular year only rests on the workers that were potential return migrants to the treated regions in that specific year.

²³ Figure A.3 in the Online Appendix summarises corresponding results for the other (sub)samples considered in Table 2. The results for workers at the bottom of the wage distribution and those, that were not employed full-time prior to initial migration, again do not provide robust evidence that the likelihood of these workers to return is significantly affected by the return initiatives.

²⁴ This argument is related to the one put forth by the literature on matching advantages in big cities, which argues that in the case of workers with specialised skills and specific labour requirements by firms, the local number of jobs increases the quality of job matches (cf., Kim, 1990).

To test whether the average of the higher return migration rates, that we observe a few years after the establishment of a return initiative, is statistically significant, we pool certain years as described in Equation (5). Specifically, we distinguish the pre-treatment period, an implementation phase and a medium time phase. For their definitions, we take into account that it apparently takes different lengths of time for return initiatives to have a positive impact on the likelihood of return migration for workers in the middle and at the top of the wage distribution. Specifically, we assume that the implementation phase is two years in the case of workers with medium wage and three years in the case of workers with high wages (cf., Figure 4).²⁵

[Table 3 about here]

The results in Columns (1) and (4) in Table 3, where we distinguish two different pre-treatment periods, indicate for both considered groups of workers that the probability of return migration in the two years prior to the establishment of a return initiative was not significantly different from the one in earlier years ($t < t_0 - 2$).²⁶ This finding again indicates that return migration rates, on average, do not follow significantly different time patterns in treated and non-treated regions prior to the treatment, conditional on covariates. Furthermore, the short term effects in the implementation phase are also not significantly different on average. However, focusing on medium term effects, we now obtain effects for both subsamples that are statistically highly significant and economically meaningful. Medium wage workers from treated regions are, according to the results in Column (1), 22% more likely to return a few years after the establishment of a return initiative. The effect is even higher for high wage workers (29%, Column (4)).

In Columns (2) and (5), we add linear time trends separately for treated and non-treated regions and in Columns (3) and (6) we add a time trend for each region (cf., Equation (5)). Furthermore, we collapse the two pre-treatment phases, because we do not find any different effects there. Overall, the effects of return initiatives in the medium term are still statistically significant, and the magnitude even increases to some extent, in particular in the case of the high wage group. The increase indicates that return migration rates in the treatment group follow, on average, a somewhat flatter trend than in the control group. Hence, the significant positive effects in the medium term cannot be explained by a general positive trend in return migration rates of treated regions. Altogether, the results of our latter specifications (Columns (3) and (6)) indicate that return initiatives increase return migration to the treated regions after few years of implementation by more than 20% in the case of workers in the middle of the wage distribution and by about 40% in the case of workers at the top of the wage distribution.

Complementing the results described so far, Tables A.10 and A.11 in the Online Appendix summarise results of a multiple-exit model where we differentiate between three alternatives: moving back to the local labour market of residence during vocational training, staying at the destination of initial migration and onward migration to a third local labour market. Altogether, the additional results indicate that the positive effect of a return initiative in the former local labour market of residence on return migration is

²⁵ We are aware that the return initiatives of 2016 and 2017 do not contribute to the identification of the medium time phase effects since the observation period ends in 2017. If we exclude all workers who were living in the regions, which were treated in 2016 or 2017, during vocational training from our analysis, this altogether does not substantially impair our regression results (compare Table 3 with Table A.13 in the Online Appendix).

²⁶ Corresponding results for the other (sub-)samples are summarised in Table A.9 in the Online Appendix.

associated with a lower likelihood of both alternatives to almost the same extent. Workers are less likely to stay at the destination of initial migration and to migrate to another, third local labour market. The results hold for both wage groups in the medium time phase, and the magnitude of the effect is again slightly larger for workers with high wages.

4.3 Robustness checks

To ensure, the effects of return initiatives on return migration identified in the previous section are robust, we estimate alternative specifications. In the following, we summarise the results that we obtain when (i) assigning the treatment randomly and (ii) using a synthetic control group that is generated by applying matching and entropy balancing (see Section 3.2).²⁷

The first robustness check is a placebo experiment, where we re-estimate specifications (3) and (6) in Table 3 a thousand times. In each replication, we assign the treatment randomly to NUTS 3-regions (for details see notes of Figure 5). The kernel density estimate of the distribution of the obtained point estimates for the medium term effects of return initiatives is shown in Figure 5 and the black dashed line denotes the corresponding odds ratio reported in Table 3 referring to the true treatment. The distributions show an almost perfect bell-shaped curve for both subsamples. They indicate – as expected – that the odds ratios consistently vary around one if the treatment is assigned randomly. Furthermore, the corresponding estimates that refer to the true treatment are larger than the 95th percentile and the 90th percentile of the estimated effects that are based on the random treatment, respectively. Therefore, this robustness test indicates that our results for the true treatment are most likely not random.

[Figure 5 about here]

Table 4 summarises the regression results of the second robustness check where we use a synthetic control group as described in Section 3.2.²⁸ Even though the coefficients are slightly smaller in the case of workers at the top of the wage distribution, the results from our previous analyses are generally confirmed. Workers who moved from treated regions are more likely to return to these regions in the medium time phase. According to these results, the average treatment effect on the treated is in the medium term about 25% and 30%, respectively.²⁹

[Table 4 about here]

²⁷ Section C in the Online Appendix contains results of further robustness checks where we (i) use the individual school-leaving degree to consider heterogeneous effects across workers (Table A.12), (ii) exclude workers from regions that were treated in certain years (Table A.13) and (iii) define return migration on the basis of NUTS 3-regions (Table A.14), respectively. Altogether, the additional results confirm the findings discussed in this paper, although the point estimates vary to some extent across specifications and in some cases the effects are less precisely estimates if we consider individual time trends for each region.

²⁸ Table A.15 in the Online Appendix contain additional results that we obtain, if we reduce the control group, but do not apply the region specific weights. They are very similar.

²⁹ In Column (6) the odds ratio is not statistically different from one at conventional levels of significance. However, it is important to note that we obtain almost the same point estimate in Column (5). In Column (6) the effect is less precisely estimated because of the region-specific time trends that we consider there.

5 Conclusions

In this paper, we study whether the probability of return migration increases by the existence of a return initiative in the region from which a worker initially emigrated. Return initiatives aim to foster the return of former inhabitants by providing information on, amongst other things, vacancies and firms located in the region on their website and often also personal support in the job search to workers interested in returning. To our knowledge, it is the first time that the impact of such a policy measure has been the focus of a solid scientific analysis. To study the effect of return initiatives, we combine event history analysis and difference-in-difference estimation in a panel event study framework. Our analysis is based on administrative information on individual labour market biographies of former vocational training graduates that we merge with novel information about return initiatives in Germany provided by Stiller and Ohlhoff (2021).

Our results indicate that the considered return initiatives on average fostered return migration after few years of implementation. However, we detect heterogeneous effects across different types of workers. While we observe no significant effects for workers at the bottom of the wage distribution, the estimated average treatment effect on the treated (ATT) in the case of workers with medium wage level is about 25%. For those workers with the highest wages in our sample, it is about 30%. One potentially important underlying channel is the reduction of spatial search frictions by return initiatives. This interpretation of our results is in line with recent findings by, e.g., Wilson (2021) and Balgová (2022) who highlight the role of information (deficits) about local employment opportunities and spatial search frictions for interregional labour migration, respectively.

The fact that return initiatives have a greater effect on workers with arguably relatively high abilities is particularly advantageous for rural regions often facing a lack of skilled labour. These regions might also benefit from increased return migration due to a potential transmission of (tacit) knowledge from workers who acquired work experience in, for instance, urban areas in the meantime (cf., Choudhury, 2015; De la Roca, 2017; Peters, 2020). Furthermore, results by Fajgelbaum and Gaubert (2020) suggest that also overall welfare might increase if return initiatives foster the redistribution of more able workers to rather peripheral areas. At least for the U.S., the authors observe that there is too low a share of high skilled labour in small cities, from which lower skilled workers in these cities might benefit through spillover effects.

The results of this article leave space for further research. In this study, we examine the average effect of all return initiatives that were established on a district level in Germany. Hence, an important question for future research is whether there are certain features or activities of return initiatives that make them particularly successful. Corresponding analyses might also provide additional insights on the significance of potential underlying mechanisms.

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Tables and Figures

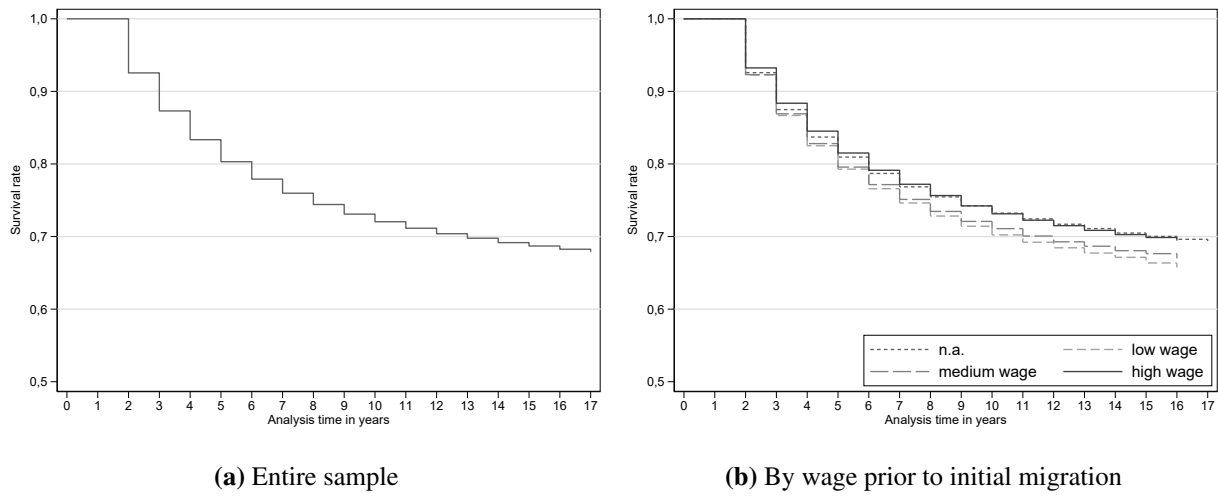


Figure 1: Frequency of return migration

Notes: The figure illustrates Kaplan-Maier estimates of return migration as defined in Section 2.1. In Figure (b), the average wage in full-time employment between the end of vocational training and initial migration serves as proxy variable for the individual ability level. The first and third quartile of observed (full-time) wages are used as thresholds. Corresponding wages are not available in particular for workers, who left the local labour market rapidly after the end of vocational training. Since this latter group also comprises workers, who initially moved in the year of graduation, we observe (some of these) individuals for 17 years.

Source: IEB, own calculations.

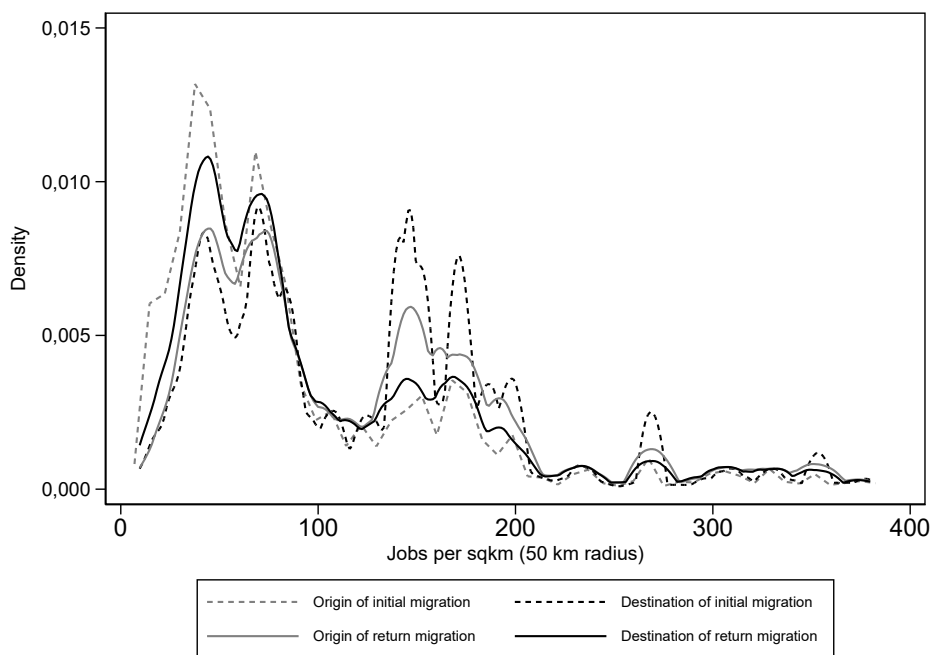


Figure 2: Labour market density at the origin and destination of initial and return migration

Notes: The figure indicates for all potential return migrants in our sample (405,320 workers) the labour market density (jobs within 50 km) at the origin and destination of initial migration. For all workers, which are detected as return migrants (92,639 workers) it, furthermore, shows the labour market density at the origin and destination of return migration. The local number of jobs within 50 km has been computed based on municipality averages in the period 1999-2017 and refers to employment subject to social security. The employment density of the largest German cities, Berlin, Hamburg and Munich, amounts to 172 emp.\ km², 142 emp.\ km² and 152 emp.\ km² within a 50 km radius, respectively. Corresponding values of other big cities in Germany are: Frankfurt a. M.: 199 emp.\ km², Cologne: 269 emp.\ km², Dusseldorf: 353 emp.\ km². Weighted by the number of workers in the observation period, the first, second and third quartile of local labour market density in Germany are 53.86 jobs per km², 85.22 jobs per km² and 144.89 jobs per km².

Source: IEB, own calculations.

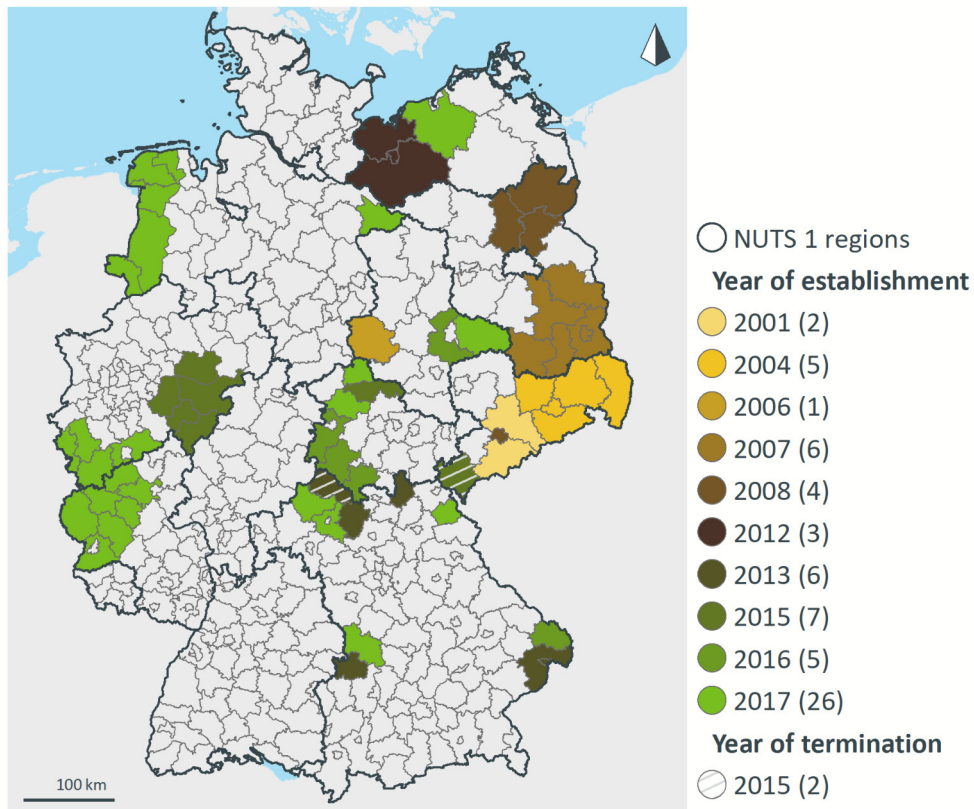


Figure 3: NUTS 3-regions with return initiatives by the year of establishment (and termination)

Notes: The map refers to all return initiatives that operate at the level of NUTS 3-regions and are maintained throughout the whole year. The number in parentheses refers to the number of NUTS 3-regions. Two return initiatives were only active until 2015, all others exist till 2017, the end of our observation period.

Source: Stiller and Ohlhoff (2021), own illustration.

Table 1: Characteristics of regions with return initiatives (treated regions) and regions in the control group after matching

	(1)	(2)	(3)	(4)	(5)	(6)
	Treated regions		Selected untreated regions before/after entropy balancing			
			Before		After	
	Mean	Variance	Mean	Variance	Mean	Variance
Employment density	-0.5535	0.5934	-0.7517	0.4894	-0.5538	0.5934
Median wage [†]	-0.1938	0.0281	-0.2068	0.0355	-0.1939	0.0281
Unemployment rate [†]	0.0895	0.2764	0.1952	0.4755	0.0897	0.2769
Net-migration rate [†]	-0.0005	0.0000	-0.0015	0.0000	-0.0005	0.0000
Dummy for East Germany	0.5411	0.2483	0.5716	0.2449	0.5412	0.2483
Dummy for large city (<i>kreisfreie Stadt</i>)	0.0332	0.0321	0.0081	0.0080	0.0331	0.0320
Potential return migrants	35,604		140,271		35,604	

[†] Among workers with vocational training.

Notes: The statistics for the treated regions (53 regions) refer to the last year before the treatment and the statistics for the control group refer to matched region-year-observations of 133 untreated regions. Regional characteristics are weighted by the number of workers in the individual data set and are considered in logarithmic terms and relative to the respective rest of Germany (cf., Mitze, 2019). The statistics reported in Columns (5)-(6) are based on an additional weighting with weights that we obtain applying entropy balancing using the code provided by Hainmueller and Xu (2013).

Source: IEB, Stiller and Ohlhoff (2021), own calculations.

Table 2: Baseline results for different (sub-)samples of medium-skilled workers

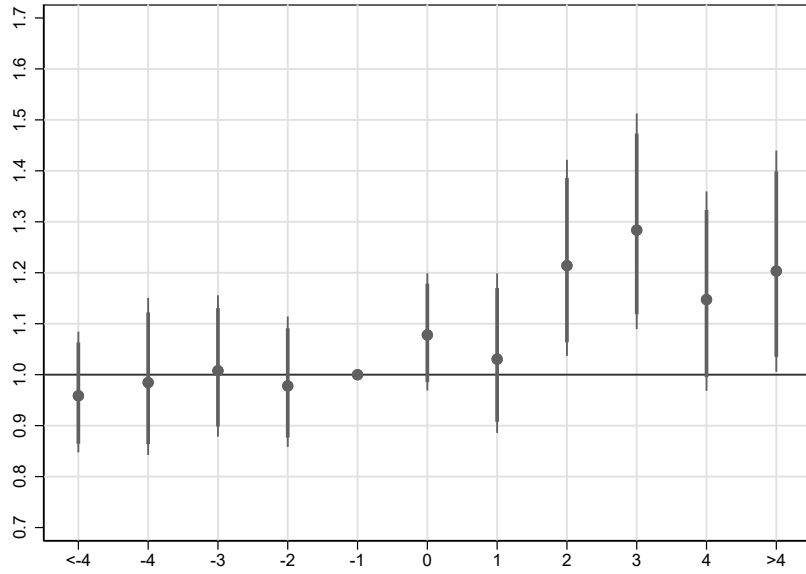
	(1)	(2)	(3)	(4)	(5)	(6)
		Employed prior to initial migration [†]		Wage prior to initial migration [‡]		
	All	No	Yes	Low	Medium	High
Return initiative	1.053** (0.025)	1.011 (0.039)	1.079*** (0.027)	0.988 (0.050)	1.131*** (0.041)	1.082 (0.069)
Observations	2,532,971	950,705	1,582,266	393,160	799,860	388,719
Number of regions	401	401	401	401	401	401
Number of individuals	405,320	135,851	269,469	65,843	136,216	67,328
Pseudo R2	0.051	0.069	0.043	0.047	0.048	0.047
Log Likelihood	-377,135	-128,398	-247,992	-63,195	-126,355	-57,303

[†] Indicator for full-time employment between the end of vocational training and initial migration.

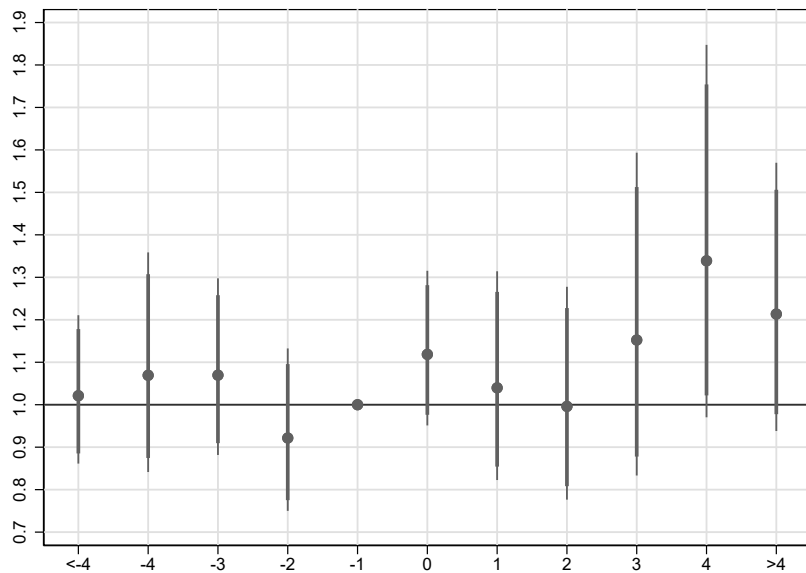
[‡] Average daily wage in full-time employment between the end of vocational training and initial migration. Thresholds are the first and third quartile.

Notes: Odd ratios (exponentiated coefficients) are reported that have been estimated based on Equations (1), (2) and (3) and refer to the likelihood of return migration. Robust standard errors are given in parentheses, which are clustered at the level of NUTS 3-regions of residence during vocational training. ***, ** and * indicate significance at the 1%, 5% and 10% levels. All models include fixed effects for the occupation of vocational training, the industry, the NUTS 3-regions of residence during vocational training and the current residential location as well as the year of observation differentiating between time fixed effects for East and West Germany. The following sets of control variables are included in all models: (i) individual characteristics including indicators for labour market success prior to and after initial migration (ii) time-varying characteristics of the local labour market of residence during vocational training and (iii) time-varying characteristics of the local labour market of current residence. For details refer to Tables A.8 in the Online Appendix.

Source: IEB, Stiller and Ohlhoff (2021), own calculations.



(a) Workers in the middle of the wage distribution



(b) Workers at the top of the wage distribution

Figure 4: Likelihood of return migration before and after a return initiative has been established for (medium-skilled) workers in the middle and at the top of the wage distribution

Notes: Odd ratios (exponentiated coefficients) are reported that have been estimated based on Equations (1), (2) and (4) for the subsamples (5) in (6) in Table 2 and refer to the likelihood of return migration. 95%- and 90%-confidence intervals are reported that are based on robust standard errors, which are clustered at the level of NUTS 3-regions of residence during vocational training. On the horizontal axis, 0 denotes the year in which the return initiatives have been implemented. For information about considered fixed effects and control variables refer to Table 2.

Source: IEB, Stiller and Ohlhoff (2021), own calculations.

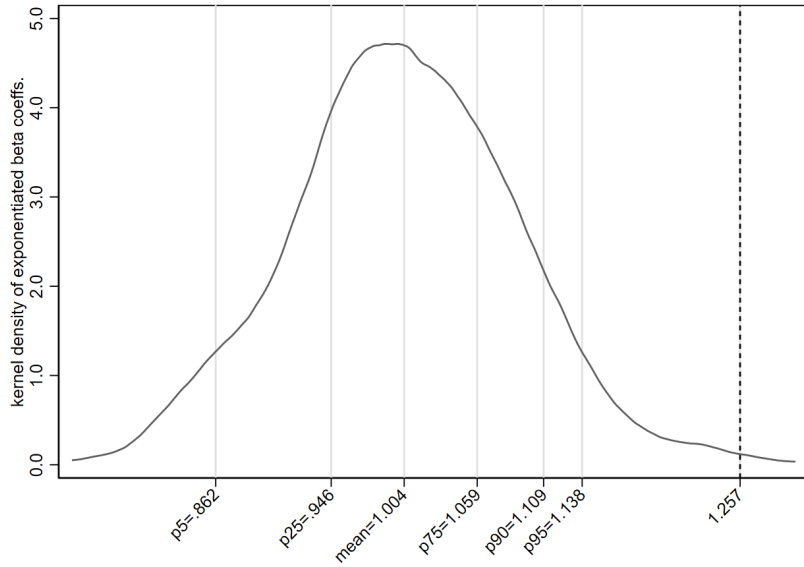
Table 3: Average effects of return initiatives in the short and medium term

	(1)	(2)	(3)	(4)	(5)	(6)
	Wage prior to initial migration [†]					
	Medium			High		
Pre-treatment phase ($t < t_0 - 2$)	0.982 (0.048)			1.074 (0.068)		
Pre-treatment phase ($t_0 - 2 \leq t < t_0$)	ref.			ref.		
Pre-treatment phase ($t < t_0$)		ref.	ref.		ref.	ref.
Implementation phase ($t_0 \leq t \leq t_0 + \varepsilon$)	1.072 (0.047)	1.093** (0.046)	1.092* (0.050)	1.108 (0.072)	1.144** (0.073)	1.121 (0.091)
Medium time phase ($t_0 + \varepsilon < t$)	1.222*** (0.064)	1.265*** (0.070)	1.257*** (0.109)	1.289** (0.140)	1.416*** (0.169)	1.395* (0.249)
Separate linear time trend for treated/non-treated regions	no	yes	no	no	yes	no
Region specific time trend	no	no	yes	no	no	yes
Observations	799,860	799,860	799,860	388,719	388,719	388,719
Number of regions	401	401	401	401	401	401
Number of individuals	136,216	136,216	136,216	67,328	67,328	67,328
Pseudo R2	0.048	0.048	0.050	0.047	0.048	0.051
Log Likelihood	-126,352	-126,266	-126,036	-57,301	-57,268	-57,048

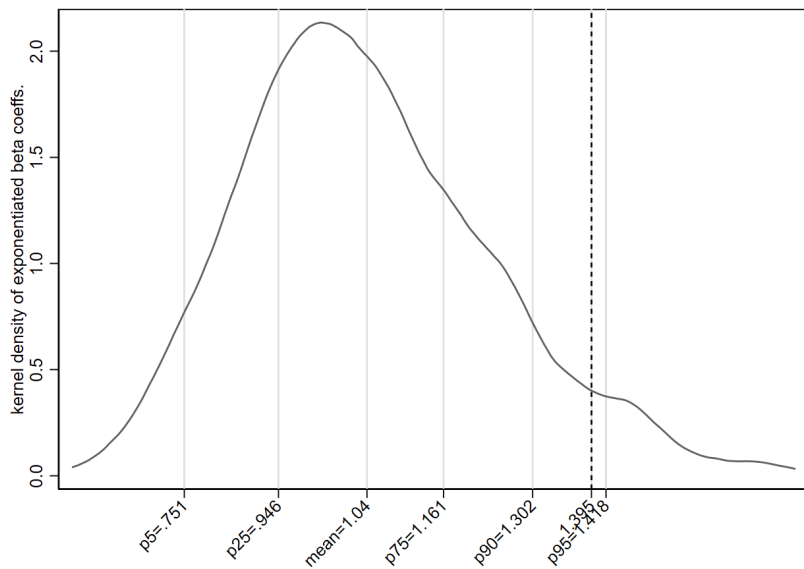
[†] Average daily wage in full-time employment between the end of vocational training and initial migration. Thresholds are the first and third quartile.

Notes: Odd ratios (exponentiated coefficients) are reported that have been estimated based on Equations (1), (2) and (5) and refer to the likelihood of return migration. Robust standard errors are given in parentheses, which are clustered at the level of NUTS 3-regions of residence during vocational training. ***, ** and * indicate significance at the 1%, 5% and 10% levels. For information about considered fixed effects and control variables refer to Table 2. t_0 denotes the year in which a return initiative is established. For the medium wage group, ε is set to 1 and for the high wage group, it is set to 2 (cf. results in Figure 4).

Source: IEB, Stiller and Ohlhoff (2021), own calculations.



(a) Workers in the middle of the wage distribution



(b) Workers at the top of the wage distribution

Figure 5: Medium term effects if treatment is assigned randomly to regions

Notes: Each figure illustrates the distribution of the odds ratios (exponentiated coefficients) obtained by 1,000 estimations with a treatment that is assigned randomly to NUTS 3-regions. The estimates are based on Equations (1), (2) and (5). When assigning the treatment randomly, we always keep the number of treated regions in East and West Germany per year constant (as with the original data) and, furthermore, ensure that large cities (*kreisfreie Städte*) are not among the treated regions. Regions that actually were treated might be chosen as well. The figures refer to the estimated treatment effect in the medium time phase. The black dashed lines indicate the estimates that we obtain based on the true treatment (cf., Columns (3) and (6) in Table 3). For information about considered fixed effects and control variables refer to Table 2. Source: IEB, Stiller and Ohlhoff (2021), own calculations.

Table 4: Short and medium term effects based on regressions with synthetic control group

	(1)	(2)	(3)	(4)	(5)	(6)
	Wage prior to initial migration [‡]					
	Medium			High		
pre-treatment phase ($t < t_0 - 2$)	0.905 (0.051)			1.081 (0.083)		
Pre-treatment phase ($t_0 - 2 \leq t < t_0$)	ref.			ref.		
Pre-treatment phase ($t < t_0$)		ref.	ref.		ref.	ref.
Implementation phase ($t_0 \leq t \leq t_0 + \varepsilon$)	1.025 (0.045)	1.063 (0.046)	1.048 (0.045)	1.075 (0.079)	1.093 (0.084)	1.086 (0.103)
Medium time phase ($t_0 + \varepsilon < t$)	1.234*** (0.060)	1.257*** (0.064)	1.262*** (0.112)	1.234* (0.152)	1.320** (0.176)	1.311 (0.274)
Separate linear time trend for treated/non-treated regions	no	yes	no	no	yes	no
Region specific time trend	no	no	yes	no	no	yes
Observations	420,898	420,898	420,898	170,318	170,318	170,318
Number of regions	186	186	186	186	186	186
Number of individuals	69,635	69,635	69,635	29,094	29,094	29,094
Pseudo R2	0.482	0.483	0.484	0.530	0.530	0.532
Log Likelihood	-35,837	-35,813	-35,753	-12,546	-12,543	-12,484

[‡] Average daily wage in full-time employment between the end of vocational training and initial migration. Thresholds are the first and third quartile.

Notes: Odd ratios (exponentiated coefficients) are reported that have been estimated based on Equations (1), (2) and (5). The synthetic control group has been generated as described in Section 3.2. Robust standard errors are given in parentheses, which are clustered at the level of NUTS 3-regions of residence during vocational training. ***, ** and * indicate significance at the 1%, 5% and 10% levels. For information about considered fixed effects and control variables refer to Table 2. t_0 denotes the year in which a return initiative is established. For the medium wage group, ε is set to 1 and for the high wage group, it is set to 2 (cf. results in Figure 4).

Source: IEB, Stiller and Ohlhoff (2021), own calculations.

Welcome back! The impact of ‘return initiatives’ on return migration
to rural regions

– **Online Appendix** –

August 19, 2022

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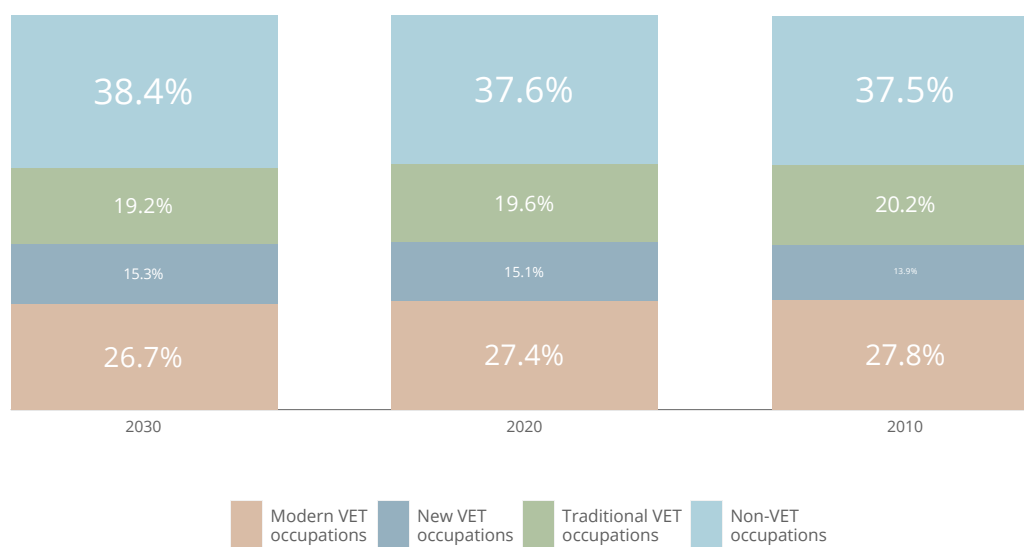
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A Key facts about the German apprenticeship system

Table A.1: Key facts about the German apprenticeship system

	2017	Comments
Total number of apprentices in dual vocational training	1,323,894	Inhabitants of Germany (Dec. 31, 2017): 82.8 million
Number of new training contracts	515,679	
Number of training occupations	325	247 trained for three years
Sector in the economy with majority of new training placements	302,940	Industry and Commerce
Training quota	19.8%	Share of companies that are engaged in training
Success rate of training	92.8%	
Average age of new apprentices (years)	19.9	p25: 17 years, p50: 19 years, p75: 21 years
New apprentices with low school qualification	24.7%	Share holding a 'Hauptschulabschluss'
New apprentices with intermediate school qualification	42.3%	Share holding a 'Realschulabschluss'
New apprentices with higher education entry qualification	29.2%	Share with permission to study
Training occupation with highest share of school leavers with a higher education entry qualification	73.7%	Banking clerk
Training occupation with highest share of school leavers with a low school qualification	65.8%	Shop assistant (food)

Source: Federal Institute for Vocational Education and Training (BIBB) (2019), representation as with Deissinger (2015, Table 1).



 CEDEFOP

Figure A.1: Importance of VET occupations in employment in Germany

Notes: Based on Cedefop Skills Forecast, indicator: Future of VET occupations. VET: vocational education and training
Source: Cedefop (2022).

B Further information about the data used in the empirical analysis

B.1 Sample restrictions

In addition to the sample restrictions discussed in the main part of the article (Section “Data”), we impose further restrictions due to different reasons.

- For workers with more than one vocational training, we consider only the first one since this denotes individual labour market entry (number of workers: 8,519,466).
- We only keep workers whose vocational training lasts between 2 and 5 years (remaining workers: 6,184,696, about 73%). The restriction takes into account that the data at hand does not contain information about the success of the vocational training. Official apprenticeships last on average 3 years, although there are also apprenticeships that only last 2 years or 3.5 years (Federal Institute for Vocational Education and Training (BIBB), 2018). In addition, if you have the appropriate prior knowledge, you have the option of shortening the training or, in the event of difficulties, extending the training.
- We only keep persons between 15 and 25 years of age when they start their vocational training (remaining workers: 6,036,736, about 98%) in order to make the sample more homogeneous.
- We only keep persons with a known (official) vocational occupation (remaining workers: 5,622,320, about 93%).
- We exclude workers for whom we have no information about the place of work and residence during the vocational training and who commute longer than 100 km during vocational training (remaining workers: 5,477,588, about 97%). Commuting such a large distance every day is unrealistic, in particular with regard to apprentices. Hence, we have no reliable information on the location of residence for these people. In our final sample, that we use for our analysis, the 50th percentile of the commuting distance at municipality level during vocational training is 6.8 km and the 75th percentile is 18.7 km.
- We only keep persons who stay in the labour market after vocational training, i.e., we need to observe an employment spell subject to social security within the first year after the end of vocational training (remaining workers: 4,686,397, about 86%). Applying this restriction, we exclude workers who, for example, study after their vocational training.
- Applying these restrictions, we end up with 4,686,397 vocational training graduates. Of these, we focus on persons, who leave the local labour market of residence during vocational training until 2014 and thereby become potential return migrants. Their number amounts to 666,152 workers.
- We exclude workers for whom we do not observe any spells after their initial migration (remaining workers: 658,875, about 99%).
- We exclude all workers with a gap in the labour market biography in the IEB of more than one year

between the end of vocational training and initial migration, e.g., because the person (temporarily) leaves the German labour market or become self-employed for some time. For women whose gap is related to the birth of a child, the gap is allowed to be up to 3 years long, provided the place of residence before and after the gap match. By excluding these workers, we ensure that we correctly determine the year of initial migration for all workers in our final sample and, thus, the year in which they become potential return migrants. To precisely measure the year in which a worker is at risk for the first time is important in order to estimate a proper hazard rate in a discrete survival model (cf. Jenkins, 1995) (remaining workers: 619,727, about 94%).

- For the same reason, it is necessary that we observe each worker every year after initial migration until the individual drops out of the sample at risk. Therefore, we exclude all subsequent worker-year observations if there is a gap in the individual labour market biography in the IEB of two or more years after initial migration. Since in some cases the gap starts in the first year after initial migration, this further reduces the number of workers considered in the analysis (remaining workers: 607,131, about 98%).¹
- We exclude workers, who move back to the local labour market of residence during vocational training about one year after initial migration to exclude very short temporal migration; recall that we observe only one place of residence per worker and year (remaining workers: 519,306, about 86%).
- We only consider workers for which we observe at least one wage in full-time employment after initial migration (prior to dropping out of the sample at risk) that we may use to determine the individual position in the (occupation specific) regional wage distribution, which we use as proxy for individual labour market success after initial migration as with De la Roca (2017) (445,459 workers, 86%).
- Finally, we only retain workers who do not work within the local labour market of residence during vocational training one year after initial migration. Thereby, we ensure that the potential return migrants completely left the former region of residence. We end up with 405,320 potential return migrants.

B.2 Definition of subsamples

To study heterogeneous effects of return initiatives on return migration, we define different groups of workers. Specifically, we consider the average wage of a worker between the end of vocational training and initial migration to gauge the individual ability level. In the IEB, only daily wages are available, but no information on hourly wages or the exact number of hours worked. Therefore, we only use wages associated with full-time employment to approximate the ability level of a worker. Considering the first and third quartile of observed (full-time) wages as thresholds, we define groups of workers with low, medium and high wages, respectively. Workers, for which no wage information prior to initial migration is available, are assigned to a fourth group. The latter group in particular comprises workers who migrated to another local labour market rather rapidly after the completion of vocational training and those, who only worked in part-time prior to initial migration. More than 75% of all workers for which we do not observe full time employment prior to initial migration,

¹ If there is a gap of only one year, we fill the gap by adding a corresponding worker-year observation. In doing so, we take over the place of residence before the gap. For women whose gap is related to the birth of a child, we fill gaps of up to three years, provided the place of residence before and after the gap match.

moved to another local labour market until the end of the calendar year, in which vocational training ended and at least 95% stayed in the local labour market, in which they lived as apprentice, for at most 3 years after the end of vocational training. In contrast, former apprentices, for which we observe full time employment and wages prior to initial migration, moved on average 5 years after vocational training to another local labour market.

B.3 Summary statistics and number of observations

Table A.2: Summary statistics - categorical variables

Individual characteristics	Freq.	Percent	Cum.
Age (time-varying)			
15-24 years	247,069	9.8	9.8
25-29 years	1,034,211	40.8	50.6
30-34 years	910,376	35.9	86.5
>35 years	341,315	13.5	100
Gender			
male	1,112,097	43.9	43.9
female	1,420,874	56.1	100
Mother			
no	2,036,014	80.4	80.4
yes	496,957	19.6	100
Nationality			
German	2,443,838	96.5	96.5
Foreign	89,133	3.5	100
High school degree			
no	2,058,190	81.3	81.3
yes	474,781	18.7	100
Onward migration [†]			
no	2,114,216	83.5	83.5
yes	418,755	16.5	100

[†] Onward migration is a dummy that is equal to 1 if the person continues to migrate more than 50 km after initial migration but does not return to the vocational training region.

Source: IEB, Stiller and Ohlhoff (2021), own calculations.

Table A.3: Summary statistics - continuous variables

	Obs.	Mean	Std.dev.	Min.	Max.
Labour market biographies					
Tenure since beginning of vocational training (in months)	2,532,971	32.498	33.813	0	247.800
Experience since end of vocational training (in months)	2,532,971	75.077	42.961	0.033	206.800
Employment before vocational training (in months)					
outside labour market of residence during voc. training	2,532,971	1.266	5.528	0	120.767
in labour market of residence during voc. Training	2,532,971	3.029	8.091	0	119.667
Years till initial migration since end of vocational training	2,532,971	3.274	2.554	1	15
Labour market status in previous year					
Months employed	2,532,971	9.973	3.871	0	12
Months minor employed	2,532,971	0.401	1.778	0	12
Months unemployed	2,532,971	0.659	2.133	0	12
Months no labour market participation	2,532,971	0.968	2.672	0	12
Months employed public sector	2,532,971	0.433	2.219	0	12
Daily gross wage ^a	2,532,971	-0.132	0.405	-2.666	6.041
Labour market status between end of vocational training and initial migration^b					
Months employed	2,532,971	9.767	2.353	0.921	12
Months minor employed	2,532,971	0.171	0.690	0	10.060
Months unemployed	2,532,971	0.515	1.086	0	10.751
Months no labour market participation	2,532,971	1.547	1.700	0	9.508
Months employed public sector	2,532,971	0.185	1.154	0	11.200
Daily gross wage ^a	1,582,266	-0.301	0.363	-7.898	2.958
Characteristics of the local labour market of residence during vocational training^c					
Median daily gross wage (occupation specific)	2,532,971	-0.076	0.164	-1.160	0.652
Unemployment rate (occupation specific)	2,532,971	0.035	0.436	-3.300	1.816
Sectoral specialisation (emp. share of individual VET sector)	2,532,971	0.046	0.457	-7.162	3.718
Occupational specialisation (emp. share of individual VET occup.)	2,532,971	-0.004	0.353	-4.647	3.581
Net migration rate (in 1,000)	2,532,971	-0.470	4.111	-32.538	26.915
Employment growth due to newly founded firms	2,532,971	0.013	0.004	0.004	0.066
Characteristics of the local labour market of current residence^c					
Median daily gross wage (occupation. specific)	2,532,971	0.005	1.132	-0.908	0.655
Unemployment rate (occupation specific)	2,532,971	-0.098	0.408	-3.321	1.808
Sectoral specialisation (emp. share of individual VET sector)	2,532,971	-0.014	0.436	-6.984	3.552
Occupational specialisation (emp. share of individual VET occup.)	2,532,971	0.009	0.332	-5.030	3.101
Net migration rate (in 1,000)	2,532,971	-1.105	4.803	-32.538	26.915

^a The individual wage is considered relative to the occupation-region specific wage level in former and current region of residence, respectively. About 20% of all considered worker year-observations do not contain information about wage in the previous year since the person was not employed full-time in the respective year. However, it is necessary to observe each worker every year after initial migration until the individual drops out of the sample at risk in order to estimate a proper hazard rate in a discrete survival model (Jenkins, 1995). Therefore, we impute these missing wages based on a regression with worker fixed effects that additionally includes the occupation specific regional wage level, age, age², work experience, work experience², tenure, tenure² and the individual share of unemployment in the previous year. The (imputed) wage serves as proxy for the (hypothetical) individual position in the occupation specific regional wage distribution because we consider it relative to the occupation-region specific wage level. The degree of individual labour market participation is captured by the variables that refer to the employment status in the previous year.

^b Average over the years between the end of vocational training and initial migration.

^c Regional wage level, unemployment rate and specialisation are considered in logarithmic terms and relative to the rest of Germany (cf. Mitze, 2019). All regional variables, except the net migration rate, are calculated at the level of (overlapping) local labour markets, that we define by tracing circles with a radius of 50 km around the centres of the municipalities in Germany, based on the IEB. The net migration rate refers to NUTS 3-regions (counties) and has been provided by Meister et al. (2019). For the unemployment rate, we divide the number of medium-skilled registered jobseekers in local labour market r and occupation j by the number of medium-skilled workers living in region r and working in occupation j . Employment growth due to newly founded firms is computed based on information provided by the Establishment History Panel (EHP) of the IAB (see Eberle and Schmucker, 2017). Specifically, we use the identifier for new firms in the EHP and compute, at the level of the considered (overlapping) local labour markets, the region specific number of new jobs created in the first year after firm birth by new establishments classified as “new establishment start-up (medium/large)” or “spin-off of part of an existing establishment” relative to total regional employment in the previous year.

Source: IEB, own calculations.

Table A.4: Worker-year observations in treatment and (unrestricted) control group

	All	Medium wage	High wage	
	<-4	109,161	32,427	13,098
	-4	28,021	9,149	3,791
	-3	32,136	10,602	4,401
	-2	36,303	12,008	5,065
	-1	40,791	13,524	5,798
Treated regions: observations (=potential return migrants) by (year of observation - year of treatment)	0	42,809	14,167	6,084
	1	28,277	8,902	3,546
	2	26,789	8,276	3,283
	3	21,777	6,433	2,040
	4	23,710	7,051	2,239
	>4	181,628	52,087	15,748
	Total	571,402	174,626	65,093
Non-treated regions: worker-year observations		1,961,737	625,234	324,193
Total		2,533,139	799,860	389,286

Notes: The treated regions are all 65 German counties (NUTS 3-regions) in which a return initiative has been established in the observation period and the non-treated regions are all other 336 German counties.

Source: IEB, own calculations.

B.4 Considered return initiatives

Table A.5: List of return initiatives

Name	Federal State [†]	Counties (NUTS 3-regions)	Start	End (Status: Nov 2017)	URL
Boomerang Lausitz / Fachkräfteportal	BB and SN	Oberspreewald Lausitz, Görlitz, Bautzen, Elbe-Elster, Dahme-Spreewald, Oder-Spree, Cottbus, Spree-Neiße	2007	ongoing	https://www.fachkraefteportal-brandenburg.de/
Comeback Elbe-Elster / Willkommen-sagentur Elbe-Elster	BB	Elbe-Elster	2012	ongoing	https://www.comeback-ee.de/
Zuhause in Brandenburg e.V.	BB	Uckermark, Oberhavel, Barnim	2008	ongoing	www.zuhause-in-brandenburg.de
Rückkehrnewsletter	BB	Cottbus, Dahme-Spreewald, Spree-Neiße, Oberspreewald-Lausitz, Elbe-Elster	2015	ongoing	https://www.arbeitsagentur.de/vor-ort/cottbus/rueckkehrer
Mehr als du erwartest	BY	Freyung-Grafenau	2016	ongoing	https://www.mehralsduerwartest.de/
Haast scho g'hörd?	BY	Haßberge	2013	ongoing	https://www.vhs-hassberge.de/
Am Main daheim	BY	Schweinfurt (LK), Haßberge	2017	ongoing	https://www.am-main-daheim.de/
Heimatpost	BY	Donau-Ries	2017	ongoing	https://www.donaurises.bayern/region/regional-und-konversionsmanagement/regionalmanagement/heimatpost/
Come back Passau	BY	Passau, Passau (LK)	2013	ongoing	https://www.kuwi.de/
Das Passauer Land - da packmas hin	BY	Passau, Passau (LK)	2014	ongoing	http://www.pa-ck-mas.de/
Club der Rückkehrer	BY	Rhön-Grabfeld	2013	2015	
Chance Heimat	BY	Kronach	2013	ongoing	https://www.regionalmanagement-landkreiskronach.de/projekt/chance-heimat/
Newsletter “Durchstarten im Landkreis Dillingen”	BY	Dillingen	2013	ongoing	https://www.facebook.com/Wirtschaftsfoerderung.dlg/
Willkommen Daheim - Willkommen in deinem Landkreis	BY	Bad Kissingen	2017	ongoing	https://www.landkreis-badkissingen.de/wirtschaft/index.html

Table A.5: List of return initiatives (continued)

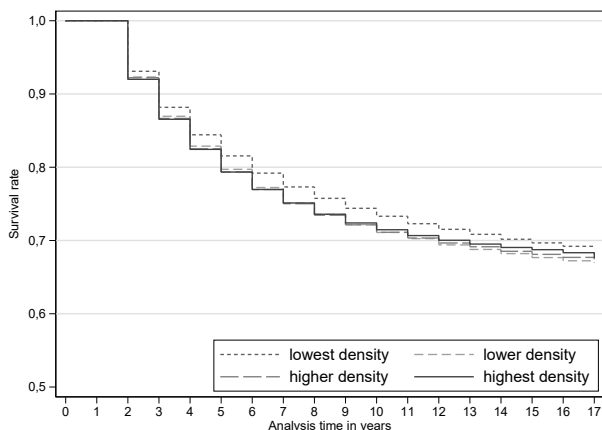
Name	Federal State [†]	Counties (NUTS 3-regions)	Start	End / Status: Nov 2019	URL
Willkommensagentur #freiraumfurmacher	BY	Wunsiedel im Fichtelgebirge	2017	ongoing	https://freiraum-fichtelgebirge.de/
Pendlerpost	MV	Ludwigslust-Parchim, Nordwestmecklenburg, Schwerin	2012	ongoing	https://www.invest-swm.de/arbeiten-leben-stellenportal
Welcome Center Rostock	MV	LK Rostock	2017	ongoing	https://www.welcome-region-rostock.de/
Heimathelden	NI	Emsland, Emden, Wittmund, Aurich, Leer, Grafschaft Bentheim	2017	ongoing	https://www.emsachse.de/heimathelden
Willkommen im Wendland	NI	Lüchow-Dannenberg	2017	ongoing	http://willkommen-im-wendland.de/
Heimvorteil	NW	Olpe, Siegen-Wittgenstein, Hochsauerlandkreis, Soest, Märkischer Kreis	2015	ongoing	https://heimvorteil-hsk.de/
Heimat Eifel: Vom Ankommen, Zurückkommen und Bleiben	NW and RP	Euskirchen, Ahrweiler, Bernkastel Wittlich, Eifelkreis Bitburg Prüm, Städteregion Aachen, Rhein-Sieg-Kreis, Vulkaneifel, Düren, Cochem-Zell, Mayen-Koblenz, Trier-Saarburg	2017	ongoing	https://heimateifel.de/
Sachse komm zurück	SN	Dresden, Görlitz, Bautzen, Meißen, Sächsische Schweiz-Osterzgebirge	2004	ongoing	https://www.sachsekommzurueck.de/servelet/portal?knoten_id=9320&sprache=de&ref_detail=RootServlet&ref_sprache=deu
Chemnitz zieht an	SN	Chemnitz	2008	ongoing	https://www.chemnitz-zieht-an.de/index.php/start
Ab in die Wachstumsregion Dresden	SN	Meißen, Bautzen, Dresden	2014	ongoing	https://www.wachstumsregion-dresden.de/
Die Heimkehrerbörse	SN	Sächsische Schweiz-Osterzgebirge	2014	ongoing	https://www.heimkehrerboerse.info/
Regionalmanagement Erzgebirge	SN	Erzgebirgskreis, Mittelsachsen	2001	ongoing	https://www.wfe-erzgebirge.de/regionalmarketing-entwicklung
Das Vogtland sind wir	SN	Vogtlandkreis	2015	2015	
Nestbau-Zentrale Mittelsachsen	SN	Mittelsachsen	2015	ongoing	https://www.nestbau-mittelsachsen.de/

Table A.5: List of return initiatives (continued)

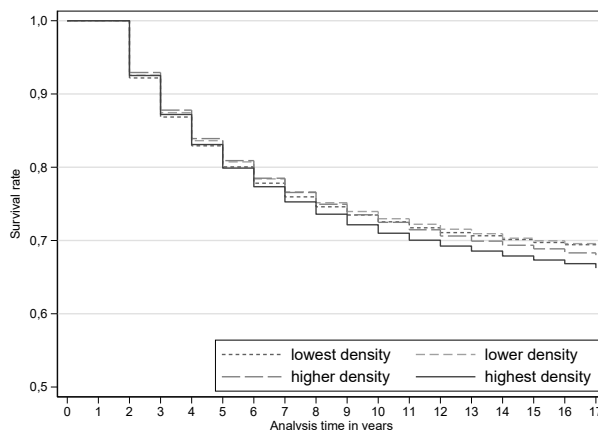
Name	Federal State [†]	Counties (NUTS 3-regions)	Start	End / Status: Nov 2019	URL
Servicestelle Heimat	SN	Sächsische Schweiz	2014	ongoing	https://fachkraefte-oberlausitz.de/projekte/servicestelle-heimat/
Bleiben-Ansiedeln-Zurückkehren	SN	Sächsische Schweiz	2014	ongoing	https://baz-initiative.de/arbeiten-und-wohnen-saechsische-schweiz.html
Welcome Center Erzgebirge	SN	Erzgebirgskreis	2016	ongoing	https://www.welcome-erzgebirge.de/
Raumpionierstation Oberlausitz	SN	Görlitz, Bautzen	2015	ongoing	https://www.raumpioniere-oberlausitz.de/
revenio...zurückkommen lohnt!	ST	Harz	2006	ongoing	http://www.revenio.de/
Zuhause im Harz	ST	Harz	2013	ongoing	https://www.zuhause-im-harz.de/
Zurück in die Heimat	ST	Wittenberg	2017	ongoing	https://www.zurueck-in-die-heimat.de/
Abi-Rückkehrer	ST	Anhalt-Bitterfeld	2016	ongoing	https://www.abi-rueckkehrer.de/
Welcome Center Kyffhäuserkreis	TH	Kyffhäuserkreis	2015	ongoing	https://www.kyffhaeuser.de/landkreis-politik/welcome-center/
Karriereheimat	TH	Wartburgkreis, Hildburghausen, Schmalkalden-Meiningen	2016	ongoing	https://karriereheimat.de/
Regionalmanagement Nordthüringen	TH	Kyffhäuserkreis, Nordhausen, Unstrut-Hainich-Kreis	2017	ongoing	https://www.perspektive-nordthueringen.de/regionalmanagement

[†] RP: Rhineland-Palatinate, NW: North Rhine-Westphalia, BY: Bavaria, BB: Brandenburg, SN: Saxony, MW: Mecklenburg-Western Pomerania, ST: Saxony-Anhalt, TH: Thuringia, NI: Lower Saxony · Source: Stiller and Ohlhoff (2021).

C Further estimation results



(a) By density at origin of initial migration



(b) By density at the destination of initial migration

Figure A.2: Frequency of return migration by labour market density

Notes: The figure illustrates Kaplan-Maier estimates of return migration as defined in Section 3. In both figures, we differentiate between four types of local labour markets that differ with regard to density. The latter is measured by the number of workers subject to social security within 50 km of the geometric centre of a municipality. The number of employees has been computed based on municipality averages in the period 1999–2017. Weighted by the number of all workers subject to social security in the observation period, the first, second and third quartile of local labour market density in Germany are 53.86 employees per km², 85.23 employees per km² and 144.89 employees per km². These values are used as thresholds to define the different types of local labour markets.

Source: IEB, Stiller and Ohlhoff (2021), own calculations.

Table A.6: Correlation of the establishment of a return initiative and regional characteristics

	(1)
Employment density	0.116* (0.064)
Wage level (median daily wage of medium skilled workers)	0.539*** (0.154)
Unemployment rate for medium skilled workers	-111.431*** (35.601)
Net migration rate of medium skilled workers	65.192 (48.344)
Constant	-33.850*** (11.356)
Region fixed effects	Yes
Observations	845
Number of regions	63
Log Likelihood	-132.87

Notes: The reported results are coefficients from a logistic regression where the dependent variable is an indicator variable that is equal to one when a return initiative has been established in the considered year and zero otherwise. Robust standard errors are given in parentheses, which are clustered at the level of NUTS 3-regions. ***, ** and * indicate significance at the 1%, 5% and 10% levels. All explanatory variables are lagged by one year. We only consider regions that were treated in the observation period and region-year observations until the year of treatment.

Source: IEB, Stiller and Ohlhoff (2021), own calculations.

Table A.7: Model selection

	all wages	low wage	medium wage	high wage
Number of failures (nf)	61,250	15,822	31,471	13,957
Number of intervals (r)	14	14	14	14
Number of individuals (n)	269,469	65,843	136,216	67,328
Observations (spells)	1,582,266	393,160	799,860	388,719
Proportion of ties $pt = (nf \cdot r)/n$	0.227	0.240	0.231	0.207
pt in %	22.7%	24.0%	23.1%	20.7%

Notes: Rule of thumb whether to use discrete or continuous hazard models. If pt is smaller than 20%, one should apply a continuous model. If pt is larger than 25%, one should use a discrete model. Both types of models can be used between 20 and 25% (Chalita et al., 2002).

Source: IEB, Stiller and Ohlhoff (2021), own calculations.

Table A.8: Results for control variables

	Wage prior to initial migration			
	Medium		High	
Personal characteristics				
Age, reference: 30-34 years				
15-24 years	1.510***	(0.049)	1.360***	(0.072)
25-29 years	1.226***	(0.023)	1.126***	(0.030)
>35 years	0.819***	(0.024)	0.854***	(0.031)
Female	0.948***	(0.016)	0.944**	(0.024)
Mother	0.930***	(0.023)	0.889***	(0.039)
Foreign nationality	0.766***	(0.027)	0.879***	(0.045)
High school degree (<i>Abitur</i>)	0.915***	(0.018)	0.876***	(0.019)
Labour market biographies				
Tenure (in months)	0.997***	(0.000)	0.998***	(0.000)
Experience (in months)	1.003***	(0.001)	1.001	(0.001)
Employment before vocational training (in months)				
outside labour market of residence during voc. training	0.975***	(0.002)	0.976***	(0.003)
in labour market of residence during voc. training	1.007***	(0.001)	1.005***	(0.001)
Years till initial migration since end of vocational training	0.980***	(0.006)	0.973***	(0.009)
Onward migration after initial migration	0.592***	(0.012)	0.603***	(0.02)
Labour market status in previous year				
Months employed	ref.		ref.	
Months minor employed	0.941***	(0.004)	0.938***	(0.007)
Months unemployed	1.009***	(0.003)	1.023***	(0.006)
Months no labour market participation	1.020***	(0.003)	1.012***	(0.004)
Months employed public sector	0.996	(0.004)	1.002	(0.006)
Daily gross wage ^a	0.894***	(0.018)	0.944*	(0.028)
Labour market status between end of vocational training and initial migration^b				
Months employed	ref.		ref.	
Months minor employed	1.057***	(0.008)	1.072***	(0.014)
Months unemployed	1.053***	(0.006)	1.069***	(0.014)
Months no labour market participation	1.038***	(0.006)	1.025***	(0.007)
Months employed public sector	1.004	(0.005)	0.987	(0.008)
Characteristics of the local labour market of residence during vocational training^c				
Median daily gross wage (occup. specific)	1.254**	(0.118)	1.197	(0.204)
Unemployment rate (occup. specific)	0.985	(0.029)	1.009	(0.053)
Sectoral specialization (emp. share of individual VET sector)	0.949***	(0.016)	0.967*	(0.018)
Occupational specialization (emp. share of individual VET occ.)	1.047*	(0.025)	1.269***	(0.038)
Net migration rate (in 1,000)	0.997	(0.002)	1.004	(0.004)
Employment growth due to newly founded firms ^d	0.766	(2.192)	0.003	(0.014)
Characteristics of the local labour market of current residence^c				
Median daily gross wage (occup. specific)	0.713***	(0.084)	0.627**	(0.121)
Unemployment rate (occup. specific)	1.017	(0.036)	1.024	(0.051)
Sectoral specialization (emp. share of individual VET sector)	1.028	(0.017)	1.001	(0.019)
Occupational specialization (emp. share of individual VET occ.)	0.973	(0.021)	0.982	(0.034)
Net migration rate (in 1,000)	1.003	(0.003)	0.996	(0.014)

Table A.8: Results for control variables (*continued*)

	Wage prior to initial migration	
	Medium	High
Observations	799,860	388,719
Number of individuals	136,216	67,328
Pseudo R2	0.048	0.048
Log Likelihood	-126,266	-57,268

^a The individual wage is considered relative to the occupation-region specific wage level in the current region of residence, so that the individual wages refer to the relative position in the wage distribution (see discussion by De la Roca, 2017). Individual wage differentials due to different region-occupation specific wage levels are captured by the regional occupation-specific wage information.

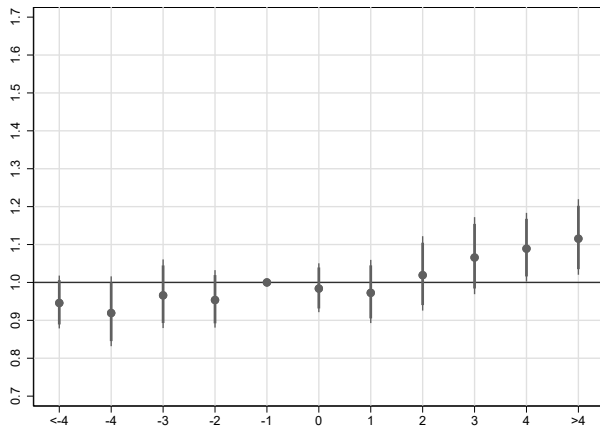
^b Average over the years between the end of vocational training and initial migration.

^c Regional wage level, unemployment rate and specialization are considered in logarithmic terms and relative to the rest of Germany (cf. Mitze, 2019).

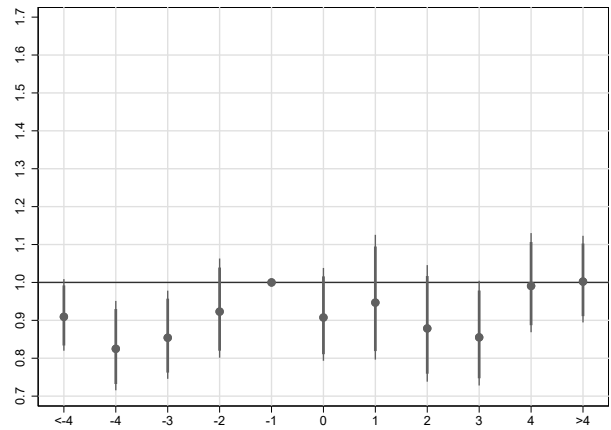
^d Employment growth is based on information from the Establishment History Panel (BHP) by the IAB. In order to approximate local demand shocks caused by new firms, we identify all new firms at the level of the considered overlapping local labour markets and compute the region specific number of new jobs created by new establishments classified as new establishment start-up (medium/large) or spin-off of part of an existing establishment relative to total regional employment.

Notes: Odd ratios (exponentiated coefficients) are reported that have been estimated based on Equations (1), (2) and (5) and refer to the likelihood of return migration. Robust standard errors are given in parentheses, which are clustered at the level of NUTS 3-regions of residence during vocational training. ***, ** and * indicate significance at the 1%, 5% and 10% levels.

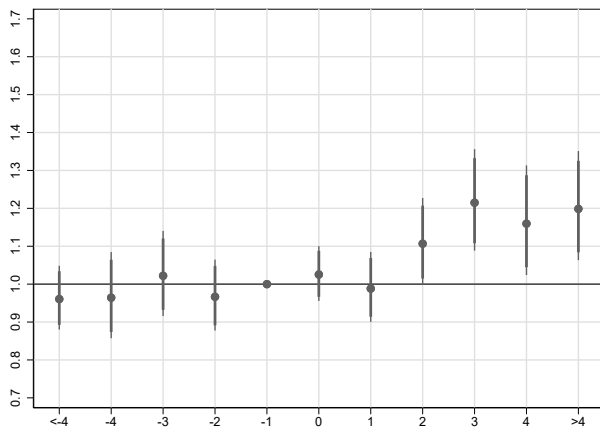
Source: IEB, Stiller and Ohlhoff (2021), own calculations.



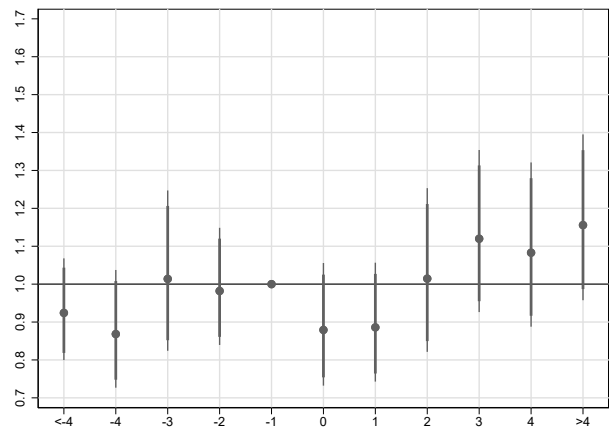
(a) Entire sample



(b) Workers not employed full-time before initial migration



(c) All workers employed full-time before initial migration



(d) Low wage before initial migration

Figure A.3: Probability of return migration before and after a return initiative has been established

Notes: Odd ratios (exponentiated coefficients) are reported that have been estimated based on Equations (1), (2) and (4) for the sub-samples (1), (2), (3) in (6) in Table 2 and refer to the likelihood of return migration. 95%- and 90%-confidence intervals are reported that are based on robust standard errors which are clustered at the level of NUTS 3-regions of residence during vocational training. On the horizontal axis, 0 denotes the year in which the return initiatives have been implemented. For information about considered fixed effects and control variables refer to Table 2 in the paper.

Source: IEB, Stiller and Ohlhoff (2021), own calculations.

Table A.9: Additional results for average effects of return initiatives in the short and medium term

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	All			No			Yes			Wage prior to initial migration [‡]		
		yes	no	no	yes	no	no	yes	no	no	yes	no
pre-treatment phase ($t < t_0 - 2$)	0.967 (0.029) ref.			0.921* (0.039) ref.			0.991 (0.037) ref.			0.948 (0.064) ref.		
pre-treatment phase ($t_0 - 2 \leq t < t_0$)												
pre-treatment phase ($t < t_0$)		ref.	ref.		ref.	ref.		ref.	ref.		ref.	ref.
implementation phase ($t_0 \leq t \leq t_0 + 2$)	1.008 (0.025)	1.037 (0.025)	1.027 (0.026)	0.944 (0.049)	0.995 (0.047)	1.003 (0.055)	1.047* (0.029)	1.063** (0.027)	1.037 (0.031)	0.917 (0.064)	0.929 (0.051)	0.874* (0.060)
medium time phase ($t_0 + 2 < t$)	1.118*** (0.039)	1.153*** (0.043)	1.132*** (0.055)	1.014 (0.049)	1.059 (0.063)	1.052 (0.088)	1.196*** (0.052)	1.226*** (0.049)	1.162* (0.089)	1.115 (0.090)	1.107 (0.080)	1.012 (0.108)
Separate linear time trend for treated/non-treated regions	no	yes	no	no	yes	no	no	yes	no	no	yes	no
Region specific time trend	no	no	yes	no	no	yes	no	no	yes	no	no	yes
Observations	2,532,971	2,532,971	2,532,971	950,705	950,705	950,705	1,582,266	1,582,266	1,582,266	393,160	393,160	393,160
Number of regions	401	401	401	401	401	401	401	401	401	401	401	401
Number of individuals	405,320	405,320	405,320	135,851	135,851	135,851	269,469	269,469	269,469	65,843	65,843	65,843
Pseudo R2	.051	.052	.052	.069	.070	.071	.043	.044	.045	.047	.048	.051
Log Likelihood	-377,128	-376,885	-376,646	-128,395	-128,289	-128,064	-247,985	-247,810	-247,573	-63,190	-63,145	-62,939

[†] Indicator for full-time employment between the end of vocational training and initial migration.

[‡] Average daily wage in full-time employment between the end of vocational training and initial migration. Thresholds are the first and third quartile.

Notes: Odd ratios (exponentiated coefficients) are reported that have been estimated based on Equations (1), (2) and (5) and refer to the likelihood of return migration. Robust standard errors are given in parentheses, which are clustered at the level of NUTS 3-regions of residence during vocational training. ***, ** and * indicate significance at the 1%, 5% and 10% levels. t_0 denotes the year in which a return initiative is established. For information about considered fixed effects and control variables refer to Table A.9.

Source: IEB, Stiller and Ohlhoff (2021), own calculations.

Table A.10: Multinomial logit for workers with medium and high wages prior to initial migration

	(1)	(2)	(3)	(4)	(5)	(6)
	Wage prior to initial migration [†]					
	Medium			High		
	no event	return	further	no event	return	further
pre-treatment phase ($t < t_0$)	ref.	ref.	ref.	ref.	ref.	ref.
implementation phase ($t_0 \leq t \leq t_0 + \varepsilon$)	0.903** (0.040)	ref.	0.914** (0.040)	0.907 (0.083)	ref.	0.915 (0.079)
medium time phase ($t_0 + \varepsilon < t$)	0.810*** (0.066)	ref.	0.830** (0.067)	0.722* (0.135)	ref.	0.748* (0.131)
Observations	704,121	704,121	704,121	343,061	343,061	343,061
Number of regions	401	401	401	401	401	401
Number of individuals	136,353	136,353	136,353	67,063	67,063	67,063
Pseudo R2	0.46	0.46	0.46	0.47	0.47	0.47
Log Likelihood	-114,292	-114,292	-114,292	-51,493	-51,493	-51,493

[†] Average daily wage in full-time employment between the end of vocational training and initial migration. Thresholds are the first and third quartile.

Notes: The reported results are relative risk ratios and refer to multiple-exit models where the treatment is specified according to Equation (5). We differentiate between three alternatives: moving back to the local labour market of residence during vocational training, staying at the destination of initial migration and on-ward migration to a third local labour market. Robust standard errors are given in parentheses, which are clustered at the level of NUTS 3-regions of residence during vocational training. ***, ** and * indicate significance at the 1%, 5% and 10% levels. For information about considered fixed effects and control variables refer to Table 2 in the paper. t_0 denotes the year in which a return initiative is established. For the medium wage group, ε is set to 1 and for the high wage group, it is set to 2 (cf. results in Figure 4 in the paper).

Source: IEB, Stiller and Ohlhoff (2021), own calculations.

Table A.11: Multinomial logit for alternative (sub-)samples

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	All			Employed prior to initial migration [†]			Wage prior to initial migration [‡]		
	no event	return	further	no event	return	further	no event	return	further
pre-treatment phase ($t < t_0$)	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.
implementation phase ($t_0 \leq t \leq t_0 + 2$)	0.976 (0.025)	ref.	0.979 (0.023)	0.962 (0.027)	ref.	0.967 (0.026)	1.152* (0.084)	ref.	1.132* (0.077)
medium time phase ($t_0 + 2 < t$)	0.891** (0.044)	ref.	0.903** (0.042)	0.879* (0.064)	ref.	0.892 (0.062)	1.039 (0.113)	ref.	1.033 (0.105)
Observations	2,180,810	2,180,810	2,180,810	1,392,707	1,392,707	1,392,707	345,525	345,525	345,525
Number of regions	401	401	401	401	401	401	401	401	401
Number of individuals	405,320	405,320	405,320	269,469	269,469	269,469	66,053	66,053	66,053
Pseudo R2	0.48	0.48	0.48	0.46	0.46	0.46	0.46	0.46	0.46
Log Likelihood	-337,167	-337,167	-337,167	-223,913	-223,913	-223,913	-56,602	-56,602	-56,602

[†] Indicator for full-time employment between the end of vocational training and initial migration.

[‡] Average daily wage in full-time employment between the end of vocational training and initial migration. Thresholds are the first and third quartile.

Notes: The reported results are relative risk ratios and refer to a multiple-exit model where the treatment is specified according to Equation (5). We differentiate between three alternatives: moving back to the local labour market of residence during vocational training, staying at the destination of initial migration and on-ward migration to a third local labour market. Robust standard errors are given in parentheses, which are clustered at the level of NUTS 3-regions of residence during vocational training. ***, ** and * indicate significance at the 1%, 5% and 10% levels. t_0 denotes the year in which a return initiative is established. For information about considered fixed effects and control variables refer to Table A.9.

Source: IEB, Stiller and Ohlhoff (2021), own calculations.

Table A.12: School-leaving degree

	(1)	(2)	(3)	(4)	(5)	(6)
	High school diploma					
	Yes			No		
pre-treatment phase ($t < t_0 - 2$)	1.038 (0.076)			0.955 (0.030)		
pre-treatment phase ($t_0 - 2 \leq t < t_0$)		ref.			ref.	
pre-treatment phase ($t < t_0$)		ref.	ref.		ref.	ref.
implementation phase ($t_0 \leq t \leq t_0 + 2$)	1.047 (0.090)	1.121 (0.087)	1.086 (0.084)	1.004 (0.028)	1.027 (0.027)	1.018 (0.030)
medium time phase ($t_0 + 2 < t$)	1.295*** (0.123)	1.493*** (0.151)	1.467*** (0.197)	1.102*** (0.040)	1.117*** (0.044)	1.095* (0.055)
Separate linear time trend for treated/non-treated regions	no	yes	no	no	yes	no
Region specific time trend	no	no	yes	no	no	yes
Observations	472,698	472,699	472,699	2,058,190	2,058,190	2,058,190
Number of regions	399	399	399	401	401	401
Number of individuals	75,980	75,980	75,980	329,153	329,153	329,153
Pseudo R2	0.055	0.055	0.058	0.051	0.052	0.053
Log Likelihood	-60,702	-60,699	-60,504	-315,704	-315,498	-315,259

Notes: Odd ratios (exponentiated coefficients) are reported that have been estimated based on Equations (1), (2) and (5) and refer to the likelihood of return migration. Robust standard errors are given in parentheses, which are clustered at the level of NUTS 3-regions of residence during vocational training. ***, ** and * indicate significance at the 1%, 5% and 10% levels. t_0 denotes the year in which a return initiative is established. For information about considered fixed effects and control variables refer to Table 2 in the paper.

Source: IEB, Stiller and Ohlhoff (2021), own calculations.

Table A.13: Excluding workers from regions that were treated in 2016 or 2017

	(1)	(2)	(3)	(4)	(5)	(6)
	Wage prior to initial migration [†]					
	Medium			High		
pre-treatment phase ($t < t_0 - 2$)	0.993 (0.073)				0.981 (0.100)	
pre-treatment phase ($t_0 - 2 \leq t < t_0$)	ref.				ref.	
pre-treatment phase ($t < t_0$)		ref.	ref.		ref.	ref.
implementation phase ($t_0 \leq t \leq t_0 + \varepsilon$)	1.049 (0.072)	1.052 (0.071)	1.027 (0.078)	1.074 (0.078)	1.164** (0.081)	1.106 (0.095)
medium time phase ($t_0 + \varepsilon < t$)	1.215*** (0.073)	1.238*** (0.078)	1.188 (0.120)	1.214* (0.140)	1.384*** (0.169)	1.377* (0.265)
Separate linear time trend for treated/non-treated regions	no	yes	no	no	yes	no
Region specific time trend	no	no	yes	no	no	yes
Observations	739,959	739,959	739,959	359,345	359,345	359,345
Number of regions	370	370	370	370	370	370
Number of individuals	125,918	125,918	125,918	62,234	62,234	62,234
Pseudo R2	0.048	0.049	0.051	0.048	0.049	0.052
Log Likelihood	-116,303	-116,225	-116,015	-52,993	-52,957	-52,763

[†] Average daily wage in full-time employment between the end of vocational training and initial migration. Thresholds are the first and third quartile.

Notes: Odd ratios (exponentiated coefficients) are reported that have been estimated based on Equations (1), (2) and (5) and refer to the likelihood of return migration. Robust standard errors are given in parentheses, which are clustered at the level of NUTS 3-regions of residence during vocational training. ***, ** and * indicate significance at the 1%, 5% and 10% levels. For information about considered fixed effects and control variables refer to Table 2 in the paper. t_0 denotes the year in which a return initiative is established. For the medium wage group, ε is set to 1 and for the high wage group, it is set to 2 (cf. results in Figure 4 in the paper).

Source: IEB, Stiller and Ohlhoff (2021), own calculations.

Table A.14: Results for return migration defined at the level of NUTS 3-regions (counties)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)			
	All			Employed prior to initial migration [†]			Low			Wage prior to initial migration [‡]					
				No			Yes			Medium			High		
pre-treatment phase ($t < t_0$)	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.			
implementation phase ($t_0 \leq t \leq t_0 + \varepsilon$)	1.015 (0.029)	0.992 (0.032)	0.979 (0.056)	0.982 (0.067)	1.035 (0.031)	0.998 (0.042)	0.887* (0.061)	0.825** (0.071)	1.092* (0.053)	1.088 (0.063)	1.082 (0.086)	1.054 (0.108)			
medium time phase ($t_0 + \varepsilon < t$)	1.153*** (0.050)	1.083 (0.059)	1.050 (0.072)	1.048 (0.100)	1.225*** (0.061)	1.086 (0.095)	1.064 (0.098)	0.933 (0.120)	1.270*** (0.076)	1.182* (0.112)	1.428*** (0.181)	1.232 (0.228)			
Separate linear time trend for treated/non-treated regions	yes	no	yes	no	yes	no	yes	no	yes	no	yes	no			
Region specific time trend	no	yes	no	yes	no	yes	no	yes	no	yes	no	yes			
Observations	2,677,128	2,677,128	1,002,058	1,002,058	1,675,070	1,675,070	416,983	416,983	846,421	846,421	410,259	410,259			
Number of regions	401	401	401	401	401	401	400	400	401	401	400	400			
Number of individuals	412,494	412,494	137,888	137,888	274,606	274,606	67,488	67,488	138,749	138,749	68,144	68,144			
Pseudo R2	0.052	0.052	0.071	0.073	0.044	0.045	0.046	0.050	0.048	0.050	0.049	0.054			
Log Likelihood	-319,271	-319,006	-108,587	-108,374	-209,950	-209,693	-55,509	-55,279	-107,310	-107,063	-46,039	-45,799			

[†] Indicator for full-time employment between the end of vocational training and initial migration.

[‡] Average daily wage in full-time employment between the end of vocational training and initial migration. Thresholds are the first and third quartile of observed wages of medium-skilled workers.

Notes: Odd ratios (exponentiated coefficients) are reported that have been estimated based on Equations (1), (2) and (5) and refer to the likelihood of return migration to the NUTS 3-region of residence during vocational training. Robust standard errors are given in parentheses, which are clustered at the level of NUTS 3-regions of residence during vocational training. ***, ** and * indicate significance at the 1%, 5% and 10% levels. For information about considered fixed effects and control variables refer to Table 2 in the paper. t_0 denotes the year in which a return initiative is established. For the medium wage group, ε is set to 1, for the high wage group and all other groups, it is set to 2 (cf. results in Figure 4 in the paper).

Source: IEB, Stiller and Ohlhoff (2021), own calculations.

Table A.15: Reduced control group - not weighted

	(1)	(2)	(3)	(4)	(5)	(6)
	Wage prior to initial migration [‡]					
	Medium			High		
pre-treatment phase ($t < t_0 - 2$)	0.951 (0.051)			1.084 (0.077)		
pre-treatment phase ($t_0 - 2 \leq t < t_0$)	ref.			ref.		
pre-treatment phase ($t < t_0$)		ref.	ref.		ref.	ref.
implementation phase ($t_0 \leq t \leq t_0 + \varepsilon$)	1.026 (0.047)	1.061 (0.047)	1.053 (0.048)	1.081 (0.084)	1.116 (0.085)	1.112 (0.106)
medium time phase ($t_0 + \varepsilon < t$)	1.200*** (0.060)	1.250*** (0.065)	1.264*** (0.110)	1.231* (0.146)	1.358** (0.175)	1.338 (0.273)
Separate linear time trend for treated/non-treated regions	no	yes	no	no	yes	no
Region specific time trend	no	no	yes	no	no	yes
Observations	420,898	420,898	420,898	170,318	170,318	170,318
Number of regions	186	186	186	186	186	186
Number of individuals	69,635	69,635	69,635	29,094	29,094	29,094
Pseudo R2	0.048	0.049	0.051	0.053	0.053	0.057
Log Likelihood	-65,898	-65,845	-65,733	-25,282	-25,269	-25,166

[‡] Average daily wage in full-time employment between the end of vocational training and initial migration. Thresholds are the first and third quartile.

Odd ratios (exponentiated coefficients) are reported that have been estimated based on Equations (1), (2) and (5) and refer to the likelihood of return migration. Robust standard errors are given in parentheses, which are clustered at the level of NUTS 3-regions of residence during vocational training. ***, ** and * indicate significance at the 1%, 5% and 10% levels. For information about considered fixed effects and control variables refer to Table 2 in the paper. t_0 denotes the year in which a return initiative is established. For the medium wage group, ε is set to 1 and for the high wage group, it is set to 2 (cf. results in Figure 4 in the paper). Source: IEB, Stiller and Ohlhoff (2021), own calculations.

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