Received: 6 November 2020 | Accepted: 12 October 2021

DOI: 10.1111/jors.12573

RESEARCH ARTICLE

JOURNAL OF REGIONAL SCIENCE WILEY

Regional borders, local unemployment, and life satisfaction

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Funding information

Spanish Ministry of Science and Innovation, Grant/Award Number: ECO2016-75805-R, PID2020-114251GB-I00; Spanish Agencia Estatal de Investigación (AEI), Grant/Award Number: CEX2019-000915-S; Catalan Agency for Management of University and Research Grants (AGAUR) Agency for Management of University and Research (AGAUR), Grant/Award Number: SGR1359

Abstract

In this paper, we provide novel evidence on the effect of local unemployment rate on life satisfaction. With this, we contribute to the expanding literature that aims to understand the role of the local labor market's conditions for individual well-being. This information can be used to only analyze the impact of regional economic policies, as well as to understand individuals' behavior and reactions to policy changes. In concrete, we investigate how changes in local unemployment rate affect subjective well-being in Germany, allowing for the presence of spatial spillovers and considering the role played by regional borders. The results indicate that higher unemployment in the own local area of residence has a negative effect on satisfaction. Similarly, individuals' happiness negatively correlates with the unemployment rate in contiguous local areas, but only if these areas are located in the same Federal State as the one where the individual lives. Heterogeneity analysis reveals that these negative effects of local unemployment rate are larger for individuals with stronger ties to the job market and less secure jobs.

KEYWORDS

life satisfaction, local unemployment, neighboring areas, regional borders, spatial spillovers

1 | INTRODUCTION

In this paper, we provide novel evidence on the effect of local unemployment rate on life satisfaction by extending the analysis to allow for spatial spillovers from unemployment in contiguous labor markets (i.e., neighboring local areas) and testing whether the potential influence of adjacent areas is driven by regional administrative borders or by geographical closeness. Our empirical analysis focuses on Germany and covers a large time spam (2000–2015). Considering the German case is interesting not only for data availability, but also to take advantage of the size of the country, the administrative division, as well as the political organization. Germany is a Federal State and, as such, its 16 states have a large degree of autonomy, only similar to the United States. Federal states in Germany, for example, levy taxes and have legislative power. This allows us to disentangle the effects of local labor markets from the effects of neighboring markets that might belong or not to the same legislative and political power. Moreover, the country is characterized by large spatial variations in the unemployment rate but, at the same time, also by a certain degree of cultural homogeneity. The paper also presents heterogeneity analysis and mechanisms to contribute to understanding the drivers of individuals' dislike for living in areas with high unemployment rate.

The literature has found a consistent negative and large effect of unemployment rate on life satisfaction, which contrasts with the fairly small role of gross domestic product (GDP; or growth) on life satisfaction, but is aligned with the significant and fairly large effect that economic crises (negative GDP growth and high unemployment rate) have on life satisfaction (De Neve et al., 2018; Wolfers, 2003). Different reasons have been put forward (and empirically tested) for why individuals dislike unemployment in their area of residence. One set of explanations is related to individuals' own position in the labor market in times of high unemployment: employed individuals become more concerned about losing their own job as well as about the difficulty of finding another one if this happens (anticipated effects); working conditions are harsher (there is pressure to decrease salaries and increase working hours); individuals might not leave a job they dislike; and unemployed individuals might see their chances of finding a job reduced (Chadi, 2014; Clark, 2003; Clark et al., 2010; Helliwell & Huang, 2014; Luechinger et al., 2010). Unemployed individuals with poor employability prospects, however, seem to show a positive effect of unemployment rate on life satisfaction, which might come through the lower social pressure that unemployed individuals might experience when the incidence of unemployment increases (Clark et al., 2010). These arguments suggest that the correlation between local unemployment rate and life satisfaction would depend on the characteristics of the individuals and the jobs they hold, such as type of contract (job security), type of job, and employability prospects which, in turn depend, for example, on the level of education. Authors of earlier papers have considered some of these characteristics to disentangle the mechanisms through which unemployment in the region where the individual lives affects their reported life satisfaction. Another set of explanations on individuals' dislike for unemployment relates to the impact that unemployment rate has on all individuals of a society, regardless of their job situation. There are mainly two explanations described in the literature: the negative externalities associated with unemployment and poverty (e.g., increasing crime rate and fiscal pressure, or loss of human capital) and the empathy towards other members of society (i.e., individuals care about others' suffering).

Our work contributes to this growing literature by focusing on a novel spatial dimension of the analysis, thus providing new empirical evidence that contributes to understanding the channels that explain the negative relationship between life satisfaction and local unemployment rate. First, similarly to Helliwell and Huang (2014) and in contrast with the rest of the literature, we consider a geographically smaller measure of aggregate unemployment. Most of the papers use the unemployment rate at the country or regional (typically NUTS 1) level. Instead, we define the unemployment rate at the local level. Specifically, we use German data and rely on unemployment at the Spatial Planning Region (ROR, *Raumordnungsregionen*) level for Germany. The RORs represent 96 territorial units that are in between NUTS 2 (Administrative Regions) and NUTS 3 (Districts) and are distributed across the 16 Federal States (NUTS 1) of the country. The definition of the ROR borders is based on the location of the different urban agglomerations and the spatial distribution of their respective catchment areas, taking into consideration commuting flows. This means that the RORs can be understood as local labor markets (Caliendo et al., 2019;

Jaeger et al., 2010). We merge administrative data on the unemployment rate at the ROR level with data from the German Socioeconomic Panel (for the years 2000–2015) and impute to each individual the unemployment rate of their own local labor market to estimate its impact on subjective well-being. The importance of using the local (ROR) labor market unemployment rate rather than more aggregate measures of unemployment is crucial, as labor markets are fairly local (Manning & Petrongolo, 2017). Second, we also depart from the current literature by enlarging the definition of the area of influence of variations in unemployment rate. Specifically, we consider not only unemployment in the local area (ROR) where the individual resides, but also the unemployment rate of all bordering RORs to each specific local area. That is, our regression also includes the (weighted) average unemployment rate of all the contiguous areas. This means that we can test for the first time whether individuals not only react to changes in unemployment in their local labor market of residence, but also (and the extent to which) to unemployment in surrounding areas. Third, we investigate whether the spatial influence of unemployment rate in surrounding areas is driven by administrative regional borders or by geographical closeness. More precisely, we analyze whether the effect of unemployment of neighboring areas depends on whether these neighboring areas belong or not to the same Federal State as the one where the individual lives. Fourth and finally, we present heterogeneity analysis and use an alternative dependent variable, which, together with the use of the novel spatial dimension we exploit, allow us to explore potential mechanisms and to understand the channels behind the dislike for local unemployment rate.

Our results indicate that local unemployment in the own area of residence matters for individuals' life satisfaction, confirming the standard result in the literature while using a smaller regional unit to define unemployment rate. Similarly, we find novel evidence on spillover effects of unemployment in neighboring regions: individuals' life satisfaction negatively correlates with the unemployment rate in contiguous local areas, although only if these areas are located in the same Federal State. In other words, unemployment rate in bordering areas belonging to the same Federal State where individuals reside affects their life satisfaction, while no effect is detected for variations in the unemployment rate in adjacent areas belonging to other Federal States. This general evidence is robust to different specifications (also to the inclusion of Federal State-specific time trends), as well as to various definitions of the unemployment rate of bordering areas, all of which are based on spatial weighted averages of each bordering ROR's unemployment rate defined according to population, the share of the ROR's border, the inverse of the distance from the RORs' centroids, as well as commuting flows from and towards surrounding areas. Similarly, we show that our results are not driven by endogenous residential sorting, endogenous commuting behaviors, or time-invariant unobserved heterogeneity, and are robust when we estimate the model using collapsed data at the ROR-year level.

This evidence indicates that the relevant regional dimension individuals take into account is both, the local area as well as the federal level where the individual resides. More importantly, individuals seem not to give any weight in terms of life satisfaction to those living close by but in a different Federal State. That is, there exist spatial spillovers of local unemployment rate, but these are not exclusively driven by geographic proximity. Indeed, administrative regional borders interact with the detrimental effect of local unemployment in contiguous areas on life satisfaction. There are two different sets of reasons that could explain this finding. One, individuals only care about unemployment in their own region to the extent that this correlates with their own job situation (e.g., through harder working conditions) and job uncertainty (e.g., with a higher probability of losing one's own job and increasing difficulty in finding a new one, if necessary). This would be the case if the extended dimension of the local labor market beyond the own area (ROR) of residence is bounded by the administrative border of the Federal State. That is, if the relevant spatial dimension in job search processes is defined by the local area of residence and surrounding areas located in the same Federal State. This assumption implies, for example, that individuals would face a higher arrival rate of job offers in their own local labor market and in the contiguous labor market only within the same Federal State; or that individuals would prefer searching for job opportunities in their own or surrounding labor markets if belonging to the same Federal State rather than others, equally far away, located in other Federal States. This is consistent with the relatively low labor mobility in the German labor market (as in other European countries)

compared with more mobile realities, such as the United States (Caliendo et al., 2017, 2019; Jaeger et al., 2010), as long as mobility is defined as crossing federal borders and not only as distance. This also implies that areas at the same distance are not considered part of the local labor market if they do not belong to the same Federal State. The second reason that could explain our findings is if individuals care about the unemployment rate for empathy motives, regardless of their own labor market situation. This explanation requires that the relevant others would only be those who belong to the same Federal State. This is consistent with the literature that argues that individuals care more about those belonging to the same group and that is often referred to as in-group bias (see, e.g., Alesina et al., 2018; Dahlberg et al., 2012). Although most of the federal borders were designed after the Second World War (while some do have historical roots), we know that group identity can also be generated artificially and therefore individuals in our sample could identify more with those who live in the same Federal State than with the rest. One could also argue that our findings are driven by an information effect, in which individuals only know the unemployment rate at the federal level, as this is the information easily available in the media. Although this could be true, it also requires that individuals are well aware of (or are affected by) the unemployment rate of their ROR area, as its effect survives the introduction of unemployment of the bordering areas belonging to the same Federal State together with Federal State-specific time trends. Finally, since unemployment benefits and labor market policies are designed at the national and not at the federal level, increased fiscal burden (negative externalities) cannot explain the differences found across different geographical definitions of unemployment rate. Other externalities—notably increased crime rate and loss of human capital—however, could still partially explain the empirical findings of the paper, even if our results are robust to the inclusion of local area controls (household income, share of migrants, and housing prices), which should pick up most of the potential local level confounders.

To gauge the relevance of each of the hypothesized channels,[1] we first investigate potential heterogeneous effects defined by individual characteristics related to their job market position. Specifically, we interact local unemployment rate in the own ROR and unemployment rate in bordering areas (within or outside the Federal State of residence) with gender, age, education, labor market status (part- and full-time workers in the private sector, public sector, and unemployed), and previous unemployment experience. The results from the heterogeneity analysis show that the negative effect of both unemployment rate of the own ROR and of neighboring RORs belonging to the same Federal State is stronger for males, individuals in the middle of the age distribution (i.e., aged 34–54), and those with previous unemployment experience. In contrast (and in line with the literature), the correlation is weaker for public-sector workers whose jobs are secure and might feel fortunate in times of high unemployment. These results point to labor market-related concerns as the main mechanism generating the negative correlation between life satisfaction and local unemployment rate. An additional heterogeneity exercise shows that the evidence is not driven by local labor markets located along the East–West border of Germany. Second, we further investigate possible channels by comparing our baseline results (active population 16–65) with the results when using only employed and inactive individuals (of the same age range, 16–65) separately. Inactive individuals show very imprecise estimates coefficients for the three measures of unemployment rate (own area, adjacent areas within the same Federal State, and surrounding areas of other Federal States). This might indicate a large degree of heterogeneity within this population group. In contrast, employed individuals show very similar results to those with the total sample. This is aligned with unemployment rate affecting life satisfaction through individuals' concerns about their own job situation. As an additional test, we use a self-reported question on individuals' perceived probability of losing their job and see that, as for life satisfaction, this perception increases with own and bordering areas' local unemployment, while it is very small and imprecisely estimated with the unemployment rate of bordering areas not belonging to the same Federal State where the individual resides. In short, self-perception of the probability of losing their job correlates with the local unemployment rate in the same

[1]Unfortunately, due to data limitations, we are not able to specifically consider the role of information asymmetries as one of the possible mechanisms behind our results. Indeed, we mostly focus on the role of labor market concerns and we also provide suggestive evidence about the relevance of the empathy towards the others.

way as life satisfaction. This again indicates concerns about own job as one of the main drivers of the negative correlation found in the baseline results.

Our evidence suggests that the effect of the local unemployment rate on life satisfaction comes through concerns about own labor market situation, rather than through empathy or other negative externalities, such as increased crime rate and fiscal burden, or loss of human capital. Second, our results show that these concerns are shaped by the conditions in the local labor markets limited to the borders of the Federal State. That is, individuals' perceptions about their own job stability are not driven by local unemployment in surrounding labor markets belonging to other Federal States. This speaks in favor of interregional mobility programmers implemented in Germany between 2003 and 2005 within the so-called "Hartz Reform" (Caliendo & Hogenacker, 2012; Caliendo et al., 2017). Those programmers aimed at incentivizing individuals to search by the geography of labor demand and the spatial distribution of employment opportunities, regardless of existing administrative regional borders.

2 | LITERATURE REVIEW

Starting from the seminal work by Clark and Oswald (1994), there have been several papers examining the effect of being unemployed on individuals' subjective well-being (see Winkelmann, 2014, for an overview). Own unemployment has been reported to have a negative, substantial, and long-lasting effect on life satisfaction, an effect that comes on top of the income-lost effect.[2] The importance of unemployment on own life satisfaction also shows important heterogeneity depending, for example, on individuals' personality traits (Boyce et al., 2015), own subjective well-being (Binder & Coad, 2015), and unemployment rate in the area where the individual lives (Clark, 2003). In addition to being one of the most important variables correlated with life satisfaction, individuals do not seem to adapt to unemployment, even after reemployment (Winkelmann, 2014). This evidence is mostly based on panel data that controls for time-persistent individual unobserved heterogeneity that affects both the probability of becoming unemployed and life satisfaction. Nevertheless, achieving a reliable identification strategy remains challenging, as identification comes only from those who change their (un)employment status. There are two papers, however, that make an important step towards causality. Kassenböhmer and Haisken-DeNew (2009) exploit an exogenous shock on unemployment due to big plant closures and confirm the negative impact of losing a job on life satisfaction. Farré et al. (2018) estimate a significant causal impact of unemployment on mental well-being using a shift-share instrument and exploiting the collapse of the construction sector in Spain in the aftermath of the 2008 crisis. Finally, there is also a set of papers that examine the spillovers effects of unemployment within the household by examining the impact that own unemployment has on their children and spouses (Bubonya et al., 2017; Marcus, 2013; Mendolia, 2014; Nikolova & Ayhan, 2019).

The literature most related to our paper examines the effect of regional (or country) characteristics (Aslam & Corrado, 2012), such as residential segregation measured with a Dissimilarity Index (Herbst & Lucio, 2016), noise pollution (Weinhold, 2012), or aggregate measures of unemployment, on life satisfaction. This literature started with MacCulloch et al. (2001), who estimated the relative importance of inflation and unemployment rate of the country for individuals' self-reported life satisfaction, to conclude that, although both important, unemployment rate has a larger size effect on life satisfaction. Since then, the literature has consistently found an economically significant negative impact of aggregate measures of unemployment on life satisfaction (see, e.g., Blanchflower et al., 2014; Di Tella et al., 2003; Schwarz, 2012; Shields et al., 2009; as well as Wrede, 2014, for a theoretical perspective). There are different reasons (mechanisms) that have been put forward to explain this finding, but all of them are related to individuals' job situation. Social norms were one of the first studied mechanisms: with increasing unemployment, the social pressure on those unemployed is reduced and thus unemployment in the region can have

[2]There is also a parallel literature that analyzes the effect of the life satisfaction drop due to unemployment on search behaviors of the unemployed (e.g., Gielen & Ours, 2014; Krause, 2013; Mavridis, 2015; O'Connor, 2020).

a positive impact on those already unemployed. In other words, for individuals with low-employability prospects, being unemployed is less stigmatized with higher unemployment rates. Clark et al. (2010) find empirical evidence sustaining this argument: the negative effect of unemployment on life satisfaction is larger for those with high prospects of employability, both employed and unemployed. Luechinger et al. (2010) instead use an objective measure of job security (rather than employability), defined according to whether the individual works in either the public or the private sectors (considering employment in the public sector as secure and with a virtually null probability of being fired). They expect those in less secure and stable job positions to react more negatively to increases in aggregate unemployment in the region of residence. As predicted, they empirically found that private-sector workers are much more negatively affected by regional fluctuations in unemployment rate than their counterparts working in the public sector. These results have been confirmed by Helliwell and Huang (2014), who analyzed the effect of variations in unemployment across US counties (i.e., a more local measure of unemployment than the one used in other papers, and thus more similar to the one in our study). They also report evidence suggesting that job stability appears to be the main channel explaining the effect of local unemployment on life satisfaction. Again using German data, Chadi (2014) reports that the negative effect of regional unemployment is higher for individuals who are unemployed at the time of the survey, although in contrast with Clark et al. (2010) he does not distinguish between individuals' estimated employability. A related literature has documented a positive relationship between life satisfaction and the generosity of the labor market policies and of the unemployment benefits (Di Tella et al., 2003). More specifically, Wulfgramm (2014) analyzes the role of labor market institutions, documenting that the generosity of (passive) labor market policies tends to mitigate the negative effect of regional unemployment on life satisfaction.

Our paper contributes to this literature by (i) offering a local measure of aggregate unemployment, (ii) examining the impact of bordering areas and the existence of spatial spillovers, and (iii) distinguishing whether they belong or not to the same Federal State (i.e., the role of administrative regional borders). Moreover, the heterogeneity analysis and the use of different samples and dependent variables enable (iv) suggesting the mechanisms of why individuals dislike local unemployment.

3 | EMPIRICAL APPROACH AND DATA

3.1 | Empirical approach

This paper thus presents the first empirical analysis of the effect of the unemployment rate in the local area of residence and in surrounding areas on individuals' life satisfaction (*LS*), while distinguishing according to whether the adjacent local areas belong or not to the same Federal State (i.e., administrative region) where the respondent lives. In most of our analyses, we exploit data at the individual level combined with aggregate information about the local unemployment rate and other control variables at the local level. Our results, however, are consistent when obtained from collapsed data at the local level. We start by estimating an equation that explains LS_{irt} of individual i, residing in the local area (ROR) r at time t, as a function of a set of individual controls (X_{it}), local unemployment rate in the own ROR of residence (U_{rt}), local areas (ROR) fixed effects (θ_r), time dummies (ρ_t), and a set of time-varying local area characteristics (W_{rt}), which may confound the relationship between local unemployment and life satisfaction. The first equation to be estimated takes the form

$$LS_{irt} = \alpha + \beta' X_{it} + \gamma U_{rt} + \theta_r + \rho_t + \omega' W_{rt} + \varepsilon_{it}. \quad (1)$$

Subsequently, we augment the model by including not only the unemployment rate in the local area (ROR) of residence of the respondent (U_{rt}), but also the average unemployment rate in all the RORs that are adjacent (contiguous) to the one where the individual resides ($\overline{UB}_{rt}$). In this way, we expand the definition of the local area of

influence considering a spatial contiguity approach, which represents the first main novelty of this paper. The corresponding equation to be estimated becomes

$$LS_{irt} = \alpha + \beta' X_{it} + \gamma U_{rt} + \psi \bar{UB}_{rt} + \theta_r + \rho_t + \omega' W_{rt} + \varepsilon_{it}. \quad (2)$$

The estimates from this equation would indicate whether individuals are affected by the unemployment rate prevailing in their area of residence (conditional on their own employment status and other individual and local controls), and whether they also respond to variations in unemployment rate in bordering areas, thus enlarging the spatial influence of local unemployment beyond the local labor market of residence (the ROR), based on a contiguity criterion.

However, Equation (2) is based on the underlying assumption that the unemployment rate in contiguous local labor markets has the same effect on individuals' life satisfaction regardless of whether these areas belong or not to the same Federal State where the respondent resides. Next, we relax this assumption and allow individuals to be differently affected by changes in the local unemployment rate in surrounding local areas that belong to the same ($\bar{UB}_{rt}^{SFS}$) and to different ($\bar{UB}_{rt}^{DFS}$) Federal States,[3] that is,

$$LS_{irt} = \alpha + \beta' X_{it} + \gamma U_{rt} + \delta \bar{UB}_{rt}^{SFS} + \lambda \bar{UB}_{rt}^{DFS} + \theta_r + \rho_t + \omega' W_{rt} + \varepsilon_{it}. \quad (3)$$

We retain Equation (3) as the baseline specification for our estimations throughout the paper. This specification contains ROR fixed effects, which capture time-invariant characteristics of the local areas, and year fixed effects, which control for time trends that are common across RORs in a flexible way. Given that our main variables of interest vary across RORs and over time, while our dependent variable is defined at the individual and year level, we cluster standard errors using two-way clusters at the ROR and year level.

One potential issue in the estimation of Equation (3) could be the excessive spatial correlation in the measures of local unemployment rates, especially within each Federal State. Although the current literature shows important unemployment differences across European regions despite the European labor market integration (Andersson et al., 2015), there is clear spatial dependence in local unemployment rates within a country (Patacchini & Zenou, 2007). In our data, we find important unemployment variations across time and RORs within Germany, which allow us to identify well the effect of local unemployment rate. Nevertheless, with the aim of showing that our results are not just a statistical artifact due to spatial correlation between the unemployment rate in the own ROR and in contiguous RORs (especially if they form part of the same Federal State), we estimate the model with and without conditioning on the unemployment rate in the area of residence. With the same aim, we also present the results obtained by estimating the model introducing each of our local unemployment measures one by one in lags up to two years. Moreover, we also present the results from alternative specifications, in which we substitute ROR fixed effects (θ_r) by Federal State (NUTS 2) specific linear and quadratic trends. In this way we control for time-varying factors at a (more) aggregate regional level that might confound the relationship between local unemployment rates in the own and surrounding RORs and life satisfaction.

For robustness, we also present results in which we cluster our data at the ROR-year level and run Equation (3) with aggregate data. Our dependent variable is then a weighted average of life satisfaction ($\bar{LS}_{rt}$) per ROR and year,

[3]We take into account the specificity of some ROR's boundaries when computing the average of local unemployment of surrounding RORs. First, we consider the existence of State Cities (Berlin, Bremen, and Hamburg), which represent separate Federal States (and ROR). As for the city of Berlin, which is nested within other RORs forming part of the Brandenburg Federal State, we consider as if it forms part of this Federal State. For Bremen and Hamburg, we assume they belong to the Schleswig-Holstein and Lower Saxony Federal States, respectively. However, our results are consistent when excluding observations of individuals residing in these places, as it happens when removing individuals residing in Saarland (which represents a Federal State with a single ROR). Finally, we also check for the sensitivity of the results when we exclude individuals living in RORs with no adjacent areas from other Federal States (for whom the variable $\bar{UB}_{rt}^{DFS}$ would always be equal to zero).

in which we use as weights the number of observations contained in each ROR-year cell.[4] The counterpart of Equation (3) based on grouped data would take the form

$$\bar{LS}_{rt} = \alpha + \gamma U_{rt} + \delta \bar{UB}_{rt}^{SFS} + \lambda \bar{UB}_{rt}^{DFS} + \theta_r + \rho_t + \omega' W_{rt} + \xi_{rt}. \quad (4)$$

Notice that the previous equation only includes time-varying controls at the local level, but not individual characteristics. Since the results from aggregate data are consistent with those obtained using individual data, we retain Equation (3) as our baseline, which allows us to perform heterogeneity analysis using individual characteristics.

To address different econometric and measurement concerns that could affect our estimates, we present a battery of sensitivity checks to Equation (3). First, we present several different reweighted measures of the average unemployment rate of the surrounding regions. In line with the literature on spatial econometrics, on top of the simple average (a), we also compute weighted average using as weights (b) the share of population in each region, (c) the fraction that each ROR represents of the total of the border length in kilometers, (d) the inverse of the distance between the centroids of each ROR to each bordering ROR (normalized by the sum of all distances), (e) the proportion of commuters to the bordering RORs, and (f) the proportion of commuters from the bordering RORs. We estimate Equation (3) with each of these four different measures of average unemployment rate across all neighboring regions (RORs). We also present results with these different measures in Equation (4), which solely exploits aggregate data. Second, we present alternative estimations to provide evidence against the possibility that our results are driven by potential endogeneity issues. Specifically, as long as the place of residence is a choice variable and individuals/families might endogenously change their location according to fluctuations in local unemployment (i.e., endogenous residential sorting), we expect at least two opposite effects. One, those who care more about local unemployment will move to areas with lower unemployment and therefore our estimates would represent a lower bound of the effect of aggregate unemployment on life satisfaction. Two, individuals with a lower socioeconomic background might also have worse employability prospects and thus be more affected by unemployment in their area. At the same time, those are less mobile individuals and thus have a larger probability of staying in their area of residence, even if unemployment increases. This means that our estimates would represent an upper bound of the true causal effects between life satisfaction and unemployment rate. Although mobility is very low in Germany and thus these concerns are bound to be small, we reestimate Equation (3) for the subsample of individuals who never change the area of residence (88% of the sample) while observed in the panel (stayers) and compare their LS changes with that of the total sample. Similarly, we estimate Equation (3) with individual fixed effects, so as to absorb any time-invariant individual heterogeneity, including time-persistent unobserved individual characteristics that affect location choices. Individuals fixed effects allow one to take into account individual time-persistent effects that are very important determinants of life satisfaction (Ferrer-i-Carbonell & Frijters, 2004). In the current context, however, introducing individual fixed effects challenges our identification. Since variations in unemployment rate are much larger across RORs than over time within the same ROR, and we control for ROR fixed effects, introducing individual fixed effects might imply that our identification is coming from those who move across RORs over the sample. These individuals, especially in a country characterized by a low job mobility as Germany, however are not representative of the whole population, as they are on average younger and better educated. Therefore, we would expect these individuals not to be as sensitive to unemployment rate as the rest of the population. To include individual fixed effects and solve this identification issue, we do not control for ROR fixed effects when estimating Equation (3). In an additional specification we estimate the regression with individual fixed effects and exclude those individuals who move RORs while in the sample. Finally, we check the stability of our baseline results by removing individuals who commute, for job-related reasons, more than 25, 50, or 75 km, as

[4]See Angrist and Pischke (2009) for more details. A similar approach has also been followed by Oreopoulos et al. (2012), among others.

those individuals have weaker ties with their local labor market. We show consistency across the different robustness checks, and we move to heterogeneity analysis and the use of other dependent variables to further analyze the mechanisms driving our findings.

3.2 | Data

The empirical analysis is based on two different German data sets. On the one hand, we retrieved data about local unemployment rates (and other local variables) from administrative registers of the INKAR database (www.inkar.de) managed by the Federal Institute for Research on Building, Urban Affairs and Spatial Development (BBSR). The INKAR database contains information about several aggregate variables over time, at several levels of spatial aggregation. We considered data at the Spatial Planning Region (ROR, *Raumordnungsregionen*) level, which corresponds to 96 territorial units that are in between NUTS II (Administrative Regions/Provinces) and NUTS III (Districts) and are distributed across the 16 Federal States (NUTS I) of the country. This level of spatial aggregation has been selected for two main reasons: first, the RORs define geographical areas that are large enough as to not capture relative concerns;[5] and second, the RORs represent local labor markets as they are defined on the basis of agglomeration economies and commuting flows (Caliendo et al., 2019; Jaeger et al., 2010). From the INKAR database, we collected information (based on administrative registers) at the ROR level on unemployment rate, average household income, population, and the share of migrants, for the years 2000–2015. Figure 1 displays the spatial distribution of unemployment rate for the 96 RORs of Germany for the years 2000, 2007, and 2014. As can be appreciated, there is an important degree of time-varying spatial variation in local unemployment, which is the main source of variation we exploit in our empirical analysis. It is however, true that, as expected, time variation (within each ROR) is larger than geographical variation (between RORs).

The second database we use is the German Socioeconomic Panel (SOEP) (Goebel et al., 2019), which contains individual-level information and is representative of German households. Although the German SOEP started in 1984 in West Germany and includes East German respondents since 1990, in this paper we use data for the years ranging from 2000 until 2015 only, as these are the years for which the aggregate variables are available. The estimation sample contains individuals aged 16–65, who were born in Germany and are not studying full time, retired, or permanently disabled. That is, our main estimation only retains individuals who are active in the labor market and presumably care about fluctuations in the local unemployment rate.[6] After cleaning observations with missing values in relevant variables, we obtained a final pooled sample of 187,431 observations. The dependent variable is measured as the answer to a life satisfaction question, which is taken as a proxy for experienced utility. In the German SOEP, respondents are asked how satisfied they are with their life, all things considered, where the answers are cast on a 0 (completely dissatisfied) to 10 (completely satisfied) scale. The two basic assumptions underlying subjective satisfaction measures (Ferrer-i-Carbonell & Frijters, 2004) are: (i) individuals are able to evaluate their life satisfaction, that is, there is a positive monotonic relationship between the answer to such questions and the theoretical concept we are interested in, and (ii) the answers to such question are interpersonally comparable. A good account of such measures, the underlying assumptions, their applications, and their (empirical) validity can be found in Ferrer-i-Carbonell and Frijters (2004), Clark et al. (2008), and Van Praag et al. (2008).

Table 1 shows descriptive statistics of all individual, household, and regional aggregate variables used in the empirical analysis. Individual-level controls have been selected according to the standard practice in the life

[5]In 2015, the last year in which all the relevant variables from the INKAR database are available, the average ROR population was 854,053 individuals and the average surface 3722 m^2.

[6]To understand the role of labor market prospects as a mechanism behind the results, we also retain inactive (i.e., retired or permanently disabled) individuals of the same age range or older. Descriptive statistics for this additional estimation sample, as well as for the subsamples of stayers (i.e., those who never changed their ROR of residence) and employed individuals are reported in Table A1 of the appendix.

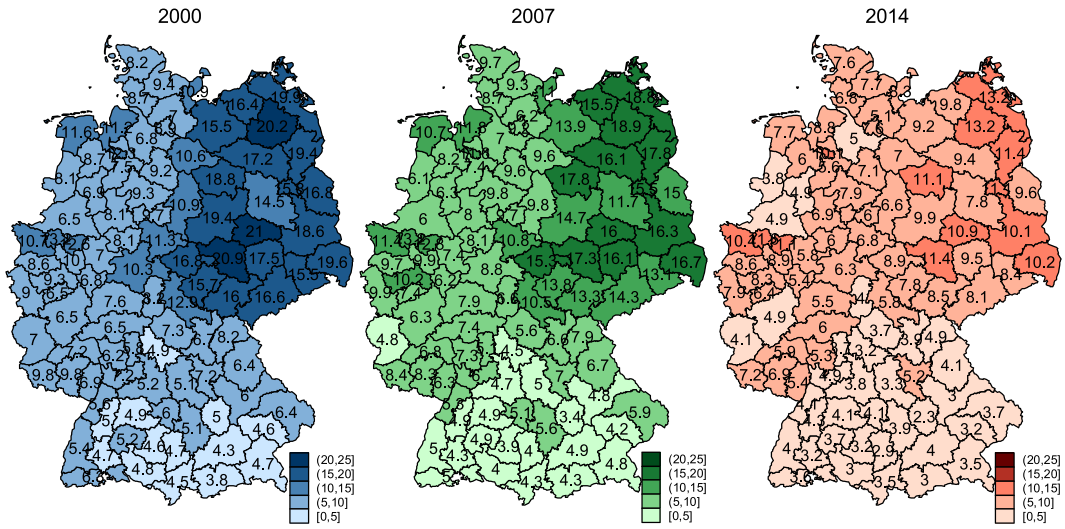

FIGURE 1 local unemployment rate at the ROR (*Raumordnungsregionen*) level

satisfaction literature. Specifically, we consider gender, age (squared), years of schooling, marital status, number of children and adults in the household, real average household income, labor market status (full-time private-sector worker, part-time private-sector worker, public-sector worker, and unemployed), as well as previous unemployment experience (in months), the number of doctor visits during the 3 months preceding the interview (as an objective proxy for health status), house size (in logs), and a dummy for home ownership.[7] Aggregate controls, defined at the level of the ROR of residence, have been selected according to relevance and data availability and include, besides the different measures of aggregate unemployment, the local share of immigrants, local average household income per capita, and local average housing prices per square meter (the last two variables are also logged).

4 | RESULTS

4.1 | Baseline results

The first set of results based on Equations (1)–(3) are displayed in Table 2. Column (1) displays the results from Equation (1), which represents the regression of life satisfaction (*LS*) against local unemployment rate, controlling for a standard set of individual and household control variables, as well as year and local area (ROR) fixed effects. The coefficients of the control variables are consistent with previous literature and are not printed in the table, except for own unemployment: males are slightly less satisfied than women, age shows a U-shaped relationship with life satisfaction, and compared with public-sector employees, full-time and part-time workers in the private sector are less satisfied with their life. In addition, and also consistent with earlier literature, life satisfaction correlates positively with education, household income, and the number of children, but negatively with the number of adults living in the household and with our proxy measure of objective health status (i.e., the number of visits to the doctor during the last 3 months). Being unemployed has a strong negative and very precisely estimated coefficient (−0.38; s.e. 0.024).

[7]Notice that continuous covariates are included using logs (plus one for the number of children, the number of visits to the doctor during the last 3 months, and previous unemployment experience).

TABLE 1 Descriptive statistics (pooled sample 2000–2015)

Variable	Mean	Std. Dev.	Min	Max
Life satisfaction	7.091	1.706	0.000	10.000
Perceived probability to lose the job[a]	0.201	0.251	0.000	1.000
Unemployment own area	9.146	4.390	2.100	24.000
Unemployment bordering areas	8.895	4.098	2.950	21.700
Unemployment bordering areas—same Federal State	8.912	4.338	0.000	21.850
Unemployment bordering areas—different Federal State	6.020	5.736	0.000	23.950
Individual controls				
Male	0.507	0.500	0.000	1.000
Age	42.73	11.03	16.00	65.00
Years of schooling	12.81	2.685	7.000	18.00
Labor situation = public-sector worker	0.075	0.264	0.000	1.000
Labor situation = private-sector full-time worker	0.571	0.495	0.000	1.000
Labor situation = private-sector part-time worker	0.239	0.427	0.000	1.000
Labor situation = unemployed	0.114	0.318	0.000	1.000
Previous unemployment experience (in months)	0.886	2.282	0.000	37.000
Net household income	3401.5	2306.3	10.0	200,000
Married	0.597	0.491	0.000	1.000
Number of children	0.776	1.027	0.000	9.000
Number of adults in the household	2.938	1.289	1.000	14.000
Number of visits to the doctors (last 3 months)	2.081	3.451	0.000	99.000
Owner of the flat	0.527	0.499	0.000	1.000
House size (in m^2)	110.1	47.12	8.000	754.0
Local controls				
Local average household income per capita	1532	234.5	1014	2319
Local share of migrants	8.128	4.641	1.000	19.20
Local average housing price (per mq^2)	121.6	103.7	8.955	632.4
Years/waves				
Year/wave = 2000	0.063	0.244	0.000	1.000
Year/wave = 2001	0.059	0.235	0.000	1.000
Year/wave = 2002	0.065	0.246	0.000	1.000
Year/wave = 2003	0.060	0.238	0.000	1.000
Year/wave = 2004	0.058	0.234	0.000	1.000
Year/wave = 2005	0.055	0.228	0.000	1.000
Year/wave = 2006	0.058	0.233	0.000	1.000

TABLE 1 (Continued)

Variable	Mean	Std. Dev.	Min	Max
Year/wave = 2007	0.055	0.228	0.000	1.000
Year/wave = 2008	0.051	0.221	0.000	1.000
Year/wave = 2009	0.053	0.225	0.000	1.000
Year/wave = 2010	0.071	0.257	0.000	1.000
Year/wave = 2011	0.074	0.261	0.000	1.000
Year/wave = 2012	0.075	0.263	0.000	1.000
Year/wave = 2013	0.072	0.259	0.000	1.000
Year/wave = 2014	0.068	0.251	0.000	1.000
Year/wave = 2015	0.063	0.243	0.000	1.000
Number of observations	188,860			

[a]Only 65,258 valid observations of employed individuals from waves 2001, 2003, 2005, 2007, 2009, 2011, 2013, and 2015.

Most importantly, the estimated coefficient of local unemployment rate in the own area (ROR) of residence (γ) confirms earlier results in the literature, suggesting that aggregate unemployment rate in the local labor market has a negative and precisely estimated effect on individuals' reported life satisfaction (−0.055, s.e. 0.005). Specifically, a one standard deviation increase in local unemployment rate (mean 9.14%, s.d. 4.39), changes individual life satisfaction by 0.24 points, that is, about a 14% change of a one standard deviation of life satisfaction (mean 7.09, s.d. 1.71). In column (2) we also include time-varying controls at the ROR level that might correlate both with life satisfaction and unemployment. These are (logged) average household income per capita, (logged) average housing prices per square meter, and the share of immigrants. The estimates of these aggregate controls indicate that only the average household income has a positive and precisely estimated coefficient. Moreover, the size of coefficient of interest is just slightly reduced (−0.051 vs. −0.055) and remains precisely estimated (s.e. 0.05).

Column (3) displays selected estimates from Equation (2), which contains the average unemployment rate of all the bordering areas (ROR), that is, all RORs adjacent to the ROR of residence ($\overline{UB}_{rt}$) as an additional regressor. This enables a broader definition of 'local labor markets' to be considered by increasing the geographical boundaries of influence based on geographic contiguity of surrounding RORs. However, this regression seems to indicate that only the unemployment rate in the own local labor market of residence matters for life satisfaction, whereas the coefficient of average unemployment in all contiguous labor markets is negative, but has a small (0.017) and imprecisely estimated coefficient (s.e. 0.013). However, when we split the average unemployment rate in bordering areas depending on whether the adjacent RORs belong or not to the same Federal State where the respondents live (Equation 3), the estimates (column 4 in Table 2) reveal an interesting pattern. Although the coefficient of the unemployment rate of the own ROR remains negative, large, and precisely estimated (a 1 s.d. increase in unemployment in the area of residence reduces satisfaction with life by 0.14 points, instead of 0.24 when only unemployment in the own region was included, without local controls), unemployment in bordering areas that belong to the same Federal State also shows a large (although smaller), negative, and precisely estimated coefficient (−0.12 points for each s.d. increase in unemployment rate, compared with 0.14 for own local area unemployment). The two coefficients (own ROR unemployment and are unemployment of bordering RORs belonging to the same Federal State) are not statistically different from each other. On the contrary, variations in unemployment rate in adjacent areas that belong to other Federal States yield a very small (0.009) and imprecisely estimated coefficient on individuals' SWB. This coefficient is statically different from the other two aggregate unemployment coefficients (own ROR unemployment and that of adjacent RORs belonging to the same Federal State).

TABLE 2 Local unemployment and life satisfaction, individual data

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Unemployment own area	−0.055***	−0.051***	−0.037***	−0.033**		−0.038**	−0.034**
	(0.005)	(0.005)	(0.012)	(0.012)		(0.013)	(0.014)
Unemployment bordering areas			−0.017				
			(0.013)				
Unemployment bordering areas—same Federal State				−0.028***	−0.053***	−0.045**	−0.021
				(0.009)	(0.007)	(0.019)	(0.017)
Unemployment bordering areas—different Federal State				0.009	0.002	0.006	0.009
				(0.007)	(0.006)	(0.007)	(0.007)
Unemployed (vs. private-sector full-time workers)	−0.380***	−0.380***	−0.380***	−0.381***	−0.382***	−0.379***	−0.380***
	(0.024)	(0.025)	(0.025)	(0.025)	(0.025)	(0.026)	(0.026)
Local area controls	No	Yes	Yes	Yes	Yes	Yes	Yes
Linear Federal State-specific trend	No	No	No	No	No	Yes	No
Quadratic Federal State-specific trend	No	No	No	No	No	No	Yes
Adjusted R^2	0.155	0.155	0.155	0.156	0.155	0.153	0.154
Number of observations	188,860	188,860	188,860	188,860	188,860	188,860	188,860

***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively. Ordinary least squares (OLS) regressions with two-way clustered standard errors at the local (ROR) and year level. All regressions include ROR fixed effects and individual controls (gender, age, and its square, (log) years of schooling, marital status, (log) number of children, (log) number of adults in the household, (log) net family income, dummies for labor market status (unemployed, public-sector worker, private-sector full-time worker, and private-sector part-time/mini-job worker), (log) number of visits to the doctors in the last 3 months, (log) unemployment experience, home ownership and (log) house size). Additional local area (ROR) controls: (log) average household income per capita, local share of migrants, (log) of average housing prices per mq^2. Regressions in columns (1)–(5) include year effects. Regressions in columns (6) and (7) include linear and quadratic Federal State-specific trends, respectively.

For robustness, we also estimate the life satisfaction equation excluding unemployment rate of own local area, while including the two local unemployment rates of the neighboring areas (column 5). This is to show that, although the measures of local unemployment rate are spatially and temporally correlated with each other (Patacchini & Zenou, 2007), the previous evidence is not the result of a statistical artifact due to collinearity. The results indicate that only unemployment rate in neighboring areas that form part of the same Federal State matters for life satisfaction, while unemployment rate in other adjacent areas appears to be irrelevant even without controlling for unemployment rate in the ROR of residence. The effect of unemployment rate in bordering areas belonging to the same Federal States is higher in this case, possibly because it is capturing, due to spatial correlation, part of the variation in unemployment rate in own local area (i.e., it behaves as a mediator variable). However, the main evidence regarding the role of regional borders remains unaffected: on top of unemployment in the area of residence, unemployment in bordering areas matters only if these belong to the region where the individual lives. Moreover, for the same purpose, we estimate Equation (3) by introducing each of our three unemployment measures at year t, while controlling for unemployment

rates in the other regions in years $t-1$ and $t-2$. The results from the model with lagged unemployment rate are again in line with our main evidence (see Table A2 of the appendix).

Finally, columns (6) and (7) replicate our baseline results (Equation 3), but incorporating, respectively, linear and quadratic Federal State-specific time trends. In this case, the regression still controls for ROR fixed effects (θ_r), but excludes time effects (ρ_t) that are already captured by the trends. This allows us to control for aggregate factors that vary over time at the regional level and may confound the relationship between local unemployment rate and life satisfaction. Specifically, our main concern is Federal State unemployment rate, as one might argue that our asymmetric results found in specification (4) are consistent with individuals caring only about fluctuations in rate at the Federal State level. Moreover, this should also rule out the effect of idiosyncratic regional differences (e.g., the evolution of labor market disparities between East and West Germany), which could be driving our results. Specifications (6) and (7), however, show that the asymmetric effects of variations in local unemployment rate of contiguous areas, depending on whether surrounding RORs are located in the same Federal State or not, survive (although we lose precision, especially in column 7). More specifically, the point estimate attached to unemployment in surrounding areas from the same Federal State is always sizable and negative, while the coefficient of local unemployment rates of bordering local labor markets from the other Federal States remains close to zero and insignificant.

In what follows, we retain specification (4) of Table 2 as our baseline, which includes ROR and year fixed effects, while controlling for ROR time-varying (and individual and household) characteristics.[8] Using this specification, we find that a one standard deviation increase in local unemployment rate in the own area (mean 9.14%, s.d. 4.39), changes individual life satisfaction by 0.14 points, that is, a 8.5% of one standard deviation of life satisfaction (mean 7.09, s.d. 1.71). A one standard deviation increase in unemployment rate of the neighboring RORs belonging to the same Federal State (mean 8.91%, s.d. 4.34) changes individual life satisfaction by 0.12 points, that is, a 7% change of the standard deviation of life satisfaction. That is, the unemployment rate of the own local labor market has a similar effect on life satisfaction as the unemployment rate of the neighboring areas that belong to the same Federal State. In contrast, the unemployment rate of the neighboring areas not belonging to the same Federal State has a very small (0.009) and imprecisely estimated (s.e. 0.007) coefficient.

Therefore, there exist spatial spillovers from the unemployment rate of contiguous local labor markets, but the effects on subjective well-being are limited to surrounding areas located in the same Federal State and are thus bounded by administrative regional borders. These results are consistent with at least two theoretical explanations, which can be tested with the available data. First, if the Federal State is the relevant regional dimension to define labor markets (e.g., for job search), our results could be explained by the fact that unemployment rate affects individuals' quality and perceptions of own job situation. Notably, in times of high unemployment, wages and potential employment opportunities decrease, while pressure at work and concerns about own job stability increase. Second, our findings could also be consistent with empathy motives, as long as individuals care more about those living in the same Federal State (within-group empathy) than about the rest. Before moving to disentangling which of the two mechanisms explains our results, we present some robustness checks to different specifications and sample selection.

4.2 | Robustness checks

In this section, we present a set of robustness checks to (i) different definitions of aggregate unemployment of adjacent areas, (ii) endogeneity issues, and (iii) econometric approach.[9] First, in Table 3 we show results obtained

[8]This specification provides a better fit than others that include Federal State-specific time trends according to any model selection criteria.

[9]As additional robustness checks, we also removed observations from individuals residing in State Cities (Berlin, Bremen, and Hamburg) or in Saarland, for whom the definition of surrounding local labor markets is subject to the assumptions described in footnote 2. The results are virtually the same. Moreover, we also replicated the main estimations after excluding individuals living in RORs that have no single bordering RORs in the other Federal States, for

TABLE 3 Local unemployment and life satisfaction, alternative definitions of average unemployment in bordering areas

	(1)	(2)	(3)	(4)	(5)	(6)
Unemployment own area	−0.033**	−0.038***	−0.030**	−0.033**	−0.034**	−0.033**
	(0.012)	(0.013)	(0.012)	(0.012)	(0.013)	(0.012)
Unemployment bordering areas—same Federal State	−0.028***	−0.023**	−0.031***	−0.028**	−0.026**	−0.027**
	(0.009)	(0.009)	(0.010)	(0.010)	(0.010)	(0.010)
Unemployment bordering areas—different Federal State	0.009	0.009	0.009	0.009	0.008	0.008
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
Adjusted R^2	0.156	0.155	0.156	0.156	0.156	0.156
Number of observations	188,860	188,860	188,860	188,860	188,860	188,860

***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively. Ordinary least squares (OLS) regressions with two-way clustered standard errors at the local (ROR) and year level. Column (1): baseline results (as in column 4 of Table 2); column (2): unemployment rate in bordering areas weighted by population share; column (3): unemployment rate in bordering areas weighted by the share of border's contiguity; column (4): unemployment rate in bordering areas weighted by the inverse of the distance from the centroids; column (5): unemployment rate in bordering areas weighted by the proportion of commuters to the bordering RORs; and column (6): unemployment rate in bordering areas weighted by the proportion of commuters from the bordering RORs. All regressions include controls for gender, age, and its square, (log) years of schooling, marital status, (log) number of children, (log) number of adults in the household, (log) net family income, dummies for labor market status (unemployed, public-sector worker, private-sector full-time worker, and private-sector part-time/mini-job worker), (log) number of visits to the doctors in the last 3 months, (log) unemployment experience, home ownership and (log) house size, (log) average household income per capita, local share of migrants, (log) of average housing prices per mq^2, year fixed effects, and ROR fixed effects.

using different measures to define the average unemployment rate of the contiguous local labor markets. In our baseline, we use a simple average that gives the same weight to the unemployment rate of all the contiguous RORs. That is, we assume that individuals attribute the same importance to variations in the unemployment rate of all the nearby local areas, depending on whether they belong or not in the same Federal State. A simple way of relaxing this assumption consists of computing weighted averages of unemployment rate by considering five main dimensions: (a) the share of population living in each adjacent ROR, (b) the fraction of the border of the own ROR that is shared with each of the bordering RORs, (c) the inverse of the distance between the centroid of own ROR with each of the bordering RORs (normalized by the sum of all distances), (d) the proportion of commuters to the bordering RORs, and (e) the proportion of commuters from the bordering RORs. The estimations obtained using these three alternative weighted averages to compute unemployment in bordering areas (belonging or not to the same Federal State) are reported in Table 3 together with our baseline results reported in specification (1). As can be seen, the estimates obtained with these five different weighted measures of unemployment rates in bordering areas are virtually the same as the baseline results and confirm the main results obtained before.

Next, we move to robustness checks related to potential endogeneity issues, to provide suggestive evidence that endogenous residential sorting and selection on individual unobserved characteristics are not the main drivers of our earlier results. Indeed, it can be argued that individuals may endogenously decide to move to another region (ROR) due to the economic situation (notably unemployment level). In this case, individuals who care more about

whom the variable capturing unemployment rate in surrounding areas would be always equal to zero. The results from these additional estimations are available upon request.

TABLE 4 Local unemployment and life satisfaction, estimations without movers and with individual fixed effects

	(1)	(2)	(3)	(4)	(5)
Unemployment own area	−0.033**	−0.040***	−0.015	−0.016	−0.018
	(0.012)	(0.013)	(0.014)	(0.009)	(0.011)
Unemployment bordering areas—same Federal State	−0.028***	−0.023**	−0.020	−0.019**	−0.020
	(0.009)	(0.010)	(0.014)	(0.008)	(0.012)
Unemployment bordering areas—different Federal State	0.009	0.010	−0.008	−0.007	−0.008
	(0.007)	(0.007)	(0.008)	(0.004)	(0.007)
Adjusted R^2	0.156	0.160	0.032	0.031	0.032
Number of observations	188,860	165084	188,860	188,860	165084

***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively. Ordinary least squares (OLS) regressions with two-way clustered standard errors at the local (ROR) and year level. Column (1): baseline results (as in column 4 of Table 2); column (2): estimation for the subsample of stayers (i.e., no change in the ROR of residence); column (3): estimation with individual fixed effects (i.e., variation from movers) and ROR fixed effects for the whole sample; column (4): estimation with individual fixed effects, but without ROR fixed effects for the whole sample; and column (5): estimation with individual fixed effects for the subsample of stayers. Regressions in columns (1) and (2) include controls for gender, age, and its square, (log) years of schooling, marital status, (log) number of children, (log) number of adults in the household, (log) net family income, dummies for labor market status (unemployed, public-sector worker, private-sector full-time worker, and private-sector part-time/mini-job worker), (log) number of visits to the doctors in the last 3 months, (log) unemployment experience, home ownership and (log) house size, (log) average household income per capita, local share of migrants, (log) of average housing prices per mq^2, and year fixed effects. Regressions in columns (3)–(5) contain only time-varying covariates.

unemployment will have a larger probability of moving when unemployment in their area of residence increases. This means that our result would be a lower bound of the *true* estimate. It is also true, however, that an individual's probability of moving when economic circumstances deteriorate also depends on their own characteristics and we expect younger individuals or those with more education to be more mobile. In this case, individuals who will remain in the region are those more affected by unemployment and our estimates would be upward-biased. Therefore, the direction of the biases if individuals changed ROR of residence as a reaction to changes in unemployment is unknown. To address these concerns, in column 2 of Table 4 we present results using the observations from the subsample of individuals who never change their place of residence while observed in the panel, that is, the stayers. The estimates obtained for the subsample of stayers are consistent and similar to the ones from the baseline model (reproduced in column 1 of Table 4), except for the fact that the point estimate attached to unemployment in the own ROR is higher (0.040 vs. 0.033), while the one of unemployment in bordering areas from the same Federal State is lower (0.023 vs. 0.028). These differences, however, are not statistically significant. It might well be that stayers are less employable, more risk-averse, and less likely to commute for a job and thus are more affected by their own area unemployment rate, while they are less likely to job search further away and are thus less impacted by unemployment in bordering areas, even if in the same Federal State. Similarly, it could be that stayers are more attached to their region and therefore feel more empathy for their close "neighbors" (within group).

In specifications (3)–(5) of Table 4 we estimate the model with individual fixed effects, which enables controlling for time-invariant unobserved individual characteristics. Including individual fixed effects, however, introduces identification challenges: since variations in unemployment rate are much larger across RORs than over time within the same ROR, including individual fixed effects implies giving more weight to those individuals who move, which are likely to be younger or with a high wage potential. This is especially true in Germany, where there is very little mobility. Consequently, specification (3) includes both, individual and ROR fixed effects, and gives rise

to imprecisely estimated coefficients, and slightly smaller than those in specification (2). This estimation is very demanding as it exploits variation within ROR and within individual and it gives more weight to those who move. To get rid of this issue, column (4) displays the main estimates for the total sample obtained, including individual fixed effects but excluding ROR fixed effects. Controlling for individual fixed effects exploits within individual variation only and therefore reduces the R^2 by about 80%. Similarly, it reduces the size of the coefficient of unemployment of own ROR by about half, while the other results remain fairly similar (most remarkably, our main result about the differential effect of unemployment in surrounding RORs). However, this specification does not control for time-invariant characteristics of the own local labor market, which are not picked up by the individual fixed effects among the movers. Therefore, in column (5) we repeat the estimation with individual fixed effects, but no ROR fixed effects for the subsample (88%) of individuals who do not change ROR while in the panel (the stayers). Our preferred specification with individual fixed effects is the one presented column (5), as it excludes those individuals who do not move and therefore identifies the effects from a more homogeneous sample. This specification indeed provides qualitatively similar evidence to our baseline model, although our estimates, as in specification (3), are very imprecisely estimated and the coefficient of own ROR's unemployment rate gets reduced by half.

Finally, we test the robustness or our results to a different econometric approach. As discussed in Section 3.1, our main variable of interest is clustered at the ROR level, while life satisfaction data are defined at the individual level. Therefore, all our regressions show (two-way) clustered standard errors. Although the number of clusters is sufficiently large to be confident that our standard errors are unbiased, we present robustness of our results by estimating the model with aggregated data. Specifically, we collapse our data into an ROR-year panel with 1536 observations (96 RORs × 16 years). Our dependent variable is defined as the year-ROR average life satisfaction ($\overline{LS}_{rt}$), which we compute using as weights the number of observations contained in each year-ROR cell. This corresponds to Equation (4) of Section 3.1. The results are displayed in Table A3 of the appendix, in which we follow the same order of presentation as in Table 2 to ensure comparability, and therefore column (4) shows our baseline results based on aggregate data. Specifically, column (4) shows that, as with data at the individual level, the local unemployment rate of the own ROR reduces the average satisfaction of the individuals living in that ROR, although the effect is less precisely estimated ($t = 1.53$). One standard deviation increase in local unemployment correlates with 0.10 points decrease on the average ROR life satisfaction (just slightly lower than the effect obtained from microdata, which was 0.14 points). All the results with aggregate data are aligned quantitatively and qualitatively with those with microdata. That is, column (4) of Table A3 shows that also exploiting only aggregate data, only variations in the unemployment rate in the own ROR and nearby RORs belonging to the same Federal State are negatively and significantly correlated with subjective well-being.[10] This alternative estimation approach therefore confirms the relevance of the unemployment rate in the local labor market of residence and in contiguous local areas that belong to the same Federal State, and the null effect of variations in unemployment in neighboring areas that belong to another Federal State. Although the results are very similar, we retain combined aggregate and microdata for the following empirical exercises, which enable exploits individual characteristics for the analyses that follow.

4.3 | Heterogeneity analysis and mechanisms

As discussed above, the baseline results indicate that individuals' subjective well-being is affected by fluctuations in the unemployment rate in the own area of residence and in neighboring areas, but only if these belong to the same Federal State, suggesting that spatial spillovers of local unemployment rate are constrained within regional administrative and legal borders. As argued in Section 1, this evidence is consistent with at least two possible

[10]As for microdata, we also replaced the simple averages of unemployment rates in bordering areas with the reweighted averages according to population, border's share, inverse distance, and commuting flows, which provided similar evidence (see Table A4 in the appendix).

explanations or channels: (i) individuals care about unemployment rate because it affects their perception about their own position in the labor market, which would be the case if the relevant geographical dimension of the labor market that individuals take into account is defined within the boundaries of the Federal State; and (ii) individuals empathize with those unemployed only if they belong to their group, where 'group' is defined as those living in the same Federal State (within-group empathy). In the rest of the paper, we seek to gauge the relevance of each of these two potential channels by means of heterogeneity analysis and additional tests.

The first set of heterogeneity tests are based on differentiating across samples defined according to characteristics related to wage potential, employability, and labor market participation. If individuals care about the unemployment rate to the extent that it affects their own job perceptions, we would expect specific samples to be more affected than others. Therefore, we proceed by estimating heterogeneous effects by including interaction terms between the unemployment variables and individuals' characteristics typically correlated with their labor situation (e.g., ties to the labor market, employability, uncertainty they face, and job quality). Specifically, we interact all unemployment rate variables with, respectively, gender, age group dummies, an indicator for having at least 14 years of education (corresponding to postsecondary education), and three dummies for current labor market status (full-time private-sector workers, which is the reference category, part-time private-sector workers, public-sector workers, and unemployed) and an indicator for having some previous unemployment experience. Finally, we also include an interaction between our measures of local unemployment and a dummy that takes the value 1 if the individual resides in an ROR located along the East–West border, to understand whether our results are driven by these specific local areas (and the corresponding differential labor market conditions related to the long-lasting East–West divide). Table 5a indicates that there seems to be an additional penalty on the coefficient of unemployment rate (both of own ROR and of neighboring areas belonging to the same Federal State) for male (columns 2 and 3). This differentiated effect across genders could be indicating that males have a stronger social pressure of being unemployed, is we assume that there is a positive correlation between the unemployment rate in the region and the perceived probability of losing own job. Similarly, as displayed in columns (4) and (5), the effects of both unemployment rates are larger (more negative) for people in the middle of the age distribution. Individuals in this age range are more sensitive to fluctuations in local unemployment, because they have strong ties with the labor market, are still consolidating their working career, and are more concerned about the stability of their job. The interaction with higher education produces a very small coefficient that is not precisely estimated (columns 6 and 7).

Table 5b shows the interactions with labor-market-related variables. Public-sector workers show a positive and precisely estimated interaction with the coefficient for both, unemployment rate in own ROR (0.016) and in bordering RORs from the same Federal State (0.016), which reduces the effect of both measures of local unemployment by half for this subgroup of workers (columns 2 and 3). These findings are in line with the results by Luechinger et al. (2010), who argued that public-sector workers are less affected by unemployment rate because they are in a more secure job. The other current working status interactions only have a well precise and larger coefficient for unemployment of the own ROR area. In concrete, individuals who are currently unemployed show a 0.18 points decrease on life satisfaction for a one standard deviation increase of unemployment on own ROR, while this is 0.14 points for those who are not unemployed. Similarly, unemployment experience shows a negative interaction term for unemployment rate in its own ROR, but not in bordering RORs from the same Federal State (columns 4 and 5, respectively).

Finally, we examine whether those RORs bordering with the East–West border are partially driving our results. To this end, we created a variable that takes value 1 if the ROR is in the border. Columns (6) and (7) show that the interactions terms between this variable and unemployment rate (of own ROR as well as of the bordering RORs belonging and not to the same federal state) are very imprecisely estimated and do not change the results. In other words, we cannot find a differentiated effect for those RORs located along the border between the East and the West of the country.

TABLE 5a Heterogeneous effects of local unemployment rate on life satisfaction

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Unemployment own area	−0.033**	−0.029**	−0.033**	−0.027**	−0.034***	−0.027**	−0.031**
	(0.012)	(0.012)	(0.012)	(0.012)	(0.011)	(0.012)	(0.012)
Unemployment own area × male		−0.007**					
		(0.003)					
Unemployment own area × *I*(34 < age < 45)				−0.014***			
				(0.004)			
Unemployment own area × *I*(44 < age < 55)				−0.008			
				(0.005)			
Unemployment own area × *I*(54 < age < 66)				0.001			
				(0.007)			
Unemployment own area × *I*(high education)						−0.006	
						(0.005)	
Unemployment bordering areas—same Federal State	−0.028***	−0.028***	−0.024**	−0.028***	−0.017	−0.028***	−0.022**
	(0.009)	(0.009)	(0.010)	(0.009)	(0.010)	(0.009)	(0.010)
Unemployment bordering areas—same Federal State × male			−0.008*				
			(0.004)				
Unemployment bordering areas—same Federal State × *I*(34 < age < 45)					−0.018***		
					(0.005)		
Unemployment bordering areas—same Federal State × *I*(44 < age < 55)					−0.014*		
					(0.007)		
Unemployment bordering areas—same Federal State × *I*(54 < age < 66)					−0.008		
					(0.008)		

TABLE 5a (Continued)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Unemployment bordering areas—same Federal State × *I*(high education)							−0.008
							(0.006)
Unemployment bordering areas—different Federal State	0.009	0.009	0.006	0.008	0.005	0.009	0.009
	(0.007)	(0.007)	(0.007)	(0.007)	(0.008)	(0.007)	(0.007)
Unemployment bordering areas—different Federal State × male			0.004				
			(0.003)				
Unemployment bordering areas—different Federal State × *I*(34 < age < 45)					0.003		
					(0.004)		
Unemployment bordering areas—different Federal State × I(44 < age < 55)					0.004		
					(0.005)		
Unemployment bordering areas—different Federal State × *I*(54 < age < 66)					0.008		
					(0.007)		
Unemployment bordering areas—different Federal State × *I*(high education)							−0.001
							(0.005)
Adjusted R^2	0.156	0.156	0.156	0.154	0.154	0.155	0.155
Number of observations	188,860	188,860	188,860	188,860	188,860	188,860	188,860

***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively. Ordinary least squares (OLS) regressions with two-way clustered standard errors at the local (ROR) and year level. Column (1): baseline results (as in column 4 of Table 2); columns (2) and (3): base category females; columns (4) and (5): base category age < 35, control for base effects of age groups; columns (6) and (7): base category low education (years of schooling < 14), control for base effect of high education. All regressions include controls for gender, age, and its square (except columns 4 and 5), (log) years of schooling (except columns 6 and 7), marital status, (log) number of children, (log) number of adults in the household, (log) net family income, dummies for labor market status (unemployed, public-sector worker, private-sector full-time worker, and private-sector part-time/mini-job worker), (log) number of visits to the doctors (last 3 months), (log) unemployment experience, home ownership and (log) house size, (log) average household income per capita, local share of migrants, (log) of average housing prices per mq^2, year fixed effects, and ROR fixed effects.

TABLE 5b Heterogeneous effects of local unemployment rate on life satisfaction

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Unemployment own area	−0.033**	−0.031**	−0.031**	−0.032**	−0.035***	−0.035***	−0.034**
	(0.012)	(0.011)	(0.012)	(0.011)	(0.012)	(0.012)	(0.012)
Unemployment own area × *I*(public sector)		0.016**					
		(0.005)					
Unemployment own area × *I*(private part-time)		0.002					
		(0.005)					
Unemployment own area × *I*(unemployed)		−0.011**					
		(0.004)					
Unemployment own area × *I*(some unemployment experience)				−0.007*			
				(0.004)			
Unemployment bordering areas—same Federal State	−0.028***	−0.028***	−0.028**	−0.028**	−0.025**	−0.028***	−0.026**
	(0.009)	(0.009)	(0.010)	(0.010)	(0.010)	(0.009)	(0.010)
Unemployment bordering areas—same Federal State × *I*(public sector)			0.016**				
			(0.006)				
Unemployment bordering areas—same Federal State × *I*(private part-time)			0.004				
			(0.005)				
Unemployment bordering areas—same Federal State × *I*(unemployed)			−0.009				
			(0.005)				
Unemployment bordering areas—same Federal State × *I*(some unemployment experience)					−0.007		
					(0.004)		
Unemployment bordering areas—different Federal State	0.009	0.009	0.010	0.008	0.008	0.008	0.005
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)

TABLE 5b (Continued)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Unemployment bordering areas—different Federal State × *I*(public sector)			−0.001				
			(0.006)				
Unemployment bordering areas—different Federal State × *I*(private part-time)			−0.002				
			(0.003)				
Unemployment bordering areas—different Federal State × *I*(unemployed)			−0.003				
			(0.004)				
Unemployment bordering areas—different Federal State × *I*(some unemployment experience)					−0.002		
					(0.004)		
Unemployment own area × *I*(East–West border)						0.007	
						(0.005)	
Unemployment bordering areas—same Federal State × *I*(East–West border)							−0.011
							(0.012)
Unemployment bordering areas—different Federal State × *I*(East–West border)							0.018
							(0.014)
Adjusted R^2	0.156	0.156	0.156	0.153	0.153	0.156	0.156
Number of observations	188,860	188,860	188,860	188,860	188,860	188,860	188,860

***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively. Ordinary least squares (OLS) regressions with two-way clustered standard errors at the local (ROR) and year level. Column (1): baseline results (as in column 4 of Table 2); columns (2) and (3): base category private-sector full-time workers; columns (4) and (5): base effect no previous unemployment experience, control for base effect of no unemployment experience; columns (6) and (7): base category RORs not located along the East–West border. All regressions include controls for gender, age, and its square, (log) years of schooling, marital status, (log) number of children, (log) number of adults in the household, (log) net family income, dummies for labor market status (unemployed, public-sector worker, private-sector full-time worker, and private-sector part-time/mini-job worker), (log) number of visits to the doctors (last 3 months), (log) unemployment experience (except columns 4 and 5), home ownership and (log) house size, (log) average household income per capita, local share of migrants, (log) of average housing prices per mq^2, year fixed effects, and ROR fixed effects.

In the appendix (Table A5) we exploit the information about commuting for working reasons contained in the SOEP data. Recent statistics show that, on average, Germans commute about 45 min a day to get to work (Eurostat), a number that has been increasing over the years. In 2016 (microcensus 2016, Statistisches Bundesamt), 25% of the workers commuted less than 25 km, and only 4.5% commuted 50 km or more (67.7% of those commutes was made in private cars). If unemployment rate affects life satisfaction through individuals' worries about their own job opportunities, we would expect commuters to be less affected by local unemployment to the extent that they are able and willing to find jobs further away, if needed. Therefore, under this hypothesis, excluding commuters should increase the coefficient of own ROR unemployment rate on life satisfaction and, if anything, reduce the coefficient for the neighboring ROR unemployment, as noncommuters do not see jobs further away as attractive. Therefore, we replicate the estimations excluding those individuals who commute for work. In Table A5 we show the results excluding those who commute more than 25 km (column 2), 50 km (column 3), and 75 km (column 4). The estimated coefficients are qualitatively similar to our baseline results and, if anything, they show a slightly larger coefficient for own ROR unemployment, as consistent with our hypothesis. Nevertheless, the differences are very small and not statistically different. We conclude that our results are not driven by individuals who (endogenously) commute for working reasons.

Next, we present results for different samples, depending on respondents labor market participation, which are displayed in Table 6. The second specification of Table 6 shows our baseline results for the employed sample and indicates that employed individuals have virtually the same coefficients as the total sample (baseline results are copied in Table 6, column 1). In contrast, inactive individuals (aged 16–65, as the original sample) show very imprecisely estimated coefficient for unemployment rate in their own ROR as well as for unemployment on bordering areas within the same Federal State (specification 3), although the results remain qualitatively the same. In fact, the size of the coefficients in specification (3) is not small and thus imprecision might come from heterogeneous effects across the group of inactive individuals that might be very different between them. We can be

TABLE 6 Potential mechanisms

	(1)	(2)	(3)	(4)	(5)
Unemployment own area	−0.033**	−0.030**	0.017	−0.032*	0.062**
	(0.012)	(0.012)	(0.029)	(0.014)	(0.031)
Unemployment bordering areas—same Federal State	−0.028***	−0.028**	−0.036	−0.024*	0.004*
	(0.009)	(0.011)	(0.030)	(0.010)	(0.002)
Unemployment bordering areas—different Federal State	0.009	0.009	0.001	0.006	−0.001
	(0.007)	(0.007)	(0.016)	(0.008)	(0.001)
Adjusted R^2	0.156	0.111	0.226	0.110	
Number of observations	188,860	167,251	28,667	65,258	65,258

***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively. Ordinary least squares (OLS) regressions with two-way clustered standard errors at the local (ROR) and year level. Column (1): Baseline results (as in column 4 of Table 2). Column (2): Dependent variable = life satisfaction (0–10 scale), estimation for employed individuals. Column (3): Dependent variable = life satisfaction (0–10 scale), estimation for inactive individuals with age between 16 and 65 (same as in the baseline sample). Column (4): Dependent variable = life satisfaction (0–10 scale), estimation for observations with valid information on perceived probability to lose the job in the next two years. Column (5): Dependent variable = perceived probability to lose the job (0-1 scale), marginal effects from the Fractional Logit model. All regressions include controls for gender, age, and its square, (log) years of schooling, marital status, (log) number of children, (log) number of adults in the household, (log) net family income, dummies for labor market status (unemployed, public-sector worker, private-sector full-time worker, and private-sector part-time/mini-job worker), (log) number of visits to the doctors (last 3 months), (log) unemployment experience, home ownership and (log) house size, (log) average household income per capita, local share of migrants, (log) of average housing prices per mq^2, year fixed effects, and ROR fixed effects.

certain, however, that our baseline results were at least partially driven by those individuals who are active in the labor market (column 2), as those show strong and similar results to our baseline. That is, those who are employed or those who are not but are actively searching for a job show concern about the prevalence of unemployment in the relevant local labor markets, which points again towards labor market concerns rather than empathy as the main driver of our baseline results.

In short, all the evidence presented in Tables 5 and 6 is consistent again with the hypothesis that individuals' dislike about the local unemployment rate is related to their concerns about their own job situation, rather than to empathy or externalities that affects all the population similarly. That is, all the evidence points towards labor market concerns as the underlying factor behind the negative relationship between local unemployment rate and life satisfaction. Finally, in Table 6 (column 5) we present the baseline specification (Equation 3), but using as dependent variable the self-reported 'probability of losing own job' on a scale from 0 to 1.[11] Since this question is only asked every odd year and only to employed individuals, in (column 4) we show the life satisfaction baseline results with this sample to show that the results are maintained. The results obtained using perceived probability of losing the own job as outcome (column 5) show large and precisely estimated coefficients of unemployment rate in own ROR and a much smaller, but well precise estimated coefficient for unemployment in bordering areas belonging to the same Federal State. In line with the life satisfaction results, the coefficients for unemployment rate of bordering areas not belonging to the same Federal State are small and imprecisely estimated. Thus, as for the heterogeneity analysis, this evidence also points towards the importance of worries about losing the own job as a reason to dislike the unemployment rate in the geographical area of influence (own ROR or contiguous RORs in the same Federal State).

5 | CONCLUSIONS

This paper has provided novel evidence on the effect of local unemployment rate on life satisfaction by analyzing the existence of geographical spillovers from adjacent local labor markets and examining the underlying mechanisms behind individuals' dislike for local unemployment rate. The empirical analysis combines micro and aggregate data at the ROR (*Raumordnungsregionen*) level for Germany, covering the period 2000–2015. We contributed to the literature by focusing on a new spatial dimension of analysis that exploits variation over time and space in the unemployment rate in the local labor market of residence (ROR) as well as in contiguous labor markets, distinguishing whether these neighboring areas belong or not to the same Federal State where the individuals reside. In doing that, we go a step ahead with respect to the previous literature by enlarging the definition of the local area of influence and allowing the existence of spatial spillovers based on a contiguity approach, while defining the local area of residence as smaller than usual geographical units that correspond to labor markets. In addition, the analysis also takes into account the role of existing regional administrative borders and exploits the difference between contiguous regions belonging or not to the same Federal State as the one where the individual resides to test whether the influence of adjacent areas is driven by regional administrative borders or by geographical closeness.

The results are aligned with earlier works and indicate that local unemployment in the own area of residence matters for individuals' life satisfaction, confirming the standard result in the literature. However, only unemployment rate in contiguous local labor markets belonging to the same Federal State where individuals reside affects their life satisfaction, while no effect is detected for variations in the unemployment rate in adjacent areas belonging to the other Federal States. Therefore, the existence of spatial spillovers of local unemployment on life satisfaction appears to be constrained by the administrative regional borders. Our results are robust to various specifications, unemployment rate definitions, endogenous residential sorting, time-invariant unobserved heterogeneity, specific local boundaries, and to using collapsed data at the same level of variation as local unemployment.

[11]The estimations are performed with a Fractional Logit and the coefficients represent average marginal effects.

With the aim of disentangling the underlying factors that generate this asymmetric effect of local unemployment in surrounding areas, we provide additional analyses that contribute to understanding the mechanisms behind this result. We hypothesize that the general evidence reported in this paper could be due to either concerns about job security and own employment status, empathy motives, or broad negative externalities associated with unemployment rate (e.g., fiscal pressure, increasing crime rate, and human capital lost). The evidence reported in the last part of the paper suggests that the latter channels do not seem to be driving our results. Instead, our results point to the correlation between unemployment rate and own labor market situation concerns (e.g., work and salary pressure as well as increased uncertainty) as the mechanism explaining why individuals dislike local unemployment. This implies that individuals' labor markets go beyond their local market, but are driven by administrative borders (Federal States) rather regional proximity.

We sustain these conclusions through various empirical exercises. First, heterogeneous analysis shows that the negative effect of unemployment rate is stronger for those individuals more attached to the labor market or facing larger uncertainty, while the effect is less strong for those with safer jobs (public workers). Similarly, we find that individuals not participating in the labor market (inactive aged 16–65) show very imprecisely estimates, which is indicative of a larger heterogeneity of the effect of unemployment on their life satisfaction within this group. Instead, active individuals show the same strong results as for the total sample. Finally, the same asymmetric effect of local unemployment rate in contiguous areas is reproduced when we use individuals' self-reported probability of losing their job, instead of life satisfaction, as our dependent variable. We recognize that we cannot discard the presence of altruistic and empathetic factors behind the relationship between local unemployment rate and life satisfaction, or other negative externalities, such as increasing fiscal burden and loss of human capital. This, however, would require that individuals with stronger ties with the labor market are more emphatic or have a stronger perception of the detrimental effects of local unemployment for others' well-being (and there are no a priori reasons to believe that this happens).

In short, the overall evidence points towards labor-related concerns to explain the link between local unemployment and life satisfaction. This, together with the consistent findings that not only unemployment rate in the local area of residence, but also the prevalence of unemployment in neighboring areas matter only if these belong to the same Federal State, make us conclude that local labor markets, in Germany, are defined or perceived at the federal level. Individuals seem not to be concerned about the unemployment rate in areas equally far from the place of residence, but belonging to the other Federal States. Therefore, policies aimed at incentivizing individuals to search for jobs in other states would be efficient in reducing unemployment differences across space. In other words, the evidence speaks in favor of interregional mobility programmers for job-seekers to promote a search driven by the geography of labor demand and the spatial distribution of employment opportunities regardless of existing administrative regional borders. This was already in place in Germany in the years 2003–2005 under the so-called 'Hartz Reform' (Caliendo & Hogenacker, 2012; Caliendo et al., 2017).

ACKNOWLEDGMENTS

This paper benefited from comments received by the participants of various seminars (Pablo Olavide University and University of Granada) workshops and conferences (XXXXIV SAEe, 4th Workshop on the Spatial Dimensions of the Labour Market, XIII Jornadas de Economía Laboral, and 30th EALE); and especially the comments from Adrian Chadi, Andrew Clark, and Enrique López-Bazo. The usual disclaimers apply. Antonio Di Paolo gratefully acknowledges funding from the Spanish Ministry of Science and Innovation ECO2016-75805-R. Ada Ferrer-i-Carbonell acknowledges funding from the Spanish Ministry of Science and Innovation PID2020-114251GB-I00; the Spanish Agencia Estatal de Investigación (AEI), through the Severo Ochoa Programme for Centres of Excellence in R&D (Barcelona School of Economics CEX2019-000915-S); Catalan Agency for Management of University and Research Grants (AGAUR); and the Agency for Management of University and Research Grants (AGAUR) SGR1359.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from DIW. Restrictions apply to the availability of these data, which were used under license for this study. Data are available from https://www.diw.de/en/diw_01.c.601584.en/data_access.html with the permission of DIW.

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REFERENCES

Alesina, A., Miano, A. & Stantcheva, S. (2018). Immigration and redistribution (NBER Working Paper 24733).
Andersson, D. E., Andersson, A. E., Harsman, B., & Daghbashyan, Z. (2015). Unemployment in European regions: Structural problems versus the Eurozone hypothesis. *Journal of Economic Geography*, *15*(5), 883–905.
Angrist, J. D., & Pischke, J. S. (2009). *Mostly harmless econometrics: An empiricist's companion*. Princeton University Press.
Aslam, A., & Corrado, L. (2012). The geography of well-being. *Journal of Economic Geography*, *12*(3), 627–649.
Binder, M., & Coad, A. (2015). Heterogeneity in the relationship between unemployment and subjective well-being: A quantile approach. *Economica*, *82*(328), 865–891.
Blanchflower, D. G., Vell, D. N. F., Montagnoli, A., & Moro, M. (2014). The happiness trade-off between unemployment and inflation. *Journal of Money, Credit and Banking*, *46*, 117–141.
Boyce, C. J., Wood, A. M., & Brown, G. D. A. (2015). The dark side of conscientiousness: Conscientious people experience greater drops in life satisfaction following unemployment. *Journal of Research in Personality*, *44*(4), 535–539.
Bubonya, M., Cobb-Clark, D. A., & Wooden, M. (2017). Job loss and the mental health of spouses and adolescent children. *IZA Journal of Labor Economics*, *6*(1), 6.
Caliendo, M., Cobb-Clark, D. A., Hennecke, J., & Uhlendorff, A. (2019). Locus of control and internal migration. *Regional Science and Urban Economics*, *79*, 103468.
Caliendo, M., & Hogenacker, J. (2012). The German labor market after the Great Recession: Successful reforms and future challenges. *IZA Journal of European Labor Studies*, *1*(1), 3.
Caliendo, M., Mahlstedt, R., & Künn, S. (2017). The return to labor market mobility: An evaluation of relocation assistance for the unemployed. *Journal of Public Economics*, *148*, 136–151.
Chadi, A. (2014). Regional unemployment and norm-induced effects on life satisfaction. *Empirical Economics*, *46*(3), 1111–1141.
Clark, A. E. (2003). Unemployment as a social norm: Psychological evidence from panel data. *Journal of Labor Economics*, *21*(2), 323–351.
Clark, A. E., Frijters, P., & Shields, M. A. (2008). Relative income, happiness, and utility: An explanation for the Easterlin paradox and other puzzles. *Journal of Economic Literature*, *46*(1), 95–144.
Clark, A. E., Knabe, A., & Rätzel, S. (2010). Boon or bane? Others' unemployment, well-being and job insecurity. *Labour Economics*, *17*, 52–61.
Clark, A. E., & Oswald, A. (1994). Unhappiness and unemployment. *Economic Journal*, *104*, 648–659.
Dahlberg, M., Edmark, K., & Lundqvist, H. (2012). Ethnic diversity and preferences for redistribution. *Journal of Political Economy*, *120*, 41–76.
De Neve, J.-E., Ward, G., De Keulenaer, F., & Van Landeghem, B. (2018). The asymmetric experience of positive and negative economic growth: Global evidence using subjective well-being data. *The Review of Economics and Statistics*, *100*, 362–375.
Di Tella, R., MacCulloch, R., & Oswald, A. (2003). The macroeconomics of happiness. *The Review of Economics and Statistics*, *85*, 809–827.
Farré, L., Fasani, F., & Mueller, H. (2018). Feeling useless: The effect of unemployment on mental health in the Great Recession. *IZA Journal of Labor Economics*, *7*(8), 8.
Ferrer-i-Carbonell, A., & Frijters, P. (2004). How important is methodology for the estimates of the determinants of happiness? *The Economic Journal*, *114*(497), 641–659.
Gielen, A. C., & Ours, J. C. (2014). Unhappiness and job finding. *Economica*, *81*(323), 544–565.
Goebel, J., Grabka, M., Liebig, S., Kroh, M., Richter, D., Schröder, C., & Schupp, J. (2019). The German socio-economic panel (SOEP). *Jahrbücher für Nationalökonomie und Statistik*, *239*(2), 345–360.
Helliwell, J. F., & Huang, H. (2014). New measures of the costs of unemployment: Evidence from the subjective well-being of 3.3 million Americans. *Economic Inquiry*, *52*(4), 1485–1502.

Herbst, C. M., & Lucio, J. (2016). Happy in the hood? The impact of residential segregation on self-reported happiness. *Journal of Regional Science*, *53*(3), 494–521.

Jaeger, D. A., Dohmen, T., Falk, A., Huffman, D., Sunde, U., & Bonin, H. (2010). Direct evidence on risk attitudes and migration. *The Review of Economics and Statistics*, *92*(3), 684–689.

Kassenböhmer, S. C., & Haisken-DeNew, J. P. (2009). You're fired! The causal negative effect of unemployment on life satisfaction. *Economic Journal*, *119*(536), 448–462.

Krause, A. (2013). Don't worry, be happy? Happiness and reemployment. *Journal of Economic Behavior & Organization*, *96*, 1–20.

Luechinger, S., Meier, S., & Stutzer, A. (2010). Why does unemployment hurt the employed? Evidence from the life satisfaction gap between the public and the private sector. *Journal of Human Resources*, *45*, 998–1045.

MacCulloch, R., DiTella, R., & Oswald, A. (2001). Preferences over inflation and unemployment: Evidence from surveys of happiness. *American Economic Review*, *91*(1), 335–34.

Manning, A., & Petrongolo, B. (2017). How local are labor markets? Evidence from a spatial job search model. *American Economic Review*, *107*(10), 2877–2907.

Marcus, J. (2013). The effect of unemployment on the mental health of spouses—Evidence from plant closures in Germany. *Journal of Health Economics*, *32*(3), 546–558.

Mavridis, D. (2015). The unhappily unemployed return to work faster. *IZA Journal of Labor Economics*, *4*(1), 2.

Mendolia, S. (2014). The impact of husband's job loss on partners' mental health. *Review of Economics of the Household*, *12*(2), 277–294.

Nikolova, M., & Ayhan, S. H. (2019). Your spouse is fired! How much do you care? *Journal of Population Economics*, *32*(3), 99–844.

O'Connor, K. J. (2020). Life satisfaction and noncognitive skills: Effects on the likelihood of unemployment. *Kyklos: Jahrbuch des Instituts fur Geschichte der Medizin an der Universitat Leipzig*, *73*(4), 568–604.

Oreopoulos, P., Von Wachter, T., & Heisz, A. (2012). The short- and long-term career effects of graduating in a recession. *American Economic Journal: Applied Economics*, *4*(1), 1–29.

Patacchini, E., & Zenou, Y. (2007). Spatial dependence in local unemployment rates. *Journal of Economic Geography*, *7*(2), 169–191.

Schwarz, P. (2012). Neighborhood effects of high unemployment rates: Welfare implications among different social groups. *The Journal of Socio-Economics*, *41*(2), 180–188.

Shields, M. A., Price, S. W., & Wooden, M. (2009). Life satisfaction and the economic and social characteristics of neighbourhoods. *Journal of Population Economics*, *22*(2), 421–443.

Van Praag, B. M., Van Praag, B., & Ferrer-i-Carbonell, A. (2008). *Happiness quantified: A satisfaction calculus approach* (revised ed.). Oxford University Press.

Weinhold, D. (2012). The happiness-reducing costs of noise pollution. *Journal of Regional Science*, *53*(2), 292–303.

Winkelmann, R. (2014). Unemployment and happiness. *IZA World of Labor*, *24*(3), 258–272.

Wolfers, J. (2003). Is business cycle volatility costly? Evidence from surveys of subjective well-being. *International Finance*, *6*(1), 1–26.

Wrede, M. (2014). Wages, rents, unemployment, and the quality of life: A consistent theory-based measure. *Journal of Regional Science*, *55*(4), 292–303.

Wulfgramm, M. (2014). Life satisfaction effects of unemployment in Europe: The moderating influence of labour market policy. *Journal of European Social Policy*, *24*(3), 258–272.

SUPPORTING INFORMATION

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How to cite this article: Di Paolo, A., & Ferrer-i-Carbonell, A. (2022). Regional borders, local unemployment, and life satisfaction. *Journal of Regional Science*, 62, 412–442. https://doi.org/10.1111/jors.12573

APPENDIX

TABLE A1 Descriptive statistics for additional samples

Variable	Main sample		Stayers		Employed, age 16–65		Inactive, age 16–65	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Life satisfaction	7.091	1.706	7.082	1.703	7.211	1.610	6.841	1.955
Perceived probability to lose the job*	0.201	0.251	0.198	0.248	0.201	0.251		
Unemployment own area	9.146	4.390	9.189	4.414	8.931	4.272	9.290	4.356
Unemployment bordering areas	8.895	4.098	8.931	4.112	8.707	4.002	9.039	4.037
Unemployment bordering areas —same Federal State	8.912	4.338	8.959	4.355	8.715	4.232	9.039	4.278
Unemployment bordering areas —different Federal State	6.020	5.736	6.062	5.767	5.842	5.608	6.006	5.804
Individual controls								
Male	0.507	0.500	0.508	0.500	0.513	0.500	0.306	0.461
Age	42.73	11.03	43.54	10.72	43.01	10.54	54.35	11.29
Labor situation = public sector worker	0.075	0.264	0.076	0.265	0.085	0.279		
Labor situation = private-sector full time worker	0.571	0.495	0.573	0.495	0.645	0.479		
Labor situation = private-sector partime worker	0.239	0.427	0.243	0.429	0.270	0.444		
Labor situation = unemployed	0.114	0.318	0.108	0.310				
Years of schooling	12.81	2.685	12.74	2.658	12.97	2.704	11.63	2.285
Net household income	3402	2306	3423	2339	3548	2329	2910	2127
Married	0.597	0.491	0.624	0.484	0.621	0.485	0.765	0.424
Number of children	0.776	1.027	0.796	1.035	0.784	1.025	0.504	0.997
Number of adults in the household	2.938	1.289	2.975	1.279	2.945	1.278	2.643	1.263
Number of visits to the doctors (last 3 months)	2.081	3.451	2.084	3.438	1.997	3.257	3.564	5.413
Previous unemployment experience (in months)	0.886	2.282	0.913	2.337	0.559	1.593	1.277	2.800
Owner of the flat	0.527	0.499	0.552	0.497	0.547	0.498	0.606	0.489
House size (in m^2)	110.1	47.12	111.4	46.88	112.2	47.14	109.8	47.27
Local controls								
Local average household income per capita	1532	234.5	1530	234.3	1542	233.5	1506	226.6
Local share of migrants	8.128	4.641	8.055	4.645	8.291	4.614	8.263	4.535
Local average housing price (per mq^2)	121.6	103.7	119.9	102.5	124.3	104.3	119.1	98.97

(Continues)

TABLE A1 (Continued)

Variable	Main sample		Stayers		Employed, age 16–65		Inactive, age 16–65	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Years/waves								
Year/wave = 2000	0.063	0.244	0.058	0.233	0.062	0.242	0.087	0.282
Year/wave = 2001	0.059	0.235	0.060	0.238	0.057	0.233	0.077	0.267
Year/wave = 2002	0.065	0.246	0.064	0.245	0.064	0.245	0.079	0.269
Year/wave = 2003	0.060	0.238	0.062	0.241	0.059	0.235	0.073	0.260
Year/wave = 2004	0.058	0.234	0.060	0.237	0.057	0.232	0.067	0.249
Year/wave = 2005	0.055	0.228	0.057	0.231	0.054	0.226	0.061	0.239
Year/wave = 2006	0.058	0.233	0.058	0.233	0.057	0.231	0.065	0.247
Year/wave = 2007	0.055	0.228	0.056	0.230	0.055	0.228	0.055	0.228
Year/wave = 2008	0.051	0.221	0.052	0.222	0.052	0.222	0.050	0.217
Year/wave = 2009	0.053	0.225	0.052	0.223	0.054	0.226	0.051	0.220
Year/wave = 2010	0.071	0.257	0.068	0.251	0.071	0.257	0.057	0.232
Year/wave = 2011	0.074	0.261	0.074	0.261	0.074	0.263	0.060	0.238
Year/wave = 2012	0.075	0.263	0.076	0.264	0.075	0.264	0.062	0.241
Year/wave = 2013	0.072	0.259	0.074	0.261	0.074	0.261	0.058	0.234
Year/wave = 2014	0.068	0.251	0.068	0.252	0.069	0.254	0.051	0.221
Year/wave = 2015	0.063	0.243	0.062	0.241	0.064	0.245	0.047	0.213
Number of observations	188,860		165,084		167,251		28,667	

*Denotes significance at the 10% levels.

TABLE A2 Local unemployment and life satisfaction, individual data, and lagged unemployment rate

	(1)	(2)	(3)	(4)	(5)
Unemployment own area (t)	−0.033**			−0.037***	−0.040***
	(0.012)			(0.010)	(0.008)
Unemployment own area (t − 1)		−0.024*			
		(0.011)			
Unemployment own area (t − 2)			−0.019*		
			(0.010)		
Unemployment bordering areas—same Federal State (t)	−0.028***	−0.037***	−0.043***		
	(0.009)	(0.008)	(0.007)		
Unemployment bordering areas—same Federal State (t − 1)				−0.025***	
				(0.008)	

TABLE A2 (Continued)

	(1)	(2)	(3)	(4)	(5)
Unemployment bordering areas—same Federal State ($t-2$)					−0.022**
					(0.008)
Unemployment bordering areas—different Federal State (t)	0.009	0.007	0.006		
	(0.007)	(0.007)	(0.007)		
Unemployment bordering areas—different Federal State ($t-1$)				0.008	
				(0.007)	
Unemployment bordering areas—different Federal State ($t-2$)					0.007
					(0.007)
Adjusted R^2	0.156	0.155	0.155	0.155	0.155
Number of observations	188,860	188,860	188,860	188,860	188,860

***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively. Ordinary least squares (OLS) regressions with two-way clustered standard errors at the local (ROR) and year level. All regressions include controls for gender, age, and its square, (log) years of schooling, marital status, (log) number of children, (log) number of adults in the household, (log) net family income, dummies for labor market status (unemployed, public sector worker, private-sector full-time worker, and private-sector part-time/mini-job worker), (log) number of visits to the doctors in the last 3 months, (log) unemployment experience, home ownership and (log) house size, (log) average household income per capita, local share of migrants, (log) of average housing prices per mq^2, year fixed effects, and ROR fixed effects.

TABLE A3 Local unemployment and life satisfaction (aggregate data)—dependent variable: (weighed) average life satisfaction at the ROR × year level

	(1)	(2)	(3)	(4)	(5)
Unemployment own area	−0.049***	−0.043***	−0.038**	−0.023	
	(0.007)	(0.008)	(0.016)	(0.015)	
Unemployment bordering areas			−0.007		
			(0.018)		
Unemployment bordering areas—same Federal State				−0.032**	−0.050***
				(0.014)	(0.010)
Unemployment bordering areas—different Federal State				0.009	0.005
				(0.009)	(0.008)
Local area controls	No	Yes	Yes	Yes	Yes
Adjusted R^2	0.398	0.400	0.400	0.405	0.403
Number of observations	1536	1536	1536	1536	1536

***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively. Fixed effects (ROR and year) regressions with standard errors clustered at the local (ROR) level. Additional local area controls: (log) average household income per capita, (log) of average housing prices per mq^2, and local share of migrants.

TABLE A4 Local unemployment and life satisfaction (aggregate data), alternative definitions of average unemployment in bordering areas

	(1)	(2)	(3)	(4)	(5)	(6)
Unemployment own area	−0.023	−0.026*	−0.018	−0.021	−0.023	−0.022
	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)
Unemployment bordering areas—same Federal State	−0.032**	−0.027**	−0.036***	−0.034**	−0.030**	−0.031**
	(0.014)	(0.013)	(0.014)	(0.014)	(0.014)	(0.014)
Unemployment bordering areas—different Federal State	0.009	0.007	0.009	0.009	0.007	0.007
	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)
Adjusted R^2	0.405	0.404	0.406	0.405	0.404	0.404
Number of observations	1536	1536	1536	1536	1536	1536

***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively. Fixed effects (ROR and year) regressions with standard errors clustered at the local (ROR) level. Column (1): baseline results (as in column 4 of Table A3); column (2): unemployment rate in bordering areas weighted by population share; column (3): unemployment rate in bordering areas weighted by the share of border's contiguity; column (4): unemployment rate in bordering areas weighted by the inverse of the distance from the centroids; column (5): unemployment rate in bordering areas weighted by the proportion of commuters to the bordering RORs; column (6): unemployment rate in bordering areas weighted by the proportion of commuters from the bordering RORs. All regressions include as local area controls the (log) average household income per capita, the (log) of average housing prices per mq^2, and the local share of migrants.

TABLE A5 Local unemployment and life satisfaction, estimations without commuters

	(1)	(2)	(3)	(4)
Unemployment own area	−0.033**	−0.038***	−0.036***	−0.037***
	(0.012)	(0.012)	(0.012)	(0.012)
unemployment bordering areas—same Federal State	−0.028***	−0.026**	−0.024**	−0.025**
	(0.009)	(0.010)	(0.010)	(0.010)
unemployment bordering areas —different Federal State	0.009	0.010	0.008	0.008
	(0.007)	(0.007)	(0.007)	(0.007)
adjusted R2	0.156	0.161	0.157	0.156
Number of observations	188860	163990	180971	184522

***, **, * denote significance at the 1, 5, and 10 percent level. OLS Regressions with two-way clustered standard errors at the local (ROR) and year level. Column (1): baseline results (as in column 4 of Table 2); column (2): estimation without individuals who commute more than 25 km; column (3): estimation without individuals who commute more than 50 km; column (4): estimation without individuals who commute more than 75 km. All regressions include controls for gender, age and its square, (log) years of schooling, marital status, (log) number of children, (log) number of adults in the household, (log) net family income, dummies for labour market status (unemployed, public sector worker, private sector full-time worker, private sector part-time/mini-job worker), (log) number of visits to the doctors in the last 3 months, (log) unemployment experience, home ownership and (log) house size, (log) average household income per-capita, local share of migrants, (log) of average hosing prices per mq2, year fixed effects and ROR fixed effects.