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Examining the roots of homelessness: The impact of regional housing market conditions and the social environment on homelessness in North-Rhine-Westphalia, Germany

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Articles on labour market issues

Examining the roots of homelessness

The impact of regional housing market conditions and the social environment on homelessness in North Rhine-Westphalia, Germany

Alexandra Kröll
Oliver Farhauer

Examining the Roots of Homelessness

The Impact of Regional Housing Market Conditions and the Social Environment on Homelessness in North Rhine-Westphalia, Germany

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Abstract

Despite large-scale governmental efforts to combat homelessness, homelessness rates can only be reduced but not eliminated completely by the measures usually applied. Hence, there is an obvious need to investigate additional factors which contribute to homelessness and gain insights on how to further reduce homelessness. To begin with, the relationship between the conditions prevailing on the housing market and homelessness levels is made out with the help of a theoretical model. From this model, a critical income ensuring positive housing consumption can be deduced; individuals with an income below this critical threshold end up homeless. The empirical analysis draws on a panel data set comprising information on all districts (Kreise) of North Rhine-Westphalia from 2004-2009. The regression analysis underpins the theoretical results: High (net market) rents as well as low vacancy rates among small flats lead to rising homelessness. Homelessness also increases when the share of long-term unemployed and of those with a monthly income below € 700 is higher, since this makes it more difficult to reach the critical income needed to rent a flat. Finally, some policy conclusions resulting from the analysis are pointed out.

Zusammenfassung

Trotz umfangreicher staatlicher Programme zur Bekämpfung von Obdachlosigkeit kann diese mit den üblicherweise eingesetzten Mitteln nur verringert, aber nicht gänzlich beseitigt werden. Deshalb ist es wichtig, zusätzliche Faktoren, die zur Entstehung von Obdachlosigkeit beitragen, zu untersuchen und so Ansatzpunkte zu deren weiterer Reduktion auszumachen. Zunächst wird modelltheoretisch der Zusammenhang zwischen den auf dem Wohnungsmarkt vorherrschenden Rahmenbedingungen und der Obdachlosigkeit hergestellt. Aus dem Modell lässt sich ein kritisches Einkommen, das den Konsum von Wohnraum gewährleistet, ableiten; Individuen mit einem Einkommen unterhalb dieser kritischen Schwelle sind obdachlos. Die empirische Überprüfung des Modells erfolgt anhand eines Paneldatensatzes mit Informationen für die Kreise Nordrhein-Westfalens für die Jahre 2004 bis 2009. Die Regressionsanalysen bestätigen die aus dem Modell abgeleiteten Erkenntnisse: Teurer Wohnraum (gemessen an den Nettoangebotsmieten) sowie geringer Leerstand an kleinen Wohnungen führen zu erhöhter Obdachlosigkeit. Die Obdachlosigkeit steigt ebenfalls, je höher der Anteil der Langzeitarbeitslosen und derjenigen mit einem monatlichen Einkommen unter € 700 ist, da hierdurch das Erreichen der kritischen Einkommensschwelle schwieriger wird. Abschließend werden einige, sich aus der Analyse ergebende, Politikimplikationen aufgezeigt.

JEL classification: R21, R31, R38, I38

Keywords: Homelessness, housing markets, regional social environment, long-term unemployment

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1 Introduction

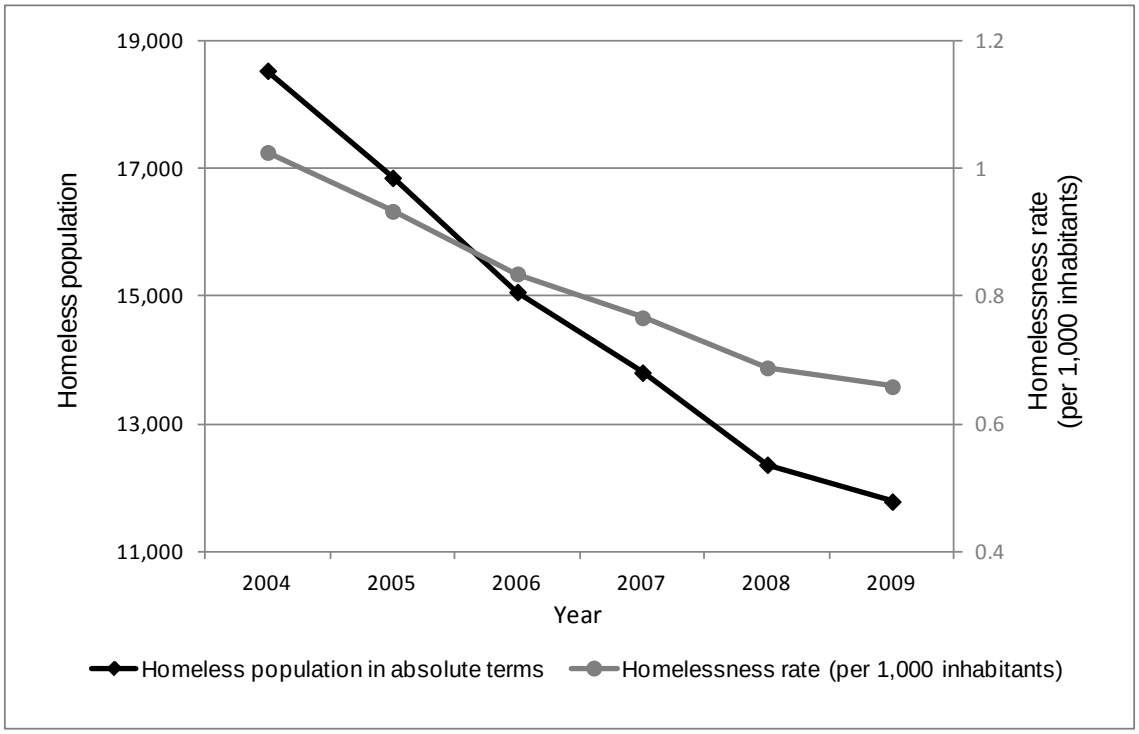
Even in industrialised countries with comprehensive social security systems, poverty continues to be a widespread phenomenon. One of the most severe forms of poverty expresses itself in homelessness. Because of the gravity of this situation for those affected, homelessness deserves special attention. Previous studies highlight that there are many causes for becoming homeless. We focus on some particularly important reasons – of economic as well as of social nature – for becoming/remaining homeless, embed them into a theoretical model and then go on to study their impact on homelessness in Germany. Employing a panel data set, the aim of this paper is to assess the influence of variables capturing the conditions on the housing market and the social environment on the number of homeless people per inhabitant. The area under consideration is North Rhine-Westphalia, because it is the only German state (*Bundesland*) keeping an official record of its homeless. North Rhine-Westphalia is densely populated, and it is the largest German state in terms of population numbers (roughly 18 million inhabitants as compared to about 82 million inhabitants nationwide).

Overall, the number of homeless people in North Rhine-Westphalia strongly fell from 18,533 in 2004 to 11,788 in 2009, as shown by the black line (left axis) in Figure 1. This corresponds to a 36 % decrease relative to initial levels in 2004. For investigating whether this result is characteristic for only a few districts (*Kreise*) – or rather shows a general trend –, the development at the spatially more disaggregated district level needs to be considered: In 25 out of 53 districts of North Rhine-Westphalia, the number of homeless people fell continuously from 2004 to 2009. In another 25 districts, the number of homeless rose only once or twice in this interval (and fell in the remaining years), whereas it increased a maximum of three times in only three districts. These results still hold when accounting for changes in population size. The grey line (right axis) in Figure 1 represents the number of homeless people per thousand inhabitants for North Rhine-Westphalia as a whole; it is continuously decreasing over the time period considered, from 1.03 in 2004 to 0.66 in 2009. At district level, the pattern of change is almost exactly the same as when looking at absolute numbers.

Being homeless is an extreme situation with negative implications on both physical and psychological health (for Germany see e.g. Fichter/Quadflieg 2001, Salize et al. 2002). The average life expectancy of homeless people in Germany is about 10 years lower than of those who are not, and results for London show that the life expectancy of rough sleepers is only 47 years (Daly 1993). Therefore, an important objective of any government's social policy should not only be to reduce homelessness, but to intervene much sooner and prevent people from becoming homeless in the first place. In 1996, the state government of North Rhine-Westphalia implemented a program to avoid homelessness. In short, the program aims at providing consulting services to homeless people and to people who are at risk of becoming homeless, and it promotes housing projects for cases of need. Furthermore, the

program offers assistance specifically targeted at women, since they are often reluctant to fall back on mixed-gender facilities (for greater detail, see Enders-Dragässer/Huber/Sellach 2004, Ministry for Generations, Family, Women and Integration of North Rhine-Westphalia 2007). Much of the marked decrease in homelessness shown in Figure 1 can certainly be attributed to the persistent efforts in the framework of this program.[1] Nevertheless, the number of homeless still has not come even close to zero. Thus, it is important to further analyse the various factors influencing homelessness in order to develop additional programs in both reducing and preventing homelessness. Several important social and economic factors impacting homelessness have been identified. So, there is a pronounced impact of the housing market on homelessness, especially in Germany (Busch-Geertsema/Fitzpatrick 2008: 79). Busch-Geertsema (2005: 9) shows that in times when the housing market tightens and vacancy rates fall, the number of homeless people goes up, and the other way around. Furthermore, there is evidence that only about 6 % of the homeless are employed, although more than 80 % of them would basically be fit for work, and almost 60 % of the homeless receive social benefits (BAGW 2009). This underpins the need to also include social variables into the analysis.

Figure 1
Homelessness in North Rhine-Westphalia, 2004-2009



Source: Authors' calculations, data from the Statistics Agency of North Rhine-Westphalia

[1] One can be pretty sure that the reduction in homelessness is not due to migration, because homeless people generally are very immobile in a spatial sense, even within their own district. Most homeless people remain in the same locality for many years, as they find easier access to soup kitchens and emergency shelters. Also, spatial mobility of homeless across districts is limited, as they generally cannot afford bus or train tickets. What is more, hardly any homeless person owns a bicycle, which severely restricts mobility (Neupert 2010: 17).

Previous studies have found that besides social factors, economic factors are among the main drivers of homelessness. Wood et al. (1990) conducted a survey in Los Angeles, California, and compared homeless families to poor housed families. It turned out that apart from interpersonal problems and social isolation, high housing costs and family poverty were reported to be the main cause for losing one's home. Another study employing micro-data is the one by Early (1999) who considers 15 cities in the U.S. He shows that the number of homeless increases the more shelters are provided and the better the quality of those shelters is, whereas - in contrast to many other studies (see below) - he finds that an increase in the amount of available housing with minimum quality only plays a minor part in reducing homelessness.

Using data not on the individual but on the aggregate level, Honig/Filer (1993) show for 50 metropolitan areas in the U.S. that homelessness is the higher the higher the rents for the cheapest flats are. Vacancy rates of the cheapest flats, on the other hand, do not have a statistically significant influence on the number of homeless. Also considering the U.S., Park (2000) finds that the rates of homelessness rise with tightening conditions on the market for down-market flats. Quigley/Raphael/Smolensky et al. (2001) come to a similar conclusion analysing the U.S. as a whole and, in greater detail, California: Low vacancy rates as well as high housing costs both lead to rising homelessness. Mansur et al. (2002) use a general equilibrium simulation model to make out the impact of policy interventions concerning the housing market in four California metropolitan areas. Their results, too, highlight the importance of economic drivers of homelessness such as the level of rents in the lower segment of the housing market and the distribution of income. They also show that in the area under scrutiny, the number of homeless can be reduced more effectively by demand-side - instead of supply-side - subsidies. Demand side policies comprise rent subsidies to all poor households to ensure their income meets a certain threshold (analytically derived in our model below) so they can afford to buy housing. Supply side subsidies, on the contrary, are general landlord maintenance subsidies which, basically, could also reduce homelessness in that they might reduce rents. However, the former instrument is much more effective in reducing homelessness than the latter, holding the total amount of the subsidy constant.

The present study stands out from the previous contributions for several reasons: Above providing a theoretical model of homelessness, we also test the predictions of this model empirically. In Section 2, the relation between housing market conditions and available income as factors driving homelessness is highlighted in a theoretical model considering the influence of prices for housing, vacancies and a critical income needed to be able to afford housing. Section 3 provides information on the data and an outline of the methodology applied. Using panel data techniques, a data set including observations for all districts of North Rhine-Westphalia from 2004-2009 is analysed. The regression results are presented in Section 4, and the last Section summarizes the most important results from which we can draw several policy conclusions to tackle homelessness.

2 The Model

We - like Honig/Filer (1993) - assume that the homeless and those who are at risk of becoming homeless would consider renting a flat rather than buying one. Thus, the model is concerned with the rental market for flats. In modelling the demand side, we build on the framework set up by O'Flaherty (1995), which we extend in several respects. Consumers have well-behaved preferences which are characterised by a continuous utility function that is defined over the consumption of two goods: $u(w, x)$. These two goods which can (but do not necessarily have to) be consumed – are housing (w) and a composite good (x) which comprises consumption of everything other than housing and is chosen as the numéraire. The utility function exhibits weakly increasing marginal returns in both arguments and is twice continuously differentiable, i.e. $u_w, u_x > 0$ and $u_{ww}, u_{xx} < 0$ as well as $u_{wx} \geq 0$. Although all consumers are said to have the same utility function, they may well differ in incomes y and, therefore, in utility levels.

An individual with positive housing consumption $(w > 0)$, i.e. he or she is not homeless, consumes an amount S of housing – which may either be the number of rooms or the square metres of a flat – of some quality q. Thus, "gross" housing consumption is given by $w = q \cdot S$. There is a continuum of qualities of housing, so that there is no need to be concerned with step size in determining w. The median quality of housing is normalised to one $(q^m = 1)$. Hence, housing consumption of an individual living in a flat of median quality and size S is $w = S$. If instead he/she lived in a flat of the same size S, but of quality below the median, this would result in $w < S$ and, therefore, show as lower housing consumption. Put differently, if housing of some quality below q^m is consumed, this has the same impact on utility (more precisely, on w which enters the utility) as if less housing was consumed, i.e. if S was smaller. The same holds true for the inverse. This approach is a modelling tool which ensures that there is no need to consider different prices for different housing qualities; the price of one quality-adjusted unit of housing $(q \cdot S = 1)$ is simply p, which is taken as given for the moment. If an individual consumes the quantity S of high-quality housing q', his or her expenditures on housing will be higher than those of another individual consuming the same quantity S housing of median quality q^m, as $q' > q^m$ and, consequently, total expenditures on housing are given by $pw' = pq'S > pw^m = pq^m S$.

Next, the semi-direct utility of gross housing consumption for a consumer with the income y, given the price p is defined as

$$W(w|y, p) = u(w, y - pw),$$

using the budget constraint $pw + x \leq y$, which is binding in the optimum. The gross housing demand set for an individual with the income y, given prices p, is then characterised by

$$W^*(y|p) = \{w^* | W(w^*|p, y) \geq W(w|p, y) \text{ for all } w\}.$$

The demand set exists and is a singleton because we assumed a utility function that is strictly quasiconcave in w (and in x as well). An individual is homeless, if zero is the only element of his/her gross housing demand set. Since $w = q \cdot S$, this is the case if preferences are such that $\min\{q, S\} = 0$, i.e., either quality zero of housing is consumed $(q = 0)$, or no positive flat size is consumed $(S = 0)$, or both are true $(q = S = 0)$. The homeless bid-rent curve $b(w|y)$ reflects the maximum amount an individual with the income y is ready to pay for the amount w of housing. Therefore, he/she is indifferent between being homeless and paying the sum $b(w|y) = pw$ for gross housing consumption w. Formally, this indifference relation can be stated as

(1) $$u(0, y) = u[w, y - b(w|y)],$$

where, again, the budget constraint is used and the bid-rent function is substituted for the price pw. The bid-rent function is continuous and twice differentiable in both of its arguments. Furthermore, the function is concave because of the positive, but diminishing, marginal utility of housing and, obviously, $b(0|y) = 0$ for all y.

The higher the income y, the higher the homeless bid-rent curve for $w > 0$, i.e. richer people are always willing to pay more on any given positive w in order to avoid being homeless. This is shown in the following: Differentiating the indifference relation in (1) with respect to income y yields

(2) $$\frac{\partial u(0,y)}{\partial x}\frac{\mathrm{d}x}{\mathrm{d}y} = \frac{\partial u[w,y-b(w|y)]}{\partial x}\frac{\mathrm{d}[y-b(w|y)]}{\mathrm{d}y}.$$

By making use of $\mathrm{d}x/\mathrm{d}y = 1$ (derived from $x = y - b(w|y)$), simplifying the last term in (2) and applying different notation, we get

$$u_{x|x=y} = u_{x|x<y}\left(1 - b_y\right),$$

and rearranging yields

$$b_y = 1 - \frac{u_{x|x=y}}{u_{x|x<y}} > 0.$$

With diminishing marginal utility, the increase in utility caused by a marginal increase of x-consumption is lower if the whole income is already spent on x as com-

pared to a situation in which both goods are consumed in positive amounts, i.e. $u_{x|x=y} < u_{x|x<y}$. Consequently, b_y - which gives the reaction of the bid-rent corresponding to a change in income - is always greater than zero for any $w > 0$. Therefore, richer people with higher incomes have higher bid-rent functions (for any positive w) and are willing to spend more on a given amount of gross housing consumption in order to avoid being homeless than the less wealthy do.

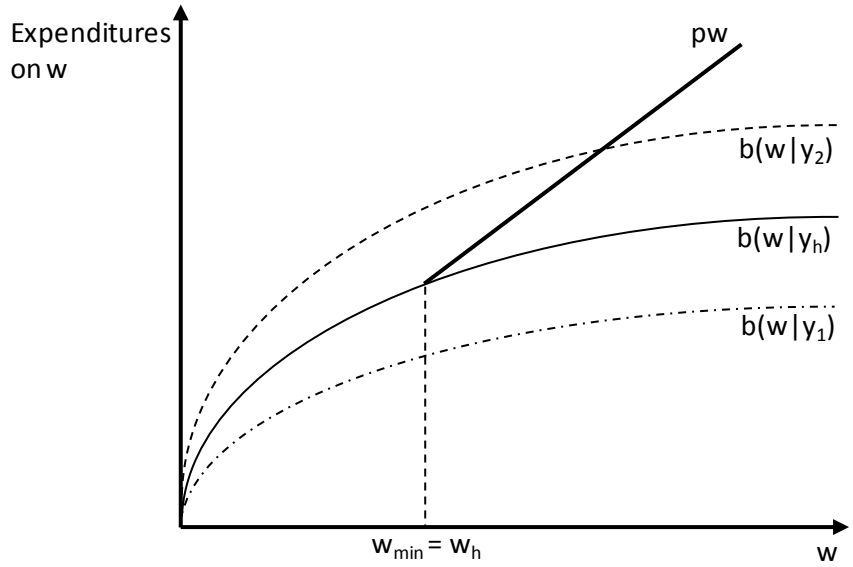
A critical income y_h can be determined, individuals with incomes below (above) this threshold value being homeless (tenants). Figure 2 illustrates bid-rent curves $b(w|\cdot)$ corresponding to different incomes as well as total expenditures on housing pw at market price p, depending on the amount of gross housing consumed w. If an individual's income falls below the threshold value y_h, expenditures shift away from housing to the composite good, and no housing at all is consumed any more: Individuals with bid-rent curves which are strictly below (at some point above) the line pw - like the one corresponding to income y_1 (y_2) -, are homeless (tenants), since their maximum willingness to pay for housing is lower (higher) than the going rate for all (some) w. The critical income y_h corresponds to the lowest bid-rent curve which just touches the housing expenditure line. An individual with the income y_h is indifferent between spending the amount pw_h on housing consumption and being homeless. Analytically, the critical income is determined by (3) which could be solved for y_h, if a specific function for the bid-rent curve was proposed.

(3) $$b(w|y_h) = pw_{min},$$

where w_{min} is the minimum amount of gross housing traded on the market: In order to be lettable, a flat has to meet some requirements with regard to quality, e.g. the roof must be leak-proof, the windows must be windproof and the flat needs to be connected to the mains. These minimum requirements for quality are denoted by q_{min}. In addition, a flat must be of some minimum size S_{min}, at least a bed and some essentials must fit in. Thus, w_{min} denotes the lowest level of gross housing consumption which could possibly be offered to let. Suppose w_{min} was smaller than w_h; then, the smallest supplied flat would be smaller than the smallest demanded housing unit. In the end, no flats of a size in between w_{min} and w_h will be supplied any more, as there will be no demand of such flats at the market price p. Moreover it is impossible that $w_h < w_{min}$, because supply and the price line only start at w_{min} which is why there cannot be any intersection of the price line and any bid-rent curve to the left of w_{min} and $w_h \geq w_{min}$ must hold. Intuitively, those whose optimal gross housing consumption is lower than w_{min} remain homeless because their spe-

cific demand is not met by the market supply. The previous argument, however, shows that it is impossible (in the long run) that $w_h > w_{min}$. Consequently, w_{min} must be equal to w_h.

Figure 2
Graphical derivation of the critical income y_h



Source: Authors' illustration

Further below, the aggregate demand for gross housing consumption is derived as the sum of the micro-founded individual demands. The aggregate demand can then be combined with aggregate supply, to determine the equilibrium on the housing market. With regard to the supply-side, we look at the short-run supply of housing, so there is no need to consider construction, decay and maintenance.[2] In fact, the model could be combined with any long-run supply-side framework that takes into account different qualities of flats (e.g., the model developed by O'Flaherty, 1995). We abstain from doing so for several reasons: With regard to the supply-side, the most important aspect is the existence of vacancies. This feature can be easily incorporated into the model when looking at the short run only. Moreover, the prior aim of this paper is not to provide a fully worked-out model of the housing market, but to investigate homelessness in a reasonably realistic setting, which is why our model is kept as simple as possible.

In the short run, the supply of housing is fixed because both, building and depreciation, take time. To incorporate vacancies into the model, imperfect information on the part of consumers is assumed.[3] Potential tenants are not perfectly informed about all vacancies, because it is too costly or too complicated to gain knowledge about all vacancies – some are only put up on the bulletin board of a handful of su-

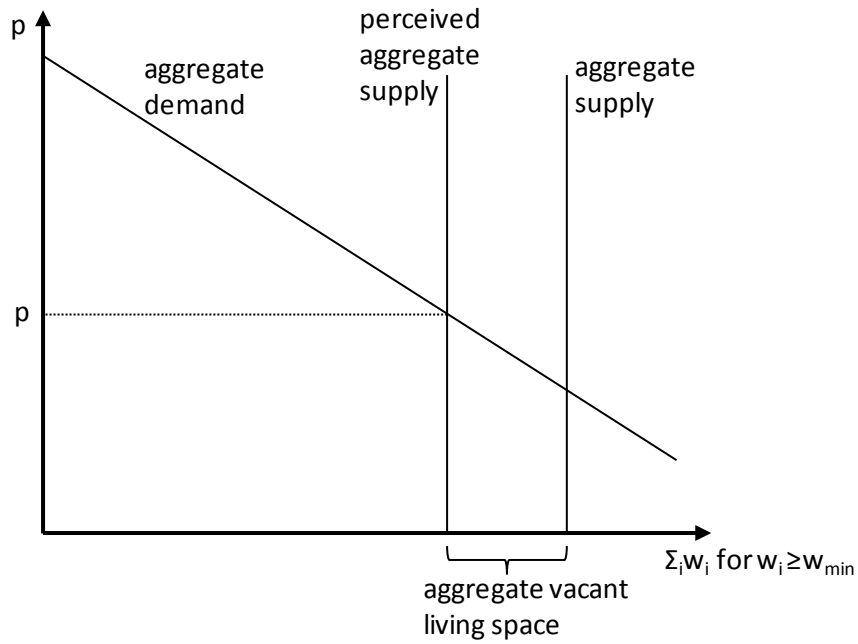
[2] Qualitatively, though, the results would be the same if the supply function was assumed to have a positive slope instead.

[3] Also, a matching function could be applied to introduce vacancies into the model.

permarkets, others are only advertised in a limited number of newspapers, while still others are only conveyed through a real estate agent. It is unlikely that the owner of a flat will use all of these channels to advertise the flat and, furthermore, it is also unlikely that a potential tenant will use all of those channels to gain information about vacancies. E.g. somebody moving to a new city will probably not scan all supermarket bulletin boards in the new area. This is why the actual aggregate supply $\overline{w}$ will be greater than the aggregate supply perceived by potential tenants, as is shown in Figure 3. Perceived aggregate supply $\beta\overline{w}$ is a fraction β of actual aggregate supply. The parameter β depends on the degree of imperfect information; the more means of advertising home-owners deploy and the more sources of information potential tenants make use of, the lower is the degree of imperfect information, i.e. the lower is β.

The vertical axis plots the price for one quality-adjusted unit of housing (see above), as the horizontal axis plots the aggregate amount of gross housing supplied/ demanded. The total amount of gross housing traded on the market is given by $\sum_i w_i$ for $w_i \geq w_{min}$. Each flat i consists of a certain amount of gross housing w_i (depending on its quality and size); summing w_i over all flats that are at least of the minimum gross size w_{min} yields the aggregate amount of gross housing traded on the market. The aggregate vacant living space equals the difference between actual and perceived aggregate supply and is given by $(1-\beta)\overline{w}$.

Figure 3
The housing market



Source: Authors' illustration

Aggregate demand is a function of the aggregate amount of gross housing demanded, i.e. the sum of all individuals' optimal amount of housing consumed:

$p \equiv p(\sum_i w_i \text{ for } w_i \geq w_{min})$; it does not need to be linear, as exemplarily depicted in Figure 3. The only conditions imposed on demand are that it is a strictly monotonic decreasing function and that it is non-zero at the intersection with the perceived aggregate supply curve. This intersection determines the equilibrium on the housing market, where the aggregate demand equals the perceived aggregate supply of housing: $\sum_i w_i = \beta \overline{w} \text{ for } w_i \geq w_{min}$. The resultant equilibrium price p for one quality-adjusted unit of housing is taken as given by all individuals: By assumption, there are a great many flat-owners and tenants, so none of them can influence the market price through individual action. Despite the price-taking behaviour, the housing market is not perfectly competitive because of the imperfect information introduced above. Due to imperfect information on the part of the consumers, vacancies can be introduced in the model. Empirically, vacancy rates (among small flats) are an important determinant of homelessness levels (see the empirical results below).

3 Data and Methodology

The dependent variable in the regression analyses is the number of homeless per inhabitant. North Rhine-Westphalia is Germany's only state keeping an official record of the number of homeless people, which is why we use data from this state's Statistics Agency. Our analysis covers all 53 districts (conforming to the territorial average in 2009) over the years from 2004 to 2009. Every year on June the 30th, the local authorities of North Rhine-Westphalia report to the Statistics Agency the number of homeless living in their area of responsibility. "Homeless" are those who either have no reasonable accommodation at all or are on the verge of losing it, those who do not have a flat and temporarily live in a shelter, as well as those who cannot – for whatever reason – provide themselves with accommodation at their own expense. The statistics report those homeless people who sleep in government or charity provided shelters and those who are placed in a state-financed flat.

To identify factors influencing the number of homeless people, several independent variables are employed. We look at the level of net market rents, the vacancy rate among small flats and - for depicting a district's social environment - the share of residents with a monthly income below € 700, the share of long-term unemployed and the share of highly skilled residents are included into the analysis. These variables are described below and interpreted extensively in the results section.

Data on the net market rents of flats are provided by the Federal Institute for Research on Building, Urban Affairs and Spatial Development (*Bundesinstitut für Bau-, Stadt- und Raumforschung*). There, only net basic rents per square metre for non-furnished flats from 40 to 130 m² in size which have not been advertised for more than one year (i.e., they are no slow sellers) are considered. There is not any information on flats smaller than 40 m², but there is also no reason to believe that net basic rents per square metre may have differed among flats of different size. Consequently, it is assumed that the available data are representative for small flats too. The data are collected from advertisements in newspapers and internet platforms

which is why the actual rents after negotiations may be slightly lower than those recorded.

In Germany, everybody who is in need is entitled to public transfers for covering real housing expenditures. The state authorities pay the cost of living of unemployed persons (*Kosten der Unterkunft*), whereas those who are not unemployed but cannot afford their flat anymore receive housing subsidies (*Wohngeld*). However, these transfers come along within certain limitations: Only the basic needs of the transfer recipient are covered, and the authorities only pay the costs actually incurred. There are no lump-sum transfers, but instead the transfer level is decided on in every individual case, so levels differ between recipients and also from district to district, as rents also vary by district. A district's rent level is a decisive determinant for the level of transfers granted. I.e., if rents are high in a given district, it follows that housing transfers will also be comparatively high in that very district. As a consequence, we do not directly include these transfers to avoid multicollinearity, as the level of net market rents captures the same effect as would transfers.[4]

A further variable capturing the conditions on the housing market is the *empirica* vacancy index which provides information on flat vacancy rates. The category of the smallest flats for which this index is available is those for flats with less than 50 m² in size. The number of vacancies from which the vacancy index (vacant flats divided by the whole stock of flats) is computed is rounded to 100. Furthermore, the index is only based on a sample, which is why for some districts there are statistically uncertain values due to a low number of cases and for a handful of districts the values are missing at all. Nevertheless, the vacancy index is a useful tool for assessing the approximate scale of vacancy rates.

Besides housing market variables, further variables depicting the social environment which impacts the incidence of homelessness in the different districts are included. One of those variables taken into account is the number of long-term unemployed relative to the total county population. In order to be considered long-term unemployed, a person has to experience a (consecutive) unemployment spell for more than one year (data from the Federal Employment Agency). The total district population is chosen as a reference mark instead of the dependent working population, since the aim is not to depict the conditions on the labour market, but to analyse the social environment of the entire district population. We look at the long-term unemployed, because often being long-term unemployed is a precursor to being homeless. Ideally, it would be preferable to also run a regression analysis controlling for the share of unskilled people, because most of the homeless are low-skilled. However, due to the limited character of the data available, this goes along with a major

[4] In spite of public housing transfers, people may become homeless if they are heavily indebted and make improper use of transfers, or they do not even have a bank account where the transfers could go to. Still for others, it might be too complicated to complete all the paperwork needed to register for transfers.

identification issue: The data provided by the Statistics Agency of North Rhine-Westphalia only display the stock of residents without school-leaving or training qualification, but it is impossible to deduce from them who of them is still in school or training. Therefore, we consider instead the share of those with the highest possible qualification obtained in the population of the district as a whole. They either hold a university or specialist college degree or have completed advanced training to become a craftsman (*Meister*). A high share of highly skilled residents is expected to go along with lower homelessness rates, because education prevents from poverty and, consequently, from homelessness.

Another explanatory variable is the share of inhabitants with a very low income, i.e. below € 700 per month, which is the lowest disclosed income category per district. People with such a low income are more prone to become homeless than those with higher incomes. The related data from the Statistics Agency of North Rhine-Westphalia exhibit some statistically uncertain values, and for a handful of observations values are missing at all. This is why the regression model where this variable is included is estimated with fewer observations. Table 1 provides summary statistics on the employed variables.

Table 1
Summary Statistics

Variable	Obs.	Mean	Std. Dev.	Min	Max
Share of homeless people in the total district population (in %)	292	0.06	0.07	0	0.57
Net market rents	292	5.50	0.80	3.97	8.34
Vacancy rates among small flats (in %)	292	4.92	2.35	1.00	17.6
Share of long-term unemployed (in %)	259	1.96	1.01	0.04	5.44
Share of residents with monthly income < € 700 (in %)	277	26.51	3.95	16.22	35.27
Share of highly qualified residents (in %)	277	13.46	4.13	6.28	30.62

Source: Authors' calculations

Using ordinary least-squares estimation, the variables describing the housing market and the social environment in the districts of North Rhine-Westphalia are regressed on the number of homeless people per inhabitant. All variables are measured at the district-level and the independent variables enter in logarithms. The regressions are estimated with heteroscedasticity-consistent White standard errors and random effects. This procedure is supported by a panel bootstrap of the Hausman test which confirms that the model should be estimated with random - rather than with fixed - effects.

4 Results

Because of the housing market's dominant role in driving homelessness in Germany (see, for example, Busch-Geertsema 2005), we first estimate the influence of hous-

ing market variables on homelessness so as to assess the importance of the conditions prevailing on the housing market for homelessness, as established in the theory section. The number of homeless per thousand inhabitants in each district is regressed on net market rents and vacancy rates among small flats. The results are reported in column 1 of Table 2, with the p-values given in brackets below each coefficient. As expected, a rise in the level of net market rents in a district leads to an increase of homelessness. More precisely, an increase of the independent variable by 1 % increases the number of homeless per thousand inhabitants by 0.033. Put differently, doubling net market rents leads to 3.3 more persons being homeless among one thousand inhabitants on average, the estimated coefficient being highly significant at the 1 % level. Intuitively, this result is due to particularly poor people facing difficulties to pay their rents from their tight budgets, as the average flat becomes more expensive. With regard to the model set up in an earlier section, higher costs of housing induce a shift of expenditures from housing towards other goods. In the most extreme case, gross housing consumption falls to zero: As housing becomes more expensive, the critical income y_h increases (the housing expenditure line in Figure 2 shifts upwards, so that the lowest bid rent curve which just touches the new housing expenditure line corresponds to a higher income). The less endowed households cannot afford to buy housing anymore and become homeless.

Table 2
Regression results

	(1)	(2)	(3)
Net market rents	3.251 (0.000)	3.480 (0.000)	3.697 (0.000)
Vacancy rates among small flats	-0.127 (0.000)	-0.085 (0.002)	-0.055 (0.049)
Share of residents with monthly income <700 €		0.263 (0.000)	0.217 (0.000)
Share of long-term unemployed		0.062 (0.000)	
Share of highly qualified residents			-0.428 (0.000)
Constant	-4.711 (0.002)	-6.041 (0.000)	-7.163 (0.000)
Random effects	Yes	Yes	Yes
Obs.	292	259	277
R^2 (overall)	0.4012	0.4300	0.4357

p-values are in parentheses
Source: Authors' calculations

The second variable reflecting the conditions on the housing market is the vacancy rate among small flats. Vacancy rates among small flats are particularly relevant in this context, as over 70 % of the homeless would wish to move into a small flat or furnished room (BAGW 2009). Again, the coefficient shows the expected sign and is significant at the 1 % level: A doubling of the vacancy rate results in a decrease of homelessness by 0.13 people per thousand inhabitants on average. The more flats

of a particular category (i.e., small flats in this case) are available on the market, the greater is the chance for a homeless person to find a flat which addresses their particular wants and needs (small and cheap). In tight housing markets, on the other hand, it is more difficult to find a suitable and affordable flat (see above). This can be expected to be particularly difficult for people with low means (which means, among other things, no or only limited access to newspapers and the internet as sources of information on vacancies). The empirical significance of this variable underpins the importance of incorporating vacancy rates into the supply side of any model used to study homelessness, like it is done in the theoretical section of this paper. Nevertheless, homelessness rates are more sensitive to changes in net market rents than to changes in vacancy rates, as is shown by the estimated coefficients. Altogether, the model explains roughly 40 % of the overall variation in the data.

The first model shows that housing market variables do have a statistically significant impact on the incidence of homelessness. In order to make out if this relation still holds when controlling for the social environment in a district, two further variables reflecting these social characteristics are included into the model: Like before, the number of homeless per inhabitant is regressed on net market rents and vacancy rates among small flats. In addition, the share of residents with a monthly income below € 700 and the share of the long-term unemployed among all residents of a given district serve as regressors in this second model. Column 2 of Table 2 shows the results: If the share of residents with a monthly income below € 700 doubles, the number of homeless per thousand inhabitants goes up by 0.26, in absolute terms. Naturally, poorer people are more vulnerable to becoming homeless in case they cannot afford to cover their housing expenses anymore (Benjaminsen/Busch-Geertsema 2009: 136). If poverty becomes more prevalent in a district, the share of residents with an income below the critical threshold y_h derived in the model above rises and more people are at risk of becoming homeless. This shows up as an increase in the rate of homelessness.

Empirical evidence shows that almost 70 % of the homeless are long-term unemployed (BAGW 2009). Consequently, the share of long-term unemployed in the total district population is also included into the long regression in column 2 in Table 2 to capture the social environment. The estimated coefficient shows that a doubling of the share of long-term unemployed leads to 0.06 more people being homeless per thousand residents. In Germany, the chances of reintegrating long-term unemployed into the labour market are pretty low. Some of the many reasons (see, for instance, Machin/Manning 1999, for an extensive treatment) are that being long-term unemployed goes along with stigmatization and signalling effects and, in the course of time, the unemployed get used to their situation. Thus, they face severe difficulties in becoming reemployed. The longer an unemployment spell, the lower state transfers become until they eventually fall down to subsistence level, and it becomes more difficult for the long-term unemployed to reach the critical income y_h needed to avoid being homeless. Moreover, (long-term) unemployed individuals are more likely

to become addicted to alcohol or psychoactive substances (Bönner 1999; Henkel/ Zemlin 2008), which makes it even more difficult to cope with the situation and to remain housed.

Both social variables are statistically significant at the 1 % level. Upon their inclusion into the estimated model, the coefficient of the net market rents is practically unchanged and remains significant at the 1 % level. The coefficient of the vacancy rates among small flats is reduced to almost 2/3 its value compared to the first estimated model. Obviously, its influence is reduced when controlling for social factors. Nevertheless, a doubling of the vacancy rates among small flats is associated with a decrease in homelessness by 0.09, and the coefficient is still significant at the 1 % level. This model performs slightly better than the short one and explains 43 % of the overall variation in the data.

Since education is one of the most effective protectors against poverty (Card 1999) and homelessness, we also include into the regression model a variable capturing residents' educational achievement. Preferably, the model would account for the share of low-skilled people. With the available data, however, this yields misleading results, as drop-outs cannot be distinguished from those still in school or training. As a consequence, the share of highly-skilled residents is included into the model, because this goes along with fewer distortions. Upon the inclusion of the share of a district's highly qualified residents, the coefficient of the share of long-term unemployed becomes insignificant (which is hardly surprising, as each of these variables nearly captures one side of the same coin). Thus, the model is re-estimated with the share of long-term unemployed being omitted, and the results are shown in column 3 of Table 2. As expected, the coefficient of the share of highly skilled residents has a negative sign: Doubling a district's share of residents who either hold a university or specialist college degree or have completed advanced training to become a craftsman goes along with 0.43 fewer homeless per thousand inhabitants. Besides, the net market rent coefficient remains highly significant and slightly increases, whereas the coefficient of the vacancy rates is further reduced (to about 2/3 its value in the model in column 2), but remains significant at the 5 % level. On the whole, this model performs slightly better than the model in column 2 and explains 43.6 % of the overall variation in the data.

One can be pretty sure that causality indeed runs in the direction postulated by the above models. The homeless represent such a tiny proportion of the population, that it is implausible they exert any influence on the housing market, such as on the net market rents and the vacancy rates among small flats. Rather, the homeless themselves are being affected by the conditions prevailing on the housing market. Rising rents and low vacancy rates are beyond the scope of their influence and lead to many of them remaining homeless. A similar conclusion holds for the social variables of the model. To the homeless, being homeless is the last resort and means a loss of social status. In countries with a highly developed social security system, it is highly unlikely that somebody will become homeless because of financial or social

troubles and only thereupon lose their job or take on a low-paid job. Instead, in most cases, unemployment and the incapability to pay rent (due to financial dependence on an ex-partner, loss of job or low income) precede becoming homeless. These considerations are supported by the fact that, in Germany, only about 6 % of the homeless are still employed (BAGW 2009).

5 Conclusion

Homelessness exerts devastating physical and psychological effects on those affected. Thus, there is an obvious need to further investigate the sources of this phenomenon so as to provide assistance to the homeless to regain permanent accommodation and to prevent those who are at risk of being homeless from actually losing their dwelling.

In our theoretical model, we build upon the model developed by O'Flaherty (1995) who considers flats of different quality. We extend this model to also include the size of flats. This is especially important when analysing homelessness, since homeless people are mostly looking for flats of a particular - i.e., small - size. Moreover, it is taken into account that there exists a minimum amount of gross housing consumption (e.g., a bed and some essentials must fit in). This minimum amount of gross housing consumption may be too high for some people, as the rent for a flat increases with size and quality, and they might not be able to afford the minimum supplied. People with an income below the critical threshold for homelessness derived in the model seek to consume less than the minimum amount of gross housing consumption. This is not possible, since the demand is not matched by the supply, and they become/are homeless. Another link between the housing market and homelessness is modelled via vacancy rates among small flats. The higher the vacancy rates among small flats, the more flats which suffice the need of the homeless - and of those at risk of becoming homeless - are available on the market. The importance of the theoretically identified factors influencing homelessness is underpinned by the subsequent empirical analysis.

Using a panel data set, the influence on homelessness exerted by housing market conditions as well as by variables reflecting the social environment is estimated. To the authors' knowledge, this is the first econometric study of homelessness explicitly focussing on a German region. The results show that there is indeed a significant (causal) correlation between homelessness and the employed housing market and social variables. The present study supports the above-mentioned observation that homelessness increases when the housing market is tight. Rising net market rents and decreasing vacancy rates among small flats both contribute to an increase in homelessness, because flats either become too expensive or too scarce to be affordable for those with very low income. Also, a high share of those with a monthly income below € 700 and high long-term unemployment rates go along with a high number of homeless people.

From these results, several specific politically relevant conclusions can be drawn. Although the measures undertaken to reduce homelessness are obviously successful (see Introduction), homelessness still exists in North Rhine-Westphalia. It is of paramount importance to study how homelessness can be reduced even further. It becomes obvious that adequate housing market policies may reduce homelessness. For example, council house building should be promoted in order to provide living space for those who cannot afford the minimum amount of gross housing consumption supplied on the market and to ease the tightness of housing markets in the lower quality/size segment. Additionally, approximately 70 % of the homeless in North Rhine-Westphalia would like to rent a small flat for a single person. This needs to be considered when promoting council house building. Also, minimizing search frictions on the housing market could be an effective way to reduce homelessness. Governmental agencies could provide assistance in searching for a suitable flat, so that the available vacancies can be distributed among accommodation seekers more effectively. Furthermore, earmarked state transfers should be granted, so everybody can reach the critical income y_h needed to rent a flat. These transfers are already in place in Germany, but it might be helpful to lower the bureaucratic barriers to register for them in order to make them available for a broader group of people. For example, you need a bank account to be able to receive transfers, but without a permanent residence it is very difficult to get a bank account and, consequently, state transfers. Furthermore, it may just be too complicated for some people to complete all the paperwork needed to register for transfers. Another point worth mentioning is that homelessness is closely related to being long-term unemployed, which is why an effective way to reduce homelessness is to counteract long-term unemployment more successfully than this is happening at the moment, and to place even more emphasis on education.

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