Quality of Life in the Regions – Results for German Counties

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Abstract:

In order to assess differences in living conditions across German regions we apply the hedonic approach of Rosen (1979) and Roback (1982) to interregional income and land-price differences across Germany's counties. Employing a recent survey of more than half a million Germans on a wide range of social and political issues we find that differences in amenities give rise to substantial differences in land-prices; amenities also tend to be positively correlated with income. As the latter possibly indicates some important unobserved composition effects in the regional income structure, we rely on land-price effects in order to compute quality of life indices for all German counties.

Keywords: Land Prices; Regional Income Differentials; Hedonic Regression; Quality of Life; Compensating Wage Differentials

JEL Classification: R22; R32

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1 Introduction

Differences in living conditions, land prices, and in the quality of life always capture a lot of attention by citizens and local governments in Germany as well as in other countries of the world. However, there has been little research on this issue in Germany as compared to the US, for example. This could well be due to a lower degree of household mobility. Moreover, without substantial taxes on real estate the whole issue of the assessment of land-price differences gains much less attention in the German case. The neglect of those issues is, however, surprising since the German system of fiscal federalism places a lot of emphasis on attempts to equalize living conditions. Moreover, since sub-national governments consume a large fraction of the public sector's budget there is a need of an evaluation of sub-national government policies.

Recently some attempts have been made to assess and compare regional growth and labor market prospects and many more possibly relevant indicators (*e.g.*, Prognos, 2004). However, an objective assessment of living conditions faces not only substantial problems in collecting information, it also would have to make rather arbitrary assumptions about how different regional characteristics can be aggregated in order to obtain a comprehensive assessment. Given the substantial difficulties involved we suggest to adopt a market-based, hedonic, approach where problems of both, gathering information as well as aggregating regional characteristics, are solved using the revealed willingness to pay. The hedonic approach, pioneered by Rosen (1979) and Roback (1982), utilizes differences in land-prices and wages across regions to infer the marginal willingness to pay for regional attributes including quantity and quality of public services. Based on corresponding estimates we follow Blomquist, Berger, and Hoehn (1988) and generate an index of the quality of life across German regions. To the best of our knowledge no attempt has been made so far to apply this concept to German regions. This might be due to the lack of information about regional characteristics, in particular with regard to hard-to-measure public services and amenities such as safety, education, or the possibilities for leisure activities.

For this study, however, we utilize a large almost untapped data source, the "Perspektive Deutschland" study 2004/2005. This is a recent survey initiated and conducted by McKinsey among more than half a million households on a wide range of social and political issues and combine this with county-level data from a variety of other sources.

Our results show that, indeed, differences in amenities and dis-amenities do capitalize into land prices, supporting the hedonic approach to land prices. With regard to income, however, we fail to detect compensating wage-differentials for differences in regional amenities. Instead, we tend to find a positive correlation between amenities and wages. Since we show that this cannot be explained by a lack of mobility the results on income point at the difficulties in controlling for individual composition effects in the regional income distribution. Nevertheless, relying on the land-market allows us to derive quality of life indicators for each German county.

The paper proceeds as follows. The following section derives the underlying theoretical model. Section 3 briefly describes the data. Section 4 discusses the investigation approach. Section 5 presents the results from hedonic income and land-price regressions. Section 6 is concerned with the implicit prices and the quality of life index. Section 7 provides our conclusions.

2 Theoretical Background

Consider a spatial equilibrium model with j locations, each of them providing distinct quantities of the (dis-)amenities $a_{j,i}$. Land is scarce such that mobile households and firms compete for locations with high levels of amenities (low levels of disamenities). Spatial equilibrium requires household utility and production costs to be equal across locations such that there is no further arbitrage opportunity by moving. Therefore, regional housing costs and wages have to adjust according to the respective amenity levels at each location.

Let us assume that households have identical preferences and offer each one unit of labor. They earn the regional wage rate w_j and consume a tradable good, the numeraire, and housing h_j. The price of one unit of housing is r_j. Utility maximization yields an indirect utility function with the usual properties. It characterizes the combinations of private consumption and amenities for which households are indifferent between locations

$$u^* = V\left(\underbrace{w_j - r_j}_{x_j}, A_j\right), \tag{1}$$

where private consumption x_j is determined by the household budget constraint $w_j - r_j$, and A_j denotes the bundle of (dis-)amenities $a_{j,i}$ at location j. (Dis-)amenities increase (decrease) household utility

$$\frac{\delta V}{\delta a_{j,i}} > (<)\, 0.$$

Firms produce the numeraire using local labor. A regional attribute $a_{j,i}$ can be a production (dis-) amenity, depending on its effect on unit cost:

$$\frac{\delta c}{\delta a_{j,i}} < (>)\, 0.$$

Profit maximization requires unit cost to equal the price of the produced good in equilibrium:

$$1 = c\left(w_j, A_j\right). \tag{2}$$

In spatial equilibrium equations 1 and 2 are fulfilled simultaneously. This is illustrated graphically in Figure 1. For a given level of amenities A_1 in region 1, all combinations of wages and housing prices that leave the household indifferent with regard to other regions are located on the lower upward sloping line. Unit costs for the same set of attributes A_1 are depicted by the vertical line at the right hand side. The intersection determines the equilibrium levels of housing price r_1 and wage rate w_1. The second set of curves refer to

region 2 which is more attractive for households in the sense that it has more amenities and less disamenities

$$\forall i \text{ where } a_{2,i} \geq (\leq)\ a_{1,i} \qquad \text{if } \frac{\delta V}{\delta a_{1,i}} > (<)\ 0.$$

As a consequence the iso-utility curve shifts up. Let all amenities be production disamenities and vice versa, then, region 2 would be less attractive for firms and the iso-cost curve shifts to the left as price competitiveness requires a decline in wages

$$\forall i \text{ where } a_{2,i} \geq (\leq)\ a_{1,i} \qquad \text{if } \frac{\delta c}{\delta a_{1,i}} < (>)\ 0.$$

As the figure shows, the households settling in region 2 with a higher level of amenities A_2 would earn lower wages and pay a higher rental rate.

The impact on land prices is often referred to as (cross-sectional) capitalization of amenities into the land-price which in our case is only partial, due to the impact on wages. Wage and rental price effects can be used to obtain the implicit price for each amenity $a_{j,i}$, f_i. To see this, differentiate equation (1) and make use of the mobility assumption to obtain:

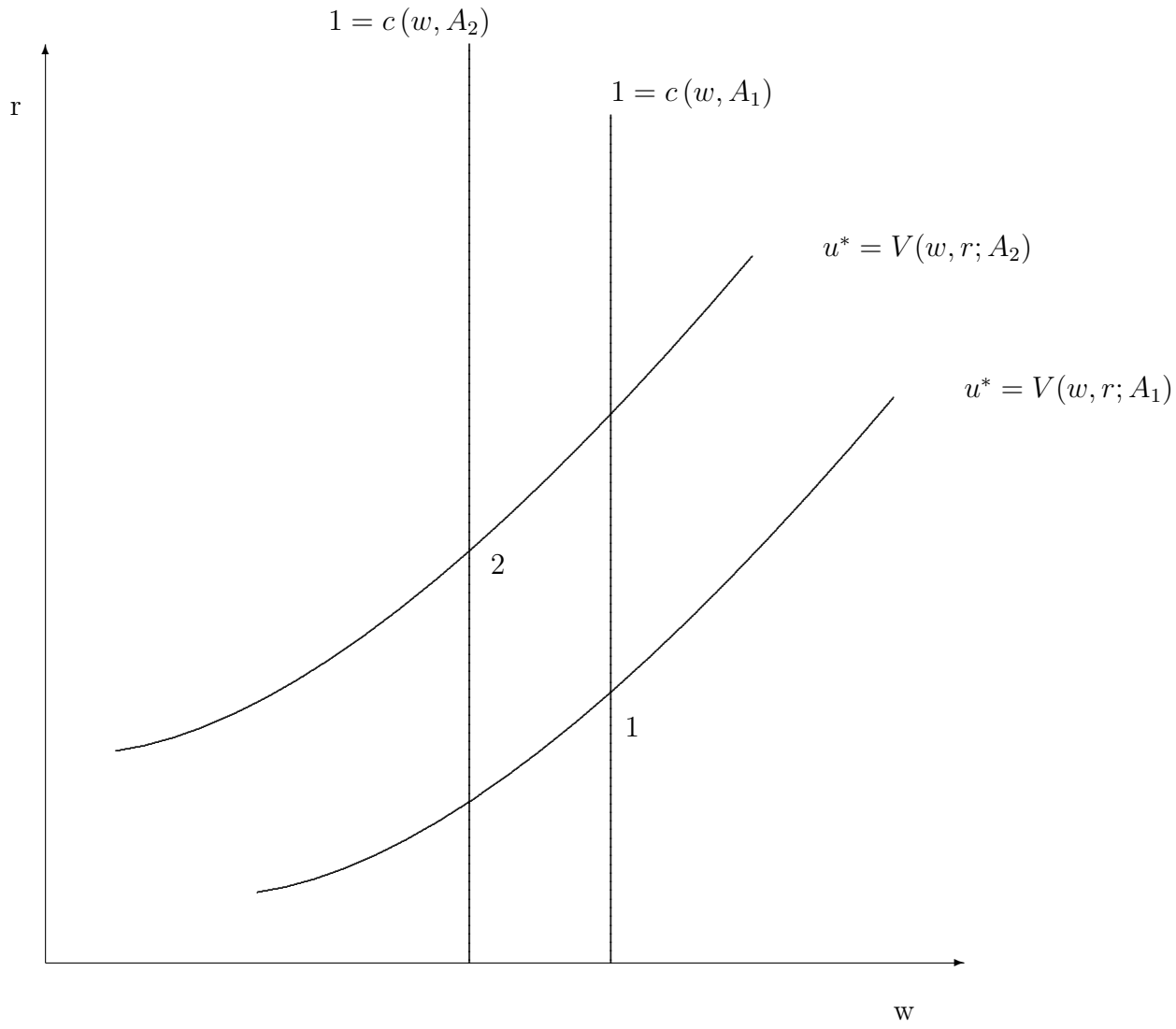
$$\frac{\partial V}{\partial x_j} dw_j - \frac{\partial V}{\partial x_j} dr_j + \frac{\partial V}{\partial a_{j,i}} da_{j,i} = 0.$$

Rearranging yields the implicit price of amenity i

$$f_i \equiv \frac{\partial V}{\partial a_{j,i}} / \frac{\partial V}{\partial x_j} = \frac{dr_j}{da_{j,i}} - \frac{dw_j}{da_{j,i}}. \tag{3}$$

This expression indicates that the marginal assessment of an amenity can be obtained from the price responses of the rental price of land and the wage rate. Given information about price responses to each of the amenities we can construct a weighted average representing the quality of life index. The index is calculated in a straightforward manner by summing

Figure 1: Spatial Equilibrium



up the amenity levels of each region, using the implicit prices as weights:

$$QOL_j = \sum_i f_i a_{ij}. \tag{4}$$

QOL_j is an estimate of the willingness to pay for the bundle of amenities and dis-amenities in region j.

3 Data and Descriptive Statistics

While the above approach has been applied several times to US data, to the best of our knowledge no attempt has been made so far to apply the quality of life concept to German regions. This study is concerned with the German counties. Germany comprises 439 counties including 116 urban counties. Where the latter combine county and municipal responsibilities, the non-urban counties are larger administrative units with groups of, on average, 38 municipalities.

The data used for this analysis come from several sources. We take the micro-level data on household income and individual characteristics from the "Perspektive Deutschland" study 2004/05, a large survey among more than half a million Germans. It reports opinions and valuations of German citizens concerning a variety of aspects of life in Germany and the German regions, respectively. Along with this information, the data set contains information on household income, age, education, local neighborhood, job, etc. Representativity is ensured by correction weights drawn from a parallel field-survey with more than 10,000 participants.

Information on monthly household income is given in eleven income classes (see appendix) and is reported net of taxes and including transfers. We use the means of each income class as dependent variable in our hedonic income estimation. To be in line with the theoretical framework we focus on full-time employed individuals in our analysis.

Apart from household characteristics typically used in Mincer-type wage regressions, we use the citizens' assessment of their regions' situation with respect to security and crime, education, cultural and leisure facilities, the local market for labor, and accessibility and traffic conditions. In the survey, these variables take on the value 1 if the participant considers the aspect in question as being one of the four most urgent problems to be dealt with in her/his residential region. For our purpose, these individual views have been turned into average valuations of the respective issues at the county level. Thus, for each county, we calculate the mean of all respondents' assessments within that county. To facilitate interpretation we recode the variables, such that our regressors take values between zero and one, where a higher value indicates a better situation or less need for improvement (except for crime, where a higher value indicates a worse situation). Thus, formally, we aggregate over individual assessments of amenity i in region j by

$$VAL_{j,i} \equiv \frac{1}{n_j} \sum_{k=1}^{n_j} (\text{urgent} = 0)_{k,j,i} \,,$$

where i refers to the variables leisure, accessibility, education, and labor market.

Land prices are calculated as average prices per sqm sold in 2001 - 2003.[1]

Further data on GDP, surface area, population density, and land prices come from the German federal and regional statistical offices and are taken on the level of the German counties. Data on industry emissions stem from the same source and refer to the German average emission of CH4, NOx and SO2 particles in 27 industry branches. For each county, we calculate the aggregate emission of these particles by the resident industries in tons per sqkm. Finally, the data on sunshine come from the federal meteorological office ("Deutscher Wetterdienst"). They report the average yearly duration of sunshine in 100 hours, calculated from 1961 - 1990 and measured at, at least, one observatory in each of the 97 planning

[1]Most data points are three-year averages. However, some data is missing for privacy reasons and we use 2004 land-prices to obtain three- or at least two-year averages where possible.

Table 1: Descriptive Statistics

Variable name	Mean	Std.Dev.	Min	Max
	Survey data "Perspektive Deutschland"			
Leisure	.760	.071	.569	.967
Crime	.240	.071	.033	.431
Accessibility	.691	.131	.288	.937
Education	.654	.060	.400	.793
Labor market	.283	.175	.017	.769
Household income	2462	336	1750	5000
	County characteristics			
Met.Area	.352	.478	0	1
East	.256	.437	0	1
Density	5.08	6.55	.398	40.2
Sunshine	15.6	.995	13.5	17.7
Emissions	6.06	9.97	.061	80.2
Tourism	4.48	6.50	.200	76.9
GDP	23.7	9.92	11.3	77.9
Land price	119	111	15.0	979

Statistics for 438 counties.

regions.[2] Table 1 presents summary statistics for amenity data, land-prices, and household income. See the appendix for definitions and further description.

4 Investigation Approach

As theory suggests, the full implicit price of any amenity reflects the willingness to pay for each amenity on the markets for land and labor, respectively. To obtain estimates of capitalization into land prices and income-effects induced by an increase in amenity a_i, we

[2]The information of a total of 167 observatories is used to obtain the values on sunshine.

estimate hedonic income and land-price regressions.

In a first step, we regress the natural logarithm of average regional land-prices on our set of regional (dis-)amenities:

$$\ln r_j = \beta_0 + \beta_1 z_j + \beta_2 A_j + \varepsilon_j, \tag{5}$$

where z_j is the vector of land characteristics and A_j is the set of (dis-)amenities in region j. In order to control for possible differences in the supply elasticity of land we include also some indicator of relative size of different types of land in each county.

In a second step, we model the median of the log of monthly net household income reported by full-time employed respondents on their individual characteristics like gender, education, job, etc., the number of adult household members as well as on our set of regional (dis-) amenities:

$$q_{0.5}\left(\ln w_k\right) = \alpha_0 + \alpha_1 x_k + \alpha_2 A_{j(k)} + \varepsilon_k, \tag{6}$$

where $q_{0.5}\left(\ln w_k\right)$ indicates the 50 % quantile of the (logarithmic) income distribution and x_k is a vector of individual characteristics. Given the censoring problem, we employ quantile (median) regression techniques because data on household income is reported in income classes, where the highest interval has no explicit upper bound. The median regressions proved extremely robust against different arbitrary specifications of the upper bound. Since in this Mincer-type wage equation we match micro data on household level with aggregate data on regional amenity levels, we estimate heteroscedasticity and group-correlation consistent standard errors obtained from a block-bootstrap approach. While the theoretical model relies on the strong assumption of perfect mobility, we experiment with different groups of households to identify possible effects of differences in household mobility.

In a third step, the coefficients of both regressions are converted into implicit prices for the amenities. Calculating the marginal effect of an increase in one of the amenities on income directly gives the per month money equivalent a household is willing to pay for the amenity in terms of foregone income. The same approach yields the monthly price paid for

an amenity at the housing market. However, we have to convert the prices per sqm into monthly spending by households. To do so, we multiply the marginal effect of each amenity by a factor h, which represents the monthly housing cost associated with a land price of €1 per squared meter.[3] The full implicit price of amenity i is then simply the housing cost differential minus the income differential following equation (3).

However, the coefficients obtained in regressions (6) and (5) are subject to considerable variation in their statistical significance. In order to provide some information on the precision of estimates, we calculate standard errors for the implicit prices. For this purpose, we employ a monte-carlo simulation approach. Technically, we randomly draw 1000 observations of each amenity coefficient from a multivariate normal distribution with an underlying variance-covariance structure equivalent to that of the respective regression. We then apply the manipulations as described above and finally get a mean value for each implicit price and its corresponding standard deviation.

5 Regression Results

Table 2 shows the results of our regressions of household income and land-prices on the set of amenities. Except for education and GDP, all amenities show a significant impact on the log of land-prices. The signs are as expected: the price for land is higher in regions with more sunshine, more appeal to tourists, or good traffic connections, whereas high levels of industry emissions or high perceived criminality clearly tend to reduce it. There is also little surprise with regard to the local labor-market conditions - the positive coefficient of the respective variable is highly significant.

[3]This factor, $h = 1.06$ is calculated in two steps. The first step provides an estimate of the average lot size used for a housing unit: for this purpose we multiply the average lot size (752.8 sqm) with a rough estimate of the share of land typically consumed by the structure (0.25) divided by the average number of housing units per structure. The second step transforms each € of land value per sqm into monthly cost by fixing the rate of interest to 0.10 and division by 12.

Table 2: Regression Results

Dep.Variable	log Landprice (€ /qm)		log HH Inc. (net)	
Region Characteristics				
Met.area	.106⋆	(.030)	.025⋆	(.006)
East	-.534⋆	(.053)	-.094⋆	(.012)
log Density	.487⋆	(.056)	.009	(.010)
Sunshine	.090⋆	(.018)	.010⋆	(.004)
log Emissions	-.106⋆	(.040)	-.010⋆	(.006)
Tourism	.007⋆	(.002)	-.001⋆	(.000)
Leisure	1.74⋆	(.291)	.121⋆	(.046)
Crime	-.822⋆	(.281)	.088	(.052)
Accessibility	1.01⋆	(.151)	-.021	(.031)
Education	.272	(.342)	.121⋆	(.057)
Labor market prospect	1.47⋆	(.155)	.195⋆	(.025)
GDP	.002	(.003)	.000	(.000)
Individual Characteristics				
German			.021⋆	(.010)
Married			.276⋆	(.003)
Female			-.057⋆	(.004)
Year of birth			.100⋆	(.004)
Year of birth sqrd			-.005⋆	(.0003)
Education			.055⋆	(.004)
Education sqrd.			-.001⋆	(.0001)
No. of household members			.080⋆	(.002)
(Pseudo-)R^2	.896		.217	

An asterisk denotes significance at the 10% level. Land price: robust standard errors in parentheses, 435 observations. Household (HH) Income: block-bootstrapped standard errors in parentheses, 240011 observations, 438 clusters.

Estimation of the Mincer-type income equation yields highly significant coefficients with the expected sign for all of the individual characteristics. However, our results on amenity driven income differentials tend to show a positive correlation between amenities and incomes. In particular, the coefficient of the labor market prospects has a highly significant positive sign. This is clearly ad odds with the idea of compensating wage differentials. To check for the robustness of this result we use different measures for various amenities, especially for the labor market situation. However, the highly significant positive coefficient on our variable in both regressions is a result that is confirmed by all other job market indicators including the local rate of unemployment.

Since land prices reflect actual transactions of land ready for a housing investment, it makes sense to argue that it reflects mobility decisions. However, this is different with the income data which simply report the earnings of the current stock of population. Hence, lack of household mobility might be much more important in the income regressions. However, experimenting with different groups of households, such as households with high income or higher education, or households who show a higher willingness to move did not yield substantive changes in our results. Table 3 reports corresponding results obtained using a sub-sample of households that have expressed a higher willingness to move in the survey. However, at least qualitatively, the results do not change. We cannot say whether the failure to confirm compensatory wage differentials is due to insufficient data, for instance because we only observe household income, or whether this is due to institutional impediments in the labor market, such as the spatial pattern in wage bargaining.

Finally, note that the dummy for eastern German counties remains significantly negative in both regressions. This indicates that the differentials in land prices and income between western and eastern Germany cannot be fully explained by specific amenity differences or by differences in the labor market situation.

Table 3: Income Regression: Further Results

Dep. Variable	log HH Inc. (net) complete sample		log HH Inc. (net) sample of mobile HH	
Region Characteristics				
Met.area	.025⋆	(.006)	.028⋆	(.006)
East	-.094⋆	(.012)	-.087⋆	(.011)
log Density	.009	(.010)	.010	(.010)
Sunshine	.010⋆	(.004)	.010⋆	(.004)
log Emissions	-.010⋆	(.006)	-.011⋆	(.005)
Tourism	-.001⋆	(.000)	-.001⋆	(.000)
Leisure	.121⋆	(.046)	.094	(.049)
Crime	.088	(.052)	.105	(.056)
Accessibility	-.021	(.031)	-.032	(.033)
Education	.121⋆	(.057)	.130	(.053)
Labor market prospect	.195⋆	(.025)	.189⋆	(.026)
GDP	.000	(.000)	.000	(.000)
Individual Characteristics				
German	.021⋆	(.010)	.017	(.012)
Married	.276⋆	(.003)	.277⋆	(.003)
Female	-.057⋆	(.004)	-.066⋆	(.004)
Year of birth	.100⋆	(.004)	.108⋆	(.006)
Year of birth sqrd	-.005⋆	(.0003)	-.005⋆	(.0004)
Education	.055⋆	(.004)	.052⋆	(.004)
Education sqrd.	-.001⋆	(.0001)	-.001⋆	(.0002)
No. of household members	.080⋆	(.002)	.086⋆	(.002)
Pseudo R^2	.217		.225	

An asterisk denotes significance at the 10% level. Complete sample: Block-bootstrapped standard errors in parentheses, 240011 observations, 438 clusters. Sample of mobile HH: Block-bootstrapped standard errors in parentheses, 164786 observations, 438 clusters.

6 Implicit Prices and Quality of Life Index

Table 4 shows two different sets of implicit prices calculated on the basis of our regressions. Column 1 represents the implicit prices for the amenities paid on the market for land. The values in parentheses give the standard deviations of the prices obtained in our monte-carlo simulation to account for differences in statistical significance. For example, the results suggest that households are willing to pay around €1.40 per year to enjoy one more hour of sunshine per year. Put differently, the average German would pay a mark-up of €22.80 per month to live in Freiburg in the South of Germany as compared to Flensburg situated in the North, which shows roughly 200 hours or 8 days less sunshine per year.

Column 2 shows the full implicit price for each amenity calculated according to equation (3) and taking into account the willingness to pay on both, the land and the labor markets. As one can easily see, most of the full implicit prices have the opposite sign of those obtained only from the land-price regressions, which is a rather counter-intuitive result. Basically, the explanation is that the income regression did not show any offsetting income differentials. Consider, for instance, the sunshine variable. Sunshine not only exerts positive effects on the land price but also on income. If the income effects translate into stronger effects on the household budget than the land-price effects, the theory implies that sunshine exerts a depressing effect on utility - otherwise households would be willing to pay even more for housing. This example illustrates that information about the relative size of the wage and land rent in the budget is crucial for a proper calculation. Since we experience difficulties in translating price effects on land into monthly housing cost it seems difficult to rely on the income effects in computing implicit prices and indices of the quality of life. Therefore, we rely on implicit prices obtained from the land-prices only.

While the east dummy basically captures our incapability to adequately capture regional amenities, we can illustrate the relevance of east-west differences by noting that if we would interpret a location in the west to be an amenity, its implicit price amounts to € 67 per

Table 4: Implicit Prices (monthly figures in €)

Specification	(1)		(2)	
Met.Area	13.1	(3.75)	-44.0	(13.9)
Density	12.1	(1.38)	7.95	(4.87)
Tourism	.924	(.250)	3.14	(.998)
Leisure	220.1	(35.6)	-57.5	(112.1)
Accessibility	126.2	(19.2)	180.3	(71.8)
Education	34.0	(43.5)	-238.9	(133.4)
Crime	-103.8	(35.6)	-306.8	(128.5)
Emissions	-2.17	(.808)	1.73	(1.94)
Labormarket	185.7	(19.2)	-262.5	(59.9)
Sunshine	11.4	(2.11)	-10.4	(8.32)
East	-67.0	(6.91)	148	(29.3)
GDP	.189	(.409)	.149	(.999)

(1): Implicit price, land market only. (2): Full implicit price. Standard errors in parentheses. 1000 realizations.

month.

Table 5 summarizes the results for the quality of life for each of the four groups. Accordingly, a total monthly premium of €260 is paid to live in Starnberg rather than in Holzminden, which are, given our set of amenities, the most attractive and the least attractive western counties, respectively. The difference in quality of life is even more pronounced among the urban counties in the west, where the maximal monthly difference is €295. Note, however, that we cannot directly compare between urban counties and rural counties as they differ in their metropolitan status and in density which proved quite significant in the land-price regressions. Similarly, eastern and western counties cannot be compared directly, as the regressions contained a dummy for counties in the east.

Table 6 in the appendix shows the results for each county based on the implicit prices

Table 5: Descriptive Statistics on the Quality of Life (monthly figures in €)

Index	Mean	Std.Dev.	Min	Max
Rural counties (west)	494	50.0	378	638
Urban counties(west)	478	51.0	301	596
Rural counties (east)	452	25.7	403	538
Urban counties(east)	468	35.0	413	551

Calculations are based on the implicit prices according to the land market for tourism, leisure, accessibility, education, crime, emissions, labormarket, and sun.

obtained from the land-prices only. The table also shows the complete ranking of the counties in eastern and western Germany according to the index. To facilitate sensible comparisons, we further distinguish between counties and urban counties.

7 Conclusions

In order to derive comprehensive indicators of the quality of life among German regions, we suggest to adopt a market-based, hedonic, approach where problems of both, gathering information as well as aggregating regional characteristics, are solved using the revealed willingness to pay. Following Rosen (1979) and Roback (1982), we utilize differences in land-prices and incomes across regions to infer the marginal willingness to pay for regional attributes including quantity and quality of public services.

Based on estimates of the cross-sectional capitalization of amenities into land-prices and incomes we follow Blomquist, Berger, and Hoehn (1988) and generate the first index of the quality of life across German regions. For this study, we utilize a large almost untapped data source, the "Perspektive Deutschland" study 2004/2005, a recent survey among more than

half a million households on a wide range of social and political issues and combine this with county-level data from a variety of other sources.

Our results show that, indeed, differences in amenities and dis-amenities do capitalize into land prices, supporting the hedonic approach to land prices. However, with regard to incomes we fail to detect compensating wage-differentials for differences in regional amenities. Instead, we tend to find a positive correlation between amenities and wages. As we show that this cannot be explained by a lack of mobility the results on the wages point at the difficulty to control for individual composition effects in the regional income distribution. Relying on the land-market nevertheless allows us to derive quality of life indicators for each German county.

Accordingly, among rural counties the counties in Bavaria, particularly those in the Munich area, as well as counties in Baden-Wuerttemberg show the highest quality of life. While the picture for urban counties shows less geographical stratification, cities in southern Germany are also ranked highest. For eastern Germany, counties in Brandenburg and in Mecklenburg-Vorpommern are ranked highest.

Appendix: Datasources and Definitions

East : dummy variable that takes the value 1 if region is located in eastern Germany.

Density : population density in 100 persons per sqkm. Taken from the German regional statistical offices (2004).

Sun : average yearly duration of sunshine in 100 Hrs., calculated from 1961 - 1990 and measured at, at least, one meteorological office (a total of 167) at each Raumordnungsregion. Taken from 'Deutscher Wetterdienst'.

Emissions : aggregate emission of CH4, NOx and SO2 particles of 27 industry branches in tons per sqkm. Calculations based on German average emissions per worker of each industry branch and regional occupation figures of the sectors. Data taken from the German regional statistical offices (2004).

Tourism : number of overnight stays per inhabitant. Taken from German federal and regional statistical offices (2003).

GDP : GDP in 1,000 € p.c. Taken from the German regional statistical offices (2003).

Land price : three-year average price in € per sqm land sold. Mostly calculated with data from 2001-2003, data on 2004 or two-year averages are used where information is missing. Taken from the German regional statistical offices.

Household income : Net Household Income in € per month, grouped in eleven income classes as follows. Taken from the Perspektive Deutschland study 2004.

1	0 € - 500 €
2	500 € - 899 €
3	900 € - 1,299 €
4	1,300 € - 1,499 €
5	1,500 € - 1,999 €
6	2,000 € - 2,599 €
7	2,600 € - 3,199 €
8	3,200 € - 4,499 €
9	4,500 € - 5,499 €
10	5,500 € - 5,999 €
11	more than 6,000 €

Throughout the paper, the results are based on a level of € 20,000 for the upper bound in the top income class.

Metropolitan area : dummy variable that takes the value 1 if region is metropolitan area (Regionenklasse Agglomerationsräume according to the scale of the Bundesamt für Bauwesen und Raumordnung). Taken from the Perspektive Deutschland study 2004.

The following variables are taken from the "Perspektive Deutschland" study 2004 and are based on answers to the question "which is the issue to be improved most urgently in your region?"The original variable takes the value 1 if the aspect in question is considered one of the four most urgent problems in the region. We calculate the average assessment of each aspect in each county. We recode the variables, such that our regressors take values between 0 and 1, where a higher value indicates a better situation or less need for improvement (except for crime, where a higher value indicates a worse situation). The interpretation of the derived variables is:

Leisure : local cultural and leisure facilities are considered as satisfactory.

Crime : local delinquency situation needs improvement.

Accessibility : local traffic system/connection to other regions are considered is considered as satisfactory.

Education : local schooling/education facilities are considered as satisfactory.

Labor market : local market for labor is considered as satisfactory.

Table 6: Ranking of Counties and Quality of Life
(monthly figures in €)

Pos.	Counties	QOL	Urban Counties	QOL	Pos.
		Former West Germany			
1	Starnberg	638	Baden-Baden	596	1
2	München	635	Karlsruhe	591	2
3	Freising	631	Heidelberg	583	3
4	Fürstenfeld	612	Freiburg	582	4
5	Miesbach	611	Bonn	564	5
6	Garmisch-P.	608	Münster	561	6
7	Ebersberg	605	Darmstadt	558	7
8	Bad Tölz	598	München	552	8
9	Dachau	591	Mainz	546	9
10	Erding	591	Wiesbaden	546	10
11	Oberallgäu	586	Kempten	534	11
12	Rosenheim	584	Ulm	533	12
13	Karlsruhe	581	Stuttgart	533	13
14	Breisgau	580	Frankfurt a.M.	532	14
15	Weilheim	580	Aschaffenburg	530	15
16	Landsberg a.L.	579	Neustadt	529	16
17	Ludwigsburg	578	Rosenheim	529	17
18	Esslingen	576	Würzburg	521	18
19	Tübingen	575	Landshut	520	19
20	Böblingen	570	Speyer	516	20
21	Eichstätt	568	Landau	514	21
22	Main-Taunus	568	Schwabach	514	22
23	Rems-Murr	566	Düsseldorf	513	23
24	Hochtaunus	563	Fürth	513	24
25	Rastatt	560	Hamburg	513	25
26	Darmstadt	559	Memmingen	511	26
27	Berchtesgaden	555	Koblenz	507	27
28	Bodenseekreis	555	Köln	504	28
29	Groß-Gerau	555	Pforzheim	502	29
30	Lindau	555	Heilbronn	501	30
31	Neu-Ulm	555	Ansbach	499	31

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Pos.	Counties	QOL	Urban Counties	QOL	Pos.
32	Ravensburg	555	Erlangen	494	32
33	Emmendingen	554	Ingolstadt	493	33
34	Regensburg	554	Frankenthal	490	34
35	Traunstein	554	Bielefeld	485	35
36	Rhein-Neckar	552	Mülheim	484	36
37	Aschaffenburg	551	Offenbach	482	37
38	Biberach	551	Essen	481	38
39	Ostallgäu	550	Oberhausen	480	39
40	Alb-Donau	549	Aachen	478	40
41	Rhein-Pfalz	549	Augsburg	477	41
42	Pfaffenhofen	548	Lübeck	476	42
43	Aichach-Friedbg.	545	Worms	476	43
44	Erlangen	544	Kaufbeuren	474	44
45	Offenbach	541	Regensburg	472	45
46	Calw	537	Saarbrücken	472	46
47	Konstanz	537	Passau	471	47
48	Mainz-Bingen	537	Straubing	471	48
49	Lörrach	536	Oldenburg	470	49
50	Enzkreis	535	Osnabrück	470	50
51	Landshut	535	Dortmund	469	51
52	Reutlingen	535	Wolfsburg	468	52
53	Nürnberger L.	534	Braunschweig	467	53
54	Augsburg	533	Mannheim	462	54
55	Bergstraße	533	Hagen	460	55
56	Hohenlohe	533	Krefeld	459	56
57	Rottweil	532	Nürnberg	459	57
58	Tuttlingen	532	Hamm	457	58
59	Heilbronn	531	M.gladbach	456	59
60	Bad Dürkheim	530	Kiel	456	60
61	Göppingen	530	Wuppertal	454	61
62	Neuburg-Sch.	529	Bottrop	453	62
63	Würzburg	529	Bochum	452	63
64	Dingolfing	528	Neumünster	451	64
65	Fürth	528	Trier	448	65
66	Ortenau	526	Leverkusen	448	66

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Pos.	Counties	QOL	Urban Counties	QOL	Pos.
67	Rheingau-Taunus	525	Delmenhorst	445	67
68	Unterallgäu	524	Gelsenkirchen	445	68
69	Neumarkt	524	Solingen	444	69
70	Roth	521	Hof	443	70
71	Freudenstadt	520	Weiden	441	71
72	Main-Kinzig	519	Duisburg	440	72
73	Stormarn	518	Bamberg	437	73
74	Wetterau	518	Bremen	437	74
75	Schwarzwald	517	Kassel	435	75
76	Günzburg	515	Kaiserslautern	432	76
77	Neuss	515	Wilhelmshaven	430	77
78	Kelheim	514	Salzgitter	429	78
79	Miltenberg	514	Bayreuth	424	79
80	Straubing	514	Emden	424	80
81	Dillingen	513	Flensburg	423	81
82	Rhein-Sieg	511	Amberg	422	82
83	Ostholstein	510	Bremerhaven	422	83
84	Südl. Weinstr.	510	Zweibrücken	422	84
85	Forchheim	509	Herne	417	85
86	Hannover	508	Remscheid	413	86
87	Erftkreis	507	Coburg	401	87
88	Germersheim	507	Ludwigshafen	379	88
89	Pinneberg	507	Pirmasens	372	89
90	Schwäbisch Hall	506	Schweinfurt	301	90
91	Donau-Ries	505			
92	Rheinisch-Berg.	505			
93	Lüneburg	503			
94	Bamberg	501			
95	Altötting	500			
96	Ahrweiler	498			
97	Passau	497			
98	Gießen	496			
99	Mühldorf a.I.	496			
100	Alzey-Worms	495			
101	Mettmann	495			

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Pos.	Counties	QOL	Urban Counties	QOL	Pos.
102	Steinfurt	495			
103	Nordfriesland	494			
104	Mayen-Koblenz	493			
105	Coesfeld	492			
106	Kitzingen	492			
107	Segeberg	492			
108	St. Wendel	489			
109	Neustadt a.d.A.	488			
110	Aachen	487			
111	Ansbach	487			
112	Vechta	487			
113	Harburg	486			
114	Main-Spessart	486			
115	Rendsburg	486			
116	Olpe	485			
117	Verden	485			
118	Zollernalb	485			
119	Lauenburg	483			
120	Oldenburg	482			
121	Plön	482			
122	Main-Tauber	481			
123	Paderborn	481			
124	Deggendorf	480			
125	Düren	480			
126	Peine	480			
127	Regen	480			
128	Viersen	480			
129	Osnabrück	479			
130	Euskirchen	477			
131	Ostalb	477			
132	Wesel	477			
133	Bad Kreuznach	476			
134	Saarpfalz	475			
135	Waldshut	474			
136	Ennepe-Ruhr	473			

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Pos.	Counties	QOL	Urban Counties	QOL	Pos.
137	Rhein-Lahn	473			
138	Göttingen	472			
139	Neunkirchen	472			
140	Fulda	471			
141	Herford	471			
142	Schweinfurt	471			
143	Sigmaringen	471			
144	Ammerland	470			
145	Bernkastel	470			
146	Schwandorf	469			
147	Wolfenbüttel	469			
148	Helmstedt	468			
149	Merzig-Wadern	468			
150	Rottal-Inn	468			
151	Soltau	468			
152	Gifhorn	467			
153	Weißenburg	467			
154	Bad Kissingen	466			
155	Bayreuth	466			
156	Borken	466			
157	Cham	466			
158	Diepholz	466			
159	Lahn-Dill	466			
160	Neuwied	466			
161	Saarlouis	466			
162	Warendorf	466			
163	Hildesheim	465			
164	Gütersloh	465			
165	Lippe	465			
166	Heinsberg	463			
167	Marburg	463			
168	Recklinghausen	463			
169	Steinburg	462			
170	Unna	462			
171	Westerwald	462			

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Pos.	Counties	QOL	Urban Counties	QOL	Pos.
172	Cochem-Zell	461			
173	Goslar	461			
174	Neckar-Odenwald	461			
175	Amberg	460			
176	Friesland	460			
177	Kleve	460			
178	Limburg	459			
179	Lichtenfels	458			
180	Trier-Saarburg	458			
181	Schaumburg	457			
182	Freyung	455			
183	Minden	455			
184	Emsland	454			
185	Neustadt a.d.W.	454			
186	Osterholz	454			
187	Siegen	454			
188	Soest	454			
189	Cloppenburg	453			
190	Heidenheim	453			
191	Rotenburg	451			
192	Höxter	450			
193	Kassel	450			
194	Oberbergischer K.	450			
195	Kaiserslautern	449			
196	Hof	449			
197	Hochsauerland	449			
198	Hameln-Pyrmont	449			
199	Schleswig-Fl.	448			
200	Rhein-Hunsrück	447			
201	Stade	446			
202	Wittmund	445			
203	Aurich	444			
204	Bentheim	444			
205	Märkischer K.	444			
206	Odenwald	444			

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Pos.	Counties	QOL	Urban Counties	QOL	Pos.
207	Dithmarschen	442			
208	Uelzen	442			
209	Bitburg-Prüm	440			
210	Kulmbach	440			
211	Leer	440			
212	Nienburg	439			
213	Altenkirchen	438			
214	Haßberge	438			
215	Hersfeld	437			
216	Wesermarsch	436			
217	Celle	435			
218	Cuxhaven	434			
219	Coburg	433			
220	Northeim	431			
221	Schwalm-Eder	430			
222	Donnersberg	429			
223	Rhön-Grabfeld	429			
224	Kusel	425			
225	Daun	424			
226	Tirschenreuth	422			
227	Waldeck	422			
228	Birkenfeld	420			
229	Südwestpfalz	415			
230	Vogelsberg	414			
231	Wunsiedel	410			
232	Lüchow-D.	408			
233	Osterode	407			
234	Werra-Meißner	406			
235	Kronach	399			
236	Holzminden	378			
		Former East Germany			
1	Rügen	538	Frankfurt a.d.O.	551	1
2	Ostvorpommern	516	Potsdam	541	2
3	Potsdam	505	Weimar	502	3
4	Bad Doberan	498	Jena	501	4

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Pos.	Counties	QOL	Urban Counties	QOL	Pos.
5	Nordvorpommern	491	Brandenburg	498	5
6	Dahme-Spreewald	487	Berlin	497	6
7	Barnim	482	Dresden	494	7
8	Müritz	478	Erfurt	493	8
9	Oder-Spree	478	Leipzig	486	9
10	Weißeritz	478	Rostock	481	10
11	Weimarer L.	477	Dessau	470	11
12	Köthen	475	Halle	466	12
13	Teltow-Fläming	475	Schwerin	465	13
14	Güstrow	474	Eisenach	465	14
15	Märkisch-Oderl.	473	Magdeburg	464	15
16	Sächsische Schw.	471	Stralsund	464	16
17	Saale-Holzland	471	Greifswald	462	17
18	Gotha	470	Cottbus	461	18
19	Meißen	470	Gera	447	19
20	Oberhavel	470	Suhl	443	20
21	Bernburg	469	Chemnitz	441	21
22	Leipziger L.	469	Neubrandenburg	434	22
23	Oberspreewald	469	Wismar	431	23
24	Wernigerode	466	Plauen	428	24
25	Uckermark	466	Görlitz	421	25
26	Ohrekreis	464	Hoyerswerda	417	26
27	Bautzen	463	Zwickau	413	27
28	Bitterfeld	463			
29	Delitzsch	463			
30	Havelland	463			
31	Uecker-Randow	462			
32	Saalkreis	462			
33	Ilm-Kreis	461			
34	Mecklenburg	461			
35	Parchim	461			
36	Muldental	459			
37	Döbeln	458			
38	Anhalt-Zerbst	457			
39	Kamenz	457			

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Pos.	Counties	QOL	Urban Counties	QOL	Pos.
40	Ostprignitz	457			
41	Jerichower L.	455			
42	N.W.Mecklenburg	455			
43	Bördekreis	452			
44	Burgenland	449			
45	Schönebeck	449			
46	Sömmerda	449			
47	Riesa	448			
48	Spree-Neiße	447			
49	Wartburg	447			
50	Wittenberg	447			
51	Aschersleben	446			
52	Freiberg	445			
53	Nordhausen	444			
54	Greiz	443			
55	Chemnitzer L.	443			
56	Stollberg	439			
57	Altenburger L.	437			
58	Demmin	436			
59	Sangerhausen	436			
60	Schmalkalden	436			
61	Merseburg	434			
62	Elbe-Elster	433			
63	Vogtland	433			
64	Halberstadt	432			
65	Mittweida	432			
66	Saalfeld	430			
67	Aue	429			
68	Prignitz	429			
69	Ludwigslust	428			
70	Eichsfeld	426			
71	N. Oberlausitz	426			
72	Saale-Orla	426			
73	Weißenfels	425			
74	Mansfelder L.	421			

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Pos.	Counties	QOL	Urban Counties	QOL	Pos.
75	Sonneberg	420			
76	Löbau-Zittau	418			
77	Quedlinburg	418			
78	Stendal	417			
79	Hildburghausen	413			
80	Annaberg	412			
81	Altmark	410			
82	Kyffhäuser	410			
83	Torgau	409			
84	Mittl. Erzgebirg	409			
85	Unstrut-Hainich	403			

Ranking of counties in Germany, sorted by QOL using implicit prices on land markets considering tourism, leisure, accessibility, education, crime, emissions, labormarket prospect, and sunshine.

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