Are workers compensated by cheaper housing in regions where unemployment is high? Theory and evidence from a housing demand survey

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Abstract: *The empirical wage curve literature has demonstrated that workers in high-unemployment regions earn less. At the same time, many labour markets, especially in Europe, are characterised by persistent regional unemployment differentials and a low interregional labour mobility rate. It is argued in this paper that workers in high-unemployment regions are compensated in the housing market, which discourages migration to low-unemployment regions. We derive a multiregional efficiency wage model allowing for endogenous land prices, and therefore house prices, as well as endogenous lot sizes. It is shown that in high-unemployment regions, land prices are lower and lot sizes are larger. Therefore, aggregate regional house price data misrepresent the compensating differential. Employing a Dutch housing demand survey, we show that attribute corrected house prices and rents are 10.4 respectively 2.4 percent lower when regional unemployment is one percent higher.*

I   Introduction

In recent years, there has been an increased interest in the interaction between regional housing and labour markets. A (mainly British) literature has built up that investigates the role of housing markets in discouraging labour migration. A first channel of interaction, according to this literature, is that labour migrants are hampered in finding suitable residences because of housing markets institutions.[1] Secondly, it is argued that cost-of-living differentials, and house price differentials in particular, discourage migration to low-unemployment regions (Bover et al., 1989). Econometric evidence in support of the latter hypothesis has been provided by Jackman and Savouri (1992) and Cameron and Muellbauer (1998) employing aggregate data.

Our present paper expands on the notion that regional house price differentials relate to unemployment. We argue, and verify empirically, that workers in high-unemployment regions are compensated through the housing market. It has been shown by Blanchflower and Oswald (1994) that, contrary to the predictions of the Harris-Todaro model (1970), workers in these regions appear not to be compensated through wages. Nevertheless, regional unemployment differentials tend to persist, especially in European labour markets (OECD, 1989, 1990, 2000, Decressin and Fatas, 1995).[2] Our hypothesis that compensation does not occur through wages but through house prices may to some extent reconcile these conflicting observations.

In the theoretical part of this paper, we extend an efficiency wage model from Blanchflower and Oswald (1994) with endogenous land prices. It is shown that land prices are lower in high-unemployment regions, so workers are compensated in the land market. We also consider housing attributes, distinguishing size and quality attributes. This distinction is relevant, because the price of size attributes is region-specific, whereas the price of quality attributes is not. It is derived that in regions where land prices are higher, households tend to buy less size attributes. This implies that workers in high-unemployment regions live in houses that are cheaper *and* larger. Aggregate regional house price data may therefore underestimate the compensating differential.

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[1] More specifically, Hughes and McCormick (1987) argue that the private rental sector in the U.K. has been squeezed between the tax-benefited owner-occupier sector and a highly regulated "council housing" sector, causing scarcity of short-term housing for migrants (cf. Minford et al, 1987, McCormick, 1997).

[2] A common explanation for rigidity of European labour markets is their relatively generous institutions (Blanchard and Summers, 1986, Layard et al., 1991, Nickell, 1997). However, such an explanation may be more satisfactory on the national than on the regional level.

Using data from a Dutch housing demand survey, we account for the systematic regional variation in housing attributes in an empirical analysis of compensating house price differentials. The survey includes both size attributes (e.g. a garden) and quality attributes (e.g. double-glazing). Our method is to regress house prices on these attributes and on 40 region dummies. Coefficients of the region dummies are interpreted as regional house price differentials that can not be explained by housing attributes. Comparing these corrected house price differentials with regional unemployment differentials, we establish a negative relationship.

For estimation of the house price equations, we distinguish an owner-occupier and a rental sector. Regulation on the latter market is substantial, so that regional rent differentials are expected to be relatively small. In addition, the data include the employment status of the households' breadwinner. This allows us to verify, for a limited number of regions, to what extent price and housing attribute differentials accrue to the unemployed or to other individuals.

The outline of the paper is as follows. In the next section, we extend an efficiency wage model, which establishes a negative relationship between regional unemployment and house prices. In Section 3, we discuss hedonic price equations used to obtain attribute-corrected prices and we introduce the data. Section 4 relates house price differentials for Dutch regions to regional unemployment rates. We conclude in Section 5, and discuss directions for future research.

II   An efficiency wage model with endogenous land prices

This section derives a negative relationship between regional unemployment and house prices. We extend an efficiency wage model proposed in Blanchflower and Oswald (1994, section 3.2), henceforth referred to as BO. In their model, a high level of regional unemployment is associated with a low level of wages. Employees in a high-unemployment region are keen to keep their job, because it will be difficult to find another. Therefore, firms need to pay lower wages to extract the required level of effort from workers. It is assumed that migration is costly, so that individuals migrate only if one region offers a better *expected* utility than another. In equilibrium, wage and unemployment differences between regions must therefore be compensated by, for example, non-pecuniary amenity differentials.

In our extension, wage and unemployment differences are not compensated by *exogenous* amenity differentials, but by *endogenous* land price differentials.[3] We assume that workers buy a piece of land in the region where they work and on this land they put their house. There is no interregional commuting. Furthermore, we assume that the price of land depends positively on the number of inhabitants in a region. This assumption can be justified in several ways. The amount of inhabitable land in a region is fixed, at least in the short run. When more people bid for a fixed supply of some good, its price will go up under very mild conditions. According to the urban economics literature, the positive relationship between land prices and the size of the population holds *even when the supply of inhabitable land is perfectly elastic*. The basic assumption in that literature is that within a regional labour market, employees work at the same location, a central business district, which is surrounded by a residential area. The average commuting costs increase when the size of the working population increases, which is reflected in land prices in turn.[4]

The basic model

In the most elementary model, we assume that lot sizes in all regions are constant and normalised to unity. Extensions to this model will be discussed further in this section.

We consider two regions that each produce distinct goods under constant returns to scale for perfectly competitive international markets (cf. BO, p. 81). Hence, the prices of these goods are exogenously determined. It is assumed that the price for one good is higher than for the other, so that wages differ between regions.[5] We will presume that the wage in region 1 exceeds the wage in region 2.

Workers are free to choose a region of residence and they are assumed to choose the region that renders the highest *expected* utility during a period.[6] During this period they may

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[3] In their basic model, regional differences in exogenous non-pecuniary amenities play an essential role, whereas regional differences endogenously in land prices do not receive any explicit attention in the theoretical analysis. Given the assumption of endogenously determined land prices, it can be easily seen that the role of non-pecuniary amenities disappears, because land prices fully compensate for differences in amenities.

[4] A general result in this type of model is that the total value of occupied land in the economy is equal to the total value of commuting costs in the economy (Fujita, 1989). The intuitive explanation for this result is that workers choose a residential location and pay an endogenously determined land price such that in equilibrium all employees with higher commuting costs are compensated for these commuting costs by lower land prices (relative to the employee with zero commuting costs).

[5] This assumption may be justified by heterogeneity in regional endowments, like differences in accessibility to international markets, or by economies of agglomeration for example. It is not material to our results.

[6] This assumption can be phrased by assuming that workers have to choose the region at the beginning of the period, but are not allowed to move during the period.

be employed or unemployed, the probabilities being known to them in advance.[7] The utility of an employed worker equals $w - e + \eta(S) - HS$, where w denotes the wage and e denotes work effort, η denotes the utility enjoyed of a house. The lot size of the house is equal to S. Land prices are denoted as H. It is assumed that e is either a fixed positive number determined by technology, or zero. In the latter case, the worker shirks. When shirking, the workers may be fired with probability $1 - \delta$. In equilibrium there is no shirking. The utility enjoyed by unemployed workers equals $b + \eta(S) - HS$, where b denotes the exogenous unemployment benefit. The probability of finding work $\alpha(u)$ depends negatively on the unemployment rate u in a convex way.

The labour markets of both regions are identical apart from the exogenous wage differences. Land prices are endogenous. For simplicity, we will assume that the height of the building (the capital intensity per square kilometre) is constant, so land prices can be interpreted as house prices. Initially we assume that residence lot size S is constant and standardised to 1, so lot sizes are fixed and land prices can be interpreted as housing expenditure. For convenience, we suppose that $\eta(1) = 0$. Given these assumptions, a *no shirking condition* derives to the following equation for both regions (cf. BO, p. 67):

$$w_i = e + b + \frac{e\delta}{[1-\delta][1-\alpha(u_i)]} \quad , i = 1, 2 \tag{1}$$

It can be shown that $u > 0$, so there exists involuntary unemployment in equilibrium (proposition 2.2). Equation (1) establishes a negative relationship between regional wages and unemployment, *the wage curve*. The intuitive explanation behind it is that wages in each region must be just enough to dissuade employees from shirking. Hence, wages are set by employers to compensate employed workers for the sum of the effort and the unemployment benefit and pay also a mark-up to prevent workers from shirking.[8]

Because employed workers compare their utility to the utility enjoyed when they would be unemployed, the non-shirking condition does *not* depend on any regional characteristic that affects the utility in a linear way.[9] Hence, because by assumption, *within* a

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[7] Alternatively, it can be assumed that the regions experience random shocks. Workers experience spells of employment and unemployment as a result (cf. BO, p. 67).
[8] In our model, regional wages are fixed. This means that equilibrium unemployment in each region must be just high enough to discourage workers from shirking.
[9] Suppose however, that there would be decreasing marginal utility of income. Real regional benefit differentials would then enter nonlinearly, and they would affect the level of regional unemployment.

region, land prices are identical for the employed and unemployed, the non-shirking condition is independent of the land price H.

Let L denotes the working population in a region, $H = h(L)$, where we assume that $h'(L) > 0$. For convenience, we normalise the land price in region 2 to one, $H_2 = 1$. In equilibrium, migration between regions is zero by assumption. Equilibrium requires then that the *expected* utility is identical in both regions. This implies (cf. BO, p. 81):

$$[w_1 - e - H_1]\alpha(u_1) + [b - H_1][1 - \alpha(u_1)] = [w_2 - e - 1]\alpha(u_2) + [b - 1][1 - \alpha(u_2)] \qquad (2)$$

The above equation has a straightforward interpretation. For example the employed utility in region 1 is equal to $w_1 - e_1 - H_1$, whereas the unemployed utility is equal to $b - H_1$. So, the expected utility in regions is determined by the probability of finding work $\alpha(u_1)$. From this equation we can solve H_1. Since by assumption $w_1 > w_2$, we have from equation (1) that $u_1 < u_2$. It follows that $H_1 > 1$.[10] Higher wages and lower unemployment in region 1 will attract migrants as long as H_1 is below its equilibrium value, but the population increase will raise land prices. In equilibrium, the superior labour market perspectives in this region will be exactly counterbalanced by higher land prices. Furthermore, it can be shown that the equilibrium land price in region 1 is negatively related to the local unemployment rate.[11] We conclude that *in a region where unemployment is high and wages are low, workers are compensated through land markets*. Following BO's proposition 2.7 (p. 74), the above result can be generalised to a multi-regional economy.

Endogenous lot size

It is straightforward to extend the basic model with endogenous lot sizes. Relaxing our assumptions about fixed lot sizes, the *no migration condition* reads:

$$[w_1 - e + \eta(S_1) - H_1 S_1]\alpha(u_1) + [b + \eta(S_1) - H_1 S_1][1 - \alpha(u_1)]$$
$$= [w_2 - e + \eta(S_2) - H_2 S_2]\alpha(u_2) + [b + \eta(S_2) - H_2 S_2][1 - \alpha(u_2)] \qquad (3)$$

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[10] *Proof:* From equation (2) we derive $H_1 = 1 + w_1\alpha(u_1) - w_2\alpha(u_2) - [e + b][\alpha(u_1) - \alpha(u_2)]$. We have $w_1 > w_2$, $u_1 < u_2$ and therefore $\alpha(u_1) > \alpha(u_2)$. In addition, it must hold that $w_i - e > b$ (from equation 1). Therefore, $[e + b][\alpha(u_1) - \alpha(u_2)] < w_2[\alpha(u_1) - \alpha(u_2)] < w_1\alpha(u_1) - w_2\alpha(u_2)$. It follows that $H_1 > 1$. (Note that the inequality would also hold when $w_1 = w_2$, so formally, we only need a nonnegative relationship between regional unemployment and wages.)

Now suppose that utility depends on lot size in a concave way, $\eta'(S) > 0; \eta''(S) < 0$. Households maximise $\eta(S) - HS$ over S, so for both regions it holds that $\eta'(S_i) = H_i$. Land prices are determined by these conditions and equation (3). It can be shown that $H_1 > H_2$ and $S_1 < S_2$.[12] This means that *in a region where unemployment is high and wages are low, land is cheaper and workers have larger lot sizes.* Again, this result generalises to an arbitrary number of regions.

The result that households buy larger lot sizes in regions where land is cheaper is hardly surprising, but it is important for the evaluation of compensation through land markets. In our model, the regional house price equals H_iS_i. Apriori, this price can be lower as well as higher in high- unemployment regions, simply because workers may buy more land. Therefore, *an analysis of aggregate regional house prices that ignores lot sizes may underestimate the compensating differential.* For this reason, we use a housing demand survey to correct for attributes related to the size of houses in the empirical part of our paper.

III   Estimation of attribute-corrected regional house prices

Housing is a heterogeneous good that varies in size, age, building quality and numerous other attributes. These attributes are reflected in the house price. We have seen in the previous section that ignoring the variation in lot sizes may lead to underestimation of regional compensation through housing markets. In this section we use microdata that distinguish numerous attributes, to deal with heterogeneity of the regional housing stock.

We divide the observed housing attributes into *size attributes* (position of the house, availability of garden, number of rooms etc.) and *quality attributes* (central heating, double glazing etc.). There will be a regional component to the price of size attributes, if land markets compensate for regional labour market perspectives. There is no obvious reason why there would be regional variation in the price of quality attributes. It may therefore be expected that

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[11] *Proof:* We simply differentiate the expression for H_1 to u_1, bearing in mind that w_1 is a function of u_1. This yields: $\partial H_1 / \partial w_1 = \alpha(u_1) \partial w_1(u_1) / \partial u_1 + [w_1(u_1) - e - b] \partial \alpha(u_1) / \partial u_1$. The derivatives of w_1 and α with respect to u_1 are negative. Recalling that $w_i - e > b$ and $\alpha > 0$, it follows that $\partial H_1 / \partial w_1 < 0$.

[12] *Proof:* Again, we have that in equilibrium, the superior labour market perspectives in region 1 must be compensated through the land market. Therefore, it must hold that $\eta(S_1) - H_1S_1 < \eta(S_2) - H_2S_2$. We substitute $\eta'(S_i) = H_i$ and write $f(S) = \eta(S) - \eta'(S)S$. The inequality $f(S_1) < f(S_2)$ implies that $S_1 < S_2$ if the function f

people in high-unemployment regions consume more size attributes, and people in low-unemployment regions consume more quality attributes.

We regress house prices on a number of observed housing attributes and region dummies, estimation of hedonic price equations being a standard approach to deal with attribute heterogeneity. The dummies are interpreted as the regional price differential that cannot be explained by observed attributes.[13]

For the estimation of this hedonic price equation, we distinguish between renters and owners.[14] This is relevant, because the level of the rent in the Dutch rental market is regulated at the national level, effecting virtually all houses (more than 90%) in the rental market. Essentially, the rent of a house is determined by governmental rules, which determine the maximum rent (and the maximum change in the rent each year). The maximum rent depends on housing attributes (and some local environmental characteristics), but *not* on the regional labour market region. Hence, the regional variation in rents is less than in house prices due to *exogenous* regulation.

The equations take the following form:

$$\log(price) = \beta^O X + D_r^O + \varepsilon^O \tag{4}$$

$$\log(rent) = \beta^R X + D_r^R + \varepsilon^R \tag{5}$$

Equation (4) presents a model for the logarithm of house prices in the owner-occupier sector. This variable is regressed on a number of observable attributes X and region dummies D_r^O, where subscript r denotes region. The superscript O indicates that coefficients and region dummies are specific to this sector.[15] The dummy D_r^O is the regional house price, controlled for size and quality attributes. Similarly, coefficients in the rent equation (5) have

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is monotonously increasing. Indeed, we derive $f'(S) = -\eta''(S)S$, which is positive since $\eta''(S) < 0$. Now that we have shown that $S_1 < S_2$, it follows that $H_1 > H_2$ from the conditions $\eta'(S_i) = H_i$ and $\eta''(S) < 0$.

[13] These attributes-controlled price differentials reflect regional differences in *amenities* as well as regional differences in labour market perspectives. In the current paper, we are interested to relate these price differences directly to unemployment differences. Differences in exogenous amenities may also cause differences in unemployment.

[14] This distinction is necessary, because a rent cannot be directly compared to a house price. An additional advantage of such a distinction is that a different valuation of attributes for renters and owners is allowed for.

[15] The coefficient β_i^O is the percentage increase in house price due to a unit increase of attribute X_i.

superscript R and the dummy D_r^R is the regional rent, controlled for attributes. Note that the same set of observable characteristics is used in both equations.[16]

Both hedonic price equations are estimated on the 1998 Dutch housing demand survey (WBO 1998).[17] It contains information on a host of housing attributes, as well as the labour market status of the members of the households. Therefore we can distinguish between the unemployed and the employed. Observations are weighted, where the weights have been supplied by the Statistics Netherlands to make the sample representative (some groups have been oversampled on purpose). As dependent variables we use logarithms of the self-reported value of the house price and the basic rent.[18] We include 40 regional labour market dummies.[19]

Equation (4) and (5) have been estimated using ordinary least squares (OLS). Table 3 in the appendix provides estimation results. House attributes appear statistically significant and with expected sign in both equations.[20] It turns out that *size attributes have a particularly strong effect on both house prices and rents*. The type of dwelling dummies (freestanding houses, semi-detached houses etc.) have the largest impact by far.[21] In the owner-occupier sector, prices for houses are about 25 percent higher than apartments. Freestanding houses are on average 50 percent more expensive than apartments. In the rental sector, rents for houses are about ten percent higher than for apartments.[22]

The overall impression is that rental differentials related to observed housing attributes are set in line with owner-occupier house price differentials, suggesting that governmental rules regarding the monetary value of housing attributes are set in line with a non-regulated market. Similarly, the *region dummy* coefficients for the two sectors are strongly correlated. However, the regional variation in house prices appears to be much larger than the variation

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[16] Note further that we do *not* include any information on household characteristics, such as number of inhabitants, children or household income. So, strictly speaking, we do *not* estimate a hedonic price equation (which captures demand and supply), but a price equation which controls for housing attributes and region.

[17] This survey has been held once in the four year since the seventies, with an average sample of about 100,000 households.

[18] The self-reported house price provides a reliable estimate of the real value of the house (DiPasquale and Somerville (1995) and Goodman and Ittner (1992)). The housing demand survey contains several measures for the rent. We employ the 'basic rent', which excludes expenses on heating etc.

[19] These regions have been defined such that they largely reflect self-contained labour markets. The large majority of workers (about 70% in 1998) lives and works in the same region.

[20] The year of construction dummies indicate that houses built just after the second world war are worth less that those built before or after (probably reflecting poor quality of construction during that period), but in general the more recently constructed houses are the most valuable. Rents seem to be more sensitive to the period of construction than prices in the owner-occupier sector.

[21] Unfortunately, our data do not observe the actual size of dwelling, or of the lot. Therefore, we consider space attributes that proxy lot size.

in rents (the standard deviation is three times higher). Arguably, regulation prevents rents from fully capturing regional differences in labour market perspectives and amenities.

IV   Regional unemployment and house price differentials

In order to establish a negative relationship between regional unemployment and house prices, we compare the 40 region dummy coefficients for the two sectors with unemployment rates. Before doing that, however, we analyse house price and unemployment differentials for only four Dutch regions. The first reason to do so is that this allows us to explore the regional differentiation of space and quality attributes without getting lost in the data. Moreover, the housing demand survey observes labour market status. We want to verify to what extent the house price differentials accrue to the unemployed.[23] The small number of unemployed that are observed in the sample are not sufficient to distinguish 40 regions.
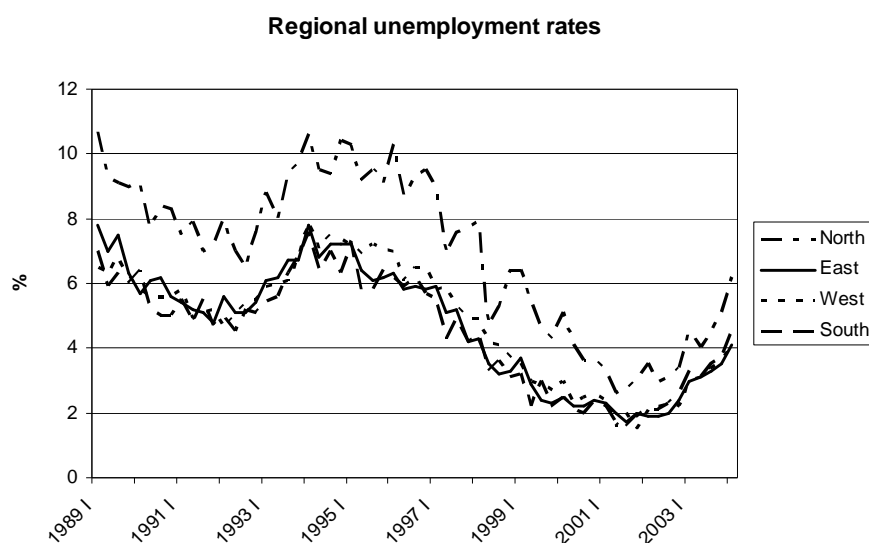
Regional unemployment rates

Figure 1: 1989 – 2003 quarterly unemployment rates for four regions,
source: Statistics Netherlands

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[22] We excluded freestanding houses in the rental sector analysis, because freestanding houses are very rare in this sector.

[23] It may be that the people benefiting from large and cheap dwellings are not the same as the workers that face a large risk of unemployment. Or alternatively, in large cities average house prices are usually high, but prices (or

Analysis of four regions

Figure 1 introduces the four regions in the Netherlands that we study, by presenting unemployment rate time series between 1989 and 2003. This figure demonstrates the persistence of regional unemployment differentials. Whereas unemployment rates in the East, West and South were at a similar level for the fourteen years we observe, the unemployment rate in the North has been consistently higher.[24] Therefore, we expect that house prices in this region are lower. Furthermore, it is useful to bare in mind that the West, containing the four largest cities in the Netherlands, is the most densely populated region.

We proceed by evaluating the regional variation in size and quality housing attributes, shown in Table 4 in the appendix. It appears that dwellings in the West have the least space attributes, and dwelling in the North has the most. Notably, the share of freestanding houses is almost three times as high in the North as it is in the West. Households in the West appear to compensate the smaller size of their house with buying more quality attributes. For example, the share of houses with central heating or double-glazing is clearly highest in this region.

Table 1: Regional house price and rent differences.

Regional price differentials	Owner-occupier		Rental	
		Corrected		Corrected
North	-0.262	-0.380	-0.143	-0.109
	(0.007)	(0.006)	(0.006)	(0.005)
East	-0.007	-0.106	-0.049	-0.064
	(0.006)	(0.004)	(0.005)	(0.004)
South	-0.009	-0.129	-0.031	-0.058
	(0.005)	(0.004)	(0.005)	(0.004)

Note: Standard errors between brackets. West is the reference region; the second and fourth columns correct for housing attributes.

Table 1 shows regional house price and rent differentials based on the full sample of households. The first and third columns show uncorrected house prices. The second and fourth columns show attribute-corrected house prices, which are, in essence, estimated

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rents) in certain high-unemployment districts may be very low. By distinguishing the unemployed, we account for these potential aggregation biases.

[24] A *wage curve* would imply that wages here were lower, but wages in the Netherlands are bargained on the national level, so that this may not be the case. However, for our model it is a sufficient condition that the relationship between regional unemployment and wages is nonpositive, so that there is no compensation through wages. This latter assumption is likely to hold.

dummy coefficients, based on equations (4) and (5).[25] The West is the reference region in this table.

Let us focus first on the owner-occupier sector. The coefficients in the first column of Table 1 indicate that people pay less for their house in the North of the country than in other regions: about 26 percent on average. When we control for housing attributes the difference between the North and the West increases with another 12 percent. In line with theory, *houses in the North are not only cheaper than in the West, but they also have more attractive size attributes on average*. Correcting for housing attributes, it appears that the West is more expensive than the East and South regions. Hence, houses in the West have particularly unfavourable attributes compared to the rest of the Netherlands.

In the rental sector (column 3 and 4 of Table 1), the regional differences appear to be considerably smaller than in the owner-occupier sector. Similar to the owner-occupier sector, rents in the West are higher than in the other regions, and they are lowest in the North. The difference between the West and the North is about 14 percent. However, unlike our findings for the owner-occupier sector, the differences in rent are not so sensitive for a correction for attributes and regional differences are *smaller* when we control for attributes. This makes sense because the rental market is regulated, so that rent formation has a strong national component.[26] After controlling for quality, rent differentials are still statistically significant, and rents in the North are about ten percent lower than in the West.

To test to what extent regional house price and rent differentials accrue to the unemployed in particular, we select households where the breadwinner is unemployed.[27] This allows us to verify that it is really the unemployed that have cheaper housing in regions where unemployment is high, which does not necessarily hold when average regional house prices are low. By regressing the residuals of equations (4) and (5) on a constant and regional dummies, we estimate whether the attribute-corrected regional house price and rent differentials for the unemployed deviate from the other individuals. Table 2 shows the corrected and uncorrected regional differentials.

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[25] Instead of 40 region dummies, we have included only 4 dummies. The coefficients did not differ significantly from the ones discussed in section III.

[26] These results make sense because in the West, houses for rent are of a higher quality.

[27] A person is unemployed when she wants but does not have a job for 12 hours a week or more, and she has been engaged in job search during the past month. The breadwinner is the member of the household with the highest income. About 14 percent of the households where the breadwinner is unemployed live in an owner-occupied house. For all households this share is about 54 percent.

Table 2: Regional house price and rent differences of the unemployed.

Regional price differentials	Owner-occupier		Rental	
		Corrected		Corrected
North	-0.343	0.098	-0.084	-0.008
	(0.102)	(0.079)	(0.037)	(0.032)
East	0.009	0.101	-0.082	-0.064
	(0.112)	(0.086)	(0.035)	(0.030)
South	0.120	0.230	-0.037	-0.050
	(0.108)	(0.084)	(0.037)	(0.032)

Note: Standard errors between brackets. West is the reference region; the second and fourth columns correct for housing attributes.

House prices paid by the unemployed appear to be significantly lower in the North than in the rest of the country. However, this difference (34 percent) is not statistically significantly larger than the difference with respect to all households (26 percent). Evaluating the second column of Table 2 we see that only the mean residual for the South deviates significantly from zero. This means that although corrected house prices are lower in the South than in the West (13 percent), this does not hold for the houses owned by unemployed households. In other words, *the house price differential does not accrue to the unemployed here*.[28] For the other regions, the attribute corrected house price difference is as large to the unemployed as it is to all households.

Rents paid by unemployed households in the North and East are significantly lower than in the West and South. However, the rent differentials are smaller for the unemployed than they are for all households. Evaluating the regional differences for the unemployed in the residual of equation (2), it appears that attribute corrected rent differentials are slightly larger for the unemployed than they are for all households. Only in the East, this deviation is statistically significant.

From Table 2, we may conclude that there are some differences in the attribute-corrected house price and rent differentials between arbitrary households and households of which the breadwinner is unemployed, but these differences appear to be modest. This implies that attribute-corrected differentials for arbitrary households give a reasonable estimate of the compensation through housing markets of the households of which the breadwinner is unemployed, or, more generally, households with a large risk of unemployment for one of the

members.[29] We infer that our estimates of the relationship between house prices and unemployment for 40 regions are not biased because of aggregation to labour market status.

Analysis of 40 regions

Using the total sample of households, we are able to make a finer regional division of the Netherlands. With an increased number of degrees of freedom, the negative relationship between regional unemployment and house prices is re-established. The figures 2 and 3 show scatterplots of attribute-corrected regional house prices and rents to unemployment, where Amsterdam (the capital, situated in the West of the country) is the reference region.
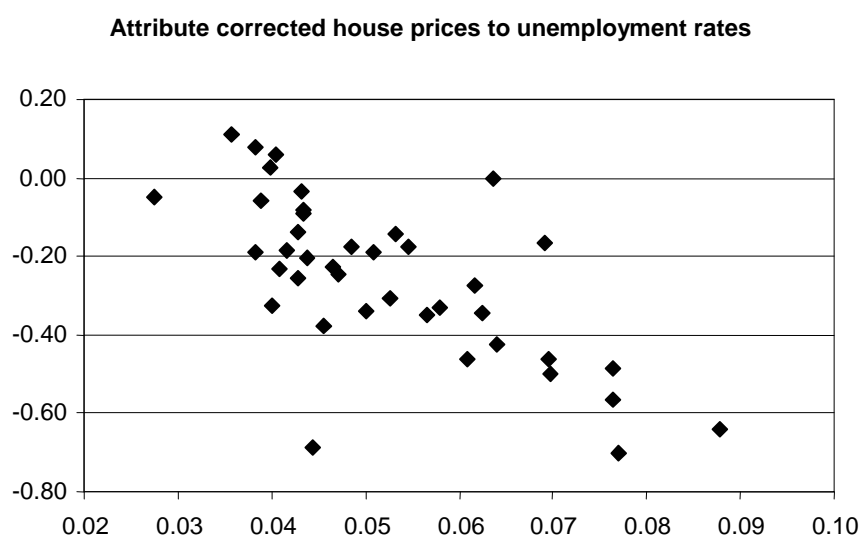
Attribute corrected house prices to unemployment rates

Figure 2: attribute-corrected regional house prices (in logarithms) to unemployment rates, Amsterdam is reference region

Figure 2 demonstrates a strong negative correlation between regional unemployment and house prices. A linear fit through these observations yields a coefficient of -10.4 with a standard deviation of 1.8. So, when unemployment is one percent higher, attribute-corrected house prices are ten percent lower on average. Ignoring attribute differences, we would have found a smaller correlation, with a coefficient of -8.1 and a standard deviation of 1.3. This result squares with those for Table 2: correcting for attributes increases regional house price differentials.

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[28] The large free standing houses, which are relatively cheap here, are apparently not bought by people running a substantial risk of becoming unemployed.
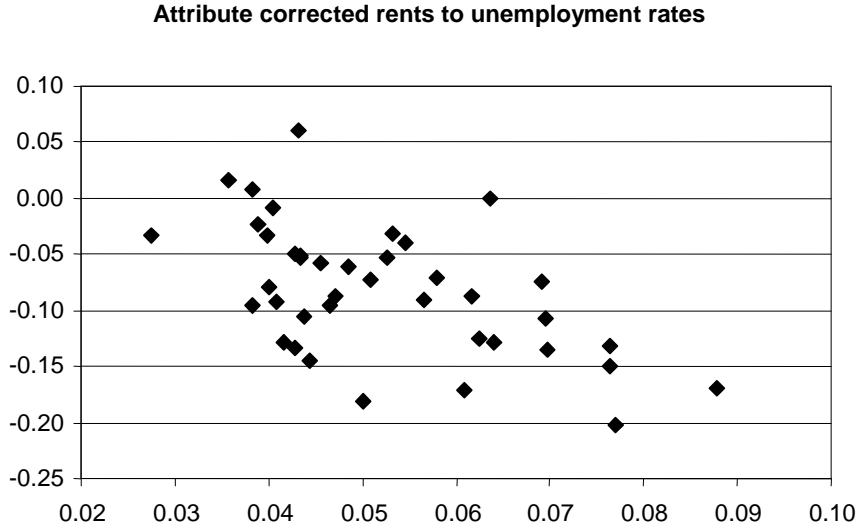
Attribute corrected rents to unemployment rates

Figure 3: attribute-corrected regional rents (in logarithms) to unemployment rates, Amsterdam is reference region

In the rental sector, there also appears to be a negative correlation between regional unemployment and attribute-corrected rents (figure 3). A linear fit on these observations yields that rents are 2.4 percent lower in a region where unemployment is one percent higher (the standard deviation is 0.6). As in Table 2, ignoring attribute differentials would lead to a somewhat higher correlation (a coefficient of -3.0 with a standard deviation of 0.7).

V   Conclusions

The central hypothesis in this paper is that workers in high-unemployment regions are compensated in the housing market. This has been established theoretically by extending a regional efficiency wage model by Blanchflower and Oswald (1994) with land markets. Endogenising lot size, it also turned out that workers in high-unemployment regions buy larger dwellings. This implies that comparing aggregate regional house prices may lead to underestimation of the compensating differential.

Empirically, it turned out that size and quality attribute corrected house prices are 10.4 percent lower and rents are 2.4 percent lower when unemployment in a region is one percent higher. In line with theory, the compensating differential was underestimated when we ignored housing attributes in the owner-occupier sector. Our results did not appear to be very

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[29] This suggests, that self-selection of households that expect the breadwinner to become unemployed is not so strong and that households do not move residence when they change between labour market status.

sensitive to selecting households with an unemployed breadwinner. This means that the compensating differentials accrue to the unemployed to the same extent as to other workers.

The compensating differential is much stronger in the owner-occupier sector than in the rental sector. This may be due to regulation in the rental market that does not account for differences in regional labour market perspectives or amenities. Alternatively, it may be argued that compensating differentials need to be much stronger for house-owners, because the consequences of becoming unemployment are much graver for them.[30]

In the original model by Blanchflower and Oswald, structural regional differences are attributed to nonpecuniary amenities. How did omission of these amenities affect our conclusions? Suppose that people in regions where wages are low and unemployment is high are compensated through amenities. These amenities must have an upward effect on house prices and rents. This means that houses in high-unemployment regions are worth even more than what we controlled for by means of observed size and quality characteristics. Therefore, omitting amenities from our model has lead, if anything, to *underestimation* of compensation through housing markets.

Compensation through housing markets may be an important finding, because the mechanism can reconcile two observations that appear to be contradictory. On the one hand, extensive empirical evidence suggests that people in high-unemployment regions are not compensated by higher wages (cf. Blanchflower and Oswald, 1994, Card, 1995, Baltagi and Blien, 1998). On the other hand, regional unemployment differentials, especially in Europe, are persistent and labour market adjustment through migration is slow (OECD, 2000). Workers may be refrained from migration to low-unemployment regions by the larger housing costs they would incur. Moreover, low house prices imply a high real benefit level if benefits are not adjusted to regional purchasing power. This may reduce the incentive for job search in lagging regions.

Is this theory consistent with the observation that regional unemployment differentials are much more persistent in Europe than in the US? In our model, a positive relationship was assumed between land prices and the number of inhabitants in a region. This relationship was justified by inelastic supply of inhabitable land. It is well known that land and housing markets are more regulated in Europe than in the US. This may further hamper adjustment of

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[30] Being unemployed is more problematic for house owners in the Netherlands because after a certain period, they are forced to sell their own house and live from the revenue. Therefore, unemployment is much less common in the owner-occupier than in the rental sector. Although house owners have a smaller risk of becoming unemployed, they may still need to be compensated because unemployment is an indicator of more general regional labour market conditions.

land and housing supply to demand in low-unemployment regions, so that compensating house price differentials are increased.[31]

Following this line of reasoning, there would be two policy recommendations for reduction of (the persistence of) regional unemployment differentials. The first would be to adjust the benefit level to the regional cost-of-living, because this would give every unemployed person in the country the same incentive to engage in job search. The second recommendation would be to reduce regulation of land and housing markets, so that more elastic supply of inhabitable land and housing would reduce compensating differentials.

We do acknowledge, however, that our paper does not provide sufficient theoretical and empirical support for such strong policy conclusions. Our agenda for future research would be, amongst other things, to identify the effect of regional unemployment on house prices and rents in a pooled cross-section framework, controlling for all time-invariant regional heterogeneity. Ultimately, we would deal with the issues of house price differentials, unemployment and wages in a unified econometric framework.

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[31] Similarly, it appears that houses in the US depreciate faster than in Europe. Apparently, houses are built in a cheaper way here, which may render housing supply more elastic.

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Appendix

Table 3. Hedonic house price equation.

Housing attributes	Owner-occupier		Rental	
	coeff.	std. err.	coeff.	std. err.
Constant	4.682	*0.018*	5.676	*0.014*
Size attributes				
Dwelling type:				
free standing	0.491	*0.013*		
semi-detached	0.265	*0.013*	0.102	*0.009*
cornerhouse	0.171	*0.013*	0.113	*0.007*
terraced house	0.116	*0.013*	0.104	*0.006*
Number of rooms	0.077	*0.001*	0.073	*0.002*
Garden	0.059	*0.011*	0.010	*0.006*
Garage	0.105	*0.004*	0.091	*0.006*
Size living room	0.065	*0.001*	0.049	*0.001*
Size kitchen	0.020	*0.001*	0.007	*0.001*
Quality attributes				
Central heating	0.096	*0.006*	0.157	*0.005*
Double-glazing in living room	0.014	*0.005*	0.017	*0.005*
Double-glazing in rest of house	0.034	*0.004*	0.007	*0.004*
Ground floor apartment	-0.016	*0.006*	-0.001	*0.005*
Stench/noise near dwelling	-0.004	*0.004*	-0.012	*0.004*
Elevator available (no ground floor apartment)	0.028	*0.013*	0.126	*0.006*
Balcony available (no ground floor apartment)	0.110	*0.014*	0.040	*0.006*
Building period:				
1945 – 1959	-0.015	*0.006*	-0.006	*0.007*
1960 – 1969	-0.030	*0.006*	0.095	*0.006*
1970 – 1979	-0.008	*0.005*	0.186	*0.006*
1980 – 1989	0.019	*0.005*	0.230	*0.007*
after 1989	0.110	*0.006*	0.285	*0.008*
Regional indicators				
Regional dummies (40)	included		included	

Note: reference category of dwelling type is apartment; free-standing houses are excluded from the rental equation, because these houses are too scarce.

Table 4. Regional distribution of housing attributes.

Housing attributes	North	West	East	South
Size attributes				
Dwelling type:				
free standing	0.28	0.11	0.19	0.19
semi-detached	0.16	0.08	0.15	0.18
cornerhouse	0.14	0.15	0.16	0.14
Terraced house	0.21	0.36	0.28	0.28
Number of rooms	4.17	4.15	4.26	4.30
Garden	0.82	0.75	0.83	0.82
Garage	0.40	0.25	0.34	0.41
Size living room	3.67	3.92	3.94	4.13
Size kitchen	4.35	4.16	4.50	4.51
Quality attributes				
Central heating	0.79	0.90	0.88	0.92
Double-glazing in living room	0.86	0.85	0.84	0.82
Double-glazing in rest of house	0.56	0.64	0.55	0.55
Ground floor apartment	0.81	0.77	0.81	0.79
Stench/noise near dwelling	0.25	0.30	0.27	0.30
Elevator available (no ground floor apartment)	0.07	0.13	0.08	0.09
Balcony available (no ground floor apartment)	0.11	0.17	0.11	0.12
Building period:				
1945 - 1959	0.12	0.10	0.11	0.13
1960 - 1969	0.15	0.16	0.14	0.17
1970 - 1979	0.22	0.21	0.21	0.22
1980 - 1989	0.14	0.18	0.18	0.18
after 1989	0.10	0.13	0.14	0.12