# The interaction of land markets and housing markets in a spatial context: A case study of Helsinki

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The purpose of the paper is to

find ways to visualize land markets

find ways to generate hypothesis about spatial structures of prices and markets

increase our understanding on how land markets and housing markets interact in a spatial context.

The term housing land supply chain is used to comprise markets for

- development land,
- housing lots and
- houses.

Hedonic models are estimated for each based on a large good quality dataset.

Two concepts are used to measure price ratios in the housing land supply chain

(1) the land share of a house price and

(2) a ratio of development land price to lot price.

The paper combines housing economics and spatial analysis.

Hedonic models produce a trend surface, and residuals are mapped to reveal the local effects.

Thematic maps are used to visualize the spatial structure of error terms.

Two scales are used: grid level to get an overview, and transaction level for exact local effects.

The paper tries to offer a broad, deep and transparent view of the housing market.

The data consists of more than 45.000 transactions during the last 21 years in Helsinki metropolitan area.

The results may be valuable in property valuation and management of housing policy.

Should we explore microspatial variation visually?
Or should we model it?

a standard econometric model

geostatistics

a hybrid version: a simple model and visualization of error terms

The benefits of a hybrid version

it is computationally fast and simple

software needed is easily available

visualization makes the results easy to interpret

spatial effects are usually very strong and easily understood even by a layman

even if more sophisticated spatial models are to be used, a visual exploration is useful as a preliminary, hypothesis generating stage



Definitions and operational criteria for research data

| | area | planning | location | project size | buildings |
|---|---|---|---|---|---|
| houses | 300-10000 m2 | design plan | urban, suburban | 1-2 homes | yes |
| housing lots | 300-10000 m2 | design plan | urban, suburban | 1-2 homes | no |
| development land | 1-100 hectares | without a design plan or planning permission | potential demand for urban land | | no valuable buildings |

descriptive statistic

| | | development land | housing lot | house |
|---|---|---|---|---|
| N | | 2681 | 12683 | 30290 |
| price (euro) (constant 2004 value) | mean | 141717 | 47524 | 137260 |
| | std dev | 606409 | 72509 | 130301 |
| land area (m2) | mean | 58880 | 1156 | 1187 |
| | std dev | 161117 | 688 | 661 |
| price (euro/m2) (constant 2004 value) | mean | 3,2 | 47,0 | |
| | std dev | 8,5 | 57,0 | |
| distance to Helsinki (km) | mean | 37,2 | 29,3 | 33,3 |
| | std dev | 17,8 | 17,7 | 21,8 |

The dependent price variables in the models and calculation of price ratios

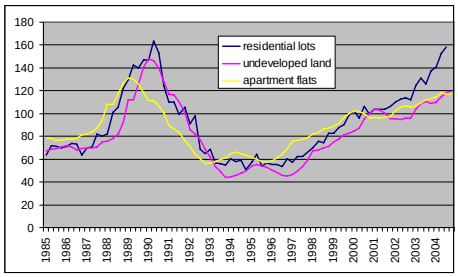
| | total price (euros) | unit price (euros/m2) |
|---|---|---|
| houses | x | |
| housing lots | x | x |
| development land | | x |
| (estimated) lot price / house price | x | |
| development land price / (estimated) lot price | | x |

Model specification: relative importance of variables (stepwise procedure)

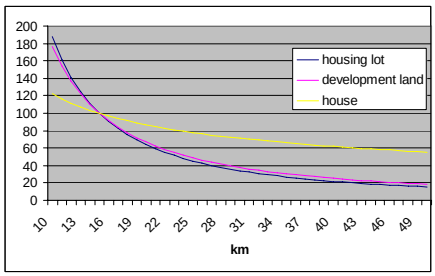
| variable | | houses | housing lots |
|---|---|---|---|
| temporal | time trend | 4 | 6 |
| | business cycle | 2 | 2 |
| spatial | distance to Helsinki CBD | 3 | 1 |
| | distance to large town | 13 | 5 |
| | distance to small town | 7 | 7 |
| | distance to shopping center | 17 | 18 |
| | distance to seashore | 8 | 11 |
| | distance to lakeshore | 14 | 13 |
| | adjacent to lake or sea | 16 | 21 |
| | accessibility to main road | 20 | 12 |
| | proximity to main road | 19 | 16 |
| | 400 ha grid: error correction | 6 | 3 |

| variable | | houses | housing lots |
|---|---|---|---|
| lot spesific | lot size | 10 | 4 |
| | building density in lot | 15 | 9 |
| house spesific | house size | 1 | |
| | house age | 5 | |
| | number of variables | 24 | 23 |
| | R2 | 0,69 | 0,69 |
| | R2 for 5 most important | 0,63 | 0,60 |
| | (*) business cycle according to MPA -flat price index (deviation from trend) | | |

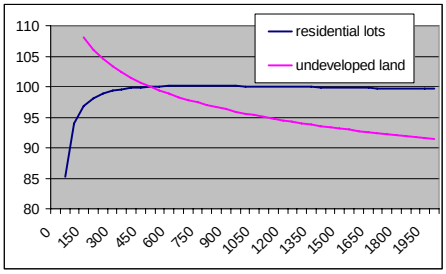
Price indices for housing, residential lots and development land (Helsinki metropolitan area)



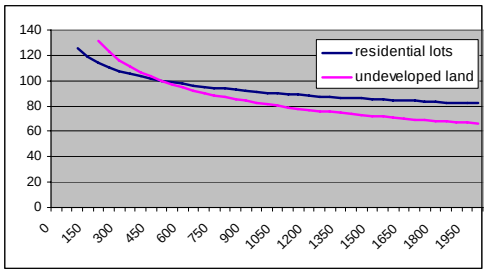

Effect of distance to Helsinki




The impact of proximity to highway




The impact of distance to Baltic Sea



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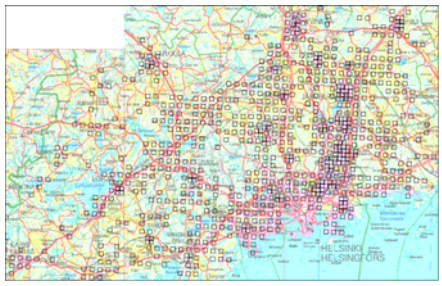
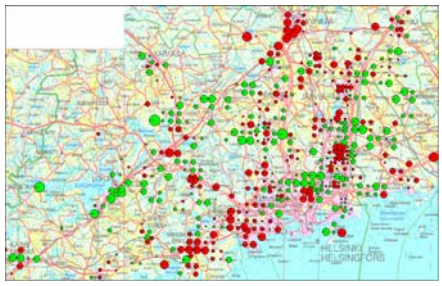
Grid locations



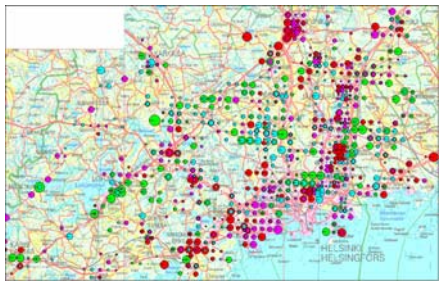
Number of house and lot sales in a 400 hectare grid.
red: house sales, n=30355
green; lot sales, n=12719

The error term of lot prices in a 400 hectare grid.
red circles: actual price >predicted price
green circles: actual < predicted

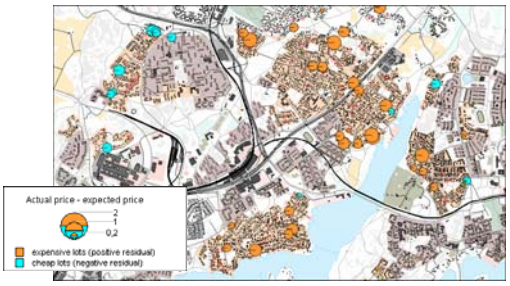


The error term of house prices in a 400 hectare grid.
lilac circles: actual price >predicted price
blue circles: actual < predicted

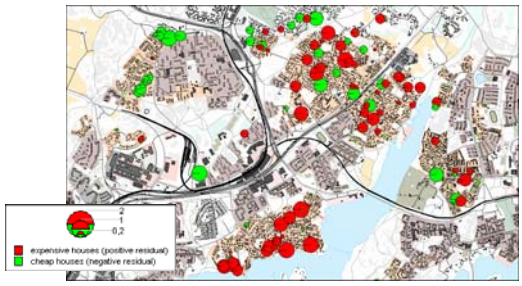
lot and house prices in a 400 hectare grid.
red or lilac circles: actual price >predicted price
green or blue circles: actual < predicted



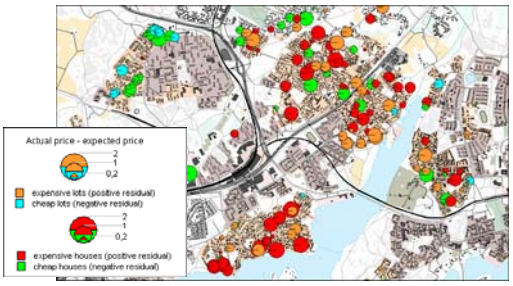
The error term of individual sales of housing lots.



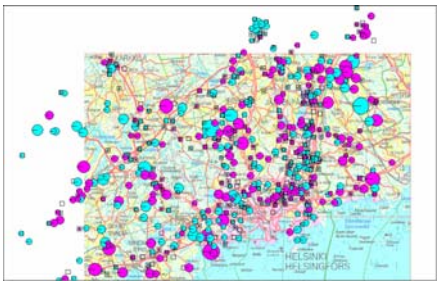

The error term of individual sales of houses.



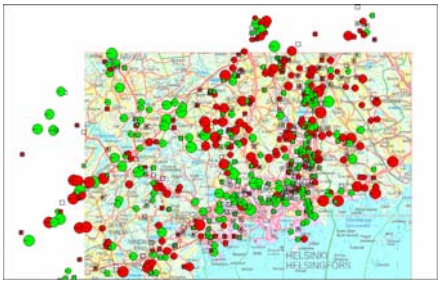

The error term of individual sales of housing lots and houses.



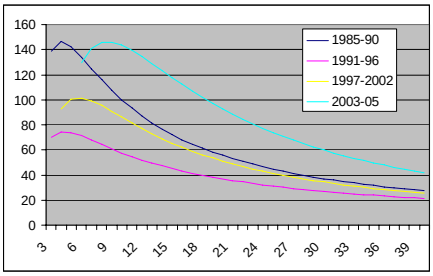

Time trend of house prices
lilac circles: price appreciation faster than average
blue circles: slower than average



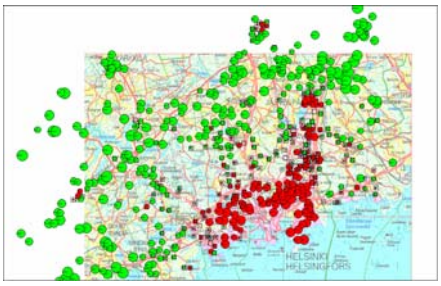
Time trend of lot prices
red circles: price appreciation faster than average
green circles: slower than average



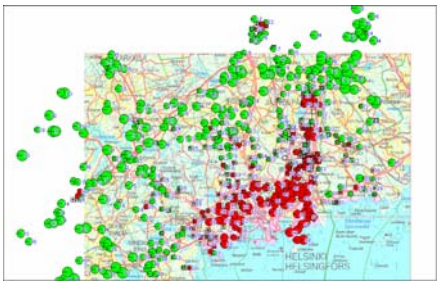
Spatial-temporal interaction:
Effect of distance to Helsinki on single-family housing lot prices in different periods



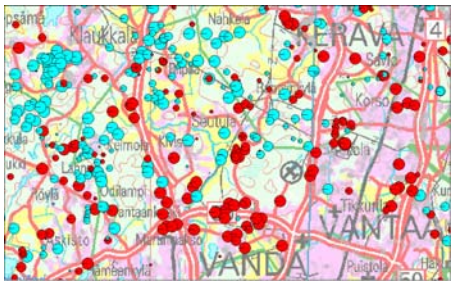
Land share of house price in a grid
(red circles = land share exceeds 27 %)



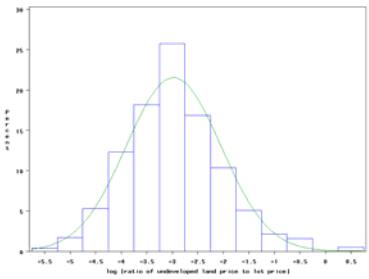
Land share of house price in a grid



Ratio of development land price to lot price
(around Helsinki airport)
red circles: ratio 5-25 %
blue circles: 1-5 %




The distribution of lot price ratio of undeveloped suburban land price



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Implications

Spatial analysis
Property valuation
Housing policy

## Implications for Spatial analysis (1)

Recognizing the visible pattern of property prices helps make decisions:

A visible pattern helps generate hypotheses

A pattern implies ways to improve the underlying hedonic model.

A pattern may reveal a spatial autocorrelation, which cannot be regressed to any missing variable. Perhaps more sophisticated spatial statistics, such as kriging, is then needed to control the autocorrelation.

## Implications for Spatial analysis (2)

Sometimes no clear pattern emerges, so the underlying trend surface explains the spatial variation.

A visible pattern is detected, and this is just enough for certain practical purposes.

A pattern may reveal outliers or a crude error in the data.

## Implications for Spatial analysis (3)

Examples of generating hypotheses / improving model specification

measurement of variables:
euklidian distances are not enough, travel times are preferred

missing variables:
income, demographics, local public finances and services,
noise, relative height, access to parks
etc
***
more advanced geostatistics is needed

## Implications for Property valuation

Automated valuation systems
Development land appraisal
Land value capture

## Implications for Housing policy

(1) if the land share of a house price is low, compared to near-by areas
---> BUILD MORE HOUSES

(2) if the ratio of development land price to lot price is low, compared to near-by areas ---> SUPPLY MORE LOTS

Property transaction data and a toolbox used here helps identifying profitable areas for development.

It helps finding ways to finance development.

## Thank you for your attention!

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