

VU Research Portal

The Internal Structure of Cities:

Koster, H.R.A.

2013

document version

Publisher's PDF, also known as Version of record

[Link to publication in VU Research Portal](#)

citation for published version (APA)

Koster, H. R. A. (2013). *The Internal Structure of Cities: The Economics of Agglomeration, Amenities and Accessibility*. Tinbergen Institute.

General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal ?

Take down policy

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

E-mail address:

vuresearchportal.ub@vu.nl

Table of contents

Table of Contents.....	5
List of Figures	9
List of Tables	11
Preface	13
1. Introduction.....	15
1.1 The importance of cities	15
1.2 The internal structure of cities	16
1.3 Empirical approach.....	19
1.4 Overview of the thesis and preview of the results	21
PART 1: FIRMS	25
2. Agglomeration economies and productivity: A structural estimation approach	27
2.1 Introduction	27
2.2 A hedonic price approach	29
2.3 Estimation procedure	31
2.4 Data.....	34
2.5 Parametric regressions	36
2.6 Semiparametric regressions.....	40
2.7 Conclusions	44
Appendix 2.A Descriptives and other results.....	45

3. Rocketing rents: The magnitude and attenuation of agglomeration in the commercial property market.....	47
3.1 Introduction.....	47
3.2 Theoretical framework and estimation	50
3.3 Data.....	55
3.4 Results	59
3.5 Robustness analysis.....	65
3.6 Conclusions	71
Appendix 3.A Descriptives	72
Appendix 3.B Estimating the spatial bandwidth.....	73
Appendix 3.C First-stage results.....	74
Appendix 3.D Kernel functions	75
4. Is the sky the limit? High-rise buildings and office rents.....	77
4.1 Introduction.....	77
4.2 Estimation procedure	79
4.3 Regional context, data and instruments	81
4.4 Results	85
4.5 Conclusions	95
Appendix 4.A Descriptives and other results.....	96
Appendix 4.B The functional form of the hedonic price function	100
5. Co-agglomeration of knowledge intensive business services and multinational enterprises.....	103
5.1 Introduction.....	103
5.2 Regionalised service economies: innovation, agglomeration, scale and entrepreneurship .	105
5.3 Empirical methodology.....	109
5.4 Data.....	112
5.5 Results	116
5.6 Conclusions and discussion.....	123
Appendix 5.A Data and descriptives.....	124
Appendix 5.B Robustness checks.....	125

PART 2: HOUSEHOLDS	129
6. Mixed land use, agglomeration and commuting.....	131
6.1 Introduction.....	131
6.2 Rents and mixed land use.....	132
6.3 Data and rents.....	136
6.4 Empirical strategy.....	140
6.5 Results.....	144
6.6 Robustness analysis.....	147
6.7 Conclusions.....	152
Appendix 6.A Descriptive statistics.....	153
Appendix 6.B Estimating land rents.....	154
Appendix 6.C Semiparametric estimation procedure.....	155
Appendix 6.D First stage results and robustness of semiparametric regressions.....	156
7. The impact of mixed land use on residential property values.....	159
7.1 Introduction.....	159
7.2 Hedonic price methods and mixed land use.....	160
7.3 Data sets and regional context.....	162
7.4 Model estimation.....	165
7.5 Results.....	167
7.6 Conclusions.....	175
Appendix 7.A Descriptives.....	176
8. Historic amenities, income and sorting of households.....	177
8.1 Introduction.....	177
8.2 Empirical methodology.....	180
8.3 Data and context.....	187
8.4 Graphical analysis.....	191
8.5 Results from parametric regressions.....	194
8.6 Results from semiparametric regressions.....	197
8.7 Conclusions.....	201
Appendix 8.A Context and descriptives.....	203
Appendix 8.B Do national conservation policies impact house prices?.....	205
Appendix 8.C Discontinuities of neighbour attributes.....	207
Appendix 8.D Cross-validation scores and bandwidth selection.....	208
Appendix 8.E Specification (13-2) for different ω	210

9. Bombs, boundaries and buildings: A regression-discontinuity approach to measure costs of.....	
housing supply restrictions	211
9.1 Introduction.....	211
9.2 Empirical methodology, data and context	214
9.3 Results	219
9.4 Conclusions	226
Appendix 9.A Descriptive statistics and illustrations.....	227
10. The gains of trains: The effect of station openings on house prices.....	231
10.1 Introduction.....	231
10.2 Rail innovations and data.....	232
10.3 Repeated sales models	234
10.4 Evidence from previous chapters.....	237
10.5 Conclusions	238
Appendix 10.A Descriptive statistics.....	238
11. Conclusions	241
11.1 Summary	241
11.2 Policy implications.....	243
11.3 Directions for further research.....	244
References.....	247
Samenvatting (Dutch summary)	265

List of Figures

Figure 2.1 – Distributions of estimated coefficients for Specification (10)	41
Figure 2.2 – Distributions of estimated ratios of coefficients	42
Figure 2.A1 – Map of agglomeration levels in South-Holland for $d_T = 2.5$	46
Figure 2.A2 – Elasticity with respect to agglomeration for different d_T	46
Figure 3.1 – Dutch employment figures	56
Figure 3.2 – Spatial distribution and growth rates of Dutch employment	56
Figure 3.3 – Agglomeration and rents	59
Figure 3.4 – Heterogeneity in the effect of agglomeration	64
Figure 3.5 – Nonlinear effect of agglomeration	64
Figure 3.6 – Spatial attenuation of agglomeration economies	68
Figure 3.B1 – Cross-validation scores for Specification (3)	73
Figure 3.B2 – Marginal increase in rents of standard deviation increase in agglomeration	74
Figure 3.D1 – Kernel functions	76
Figure 3.D2 – Cross-validation scores for Specifications (3), (16), (17) and (18)	76
Figure 4.1 – Building height and distance to the city centre	81
Figure 4.2 – Effect of building height on commercial rents	87
Figure 4.A1 – Maps of the study area	96
Figure 4.A2 – Marginal effect of building height on rents for different bandwidths ρ	99
Figure 4.A3 – Sensitivity analysis with respect to fixed effects	99
Figure 4.A4 – Building height effect for different distance cut-offs	100
Figure 4.A5 – The stability of α_t over the study period	100
Figure 4.B1 – Predicted total and marginal effect of building height on rents	101
Figure 5.1 – Location of the Randstad Northwing in the Netherlands	109
Figure 5.2 – Agglomeration of KIBS (left) and MNEs (right) in the Randstad Northwing	114
Figure 5.3 – KIBS-births in the Randstad Northwing	115
Figure 5.4 – Kernel densities, local and global confidence intervals	117
Figure 5.A1 – Histogram of KIBS births per PC6-location	125
Figure 6.1 – Agglomeration potential (z_x) per PC4-area	136
Figure 6.2 – Land use in urban areas	137
Figure 6.3 – Residential rents	139
Figure 6.4 – The effect of agglomeration and distance to business areas	146
Figure 6.A1 – Distribution of the mixedness index mi	153
Figure 6.A2 – Historic instruments	155
Figure 6.A3 – Location of CBD	155
Figure 6.D1 – Parametric specification for different decay parameters δ	156
Figure 6.D2 – Semiparametric specification for different bandwidths h	157

Figure 7.1 – Diversity, employment and household density in the Rotterdam Region.....	165
Figure 7.2 – Heterogeneity in MWTP for diversity and household density.....	171
Figure 7.3 – Mapping heterogeneity in MWTP for leisure and retail	171
Figure 7.4 – MWTP for household density and retail for different house prices	172
Figure 7.A1 – The Distribution of the (adjusted) diversity index	176
Figure 8.1 – Total area size designated as conservation area in the Netherlands.....	187
Figure 8.2 – Discontinuities along the conservation boundary	192
Figure 8.3 – Discontinuities of household characteristics along the boundary	193
Figure 8.4 – Distributions of implicit prices $\hat{\alpha}$ and $\hat{\beta}$	198
Figure 8.A1– Study area.....	204
Figure 8.A2– Conservation areas in Rotterdam.....	205
Figure 8.C1 – Discontinuities of neighbour attributes near the conservation boundary	207
Figure 8.D1 – Bandwidth selection for Specification (10)	208
Figure 8.D2 – Bandwidth selection for Specification (11)	208
Figure 8.D3 – Bandwidth selection for Specification (12)	209
Figure 8.D4 – Bandwidth selection for Specification (13)	209
Figure 8.E1 – Effect of log(income) on α_i^* and β_i^* in Specification (13-2)	210
Figure 9.1 – Rotterdam after bombing in 1940	216
Figure 9.2 – Rotterdam in 2007.....	216
Figure 9.3 – House prices and housing attributes around the bombing boundary.....	220
Figure 9.4 – Discontinuities of building and household characteristics	221
Figure 9.A1 – Residential near the bombing boundary.....	229
Figure 9.A2 – Planning map of the Rotterdam area.....	230
Figure 10.1 – Number of stations between 1830-2010	232
Figure 10.2 – Map of the Netherlands with selected cities and new stations.....	233
Figure 10.3 – Distance before station openings and distance reductions to railway stations	234

List of Tables

Table 1.1 – Overview and structure of the thesis.....	21
Table 2.1 – Parametric regression results.....	37
Table 2.2 – Robustness analysis of regression results.....	38
Table 2.3 – Semiparametric regression results – first stage	40
Table 2.4 – Semiparametric regression results – second stage	42
Table 2.5 – Semiparametric regression results – second stage	43
Table 2.A1 – Descriptive statistics of attributes of rental properties.....	45
Table 2.A2 – Descriptive statistics of firm characteristics	45
Table 3.1 – Regression results on the impact of agglomeration.....	60
Table 3.2 – Regression results, alternative specifications.....	63
Table 3.3 – Regression results, agglomeration and shocks	66
Table 3.4 – Regression results, attenuation of agglomeration economies.....	67
Table 3.5 – Regression results, agglomeration economies and house prices	69
Table 3.6 – Regression results, alternative specifications.....	70
Table 3.A1 – Descriptive statistics.....	72
Table 3.A2 – Industrial composition.....	73
Table 3.C1 – Descriptive statistics of instruments	74
Table 3.C2 – First stage regression results	75
Table 4.1 – 10 tallest office buildings in the Netherlands	82
Table 4.2 – Regression results of the effect of building height on office rents.....	86
Table 4.3 – Regression results, alternative specifications.....	90
Table 4.4 – Regression results of the effect of a view on office rents.....	92
Table 4.5 – Regression results of commercial office rents and building height	94
Table 4.A1 – Descriptive statistics of the commercial property dataset.....	98
Table 4.A2 – First stage regression results.....	98
Table 5.1 – Number of and employment in KIBS in 2000 and 2009 in the Randstad Northwing.....	116
Table 5.2 – Localisation of KIBS and MNEs.....	118
Table 5.3 – Regression results of the impact of MNEs and KIBS on KIBS-births.....	119
Table 5.4 – Regression results of the impact on KIBS-births for different sectors.....	121
Table 5.5 – Regression results of the impact on KIBS-births: different MNEs and survival.....	122
Table 5.A1 – Definition of KIBS in terms of NACE industry classification.....	124
Table 5.A2 – Descriptive statistics.....	125
Table 5.A3 – Correlations.....	125
Table 5.B1 – Regression results of the impact on KIBS-births: robustness checks.....	126
Table 6.1 – Regression results of the impact on rents	145
Table 6.2 – Results for the endogenous switching model	148

Table 6.3 – Robustness analysis of regression results.....	150
Table 6.A1 – Descriptive statistics of properties’ attributes	153
Table 6.A2 – Descriptive statistics of variables of interest.....	153
Table 6.D1 – First stage regression results.....	156
Table 7.1 – Regression results on the impact of mixed land use on property values.....	169
Table 7.2 – Regression results on the impact of mixed land use with an adjusted diversity index	170
Table 7.3 – Average semi-elasticities for different house types	173
Table 7.4 – Spatial econometric regression results on the impact of mixed land use.....	174
Table 7.A1 – Descriptive statistics of housing transactions	176
Table 8.1 – Descriptive statistics of housing transactions and household characteristics	191
Table 8.2 – Regression results on the impact of conservation areas.....	195
Table 8.3 – Robustness analysis of regression results	196
Table 8.4 – Semiparametric regression results	198
Table 8.5 – Second stage regression results: explaining heterogeneity, total sorting effect.....	200
Table 8.6 – Second stage regression results: explaining heterogeneity, direct sorting effects.....	201
Table 8.A1 – Descriptive statistics of housing transactions	204
Table 8.A2 – Descriptive statistics of household characteristics	205
Table 8.B1 – Regression results on the impact of a change in conservation area status.....	206
Table 9.1 – Regression results on the impact of regulatory constraints.....	223
Table 9.2 – Robustness analysis of regression results.....	224
Table 9.A1 – Descriptive statistics of housing transactions	227
Table 9.A2 – Descriptive statistics of housing transactions for full sample	228
Table 10.1 – Descriptives of repeated sales sample before and after station openings.....	234
Table 10.2 – Regression results on the impact of stations.....	236
Table 10.3 – Effect of stations on commercial rents, KIBS-births and house prices.....	237
Table 10.A1 – Descriptive statistics.....	238
Table 10.A2 – Change of variables between transactions.....	239