The internal structure of cities
The economics of agglomeration, amenities and accessibility
The work contained in this thesis has been carried out in the framework of the Platform 31/NICIS Institute programme “Knooppuntontwikkeling in Corridorverband: Economische Betekenis en Institutionele Prikkels” (“Nodal Development in Transit Corridors: Economic Importance and Institutional Incentives”). Financial support from the institute is gratefully acknowledged. This thesis reflects the author’s views and not necessarily those of Platform 31 or any of its partners.

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THE INTERNAL STRUCTURE OF CITIES:
THE ECONOMICS OF AGGLOMERATION, AMENITIES AND ACCESSIBILITY

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door
Hans Robert Aernout Koster
geboren te Houten
promotoren: prof.dr. P. Rietveld
prof.dr. J.N. van Ommeren
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Preface

About three years ago I started my PhD. at the VU University Amsterdam on a NICIS project ‘Nodal development in transit corridors’. I am very happy that Piet Rietveld became my promotor. Piet, I learned a lot from your concise comments, mostly provided in the stage of finishing a paper. I am glad that you give me plenty of academic freedom. Jos van Ommeren became my promotor, slightly by accident. We were discussing some ideas on parking and agglomeration, which eventually led to a nice paper on agglomeration economies (Chapter 2). Because cooperation went very smooth and nice, more papers, of which many are part of this dissertation, followed almost automatically. I very much like the lengthy discussions we often have on our papers. Although you are a full (and therefore busy) professor, you always seem to have time for these discussions. Most of the papers have improved immensely due to your creative input. Jos, Piet, I hope many good papers on agglomeration, parking, sorting, inland shipping, car-ownership, or whatever topic will follow.

I became excited about urban economics when I became employed as a research assistant at the department of Urban, Port and Transport Economics at the Erasmus University Rotterdam. With Wouter Jacobs I did research on the clustering of maritime business services near seaports. Thanks, Wouter, for making me enthusiastic about cities, geography, and (trans)port(s). Because I aimed to develop my quantitative skills I decided to apply for the master Spatial, Transport and Environmental Economics at the VU University Amsterdam. Jan Rouwendal kindly supervised my master thesis at that time. Together with him I wrote two papers that are part of this dissertation. Jan, thanks for comments, good discussions and ideas.

The Department of Spatial Economics is a very inspiring environment to do research. Frank Bruinsma, thanks for joining me to many NICIS-KEI meetings and to support me in many policy discussions. Your clearly stated opinion about location based policies seems to make the world a lot easier. Martijn Kobus, Marc de Graaff, Yuval Kantor and Jonathan Verheul, thanks for being nice (former) roommates. I would like to congratulate Martijn, who is the only one that ‘survived’ my presence up to now. Also other colleagues at the fifth floor, paranymph Sergej Gubin, Jessie Bakens, Stefanie Peer and Ceren Ozgen, are thanked for generating a nice atmosphere for doing research in the last couple of years. Furthermore, thanks to Elfie en Jenny from the secretary, who are always so helpful and have answers to almost every practical question that comes into mind. I also want to thank Paul Koster, for being a nice colleague, as well as a brother and good friend. I very much appreciate working on our joint papers and academic and non-academic discussions.

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Hans Koster, Rotterdam 2013
1 Introduction

1.1 The importance of cities

We have seen a vast increase in the number of people residing in urbanised areas in the last two centuries. It rose from about 7.5 percent in 1800 to more than 50 percent nowadays (Huriot and Thisse, 2000; Glaeser and Gottlieb, 2009; Glaeser, 2011). The number of urban megapolises is steadily rising: cities like New York, London, Tokyo, Mumbai and Rio de Janeiro become an increasingly common sight. The foremost question for urban economists is then why cities exist and why they keep emerging. This intellectual quest has been pursued for already more than a century by a wide variety of scholars. Marshall (1890) was the first to argue that the most important reason why firms agglomerate is a reduction in transport costs. Firms can lower the costs of moving goods, people and ideas by agglomerating in an urban area (Glaeser, 1998; Glaeser and Gottlieb, 2009; Ellison et al., 2010). More specifically, firms may locate near suppliers and customers to save shipping costs. In the nineteenth century many cities have evolved around transport nodes like railway stations and waterways. For example, the industrial concentration in Manhattan’s midtown was mainly around the central station (Glaeser, 2008). Firms may lower the costs of moving people by locating in a city, because large urban area often implies a thick labour market. Large labour markets like Los Angeles and Paris are offering a wide array of different jobs and give workers the opportunity to specialise. For specialised workers it is easier to switch between employers and for employers it is easier to find specialised workers. A third source of agglomeration economies is the exchange of ideas. Firms learn from each other and increase the rate of innovation. A classical example is Silicon Valley’s computer cluster where the ICT revolution started. Fallick et al. (2006) show that employees in Silicon Valley often switch between jobs, which increases the likelihood that knowledge acquired in one firm is used in another. Marshall (1890) suggests that these external economies are particularly important for firms of the same sector. Jane Jacobs (1969) argues that especially diversified urban environments may stimulate the exchange of ideas between different firms leading to new product combinations. Hoover (1936; 1937) already made the distinction between urbanisation economies, which are external economies occurring between firms irrespective of sector, and localisation economies, occurring between firms of the same sector.

Although the benefits of reducing transportation costs of goods are at the heart of the new economic geography models (Krugman, 1991a; b), it may be argued that this agglomeration force is not so important anymore, as the costs of transporting physical goods have declined with more than 90 percent in the last century (Glaeser and Kohlhase, 2004). Nevertheless, the agglomeration advantages that are based on reducing transport costs for people and ideas remain and are thought to be the main reason for the growth of cities like San Francisco and Tokyo (Glaeser, 2008). Indeed, it has been argued that face-to-face contacts have become the most fundamental force of agglomeration (Storper and Venables, 2008). Deal-making, relationship adjustment, finding a new employer and exchanging ideas are all heavily dependent on face-to-face contacts.
It has been widely recognised that the raison d’être of contemporary cities cannot only be explained by productivity advantages. Urban economists consider cities also as centres of consumption (Roback, 1982; Glaeser and Gottlieb, 2006). Dense urban areas generate a critical mass for the provision of many consumption amenities like theatres, cinemas and cafés and restaurants, and guarantee a wide diversity of consumer goods (Glaeser et al., 2001). For example, the theatre district in London’s West End could only evolve because of the enormous number of potential customers. In the future, as people seem to become increasingly rich, the quality of life is likely to become an even more important determinant of location choices of households.

Cities not only generate positive externalities for firms and its inhabitants, a concentration of people and firms may also lead to negative externalities. The largest metropolitan areas in the world are for example all plagued by traffic congestion. Scholars and policy makers therefore have offered a plethora of solutions to these problems. For example, policies may opt for road expansion or congestion pricing (Small, 1992; Verhoef et al., 1996; Hymel, 2007). Another solution is suggested by urban planners (e.g. Cervero, 2004). They argue that one should aim for urban development around public transport nodes, e.g. railway stations. It is then argued that a good access to public transport and mixed land use around nodes will reduce traffic congestion and increase the liveability of neighbourhoods. Advocates of this ‘smart growth’ movement claim economic benefits, but the benefits of transit-oriented mixed-use development have not been well understood (Jenks et al., 1996; Burton, 2000). Crowding may also imply negative externalities in the form of air and noise pollution and higher crime rates (Glaeser and Sacerdote, 2006; Bajari et al., 2012). Although the latter issues are potentially relevant and interesting, we will not study them in this dissertation.

1.2 The internal structure of cities

A. Theory

Cities are caused by net positive agglomeration economies. Many studies confirm the positive relationship of agglomeration economies using data on firm productivity, location choices of start-ups, wages, rents and co-agglomeration patterns of industries.2 Also the positive impact on amenities and importance of accessibility has been confirmed. However, much of the urban economic research relies on data at the urban, or even metropolitan, level. This is relevant when one is interested in comparing and explaining differences in city growth figures. It will, however, not explain the huge differences in economic outcomes within the city. Empirical studies on the urban level cannot explain the existence of employment subcentres, mixed land use and sorting of rich household in specific neighbourhoods within cities. Furthermore, understanding the organisation of cities generates insights into more

1 In contrast, Jacobs (1969) and Glaeser (2012) see urban living as the solution to many environmental problems, as commutes are shorter, and people living in cities have lower energy consumption.
general economic concepts, such as economic growth, returns to scale, monopolistic competition, technological innovation, and industrial specialisation (Anas et al., 1998).

The theoretical urban economic literature heavily relies on the stylised monocentric city model to explain the urban spatial structure. In this classical model of Alonso (1964), Mills (1967) and Muth (1967), it is assumed that households choose a residential location conditional on an exogenous workplace location. Rich households sort themselves in locations close to the central business district (CBD), depending on their preferences for house size and commuting costs (see e.g. Glaeser and Kahn, 2003; Glaeser et al., 2008). Wheaton (1977) shows that the income elasticity of housing demand and commuting time costs are of about equal value. Therefore, the monocentric city model fails to explain why income levels are generally increasing in distance to the city centre in the US, while this pattern is the reverse in most European cities (Mills and Lubuele, 1997; Anas et al., 1998; Brueckner et al., 1999). Furthermore, it is recognised that in reality almost no city is strictly monocentric: much production is located outside the city centre and production is often mixed with residential land use. Because the location of employment is assumed from the outset, one cannot explain the existence of employment subcentres and mixed land use using the monocentric city model. More recently, the study by Lucas and Rossi-Hansberg (2002), titled ‘on the internal structure of cities’, extend the classical monocentric model, by allowing both firms and households to bid for land. They show that spatial variation in wages and rents depends on commuting costs and the magnitude of agglomeration economies. Anas et al. (1996; 1999; 2006) find similar results, by estimating computable general equilibrium models of the internal structure of cities based on commuting, shopping and transportation trips. Still, other factors than commuting costs and agglomeration economies, such as building attributes and external urban amenities, are likely to explain the internal structure of cities and explain the easy-to-observe variation in location choices of different types of households.

Understanding to what extent economic forces shape the internal structure of contemporary cities is crucial for urban policies. It is the purpose of this thesis to shed light on the impact of three, arguably the most important, forces that shape the internal structure of contemporary cities: agglomeration, amenities and accessibility. For the latter force, we particularly focus on accessibility by public transport. We will take an empirical approach to analyse these forces using a large number of highly-detailed micro datasets. In contrast to many existing studies, we will not merely focus on behaviour of either firms or households, but will analyse location choices of both firms and households.

B. Agglomeration

Agglomeration economies are likely to have an impact on the urban spatial structure. Porter (1995) argues that the most obvious place for firms to locate is in inner cities because there is where one finds the four ‘true advantages of the inner city’: market access, strategic location, human resources and the integration possibilities with regional clusters. Indeed, the highest employment densities and rents are typically found in the inner city (Mills and Lubuele, 1997). Although the CBD is still regarded as a favourable location for firms, due to the presence of agglomeration economies, we see a strong decentralisation of jobs in the last century (Mieszkowski and Mills, 1993). Firms then locate in employment subcentres, which are often older towns that became incorporated in an urban area, but
may also be so-called edge-cities (Garreau, 1991; Giuliano and Small, 1991; Anas et al., 1998). There is some empirical evidence that agglomeration economies are important at a low spatial scale and therefore have an impact on the internal structure of a city. For example, Sivitanidou (1996) shows that firms value access to employment centres. Rosenthal and Strange (2003) provide some evidence that agglomeration economies are localised and attenuate very quickly within 10 kilometres. Arzaghi and Henderson (2008) focus on the location choices of advertising agencies within Manhattan, New York. They show that agencies are much more productive in close proximity to other agencies. So, in line with Anas et al. (1998), it may be argued that cities are strongly shaped by agglomeration economies.

C. Amenities

Contemporary cities are also shaped by amenities, as cities generate a critical mass for the provision of many consumer amenities like cinemas, theatres, cafés, restaurants and a plethora of other consumer goods. Studying location choices of households within a city is crucial, as many urban problems (e.g. racial segregation, crime) are related to sorting and self-segregation of households. This sorting may be caused by differences in preferences for social composition of a neighbourhood, but also by differences in preferences for certain urban amenities. For example, historic amenities are typically found in many centres of European cities. Households are likely to prefer urban areas because of an abundant supply of these amenities, but especially the rich households may sort themselves near amenities, as the latter type of households are thought to put more value on the quality of life of the neighbourhood wherein they live.

There is substantial empirical evidence that amenities are important determinants of location choices of households (see Cheshire and Sheppard, 1996). More specifically, Black (1999) and Gibbons and Machin (2003), among others, find that good schools tend to increase house prices, so good schools are valued as an amenity. Ahlfeldt and Maennig (2010c) and Lazrak et al. (2012), among others, find that historic amenities tend to increase house prices. Irwin (2002), Smith et al. (2002) and Rouwendal and Van der Straaten (2008) show that houses near open spaces are valued substantially more. Ahlfeldt and Maennig (2010a; b) illustrate that sports arenas generate positive externalities that improve location desirability in their neighbourhoods. However, the evidence also supports concerns that negative external effects of arenas may adversely affect neighbourhoods.

These are just a few studies that illustrate the importance of the built environment. Although it is clear that urban amenities positively impact house prices and therefore the locational preferences of households, little attention has been paid to sorting effects due to differences in preferences between households. Exceptions are Bajari and Kahn (2005), who show that suburbanisation of white people in the United States is driven by a greater demand for single detached housing, and Bayer et al. (2007), who find that households tend to self-segregate on basis of education and race.

D. Accessibility

The reason that the economy does not only consists of extremely dense cities is the presence of dispersion forces. Households often are not willing to pay high house prices for a small apartment in the inner city but move to suburbs and take the longer commute for granted. Baum-Snow (2007; 2010) and
Duranton and Turner (2011) for example show that the construction of new highways has contributed to a strong central city population decline, because of better accessible suburbs. Commuting between suburbs and the inner city explains why many large cities experience severe traffic congestion. Improving accessibility is therefore an important issue on the agenda of local policy makers. Many policies have been proposed to reduce congestion, for example by investing in mass public transport and aiming at mixed land use near railway stations (Anas et al., 1998). Policies that stimulate the mixing of land uses and aim at increasing public transport ridership (which we refer to as Transit-Oriented Development) are based on the crucial assumption that the benefits of mixing offset potential negative land use externalities (such as noise pollution). Moreover, it is often assumed that railway stations will lead to lower congestion externalities. There is some evidence that railway stations impact house prices positively, implying that households value accessibility by public transport (Gibbons and Machin, 2005). Studies by Baum-Snow and Kahn (2000) and Duranton and Turner (2011) also stress that the effects on house prices are small and not uniformly distributed across different demographic groups, indicating sorting. Moreover, the effect of investments in public transport on car usage seems very limited, so people hardly substitute to public transit away from private vehicles (Baum-Snow and Kahn, 2000). Besides positive accessibility benefits, it also has been argued that stations may cause negative externalities, for example due to increased crime rates and unsightly parking lots near stations (Bowes and Ihlandfeldt, 2001). So, to what extent investments in public transports are beneficial for the society is a question without a clear answer.

1.3 Empirical approach

A. Hedonic pricing

To measure the impact of economic forces on the urban spatial structure, in most chapters we will use commercial property values and house prices as indicators. If agglomeration economies increase firms’ profits, in spatial equilibrium commercial property values should be higher at locations with more possibilities to interact. Similarly, if amenities increase utility of households, locations hosting amenities should command higher house prices. Or, if the opening of a new station reduces commuting times, households should be willing to pay a higher house price. We refer to the approach to use prices of multi-attribute products (e.g. houses) to reveal implicit prices of its attributes as the hedonic price approach. Hedonic price studies have been popular in economics ever since Griliches (1961) study of the automobile market and especially since Rosen’s (1974) analysis that emphasised the relationship between the partial derivatives of the hedonic and the marginal willingness to pay (WTP) for attributes of differentiated goods. So, hedonic methods are particularly useful to investigate to what extent firms and consumers appreciate public goods like agglomeration and amenities. Rosen (1974) also suggested a two-step procedure to identify structural utility or profit parameters. In the first step one has to estimate the marginal willingness to pay for a certain attribute. In the second step, the estimated marginal WTP is used in conjunction with first-order conditions of attributes. However, it may be shown that technology parameters are only identified given arbitrary functional form assumptions, e.g. assuming that there are homogeneous firms or consumers. Recently, Ekeland et al. (2002; 2004) and Bajari and Benkard (2005) have shown that these structural parameters are nonparametrically
identified given weaker assumptions on the functional form of the utility or profit function. We will come back to the issue of structural identification in Chapter 2.

B. Econometric issues: unobservables, heterogeneity, and aggregation

Empirical studies in the field of urban economics in general, and hedonic price studies in particular, arguably face three major identification challenges. The first is the issue of unobserved spatial variables. For example, the price of a house is a function of numerous attributes. Some of them are most likely unobserved to the researcher (Bajari and Benkard, 2005). This may lead to severe omitted variable biases. Firms are likely to cluster at locations that are attractive for unobserved reason (e.g. rivers, natural resources). The density of firms is then positively correlated to unobserved endowments of a location. As we will use density of firms as a proxy for agglomeration economies, the coefficient of agglomeration is likely an overestimate if we do not control for unobserved factors. In this dissertation, we therefore include location fixed effects (e.g. municipality fixed effects), use a spatial regression-discontinuity design, and/or use instrumental variables to allow for unobserved locational endowments.

The second issue is that most of the research on cities ignores heterogeneity in profitability of firms and preferences of households. This is unfortunate as firms and households are highly heterogeneous. For example, rich households will likely have a substantially higher willingness to pay for urban amenities compared to poor households. Similarly, large multinational enterprises will have a different profitability of agglomeration spillovers compared to local retailers. In this thesis we will heavily rely on state-of-the-art semiparametric modelling as to allow for heterogeneous profitability and preference parameters. A problem of fully nonparametric estimation, compared to semiparametric estimation, is that it is very information-intensive, as most spatial regressions (e.g. hedonic price regression) contain a large number of explanatory variables. This may lead to the so-called ‘curse of multidimensionality’: Estimation precision rapidly deteriorates when the number of explanatory variables increases (Horowitz and Savin, 2001; Bontemps et al., 2008; McMillen, 2010). Using few explanatory variables is not an option as this will lead to omitted variable bias, which cannot be solved by a parsimonious specification. However, recent empirical studies propose a partially nonparametric estimation of the function to be estimated consisting of numerous attributes (see for some examples McMillen, 2010; McMillen and Redfearn, 2010). These hold the promise for the researcher to have the best of both worlds: a nonparametric estimate of the effects of primary interest and avoidance of the curse of dimensionality associated with a fully nonparametric approach.

The third issue is spatial aggregation. Many empirical studies on cities use fairly aggregate data at the urban or metropolitan level. This means that potentially important information is ignored (Duranton and Overman, 2005). It may also lead to additional biases, especially when the dependent variable is measured in a disaggregate way, while the explanatory variables are not (Briant et al., 2010; Burger et al., 2010). Throughout this thesis we will therefore use high-quality micro-datasets. For all chapters in this thesis rely on advanced econometric techniques, such as nonparametric and semiparametric estimation techniques. To enable the reader to read chapters separately, we present estimation techniques in each chapter separately, rather than having one methodological chapter.
households and firms we have obtained location identifiers at a very detailed spatial level, approaching continuous space. Also, the measures of agglomeration, amenities and accessibility are often continuous over space.

1.4 Overview of the thesis and preview of the results
The structure of this thesis is presented in Table 1.1. The thesis is divided in two parts. In the first part, consisting of four chapters, we analyse the location choices of firms and mainly focuses on the measurement and identification of agglomeration economies. In the second part, consisting of five chapters, we analyse household location decisions. Then, the focus shifts from agglomeration economies to the impact of amenities and accessibility. In Table 1.1, we indicate for each chapter whether the effect is found to be positive (+), negative (–), or statistically insignificant (±). In the first part we find strong evidence for the importance of agglomeration economies. These spillovers tend to decay within 15 kilometres, but are also important at a very local level, even within a building. In the second part, we find that household density is not positively valued by households, possibly because of negative crowding effects. Amenities are generally also positively influencing property prices. We show for example that historic amenities increase house prices, but policies that sustain these amenities may imply high gross costs for house owners. The effects of accessibility tend to be smaller, as far as it concerns accessibility by public transport.

More specifically, in Chapter 2 we analyse the impact of agglomeration economies on commercial property values in the province of South-Holland, the Netherlands. Given a production function that allows for input factor substitution, we identify structural ratios of firm-specific production parameters

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using a semiparametric control function approach that corrects for endogeneity. The results show that agglomeration economies capitalise in commercial rents: doubling of agglomeration leads to an increase in rents of about 3.5 percent. Expenditure on agglomeration is in general limited. For example, it is on average only 5.3 percent of expenditure on office floor space. Agglomeration expenditure is much higher in some sectors: for shops of retail firms, it is about 20 percent of the expenditure on floor space.

Chapter 3 shifts the focus from heterogeneity in the profitability of agglomeration economies to identification of agglomeration economies. Again we use unique micro-data on commercial rents and employment. A measure of agglomeration is employed that is continuous over space, avoiding the modifiable areal unit problem. To distinguish agglomeration economies from unobserved endowments and shocks, we use temporal variation in densities and instrumental variables. The spatial extent of agglomeration economies is determined by estimating a spatial bandwidth parameter within the model. The results show that agglomeration economies have a considerable impact on rents: a standard deviation increase in employment density leads to an increase in rents of about 10 percent. The geographical extent of these benefits is about 15 kilometres. This effect is larger than found in Chapter 2. This is mainly because agglomeration economies are assumed to be bounded by municipal boundaries in the previous chapter, leading to an underestimate of agglomeration economies. Surprisingly, the bias of ignoring time-invariant unobserved endowments and unobserved shocks seems to be very limited.

In Chapter 4 we aim to explain the presence of extremely tall buildings in many contemporary cities: Many central business districts are dominated by high-rise office buildings, but their presence cannot be explained by standard urban economic models only. We aim to test the impact of other forces than economising on land that explain the presence of these tall buildings, such as within-building agglomeration effects and a landmark premium. We find that firms are willing to pay on average about 4.2 percent more for a building that is 10 meters taller, so there is a substantial premium associated with tall buildings. Using semiparametric estimation techniques, we aim to disentangle landmark effects from within-building agglomeration effects. Given functional form assumptions on the agglomeration effect, the results suggest that the sum of the landmark and view effect is about 2.8-5.5 percent of the rent for a building that is 5 times the average height.

Chapter 5 is the only chapter that does not employ a hedonic price approach. We will use a random profit location choice framework to analyse the relationship between knowledge intensive business services (KIBS) and multinational enterprises (MNEs). It is likely that KIBS aim to locate proximate to (internationally operating) MNEs because of agglomeration externalities. Our results, controlled for other location factors, indicate that KIBS are co-agglomerated with MNEs and that the presence of a MNE significantly influences the birth of KIBS nearby, but the effect on such start-ups is considerably smaller than the positive effect of the presence of already established KIBS.

The second part is an analysis of household location choices within cities. In Chapter 6 we review and test implications of the intra-urban economic model by Lucas and Rossi-Hansberg (2002) for the residential rent gradient. Agglomeration is proxied by employment density and accessibility is measured by the distance to the nearest business area. We show that in mixed urban areas,
agglomeration is an important determinant of the rent, while in residential areas accessibility significantly impacts rents. These results are broadly in line with the theory.

Chapter 7 also analyses mixed land use, but in a more sophisticated way. Contemporary European urban planning policies assume that mixing land uses yields socio-economic benefits and therefore has a positive effect on housing values. We then investigate the impact of mixed land use on housing values and demonstrate that a diverse neighbourhood is positively valued by households. There are various land use types that have a positive impact on house prices, e.g. business services and leisure. Land uses that are incompatible with residential land use are, among others, manufacturing and wholesale. We find that households are willing to pay about 2.5 percent more for a house in a mixed neighbourhood compared to a house in a monofunctional neighbourhood. We also show that there is substantial heterogeneity in willingness to pay for mixed land use. For example, only apartment occupiers are willing to pay for an increase in diversity, whereas households living in other house types are not willing to pay for diversity.

In Chapter 8 we analyse the impact of historic amenities on housing values and of sorting of households within the city. Conservation area boundaries enable us to employ a semiparametric regression-discontinuity approach to measure the impact of historic amenities (see similarly Bayer et al., 2007). The approach allows for household-specific preferences. Conditional on neighbour attributes, the price difference at the conservation boundary is about 3 percent. Internal historic amenities are also important, as listed houses are about 6 percent more expensive. It is shown that rich households sort themselves in conservation areas and in listed buildings, because they have a higher willingness to pay for historic amenities. The results contribute to an explanation for the substantial spatial income differences within cities.

Chapter 9 analyses the effects of location-based policies, in particular policies to protect cultural heritage. We argue that these policies may have adverse side-effects. Houses may for example have stronger maintenance obligations and are subject to stronger regulations with respect to changes in the exterior of a house. We then aim to estimate the costs of within-city regulatory restrictions for house owners. To avoid endogeneity issues with respect to supply restrictions, we employ a regression-discontinuity approach using a World War II bombing boundary within the city of Rotterdam. Conditional on amenities and housing attributes, in the bombed area (where fewer restrictions apply) house prices are about 10 percent higher. This implies regulatory costs of about 0.72 million euro per hectare for the area under consideration. The results suggest that house owners’ benefits should be substantial to compensate for the costs of additional restrictions.

Chapter 10 focuses on the benefits of improved railway accessibility. We investigate the effects of new railway stations on house prices using an extensive repeated sales dataset over a period of 13 years. We show that station openings seem to have a negligible impact on residential property values. In this chapter we also review evidence on the effect of railway accessibility in earlier chapters.

Chapter 11 concludes, derives some policy implications, and discusses avenues for further research.
PART 1

FIRMS