



**Universität  
Zürich** <sup>UZH</sup>

## **Masterthesis**

zur Erlangung des

Master of Advanced Studies in Real Estate

*Are housing prices in U.S. metropolitan areas  
being raised by zoning and land use regulations?*

Name: Patrick Harsch  
Adresse: Kalchbühlstrasse 108, 8038 Zürich  
Eingereicht bei: Prof. Dr. Christian P. Hoffmann, Universität St. Gallen  
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**List of abbreviations**

AER	American Economic Review
AREUEA	Journal of the American Real Estate and Urban Economics Association
CA	California
D.C.	District of Columbia
FL	Florida
GA	Georgia
ID	Idaho
IL	Illinois
JHE	Journal of Housing Economics
JHR	Journal of Housing Research
JLE	Journal of Law and Economics
JUE	Journal of Urban Economics
JUS	Journal of Urban Studies
MA	Massachusetts
MD	Maryland
MN	Minnesota
MSA	Metropolitan Statistical Area
NC	North Carolina
NE	Nebraska
NJ	New Jersey
NV	Nevada
NY	New York State
OH	Ohio
OR	Oregon
TX	Texas
U.S.	The United States of America
RSUE	Regional Science and Urban Economics
WA	Washington State

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**Executive Summary**

In the United States of America, local governments take action in order to protect their cities from undesired occurrences like high population densities, low income residents, costs of additional infrastructure, urban sprawl, congestion and pollution. In order to mitigate these occurrences, they enact zoning codes and land use regulations that are regarded to protect the city and its residents from the impact of these undesired effects. Regulations separate the land in developable zones and in areas, where no development is possible. In places where development is permitted, zoning codes secure the separation of uses by allotting areas for residential, commercial or industrial use. By means of regulations such as minimum lot size or height restrictions, governments also define the extent to which a plot can be overbuilt. In consequence, land use regulation policies lead to a limitation of building supply, prevent the production of new housing units and cause lower densities.

Analysis attempting to investigate housing prices often pay attention to demand side factors such as population growth or income. The supply side of the housing market is almost ignored by these analyses. Looking at both supply and demand factors of real estate markets it turns out that increasing prices require not only rising demand, but also restrictions in supply. These supply restrictions either derive from natural constraints or artificial rules, both cause scarcity in the supply of developable land.

Economic theory teaches that scarcity contributes to higher prices. If local governments withdraw land from development and thus limit the supply, they constrain the amount of buildable land, hence reducing the production of new housing units. Restrictive zoning policies, limits on density and urban growth boundaries are usually associated with increased prices for housing. Under the assumption of growing population (i.e. increasing demand) the lack of housing supply is expected to lead to higher prices for housing, as housing supply in short term is inelastic. With this policy local governments, contribute to increasing housing values, making housing for a large number of consumers more expensive or even unaffordable.

## Zusammenfassung

In den Vereinigten Staaten von Amerika versuchen örtliche Behörden ihre Städte vor unerwünschten Erscheinungen wie hohen Bevölkerungsdichten, Bewohnern mit geringem Einkommen, Kosten zusätzlicher Infrastruktur, Zersiedelung, Überfüllung oder Verschmutzung zu bewahren. Um diese zu vermeiden, setzen sie Bauzonenpläne und Landnutzungsbeschränkungen in Kraft, deren Absicht ist, die Stadt und ihre Bewohner vor den Folgen dieser unerwünschten Auswirkungen zu schützen. Regulierungen teilen das Land in entwickelbare Zonen und in Gegenden, in welchen eine Entwicklung nicht möglich ist. In entwickelbaren Orten sorgt die Bauzonenplanung für eine Funktions-trennung, indem sie Gebiete für Wohnen, Handel oder Industrie zuweist. Mithilfe von Vorschriften wie Mindestgrössen für Grundstücke oder Höhenbeschränkungen bestimmen die Behörden das Ausmass in welchem ein Grundstück überbaut werden kann. In Folge führen diese Beschränkungen zu einer Begrenzung des Flächenangebots, verhindern die Erstellung neuen Wohnraum und sorgen für geringere Dichten.

Untersuchungen, welche zum Ziele haben, Wohnpreise zu beobachten, konzentrieren sich oft auf Nachfragefaktoren wie Bevölkerungswachstum oder Einkommen. Die Angebotsseite jedoch wird von diesen Untersuchungen kaum weiter beachtet. Eine Betrachtung der Faktoren Angebot und Nachfrage zeigt, dass steigende Wohnpreise nicht nur wachsende Nachfrage voraussetzen, sondern auch Angebotsbeschränkungen. Diese Angebotsbeschränkungen entwachsen einerseits natürlichen Beschränkungen, andererseits künstlich hervorgerufener Begrenzung, welche beide eine Verknappung des Angebots an bebaubarem Land zur Folge haben.

Die ökonomische Theorie lehrt, dass auf Knappheit höhere Preise folgen. Wenn Behörden Land der Entwicklung entziehen und somit das Angebot beschränken, begrenzen sie auf diese Weise die Menge des entwickelbaren Landes, also auch die Produktion neuen Wohnraumes. Restriktive Bauzonenplanung, Beschränkungen baulicher Dichte und räumliche Wachstumsgrenzen werden üblicherweise mit höheren Wohnimmobilienpreisen verbunden. Unter der Annahme eines Bevölkerungswachstums (d.h. steigender Nachfrage), ist zu erwarten, dass der Mangel an Wohnraum zu höheren Preisen führen wird, da das Wohnraumangebot kurzfristig unelastisch ist. Mit dieser Politik tragen die Behörden zu steigenden Wohnimmobilienpreisen bei und sorgen so dafür, dass Wohnen für eine grosse Zahl an Nachfragern teurer oder gar unerschwinglich wird.

# 1 Introduction

This chapter will inform about the reasons for having chosen the subject of price impacts of zoning on housing prices as the theme for this master thesis.

## 1.1 Motivation

Housing and the high costs of real estate are an almost daily component of media articles not only in Switzerland but in many countries around the world. The debate arose due to rents or sale prices for residential units, especially in the metropolitan regions, being regarded as high and therefore making housing in these regions almost unaffordable to a certain number of people.<sup>1 2</sup> Following this matter, ideas have been developed in everyday discussions in order to mitigate the alleged high costs of housing by numerous means. Regrettably, the media hardly investigate the reasons of housing costs but take it for granted.

It is part of this thesis to analyse the costs of housing under the aspect of zoning and land use regulations. The real estate market for housing in the United States of America (U.S.) is subject to this thesis because there is numerous research data about the impacts of zoning and land use regulations available. Furthermore, the U.S. housing market in most regions is still growing<sup>3</sup> and one of the most transparent in the world. Another advantage of the U.S. market is the fact that zoning ordinances and land use regulations in most states are being enacted by municipalities, whereas there is no binding national building code.

This thesis concentrates on metropolitan areas, as the amount of existing appraisals in these regions is quite high and the census shows that the demand for housing in most metropolitan areas is still intact.

The results of this thesis depict the American real estate market and cannot be assigned to the Swiss or other markets in detail. But in general, as economic principles are ex-

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<sup>1</sup> "Weltwoche" Nr. 37 2010, p. 56-58

<sup>2</sup> „Finanz und Wirtschaft“ Nr. 90 2010, p. 1

<sup>3</sup> U.S. Census Bureau 2010 Census

pected to apply in every economy, the tendencies and conclusions may also be attributed to other economic entities.

As it is almost impossible to investigate all components and factors of influence on real estate markets, this thesis focuses exclusively on the price effects of zoning and land use regulations. These regulatory constraints are assumed to have impacts on housing affordability. The question that has to be answered therefore is about the impacts of zoning and land use regulations on housing prices.

The aforementioned discussion usually focuses on the demand side of housing. However, it would be desirable to answer the question why, if there is a constant and steady demand for housing (due to immigration and/ or population growth) and there are investors on the other side, why are not more housing units being built in order to satisfy this demand?

This question turns the debate to the supply side of housing,. It seems confusing that only a few residential units are realised and so the questions arise as to what detains the construction market from offering more residential units. The answer seems rather simple, it might be the unwillingness of investors or developers to build more housing, or perhaps they are just not able to do so, in that they must be externally constrained and thus are not able to offer more residential space. It is rather improbable that developers relinquish the opportunity to construct more housing units, hence it might be assumed that there must be a certain restriction on development keeping the amount of new housing low. The only restrictions coming into consideration must be constraints on the supply side of land or restrictions on land utilisation. Land can be restricted through natural reasons, such as steep mountains, large water surfaces, or by man-made restrictions.<sup>4</sup> The latter seems to have larger effects; as if a builder is willing he may find a solution to build on even on a steep rock or in the middle of an ocean, whereas he cannot realise a proposed structure where the man-made law hampers him from doing so.

Zoning and land use regulations constrain the amount of available land for construction or impose certain rules on plots that impede builders to utilise their land in the way they regard it to be ideal. Economic literature concedes that restrictions on the supply side

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<sup>4</sup> “Both, large bodies of water and local governments restrict the supply of urban land.”, Rose 1989, p. 325

lead to higher prices if the demand is intact i.e. higher than the possible amount of supply. Pursuing this assumption it is the purpose of this thesis to point out whether zoning and land use regulations constrain the amount of developable land or restrict the use and utilisation of already developed sites in U.S. metropolitan areas thus raising the price for housing.

## 1.2 Topic and research question

Zoning and land use regulations have been subject to numerous studies on the real estate markets, not only for residential housing but for other property types as well. These studies usually concentrate on certain issues of zoning such as exclusionary zoning, society effects or externalities.

This thesis is an approach to answer the question on whether zoning raises the price of housing and is an analysis of existing investigations dealing with the impacts of zoning and land use regulation on housing prices.

The focus of this thesis is primarily the supply of land and to a certain extent, housing construction. It is artificial restrictions on land supply that are supposed to have an impact on housing prices. The demand side for housing is hard to measure, hence the assumption underlies that the demand for residential units in metropolitan areas is intact. In 47 out of 51 Metropolitan Statistical Areas with more than one million inhabitants, the population between 2000 and 2010 grew to around 13% in average, with ranges from 1 to 42% <sup>5</sup>.

It is assumed that limited supply of land is not only the result of geographic or technological constraints, but the consequence of an accelerating regulatory surrounding. Previous research indicates that there is an impact of law imposed land supply shortages on housing prices <sup>6</sup>. It will be subject of this thesis to reveal if the artificial shortage of land supply by means of zoning shows impacts on housing prices and thence to the question of if prices are being raised by these regulations.

The research question will be answered by means of a meta-analysis. This analysis is the systematic examination of nine relevant journals dealing with real estate aspects <sup>7</sup>. The journals have been identified with key words best matching the research theme (see chapter 3.2).

After having completed the meta-analysis and examining the result whether zoning and land use regulations are raising housing prices or not will be unfold.

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<sup>5</sup> Table 1: Metropolitan Statistical Areas in the U.S

<sup>6</sup> Katz and Rosen 1987, Malpezzi 1996, Pollakowski and Wachter 2005

<sup>7</sup> Table 3: Total number of reviewed journals

### **1.3 Confine**

Subject to this thesis is the question of whether housing prices are being raised by land use regulations and zoning. Hence the research applies only to residential real estate markets. Housing (sales and rental properties) in this sense encompasses all free market housing, i.e. residential units accessible to everybody. This means that special housing products such as residential living, granted or subsidised by governments, cooperatives and private communities are not part of the analysis.

Although there are many other government imposed constraints on the real estate market, this thesis only deals with mandatory zoning and land use regulation and its effects.

This thesis concentrates on the supply side of housing markets under the aspects of zoning regulations. The constraint of land supply by natural circumstances is not the main focus.

The geographic areas to be investigated are growing metropolitan areas (MSAs) the United States of America (U.S.) with more than one million inhabitants. Thus other geographical entities, MSAs with less than one million inhabitants and shrinking MSAs with more than one million inhabitants are excluded. The data used for this thesis solely examines institutional settings within the U.S.

## **1.4 Structure**

The introduction (section 1) disclosed the motivation for this thesis and then explains the topic and research question.

Section 2 “theory” continues with a statement to metropolitan areas followed by a description of price mechanisms in real estate markets. This section also explains zoning and regulations in theory and in practice, including its history and motivations. The impacts of regulations on housing prices will accomplish the section.

In section 3 the method of analysing the research question will be described. This includes the description of the scientific approach and the following meta-analysis.

The empirical analysis and results are contained in section 4, where the investigated data will be described and discussed. The meta-analysis examines nine scientific journals regarded as relevant with respect to land use regulations in order to learn about the impacts of these regulations. The analysis is expected to reveal a tendency with regards to the research question and to be followed by an unambiguous conclusion.

Section 5 concludes the previous findings. It will encompass the results found out in the thesis and literature after having dealt with the research.

The structure of this master thesis is depicted in illustration 1 (p. 7).

Are housing prices in U.S. metropolitan areas being raised by zoning and land use regulations?				
Introduction	Theory	Scientific approach	Empirical analysis and results	Summary
Motivation	Housing and metropolitan areas	Introduction and application	Examination	Review
Topic and research question	Real estate prices and mechanisms	Method	Article overview	Application of the results to Switzerland
Confine	Housing prices - Introduction - Costs of land - Costs of construction - Implication		Discussion - Beneficiaries - City shape/ density - Development/ construction - Quantification	Conclusion - What can be done to make housing more affordable? - Final remarks - Future research
Structure	Explanation of zoning		Results	
	Types of zoning - Introduction - Separation of uses - Indirect types		Criticism	
	Regulation theory and practice - History in the U.S. - Reasons - Perception - Application			
	Impacts of regulation			

Illustration 1: Content

## 2 Theory

The theoretical framework of regulations will be explicated in this chapter. The functions and mechanisms of real estate prices are being introduced. Zoning as an expression will be explained and so will the different types of zoning. The application of zoning in theory and practice is turned out and the section closes with an overview to the impacts of zoning policies.

### 2.1 Housing and metropolitan areas

This chapter gives a brief overview about the development of U.S. metropolitan areas in the last ten years and shows the importance of research on zoning impacts especially in large agglomerations.

According to the 2010 U.S. census <sup>8</sup>, 54.12% of the nation's population lived in one of the 51 largest Metropolitan Statistical Areas (MSA) exceeding one million inhabitants <sup>9</sup>. More than half of the MSA population again resided in the ten most populated MSAs. The U.S. Office of Management and Budget defines MSA as follows: "Metropolitan Statistical Area—A Core Based Statistical Area associated with at least one urbanized area that has a population of at least 50,000. The Metropolitan Statistical Area comprises the central county or counties containing the core, plus adjacent outlying counties having a high degree of social and economic integration with the central county or counties as measured through commuting." <sup>10</sup> The population in the mentioned 51 MSAs increased to around 13% in average from 2000 to 2010. Only five MSA were shrinking in that period.<sup>11</sup> Unsurprisingly one of the shrinking MSAs was New Orleans (-11.3%) following the 2005 Katrina hurricane disaster. The others are the former heavily industrialised cities of Detroit (-3.51%), Cleveland (-3.30), Pittsburgh (-3.08%) and Buffalo (-2.96%).

Population grew fastest in Las Vegas and Raleigh (both +41.83%), followed by Austin with +37.33% and Charlotte with +31.17%. 24 of the MSA were growing above the average of 13%. This altogether indicates a strong and continuing demand in housing,

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<sup>8</sup> U.S. Census Bureau 2010 Census

<sup>9</sup> Table 1: Metropolitan Statistical Areas in the U.S

<sup>10</sup> Federal Register 2010

<sup>11</sup> For a better understanding MSAs in this thesis are named by their largest city.

especially in the 46 growing MSAs. Glaeser (2011)<sup>12</sup> concludes that robust demand, created by economic vitality and urban pleasures explain why prices in attractive cities have risen so steadily. For that reason (constant population growth is assumed) this thesis focuses on MSAs only.

Previous research about housing prices and the impacts of regulation usually focused on Boston, Dallas, Houston, Los Angeles, Miami and San Francisco and their surroundings. As Houston is the only major city without zoning rules, there have been several investigations undertaken and Houston often serves as an example and benchmark as a city without zoning.<sup>13</sup> On the other hand, heavily regulated places like Boston, New York City and San Francisco used to be analysed in various reports. It is important to note that hitherto no entire MSA has been investigated with respect to housing prices and zoning but only parts of an MSA.

The interrelation between metropolitan areas and zoning is explicated by Pendall, Puentes, Martin (2006): “More than 91 percent of the jurisdictions in the 50 largest metropolitan areas have zoning ordinances of one kind or another [...]. Only 5 percent of the metropolitan population lives in jurisdictions without zoning, but as much as 11 percent of the land area is estimated to be unzoned. Almost as many jurisdictions—85 percent—have a comprehensive plan. As a result, 84 percent of the population and 92 percent of the land area is subject to a plan for how the particular jurisdiction intends to grow and develop in the future.”<sup>14</sup>

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<sup>12</sup> Glaeser 2011

<sup>13</sup> Although Houston often is described as a city without zoning there are private; hence voluntarily, covenant rules within the city limits. The city itself enacted several rules on building setbacks or minimum parking requirements but there is no municipal zoning ordinance and attempts to impose such ordinances have been rejected by Houston voters three times, last in 1993.

<sup>14</sup> Pendall, Puentes and Martin 2006, p. 10

## 2.2 Real estate prices and mechanisms

For a better understanding of the function of supply and demand in housing consumption and production, this chapter will summarise the state of knowledge on real estate prices and mechanisms hitherto identified.

“Fundamental to any understanding of housing supply is insight into the production of new housing units. Housing is supplied by single-family and multi-family builders.”<sup>15</sup> Of course, the housing markets include not only new but also already existing (i.e. used) housing. New housing accommodates population growth and replaces out of time units. The price of used housing is determined by the cost of new housing. If the price of new housing rises, potential sellers of existing homes will react by adjusting their asking prices to that of the range of new housing.

Overall, housing is influenced by factors such as land, materials, labour and construction time<sup>16</sup>.

In order to grasp the context of housing prices, it is expedient to look at the supply and demand curves for new housing.

The steepness (elasticity) of those curves describes the sensitivity of prices to changes in demand or supply. “The determinants of the supply elasticity of land may be physical (topography) or man-made (regulations restricting land use).”<sup>17</sup> “(T)he housing supply cannot adjust rapidly because of regulatory constraints, so price effects are greater in more regulated (inelastic) markets.”<sup>18</sup> A flat or elastic supply curve ( $s_e$ ) implies that large changes in demand will lead to small changes in price (from  $p_e$  to  $p_e'$ ). In contrast a steep or inelastic curve ( $s_i$ ) implies that small changes in demand (from  $d_i$  to  $d_i'$ ) can lead to large changes in price ( $p_i$  to  $p_i'$ ). “In markets with a relatively inelastic supply of land or housing, demand shifts mostly affect house prices”<sup>19</sup>

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<sup>15</sup> Gyourko 2008, p. 4

<sup>16</sup> Of course, other factors like rules set by a regulatory framework (such as laws and taxes), demand and supply also influence housing.

<sup>17</sup> Hilber and Robert-Nicoud 2009, p. 1

<sup>18</sup> Gyourko 2008, p. 21

<sup>19</sup> Hilber and Robert-Nicoud 2009, p. 1

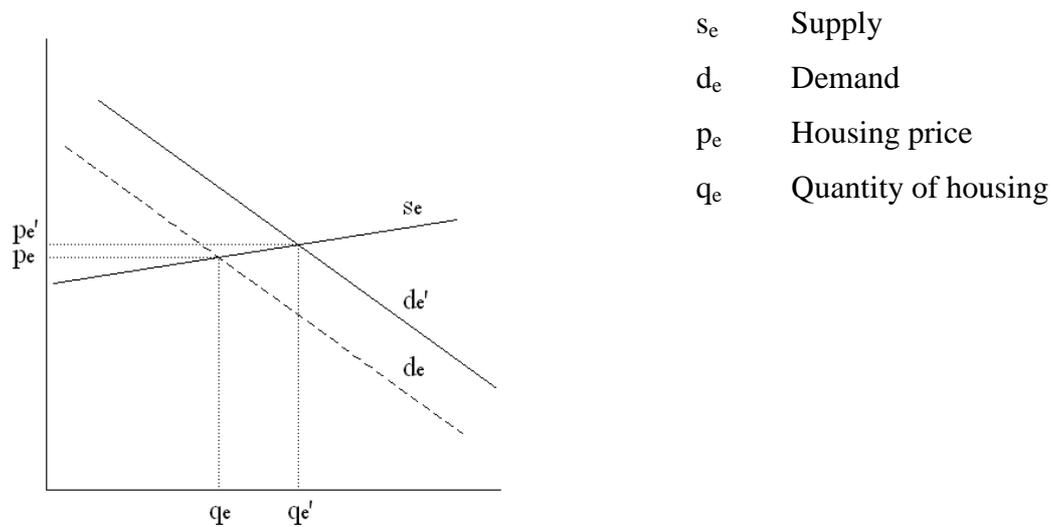


Illustration 2: Elastic supply

If the supply is elastic, as in illustration 2, additional demand will lead to little changes in price, but the housing stock will grow in order to fulfil demand. As the curve is rather flat the increased demand has only small price impacts. “In many places, the supply of houses seems almost perfectly elastic. [...] the population of Las Vegas almost tripled between 1980 and 2000, but the real median housing price did not change.”<sup>20</sup>

<sup>20</sup> Glaeser, Gyourko and Saks 2005b, p. 332

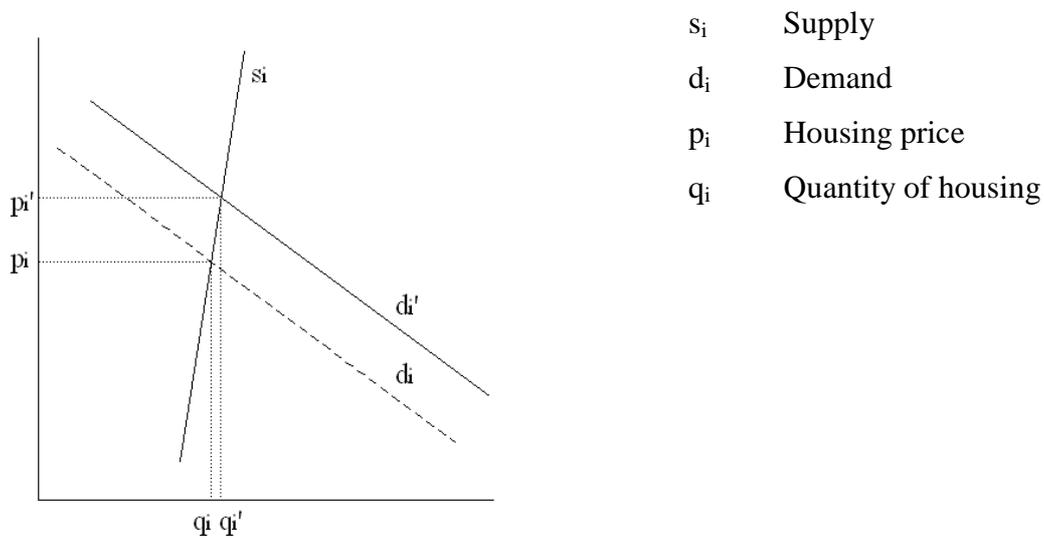


Illustration 3: Inelastic supply

The supply shown in illustration 3 is inelastic, hence any additional demand will lead to severe price changes and the housing stock will grow to a very small extent only. Several groups of consumers can no longer afford housing. As the curve is steep the increased demand has considerable price impacts. “We [...] find that greater land use regulation produces lower levels of supply elasticity.”<sup>21</sup>

In their 1980 research Hanushek and Quigley<sup>22</sup> reveal that the housing demand is inelastic, few people are willing to live without a home. The vast majority of Americans seem to prefer a single-family home. People willing to live in multi-family housing usually regard such housing as temporary until they can afford a single-family home. This suggests that the demand for single-family housing may be even more inelastic than for housing in general.

In a theoretic model, Pogodzinski and Sass (1990) assume that “consumers are immobile and that the effect of the zoning regulation is to force the consumption of a more-than-optimal amount of housing (for example, by requiring a minimum consumption of

<sup>21</sup> Green, Malpezzi and Mayo 1995, p. 337

<sup>22</sup> Hanushek and Quigley 1980

housing [...]).”<sup>23</sup> Then if regulatory constraints are mandatory, the demand curve becomes vertical, i.e. “perfectly inelastic”<sup>24</sup>.

The impacts of inelastic demand have been pointed out above, thence small changes in the supply of new homes lead to higher prices. Mills and Hamilton (1997) turn out, that housing supply is relatively fixed in the short term, whilst the long run supply for housing prices is perfectly elastic.<sup>25 26</sup>

Elastic supply as shown above leads to moderate alterations in prices and keeps housing prices rather stable. In contrast, inelastic supply leads to large changes in prices. Applied to the real estate market this states that constraints on the supply of land cause scarcity and thus lead to higher housing prices. The influence of land and construction on housing prices is explained in the next chapter.

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<sup>23</sup> Pogodzinski and Sass 1990, p. 298

<sup>24</sup> Pogodzinski and Sass 1990, p. 298

<sup>25</sup> Mills and Hamilton 1997, p. 196

<sup>26</sup> One reason for the short run inelasticity of housing is the construction time needed to complete a structure.

## 2.3 Housing prices

Housing prices are influenced by many factors. Prevalent on the supply side are the costs for land and the costs for construction. Both components will be closer looked at in this chapter.

### 2.3.1 Introduction

Housing costs consist of the following major elements: “raw land and improvement costs, construction costs, financing cost, overhead and profit.”<sup>27</sup>

Cost of raw land and all improvements being needed to convert raw land into a lot are the first component. Subsequently, costs of building materials and labour to construct the structure are added. Further costs, not subject to this thesis, contain financing and the developer’s profit, taxes and fees.

In their 2002 discussion paper Glaeser, Gyourko and Saks discover that “Housing prices are determined by both demand and supply concerns. High housing prices must reflect high consumer demand for a particular area. However, they must also reflect some sort of restriction on supply.”<sup>28</sup> They assume that physical houses can be supplied almost perfectly elastically. “As such, the limits on housing supply must come from the land component of housing. The usual urban economics view of housing markets suggests that the restriction on housing supply is the availability of land. Because land is ultimately inelastically supplied, this naturally creates a limit to the supply of new housing at construction costs.”<sup>29</sup> With their findings they turn out the importance of land as the main leverage of housing costs.

In 2005 Glaeser, Gyourko and Saks find about the rise in housing prices: “Too often, analysts attempt to understand housing prices only by attending to demand-side factors such as interest rates or per capita income, while ignoring the supply-side of the market. Rising prices require not only rising demand, but also limits on supply. The supply of housing includes three elements: land, a physical structure, and government approval to put the structure on the land. Thus, rising prices must reflect rising physical costs of

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<sup>27</sup> Atash 1990, p. 232

<sup>28</sup> Glaeser and Gyourko 2002, p. 11

<sup>29</sup> Glaeser and Gyourko 2002, p. 11

construction, increasing land prices or regulatory barriers to new construction.”<sup>30</sup> Glaeser and Gyourko indicate that, according to their 2002 figures, supply of physical housing entities is elastic whilst land is supplied in an inelastic way.

### 2.3.2 Costs of land

“Many factors bear on the price of developed lots in urban areas. [...] On the supply side, we have the costs of raw land, utilities and roads, obtaining local approvals, competition among developers, municipal contributions, and topographical factors that affect the cost of producing developed lots.”<sup>31</sup> Costs of land hence do not only contain the price for an area of land, but also costs like building site preparation or sewer coverage. The last two mentioned types of cost belong to the land, but they can be characterised as construction costs and will be referred to below.

Underlying the assumption made by Glaeser, Gyourko and Saks<sup>32</sup>, the costs of construction are a rather stable component, the price of housing supply shifts from  $p_c$  to  $p_c'$  only, but the price of the inelastic land supply turns from  $p_l$  to  $p_l'$  and thus is responsible for the high price of housing. The gaps between  $p_c$  and  $p_c'$  as well as from  $p_l$  and  $p_l'$  will be named as  $\Delta_c$  and  $\Delta_l$  respectively. With the premises that housing contains a component of land<sup>33</sup> and a physical entity, the overall costs will be  $(p_c + \Delta_c) + (p_l + \Delta_l)$ . This demonstrates that the rise of inelastic  $\Delta_l$  (land price) is proportional higher than the rise of elastic  $\Delta_c$  (building) and thus the leverage on housing costs. The land supply curve's steepness will change from location to location, whereas the building supply curve remains rather elastic and therefore hardly steepens (see illustration 4, p. 16).

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<sup>30</sup> Glaeser, Gyourko and Saks 2005a, p. 2

<sup>31</sup> Peiser 1981, p. 397/398

<sup>32</sup> Glaeser, Gyourko and Saks 2005a, p. 2

<sup>33</sup> “Both structure and land are required to produce housing” Gyourko 2008, p. 5

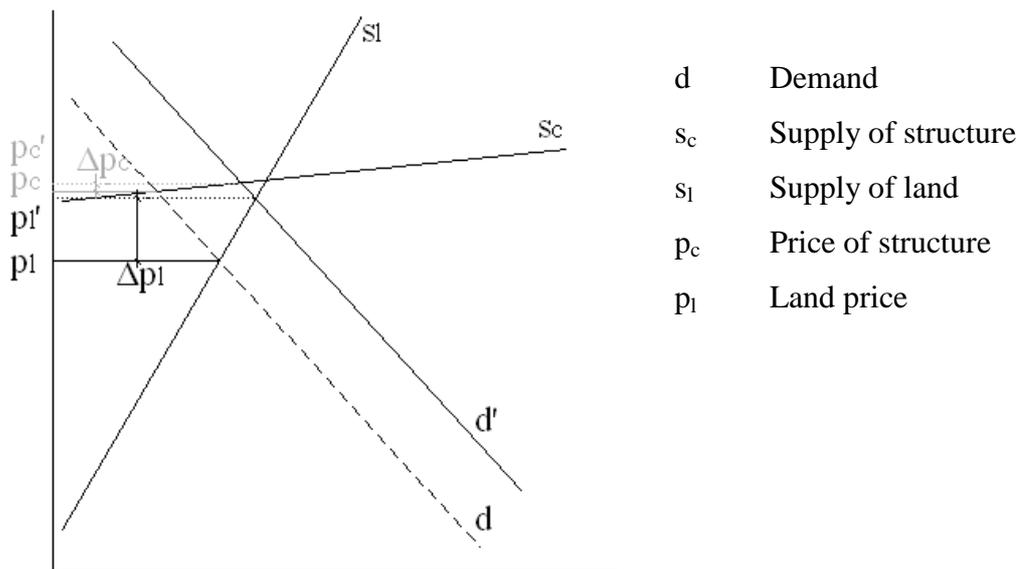


Illustration 4: Supply of land and structure

Illustration 5 (shown on p. 17) depicts a stylised supply of land curve. “In region I, land is abundant and, thus, inexpensive, so the replacement cost of residential structures accounts for just about all of home values in the locality.”<sup>34</sup> Between A and B the curve is rather elastic, hence embodying the ease with which new housing can be constructed. Region II shows a scarcer amount of lots, hence more expensive homes. Moving from B to C and to D, land becomes even scarcer and thus more expensive. The monetary land’s share on housing will be increased and lowers the elasticity of housing supply.

<sup>34</sup> Davis and Palumbo 2008, p. 353/354

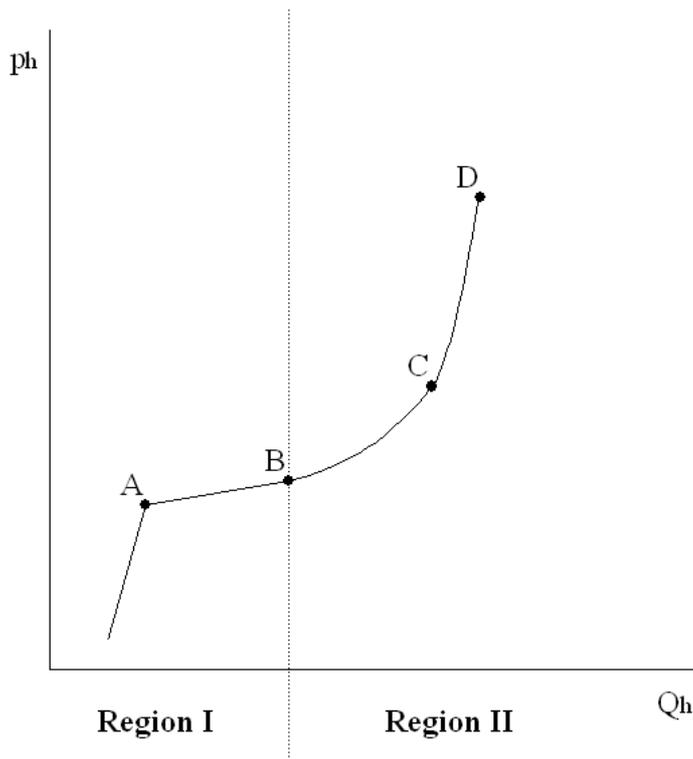


Illustration 5: Land supply

Design after Davis and Palumbo 2008, p. 353/354

### 2.3.3 Costs of construction

After having explained the housing prices it is now time to focus on the other influencing factors of housing costs. The construction time depends on the time needed to erect a structure and the time it takes to get a building permit. A pre-assembled home can be constructed within a few weeks. However, it is hard to estimate the time needed for a building permit which may stretch from a few days to several years in the case of large developments. Labour needed as workforce in order to construct housing is an essential factor. Within a developed national economy labour costs should vary to a small extent only (see 2.3.4).

Developers usually attempt to minimise their variable costs of construction (e.g. labour), hence they prefer to build in locations with little regulation. The amount of costs saved due to lower land prices are thence passed on to consumers.

#### 2.3.4 Implication

As shown here and in chapter 2.2, the land price is the main contributor of housing costs. Higher land costs will directly lead into higher costs for housing. The supply of land in a regulated situation is limited, thus the supply curve is inelastic and characterised by fast growing prices. In the long run, housing prices are elastic and only short term inelastic, as it takes some time to produce new housing.<sup>35</sup> Assuming that housing supply tends to be elastic, the key to housing cost must be the land price, the factor varying most of the aforementioned.

With regards to construction costs, Glaeser turns out: “In Los Angeles, construction costs are 25 percent higher than in Houston, but housing is over 350 percent more expensive in Los Angeles.”<sup>36</sup>

This turns out that construction costs of a comparable structure may change to a certain extent between locations, whereas the land price can vary in a wide range and people seeking to avoid high land costs will move to less regulated (hence more elastic in land supply), communities.

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<sup>35</sup> see Mills and Hamilton 1997

<sup>36</sup> Glaeser 2011, p. 191

## 2.4 Explanation of zoning

As zoning and land use regulations are the main body of this thesis, it is essential to clarify these terms. Zoning is defined either by theoretical definition or practical exercise. The different approaches of theoretical and practical zoning definitions will be explained below.

Zoning laws are introduced in order to separate different kinds of real estate use such as commercial, industrial and residential. They also may impose certain rules on utilisation of plots like height limitations or the lot size.

Hilber and Robert-Nicoud explain land use regulations as follows: “Land use regulations impose substantial restrictions on the property rights of landowners, they take many forms (e.g., zoning, growth boundary controls, building height or minimum lot size restrictions), and they serve various purposes [...]. Though they differ in purpose, kind and scope, all these regulations have a component in common: they act as quantitative restrictions to land use and, as such, they have a shadow tax equivalent.”<sup>37</sup> This explanation indicates an effect of land use regulation on housing prices named “regulatory tax”<sup>38</sup> by the authors.

Following this definition, zoning can be regarded as a version of land use regulation. Furthermore, effects for and intentions of zoning and land use regulation are the same and zoning can be interpreted as a mean to reach land use regulation. Both will be dealt with as one subject here.

Dain (2005) with regards to the Massachusetts Zoning Act alludes: “Zoning is a regulatory system that permits and prohibits various land uses in mapped districts that cover all of the land of a municipality. Zoning bylaws and ordinances [...] commonly include lists of activities that can be permitted in each zoning district, the densities at which structures can be built, height of structures, dimensional requirements [...]”<sup>39</sup>

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<sup>37</sup> Hilber and Robert-Nicoud, 2009 p. 1

<sup>38</sup> Hilber and Robert-Nicoud, 2009 p. 5

<sup>39</sup> Dain 2005 p. 18

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Another interesting observation is Ellickson's "Zoning typically involves at least two types of controls. First, the authorities define classes of activities, termed uses that are permitted in each geographic area. [...] In addition, the zoning officials set structural restrictions. The early controls of this type were primarily concerned with building and lot dimensions, but recent ordinances impose broader regulations dealing with matters like minimum parking space and the use of signs. Both types of restrictions are mandatory [...]"<sup>40</sup> He divides zoning regulations into a land use and a building appearance component and points out the alteration of zoning policies over time.

Concluding the previous definitions, zoning can be regarded as a government imposed restriction on landowner's property rights by regulating what type of use and to what extent is permitted on their plot.

Zoning appears in many forms, the most common forms will be explained in the following chapter 2.5.

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<sup>40</sup> Ellickson 1973, p. 692

## 2.5 Types of zoning

Numerous types of regulations on housing have been enacted. They vary between legislations and no two zoning practices are the same. The most commonly used types will be introduced here.

### 2.5.1 Introduction

It is not easy to provide a complete overview over all different kinds of zoning. “The ways in which housing is allowed, regulated and restricted are as numerous as the jurisdictions themselves”<sup>41</sup> Ellickson notes: “There is no consistent practice as to what will be included in a zoning ordinance; further, many local governmental prohibitions, mandatory standards, and directives affecting land use may be contained in regulations falling under other labels-subdivision regulations, building codes, housing codes, fire codes, health codes, and the like. From an economic standpoint, however, local zoning regulations are the most significant land use controls [...]”<sup>42</sup> The example of Massachusetts demonstrates<sup>43</sup> that every municipality has its own local zoning ordinance and no two zoning ordinances are identical. The same picture is drawn with regards to California “A Study of 443 communities in California identified 907 different types of zoning regulations [...]”<sup>44</sup> Hence there are a vast number of different zoning practices from community to community and between each State.

Quigley and Rosenthal (2005) categorise land use regulations based on a 1992 survey of municipal development authorities in California. The excerpt, shown in table 2 of their 2005 article, delivers a first overview on the variety of zoning.

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<sup>41</sup> Schuetz 2007, p. 6

<sup>42</sup> Ellickson 1973, p. 691

<sup>43</sup> Dain 2005

<sup>44</sup> Harney 2009, p.486

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 Land use regulatory categories
 

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**Residential development**

Building permit cap

Population cap

Floor area ratio limit

Downzoning to open space/ agricultural use

Referendum for density increase

**Commercial/ industrial  
development**

Square footage cap

Rezoning to lower intensity

Height reduction

**Land planning**

Growth management element

Moratoria

Urban growth boundary

Tiered development

Subdivision cap

Other growth control

**Adequate public facilities  
requirements**

Roads and Highways

Mass transit

Parking

Water supply, distribution, purification

Sewer collection and treatment

Flood control

Other adequate public facility measures

Table 2: Land use regulatory categories

Source: Quigley and Rosenthal 2005, p. 74

The California Planning and Zoning Law legitimate counties or cities to adopt zoning rules as follows:

- “(a) Regulate the use of buildings, structures, and land as between industry, business, residences, open space, including agriculture, recreation, enjoyment of scenic beauty, use of natural resources, and other purposes.
- (b) Regulate signs and billboards.
- (c) Regulate all of the following:
  - (1) The location, height, bulk, number of stories, and size of buildings and structures.
  - (2) The size and use of lots, yards, courts, and other open spaces.
  - (3) The percentage of a lot which may be occupied by a building or structure.
  - (4) The intensity of land use.
- (d) Establish requirements for offstreet parking and loading.
- (e) Establish and maintain building setback lines.
- (f) Create civic districts around civic centers, public parks, public buildings, or public grounds and establish regulations for those civic districts.”<sup>45</sup>

In general, two types of zoning can be distinguished. First the separation of uses (also known as “Euclidean zoning”), divides a city into zones where only certain use is permitted. “Zoning takes three general forms: constraints on density, lot size and allowable use.”<sup>46</sup> Secondly, there are indirect types of zoning such as exclusionary zoning that intend to exclude certain uses altogether.

With the separation of uses planners achieve that only uses matching the planning zone will be built in a certain area whilst other uses are excluded and thus cannot be constructed. They reach that industrial uses do not occur in residential areas but they also prevent residential areas from being equipped with grocery stores.

Indirect zoning, like exclusionary zoning, is more subtle. The aim of exclusionary zoning is not only the exclusion of certain uses, but of certain users. These users cannot be excluded by law hence the planning tool fulfils the function in order to reach the desired effect. The zoning ordinance is just a mean in order to exclude undesired consumers by dictating, for instance, minimum lot sizes.

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<sup>45</sup> The State of California, The Planning and zoning law (California Government Code), Title 7: Planning and land use, Division 1, Planning and zoning, Chapter 4, Zoning Regulations, Section 65850 Regulation by ordinance, Article 2

<sup>46</sup> Grieson and White 1981, p. 271

The counterpart to exclusionary zoning is inclusionary zoning, where multi-family housing developers are urged to offer affordable housing (usually 10 to 25% of all units).

### 2.5.2 Separation of uses zoning

In accordance with academic literature the main regulations are building codes, environmental regulations, land use regulations and zoning. Building codes like floor-area ratios and height restrictions are rules imposed on buildings (usually before they are constructed) that have to be fulfilled. Environmental regulations seek to protect the environment therefore they contain regulations like the conservation of green belts. Land use regulation and zoning have already been explained in chapter 2.4.

In his 2006 article, Brueckner categorizes three types of land use interventions: urban growth boundaries, floor-area ratio restrictions and various cost increasing regulations.

With regards to urban growth boundaries, Brueckner writes “the government effectively draws a ring around a city and outlaws urban development outside this ring.”<sup>47</sup>

Floor-area ratios regulate development densities. This aim can be reached in several ways. One approach is a minimum lot size restriction, limiting densities in single-family housing areas by requiring that buildings are surrounded by a certain area of land. Another regulation of density is the imposition of building-height limits. They are imposed via a restriction on a structure’s floor-area ratio equalling the total floor area in the building divided by the lot size. A floor-area ratio limit prevents a developer from constructing a larger building.

Other regulations, presumed to increase the cost, are broader based. They include a variety of interventions like the requirement of excessive road widths in newly developed areas, excessive street set-backs for structures and requirements for community facilities in new developments.

Dain (2005) provides an overview on zoning, based on a study of 187 Communities in Massachusetts. With regards to multi-family housing, Dain writes: “Multi-family housing comes in a wide variety of forms and sizes. The ways municipalities define and categorize multi-family housing also varies widely, as do the use regulations that govern multi-family housing development.”<sup>48</sup>

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<sup>47</sup> Brueckner 2006, p. 3

<sup>48</sup> Dain 2005, p. 31/32

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The most commonly used types of direct regulation will be explained as follows:

#### Minimum lot sizes:

Minimum lot sizes set a minimal space requirement on plots which means that a potential builder needs to own a plot fulfilling the demanded lot size. Minimum lot size regulations usually appear in single-family home areas. A common minimum requirement for cluster development is ten or five acres.

“It is widely acknowledged that enforced minimum lot size [...] achieves two purposes. First, it provides adjacent property owners [...] with ‘greener’, more open landscape [...]. Second, it makes it more likely that new development will be expensive enough to yield sufficient [...] tax revenue.”<sup>49</sup> The latter is known as exclusionary zoning which will be described below.

#### Floor-area ratios:

The floor-area ratio sets an upper limit of production on the square footage of housing. This can either be height limits or the possible space of a building in dependency of the lot size. A floor-area ratio of 2.0 on a 40'000 sq. ft. lot means that floor space of 80'000 sq. ft. can be built, whilst a floor-area ratio of 0.5 allows floor space of 20'000 sq. ft. Floor-area ratios hence can prevent the construction of large structures.

#### Building Codes:

“Building codes set forth the minimum standards that developers are required to meet when they construct housing.”<sup>50</sup> These codes may contain regulations like the colour of houses, the steepness of roofs or setbacks.

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<sup>49</sup> Wheaton 1993, p. 102

<sup>50</sup> Schill 2004, p. 6

**Height measurement:**

Many communities dictate the maximum number of storeys; a few specify the total amount of storeys but not height. Height requirements within a community usually vary by zoning district.

**Shape:**

A lot's shape can be regulated in many ways. Size, frontage, width and setback requirements influence the shape of lots when land is subdivided. "A couple of bylaws do not include specific shape rules, but generally prohibit oddly shaped lots. [...] Other bylaws and ordinances that contain specific dimensional requirements for lot shape regularity also preface the shape regulation with general statements prohibiting irregular lots."<sup>51</sup>

**Mixed-Use Developments:**

Communities are zoning for mixed uses with residential units and commercial space in the same building through either conventional use regulations, special regulations such as planned unit developments or mixed-use overlays.

**Urban Growth boundaries:**

Urban growth boundaries are enacted to protect the landscape from being built on. They limit urban expansion by setting a ring around a community and thus prevent further expansion of the city. "In response to rapid population growth, communities [...] have imposed growth controls in an attempt to divert unwanted additional residents to other cities."<sup>52</sup>

**Urban Growth Management:**

In contrast to the other types of regulation, urban growth management does not specify what can be built. Urban growth management systems "add a third consideration – that of timing, or when one can build."<sup>53</sup> Urban growth management sets a fixed number of units to be built within a certain period of time. If this number is reached then further construction is no longer possible.

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<sup>51</sup> Dain 2005, p. 26

<sup>52</sup> Brueckner and Lai 1996, p. 126

<sup>53</sup> Gleeson 1979, p. 350

### 2.5.3 Indirect types of zoning

#### Exclusionary zoning:

The main reason for communities to adopt exclusionary zoning is the fear that low income housing will lower tax paying homeowners' property values. As long as property values (i.e. prices) are high enough, lower income classes cannot afford such homes and hence prescind from moving to an affluent community. This makes the municipality better off, as it profits from high income taxes and risen real estate values whilst it does not need to grant social measures to low income classes. In fact, cities enact exclusionary zoning as they want to reap the benefits but seek to avoid bearing the costs. Exclusionary zoning cannot be reached directly, hence it requires another kind of zoning like minimum lot size or a single-family housing zone.

“Communities attempt to build ‘invisible walls’ which exclude particular categories of land users whose entrance would disrupt the homogeneity of exclusive residential districts.”<sup>54</sup>

#### Inclusionary Zoning:

Inclusionary zoning is used to encourage multi-family housing developers to include affordable units within their new developments. Most inclusionary provisions are based on a 10% set-aside of affordable units.

#### Fiscal zoning:

Another indirect mean of zoning is fiscal zoning. Affluent communities need to establish low service needs whilst benefitting from high property taxes to fund community projects. This policy encourages local officials to look out for land uses that deploy high tax payers, usually industrial and commercial uses.

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<sup>54</sup> Rolleston 1987, p.2

## 2.6 Regulation in theory and practice

For a better understanding of land use regulations it is helpful to know about the history of zoning and for what reasons it has been applied. In this chapter a brief overview about the history of zoning is being given, followed by an explication as to why there is zoning at all. The chapter will close with examples of zoning application.

### 2.6.1 History of regulation in the United States

According to Liebmann (1996) the idea of zoning in the U.S. has a German origin. He points out differences between the German and American approaches: “German zoning had its roots in the desire [...] of an increasingly crowded country to conserve unspoiled land and to protect residencies against noxious industrial and commercial uses.”<sup>55</sup> That time the U.S. was a low dense country, the motivation for zoning in the U.S. relied mainly on the separation of uses not the preservation of undeveloped land. He further describes, that German practice, unlike the American, allowed duplex housing in most restricted residential zones whilst duplex uses have almost disappeared from most American ordinances, hence being less flexible than the German ones. The results of these policies can still be observed today, multiple-use zones and duplex buildings in Germany are far more common than in U.S.

#### The Equitable Building case, New York City

Land use controls first occurred in the U.S. in the 1916 New York City zoning ordinance. It was adopted to regulate the land use as well as the size and height of buildings. The ordinance was enacted in succession of the 1915 completion of the 42-storey Equitable Building. The building covers the entire plot and blocks adjacent building’s windows. Furthermore the structure rises without setbacks and due to its height, shadows neighbouring buildings. This intensive use of available space has been criticised by neighbours and city officials and led to the zoning ordinance with its mandatory setbacks and interspace rules.

The 1916 ordinance contained three use districts: residential, commercial and unrestricted, furthermore five classes of height. Today, New York’s zoning ordinance contains more than 70 zoning districts.

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<sup>55</sup> Liebmann 1996, p. 72

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The typical structure of zoning laws in North America is based on the first New York City zoning law and the Standard State Zoning Enabling Act issued in 1922.

The case of Euclid, OH

In 1926 *Euclid v. Ambler* was the first case for the Supreme Court to regard the new policy of zoning and had a major contribution on enacting zoning regulations in the U.S. Euclid is a suburb of Cleveland, where Ambler Realty owned a plot of 68 acres. As the City of Cleveland had a growing industrial sector, the village of Euclid sought to prevent their cityscape from industrial use and developed a zoning ordinance that divided Ambler's plot into three categories of use. In consequence, Ambler was no longer able to develop the site for industrial use (as intended) and sued the village, arguing that the zoning ordinance lowered the value of its property by limiting the possible use.

The U.S. Supreme court <sup>56</sup> held that the zoning ordinance was not unconstitutional, although the lower court regarded the ordinance as unconstitutional. In fact, the Court stated Euclid's zoning ordinance to have a rational basis and thus legitimated the zoning practice.

Ellickson (1973) provides a good overview to zoning history after the Village of Euclid, Ohio v. Ambler Realty Co. in 1926 sentence. "[...] (I)n 1926 the United States Supreme Court upheld zoning against constitutional challenge, and by 1930 the number exceeded 1,000. By 1967, over 9,000 governments exercised zoning powers [...]. Today, zoning is virtually universal in the metropolitan areas of the United States, where more than 97 percent of cities having a population over 5,000 employ it. Of cities with over 250,000 inhabitants only Houston, Texas, has not enacted a zoning ordinance."<sup>57</sup> Following the *Euclid vs. Ambler* sentence, Wisconsin authorised rural zoning by counties in 1923 and the first state-wide law was enacted in Hawaii in 1960.

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<sup>56</sup> The United States Supreme Court 1929: *Village of Euclid v. Ambler Realty Co.*, 272 U.S. 365 (1926)

<sup>57</sup> Ellickson 1973, pp. 691-692

### 2.6.2 Reasons for regulation

“Throughout the world, land use decisions are affected by various forms of government intervention in real estate markets. Such interventions include U.S.-style zoning regulations, which are meant to minimize externalities by separating different types of land uses, as well as greenbelt laws and urban growth boundaries, which limit the spatial expansion of cities.”<sup>58</sup>

As mentioned in chapter 2.4 the Massachusetts Zoning Act, Chapter 40A defines zoning as: “Zoning ordinances and by-laws, adopted by cities and towns [...] to protect the health, safety and general welfare of their present and future inhabitants.”<sup>59</sup> and therefore offers a major incentive for governments to enact land use regulations.

The most obvious intention for zoning is the separation of different land uses such as commercial, industrial and residential with the goal of limiting negative externalities. In the eyes of urban planners, a mixture of these uses has to be avoided.

Traditionally, zoning sought to separate uses regarded as incompatible to each other by governments. It was the attempt to avoid industrial uses in residential areas. Schill (2004) writes “Over time, ordinances made finer distinctions within each type of use (e.g., single-family v. multi-family) and imposed an array of requirements on the permitted size and bulk of the buildings allowed (e.g., height restrictions and minimum floor area requirements) [...] (T)he variety of land use regulations has mushroomed.”<sup>60</sup>

Another reason for zoning is city beautification. City planning paid much attention to this issue in the early decades of the 20<sup>th</sup> century. In order to carry out plans for these beautifications, control over buildings on private land was necessary.<sup>61</sup> Beautification should be reached by developing civic centres and public areas as well as readjustment of traffic facilities.

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<sup>58</sup> Bertaud and Brueckner 2005, p. 109

<sup>59</sup> The Commonwealth of Massachusetts, General Law Title VII: Cities, towns and districts;  
Chapter 40A Zoning

<sup>60</sup> Schill 2004, p. 8

<sup>61</sup> See Fisher 1942, p. 332

Washington D.C. enacted zoning in order to protect the cityscape: “Governments [...] exert explicit control over the density of development. While minimum lot size rules and other regulations are designed to limit suburban development densities [...], a related regulatory tool is the building height restriction, which governs land use in [...] many cities worldwide. The most obvious (example is) Washington, DC, where no building can be taller than the U.S. Capitol.”<sup>62</sup>

It is also an important purpose of land use regulations to mitigate external, undesired, effects. “The purpose of zoning is usually described as regulating external effects among land uses [...]”<sup>63</sup> Planning authorities seek to mitigate certain external effects like road congestion, urban sprawl or additional costs for infrastructure. Cheshire and Sheppard (2002) add that regulation of land use can also be a way of providing valued public goods (neighbourhood quality) and amenities (open space).<sup>64</sup>

A more concealed motivation for zoning is that growth management seeks to reduce public service costs through a combination of concentrating physical development in a certain area and controlling the number or type of new service demanders.<sup>65</sup> In this case, the community just undertakes an attempt to concentrate certain public goods in order to keep expenditures low.

### 2.6.3 The perception of zoning

Although governments use no unique definition of zoning, they influence the theoretical framework on zoning research by taking action with zoning ordinances.

The New York City Department of City Planning describes zoning as follows: “Zoning shapes the city. Zoning determines the size and use of buildings, where they are located and, in large measure, the density of the city's diverse neighbourhoods. Along with [...] the power to budget, tax, and condemn property, zoning is a key tool for carrying out planning policy. New York City has been a pioneer in the field of zoning policy since it enacted the nation's first comprehensive Zoning Resolution in 1916.”<sup>66</sup> In the Massa-

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<sup>62</sup> Bertaud and Brueckner 2005, p. 110

<sup>63</sup> Fischel 1978, p. 64

<sup>64</sup> Cheshire and Sheppard 2002, p. 243

<sup>65</sup> See Gleeson 1979, p. 363

<sup>66</sup> The City of New York, Department of City Planning; About Zoning, New York City (2011)

achusetts Zoning Act, Chapter 40A, zoning is set as: “Zoning ordinances and by-laws, adopted by cities and towns to regulate the use of land, buildings and structures [...] to protect the health, safety and general welfare of their present and future inhabitants.”<sup>67</sup>

Both the New York City and the Commonwealth of Massachusetts’ definitions indicate the function of zoning properly by pointing out the use of land and buildings as the main incentive for municipalities to enact zoning and land use regulation jurisdiction. Although Hilber and Robert-Nicoud define land use regulation whilst the government authorities of New York City and Massachusetts describe zoning, it is worth outlining their different points of view.

Hilber and Robert-Nicoud (2009) focus on the effects of regulation in the definition itself. Furthermore they describe regulations as an imposition on property rights. Hilber and Robert-Nicoud consequentially identify regulations as an intrusion into property rights that are restricting land use and thus cause additional costs which they describe as a “shadow tax equivalent”<sup>68</sup>

On the other hand New York City and Massachusetts of course define zoning in a different way. New York City sees zoning as determinant for size and density of buildings and as a key tool for planning. Massachusetts names zoning as regulation of land use in order to achieve higher aims like the general welfare of inhabitants. It should be mentioned that New York City as a single city might have different incentives to enact regulations than a state entity like Massachusetts. This becomes obvious when New York City defines size of buildings, whereas Massachusetts focuses on society, hence it can be assumed that most cities define special building codes whilst States seek to make society better off.

In contrast to the New York City approach, the introduction of the Boston Zoning Code explicates “The purposes of this code are hereby declared to be: to promote the health, safety, convenience, morals and welfare of the inhabitants of the City; to encourage the most appropriate use of land throughout the City; to prevent overcrowding of land; to conserve the value of land and buildings; to lessen congestion in the streets; to avoid undue concentration of population; to provide adequate light and air; to secure safety from fire, panic and other dangers; to facilitate adequate provision for transportation, water, sewerage, schools, parks and other public requirements; and to preserve and in-

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<sup>67</sup> The Commonwealth of Massachusetts, General Law Title VII: Cities, towns and districts; Chapter 40A Zoning

<sup>68</sup> Hilbert and Robert-Nicoud 2009, p. 1

crease the amenities of the City.”<sup>69</sup> This introduction is to be interpreted as regulation of the cityscape, whilst the shape of single buildings is regulated in the following ordinance. The Boston Zoning Code is more substantial than the New York City and Massachusetts definitions, it might be assumed that Boston is more regulated than New York City and the planners in Boston have a more precise notion how their city should look. Comparing the statements of Hilber and Robert-Nicoud (2009) with New York City and Massachusetts, they seem intransigent to each other. Governments like New York City and Massachusetts seek to reach protection from undesired occurrences whereas scientists like Hilber and Robert-Nicoud identify zoning as an intrusion into property rights. The incoherency of these two approaches might not only result from the different perception of zoning but also from a different approach. Government regards regulations from a perspective of urban or spatial planning as well as architectural solutions. Hilber and Robert-Nicoud in contrast see regulations as an issue of economy and law. Unsurprisingly it is impossible to align both views.

The different perception of zoning, on the one hand in terms of planning and society, on the other hand in terms of law and economy is crucial to further understanding. Urban planners usually do not care about issues of economy and law, vice versa economists and jurists do not concern with aspects of urban planning. Both remain in their faculties and do hardly go beyond their own horizon. It is evident that in consequence land use regulations meant to be helpful by governments contribute to plenty of unintended and undesired impacts in the view of law and economy.

#### 2.6.4 Application of zoning, two extremes

##### The case of Houston

Amongst the major U.S. cities, Houston is the only one without a zoning ordinance. Thanks to the “lack of zoning”;<sup>70</sup> developers in Greater Houston hardly face regulation when building on vacant lots. Nevertheless, Houston has got land use controls, but these are primarily economic. Siegan (1972) explains that land use is controlled in three different ways: first, by the normal economic market forces; second, through legal agreements, principally covenants and third, through a relatively limited number of land use

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<sup>69</sup> The City of Boston, Boston Zoning Code and Enabling Act, Boston Redevelopment Authority, Article 1, Section 1-2

<sup>70</sup> Pendall, Puentes and Martin 2006, p. 16

ordinances.<sup>71</sup> The case of Houston turns out that zoning and land use regulation are not essential to the cityscape as real estate markets do not operate chaotically. Even in an unregulated situation, different uses tend to separate. It can be objected that commercial developments such as supermarkets, petrol stations or fast-food restaurants will locate on thoroughfares, as these are more frequented than streets in residential zones.

The lack of zoning in Houston shows impacts on housing prices as a 2008 Federal Reserve study turns out: “Houston’s large supply of land means that demand growth primarily results in more construction, not higher prices. [...] Houston’s policies are relatively permissive, making the metro friendly toward development.”<sup>72</sup> According to the National Association of Realtors the median sales price for a single family home in the Houston MSA in 2011 is at \$148,500 (the national average is at \$158,700).<sup>73</sup>

#### The case of Los Altos Hills

Located in the San Jose MSA, the town of Los Altos Hills is a community with strictly residential zoning, of course there are other zones for public buildings like schools or open space use as well. Thanks to zoning, the city has got only one bookstore, located on a college campus but no post office. The town’s regulations codes are amongst the strictest in California and require a minimum lot size “No parcel shall have a net area less than [...] (43,560) square feet”<sup>74</sup> Other regulations define the maximum height of buildings (35 ft.) or setback limits. Furthermore, “The following primary uses shall be permitted in the Residential-Agricultural District: (a) Primary dwellings”<sup>75</sup> this means that landowners are not permitted to build more than one primary dwelling per lot, which effectively bans multifamily housing. Los Altos Hills is one of the most affluent communities throughout the U.S. and with regards to real estate, one of the most expensive. The median home price was at \$2,435,000<sup>76</sup>, whilst the 2011 median sales price in the San Jose MSA is at \$545,000, the second highest throughout the nation.<sup>77</sup>

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<sup>71</sup> Siegan 1972

<sup>72</sup> Federal Reserve Bank of Dallas 2008, p. 3

<sup>73</sup> Table 6: Median house prices in the United States

<sup>74</sup> Los Altos Hills Municipal Code 10.1.501

<sup>75</sup> Los Altos Hills Municipal Code 10.1.701

<sup>76</sup> 2009 Multiple Listing Survey

<sup>77</sup> Table 6: Median house prices in the United States

## 2.7 Impacts of regulation

Regulations affect housing prices. Several studies reveal that zoning and land use regulation limit the supply of land for construction. The impacts of artificial supply shortages are subject to this chapter.

Economics teach that scarcity raises prices, not only in real estate but in every marketable good. This principle is true regardless whether the scarcity is intrinsic or the result of government imposed provisions such as zoning. When communities withdraw land from supply, the land factor and the product housing can become pricier. Limits on development or densities are usually associated with increasing housing prices. Numerous communities in metropolitan areas have adopted zoning and land use restrictions (henceforth “regulations”) which have been explained in chapter 2.5. These regulations allow construction or development under strict conditions only, zoning rules therefore can artificially constrain the supply of developable land. Minimum lot size regulations, as one type of constraints, are widespread in the U.S., they reduce the amount of lots available for potential housing construction. This policy of regulations is usually called “growth management”. It causes artificial scarcity of land and hence, as economic theory claims, raises the price of housing.

In a 2005 OECD study on housing, the following results have been found: “House prices can also be affected by other features [...]. Of note are restrictions on the availability of land for residential housing development that can constrain the responsiveness of supply. These would include tough zoning rules, cumbersome building regulations, [...] all which would restrict the amount of developable land. [...] In the United Kingdom, complex and inefficient local zoning regulations [...] are among the reasons for the rigidity of housing supply, underlying [...] the trend rise of housing prices. [...] In Korea, government limitations on urban land supply [...] have been important causes of the rapid rise in housing prices. Heavy land use regulations in some U.S. metropolitan areas have been associated with considerably lower levels of new housing construction which have restricted housing supply and thus increased house prices [...].”<sup>78</sup>

Turning back to the U.S. housing markets, several studies of regional housing markets discovered that the low supply elasticity of residential space is an important factor be-

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<sup>78</sup> OECD Economic Outlook 2005, p. 136-137

hind price increases in certain areas.<sup>79</sup> The Report of the President's Commission on Housing (1982) revealed that “excessive restrictions on housing production had driven up the price of housing generally”<sup>80</sup>.

It is shown that housing prices remarkably exceed construction costs throughout the North-East and the West Coast. The mentioned studies reveal that raising prices for housing do not just reflect income growth or demographic effects, but other factors as well. Amongst them are regulations on housing development. Regulations have driven up housing affordability as the supply curve steepens<sup>81</sup> and make prices more volatile especially in Boston, New York and San Francisco.<sup>82</sup> In their 2002 study Glaeser and Gyourko<sup>83</sup> point out that zoning and building restrictions reduce the supply of developable land, as the amount of available land is limited. In consequence, prices need to rise, as supply is scarce. The investigation undertaken by Glaeser and Gyourko is based on fundamental economic principles and it says that prices rise when supply is short. This observation is not only true in the U.S. but in every other economy. The only demur towards their study is that they only analysed the sales market, hence their results cannot in principle be applied to the rental market.

Quigley and Raphael (1995) conclude that new construction is more likely in less regulated communities: “Our analysis documents the proposition that land use regulation increases housing costs in California cities. [...] We also find evidence that new housing construction is lower in more regulated cities relative to less regulated cities. [...] we find that changes in the housing stock arising from new construction are smaller in more regulated cities.”<sup>84</sup>

In their studies Glaeser and Gyourko as well as Cheshire and Hilber<sup>85</sup> both name the gap between overall housing costs and the final price of the building as “tax”. This zoning tax is meant to include all impacts of government regulation on the costs of con-

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<sup>79</sup> Glaeser, Gyourko and Saks 2005a; Mayer and Somerville 2000; Malpezzi 1996

<sup>80</sup> The Report on the President's Commission on Housing 1982, p.199

<sup>81</sup> See Chapter 2.5

<sup>82</sup> Hilber and Robert-Nicoud 2006, p.1; Glaeser, Gyourko and Saks 2005a, p.3

<sup>83</sup> Glaeser, Gyourko 2002

<sup>84</sup> Quigley and Raphael 2005, p. 327

<sup>85</sup> Glaeser and Gyourko 2002; Cheshire and Hilber 2008

struction. The marginal construction costs rise with the building height. In absence of height limits the construction is expected to rise to the point where the marginal costs of an additional floor equal the market price. Cheshire and Hilber write: “Any gap between the observed market price and the marginal construction cost can be interpreted, therefore, as a ‘regulatory tax’ – the additional cost of space resulting – in aggregate – from the system of regulation in that particular market. [...] The difference between the price of floor space and its costs of construction must be due to some form of regulation.”<sup>86</sup>

Carruther’s (2002) figure (illustration 6, p.38) demonstrates the influence of regulation (here embodied by local and state-wide settings) on outcome factors. A various combination of regulations are enacted by institutional settings such as local governments. Growth management is characterised as a combination of policies that are implemented within an existing institutional setting.<sup>87</sup> The consistency of regulation policies, executed by local governments and state planning programmes, show impacts on regional land markets where supply constraints imposed by the two institutional settings meet consumers demand. “(T)he two boxes act as separate inputs [...] because the same combination of policies is likely to produce different results [...]”<sup>88</sup> The consequences are various, often unintended impacts on determinants like density or property values.

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<sup>86</sup> Cheshire and Hilber 2008, p. 189

<sup>87</sup> see Charruthers 2002, p. 1965

<sup>88</sup> Charruthers 2002, p. 1965

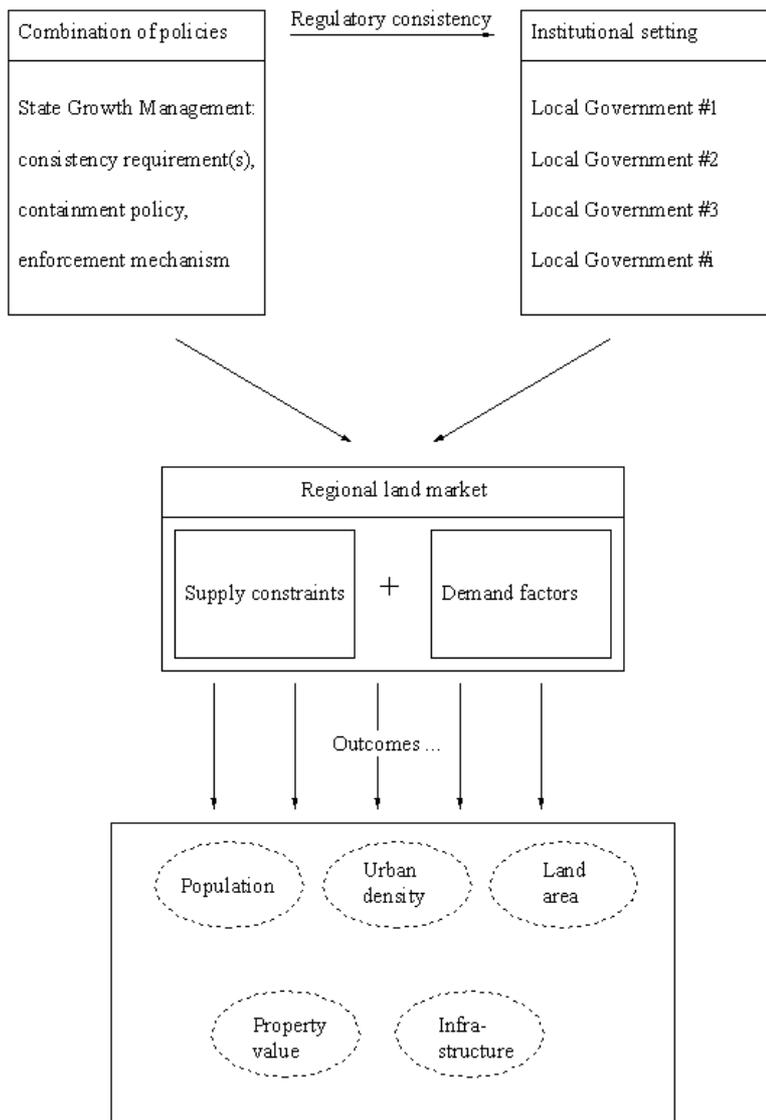


Illustration 6: Regulatory consistency

After Carruthers (2002) p. 1964

The observations made in chapter 2.2 and 2.3 indicate that land use regulations contribute to higher costs of housing. As there are only some sources investigated in this section, the analysis should go deeper and investigate more data. A general view focussing the impacts of regulation on the costs of housing is subject to the following section. The results of this analysis should clarify the impacts of land use regulations on housing prices. Thus it is expected to become obvious to what extent the findings of chapter 2.3 as a whole or partially can be attributed to regulation.

### 3 Scientific approach

The principal item of this thesis is the meta-analysis that examines journal articles with regards to the impacts of zoning and land use regulations on housing prices. The course of action for the meta-analysis will be introduced in this chapter.

#### 3.1 Introduction and application

Economic literature examined in section 2 indicates that scarcity causes higher prices. With the help of the meta-analysis, existing observations can be investigated and reviewed. It is the function of the meta-analysis to review literature on land use regulations and its effects on housing prices.

##### Application of a meta-analysis in this thesis

In order to examine the content of the selected journal articles, this thesis is based on a meta-analysis. Meta-analysis is the quantitative analysis of an amount of studies (here journal articles) thus offering a more comprehensive framework for the literature review process by providing empirical means of evidence by investigating the impact of one variable (here regulations) on another (here housing prices). Although meta-analysis derives from psychological research, it has become a widely used tool in examining economical issues. In their 1989 article Stanley and Jarell point out the advantages of meta-analysis by saying that meta-analysis is a means to objectify a literature review process. “Meta-analysis forces the reviewer to include all studies [...] on a given topic, or [...] to take a random sample of these studies. Rules of inclusion and exclusion are made explicit and represent an essential part of a meta-analysis.”<sup>89</sup>

They regard meta-analysis as a framework in which to organise and interpret replications and to review more objectively literature already in the public domain. Stanley and Jarell conclude that meta-analysis “provides a mechanism through which one can more objectively ask questions about economic research.”<sup>90</sup>

##### Analysed literature

The literature used for the meta-analysis exclusively relies on published journals engaging in real estate or urban context issues. Journals deliver a highly scientific approach

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<sup>89</sup> Stanley and Jarell 1989, p.168

<sup>90</sup> Stanley and Jarell 1989, p.169

and they are usually researched using the same method thus their approach can be compared to each other in a reliable way. The method of collecting and evaluating journals will be described below in chapter 3.2.

#### Definition of the examined effect

The target of the analysis is to reveal the impacts of zoning and land use regulation on housing prices. The effect observed is the price of housing and its dependency on land supply impacts set by a regulatory framework.

#### Boundaries of the analysis

Subjects are regulations and housing prices in the 46 largest U.S. metropolitan areas with population growth from 2000 to 2010. Other factors such as general law, regular taxes, profit, subsidies, rent regulation, traffic, location choices, demographic issues, externalities and the economic framework are not the focus of this investigation.

### 3.2 Method

#### Data collection

The data collected for this thesis derives from scientific journals with an economic or urban planning background. In a second stage out of the theme related journals, those containing articles that deal with questions of regulatory impacts on housing prices, have been selected for the meta-analysis. Table 3 shows the total number of reviewed articles and the amount of articles used for the analysis.

<b>Journal</b>	<b>Abbreviation</b>	<b>Total Number</b>	<b>“Meta” relevant</b>
American Economic Review	AER	6	1
Journal of Housing Economics	JHE	5	2
Journal of Housing Research	JHR	3	2
Journal of Law and Economics	JLE	3	3
Journal of the American Real Estate and Urban Economics Association	AREUEA	6	5
Journal of Urban Economics	JUE	29	10
Journal of Urban Studies	JUS	7	3
Land Economics	LE	21	6
Regional Science and Urban Economics	RSUE	12	3
<b>Total</b>		<b>92</b>	<b>35</b>

Table 3: Total number of reviewed journals

#### Selection of articles – inclusion and exclusion

The first criterion, as described above, was economic journals engaging either in real estate or urban planning. Journal articles have been identified through the key word search procedure. Nine journals have been chosen for further research as the number of articles in these journals dealing with one of the keywords, “search procedure” (see below), was higher than three. 92 articles contained one of the focussed key words from the nine relevant journals. Consequently, only articles dealing with the U.S. housing market have been chosen. A further target was to identify articles investigating the price effects of regulation. Articles about commercial urban issues have been sorted out. Out of these articles, the ones not researching in MSAs with more than one million inhabitants and population growth have also been removed. Articles published before 1970 and containing data prior to 1970 have also been excluded from meta-analysis research. The articles have undergone a further selection process which aimed to exclude articles matching the keywords but which are not relevant for the analysis. Examples are articles on zoning but with exclusive attention to externalities to be avoided by the means of

zoning, articles on land use regulations without research on housing prices but on demographic issues, articles on growth controls dealing with birth controls instead of construction limitations, articles focussing on tax or traffic issues or judicial articles pointing out the question for what reason zoning can be justified. Hence, articles not investigating the effects of land use regulations or zoning on housing prices or land values are not part of the analysis.

Following the search procedure, out of 92 articles, 41 remained to be relevant for the meta-analysis. These articles engage with the effects of land use regulation and zoning on housing prices in 46 of the 51 largest U.S. metropolitan areas with population growth.

#### Search procedure

The search for journals used to be carried out with the help of the citation linker <sup>91</sup> accessed via the Zurich University Library webpage <sup>92</sup>. With this tool, journals can be found easily by entering the name of the journal and then continuing the search on the following web page. <sup>93</sup> Once on this page, search terms and keywords can be entered. The terms used for this thesis were (in alphabetical order) “building codes”, “construction costs”, “development constraints”, “growth boundaries”, “growth controls”, “growth management”, “home prices”, “home values”, “housing costs”, “housing prices”, “land constraints”, “land supply”, “land values”, “land use constraints”, “land use controls”, “land use planning”, “land use regulations” and “zoning”.

The data base offered numerous results; these went through a selection process as described below.

It is important to note that articles not used for the meta-analysis can still be subject to the thesis itself.

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<sup>91</sup> [http://sfx.metabib.ch:9003/sfx\\_uzh/cgi/core/citation-linker.cgi](http://sfx.metabib.ch:9003/sfx_uzh/cgi/core/citation-linker.cgi)

<sup>92</sup> <http://www.hbz.uzh.ch>

<sup>93</sup> e.g. Elsevier, Scencedirect, or the University of Wisconsin Press

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### Classification of articles

Regarding the results, all 41 articles were chosen to be separated into groups. It came out to shape four separate groups: beneficiaries, city shape and density, development and construction, and quantification. The groups are being explicated in chapter 4.1. Depending on the research result, each article was classified to the group it predominantly dealt with. Out of 41 articles, 35 were explicitly addressable to one group. In order to keep the number of groups clear, the minimum number of articles per group was set to five. Hence, six articles have been sorted out, as they were not matching with any group and were unsuitable to shape a group of their own. The purpose of this classification is to structure the total number of articles into smaller units that can be compared to each other with respect to their results. Articles dealing with more than one topic, hence matching others groups as well, used to be sorted to the group regarded as best with concern to the results so that no article appears twice.

The following chapter will describe the groups and give an overview about the trends found out.

## 4 Empirical analysis and results

This section examines the total number of 35 articles that were clustered into four groups, identified through their results of research. All articles are expected to provide empirical evidence about zoning or land use regulations and their effects on housing prices with regards to their classification.

### 4.1 Examination

Although the focus of the meta-analysis is to identify the impacts of regulations on housing prices, the groups have been aligned in a different way, focussing more on the impacts of regulations as a direct result of price changes due to zoning policies. Changing housing prices do affect the city itself, they effect development and the make several groups of people better off. Other impacts of price changes due to zoning like issues of demography have not been further investigated.

As this thesis concentrates on the impacts of zoning, the articles where classified after their results of research. Other ways of classification e.g. by geographic region or the way of measure would shift the focus away from the impacts and focus on the inputs. The idea is to compare the impacts to each other and then explain possible differences in the findings that might occur through different approaches of measure.

The four groups are:

- **Beneficiaries**  
Identify the parties that are profiting (or not) through regulation policies as prices increase or decrease.
- **City shape and density**  
Engage with the impacts of regulations on a city's shape, structure or density. Larger lots are more expensive (as more land is needed), but a city is less dense if the ratio of possible construction on a lot is constrained by minimum lot size or height restrictions.

- **Development and construction**  
Reveal the effects of zoning on the number of new housing; hence changes in the housing stock, or on possible new construction. Reduced housing production is expected to cause scarcity thus raising prices.
- **Quantification**  
Cost effects of a regulatory surrounding are quantified in measurable units.

Table 4 shows the four groups and the criteria of assignment.

<b>Group</b>	<b>Subject</b>	<b>Number</b>
Beneficiaries	Who are the “winners” and “losers” of regulation?	7
City shape and density	How does a regulated city look?	9
Development and construction	Is the construction of housing being influenced?	11
Quantification	Can the costs of regulations be quantified?	8
		35

Table 4: Meta-analysis group classification

Each group has been divided into subgroups (illustration 7, p. 48). These subgroups embody common research approaches within each major group and demonstrate the influence of zoning policies on housing prices and its consequences. Shaping additional subgroups makes articles within the major groups more comparable and turns out the focus of different author’s investigations with regards to the results.

## 4.2 Article overview

After a first examination of the 35 articles, there is strong evidence that zoning and land use regulations have a price driving influence on housing affairs.

Most authors find clear indication that zoning and land use regulation policies impact housing prices directly or in an indirect way. Some authors assume a price effect. No author totally excludes a contribution of regulations on housing prices. These findings seem to sustain the assumption already made in chapter 2.3.

### Different types of approach

The approach of research and the way of measure differ within the 35 articles.

A common method to investigate the effects of regulations is the regression analysis (e.g. Dowall and Landis 1982). Some authors, such as Malpezzi (1996) even develop an index of regulatory restrictiveness whilst others rely on empirical models without existing transaction data (Noam 1983). The methods differ from article to article, some authors take measures already used in precedent analysis and apply them to their model. Data for the regression analysis can derive from hedonic observations or surveys; this means that some data contain transaction prices whilst others are based on tax surveys or estimations.

Most authors are investigating price effects of regulations on single or multi-family housing but the ways to get to these results are numerous. The majority of authors turn to single-family homes, thus ownership units are better investigated than the rental market. Glaeser et al. (2005) measure a regulatory tax also used by Cheung et al. (2009). Authors like Peiser (1981) compare communities with certain restrictions to communities without these restrictions. Cooley and La Civita (1982) consider the motives of homeowners to support zoning legislation and Gleeson (1979) points out why a Minneapolis suburb successfully enacted zoning laws.

Other authors investigate vacant land inside and outside of growth boundaries (Beaton 1991) even under the aspects of future development or investigate the effects of nearby commercial zoning on property values in residential zones. Sheppard (1988) turns out how zoning affects the city shape.

Authors like Jud (1980) include not only housing factors but externalities as well, thereof some authors account housing standards and quality, demographic issues, transit and roads, proximity to the seaside and parks or the city centre, but no authors include all of them, whilst others (Moss 1977) exclude all external effects.

In the meta-analysis, only articles engaging with at least one of the growing MSAs with more than one million inhabitants in table 1 have been examined <sup>94</sup>. Unsurprisingly, most studies investigate the east or west coast. Especially the San Francisco Bay Area, which seems to be a well investigated agglomeration; six articles more or less exclusively focus on either the San Francisco or San Jose MSA. Some, such as Rose (1989), compare a total of 45 MSAs, whilst others (White 1988) focus on one region only, Engle et al. (1992) develop a model city without real background.

Dealing with an entire MSA as one field of research might be difficult, as the zoning practices (shown in chapter 2.6) differ from community to community. Furthermore MSAs differ in size, infrastructure, demography and geographic conditions.

Groves and Helland (2002) focus on Harris County in Texas by comparing jurisdictions with zoning to jurisdictions without zoning; geographic proximity can be assumed to make comparisons more reliable to each other. Hamilton (1978) investigates the correlation between an area's number of jurisdictions and the extent of zoning practice.

Although the approaches of what is measured where and in what kind of measure differ, a trend that regulations impact real estate prices can be stated. This suggests that despite the numerous measures there seems to be a unique tendency in the results.

In order to provide an overview of the results revealed by the 35 authors it is useful to classify them. As shown above, the ways of approach may differ to a certain extent, hence a summary should shed some light on the meta-analysis findings.

The following chapter provides a clustered overview of all articles and their results. The results will be reviewed and compared to each other.

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<sup>94</sup> The approach and criteria for the meta analysis are described in chapter 3.2

### 4.3 Discussion

The results of the meta-analysis will be introduced in this chapter. By means of the four groups and the particular subgroups, the meta-analysis articles will be discussed and their results will be pointed out.

The first observation going through all of the articles indicates a trend that regulations impact housing prices. Now each group will be examined and it is expected that this tendency will be sustained.

Meta analysis			
Beneficiaries	City shape and density	Development and construction	Quantification
Tax redistribution - White 1975 - Pogodzinski/ Sass 1994	Uniformity premium - Jud 1980 - Dowall/ Landis 1982 - Kahn/ Vaubgn/ Zasloff 2010	Reduction of land - Peiser 1981 - Rosen/ Katz 1981 - Knaap 1985 - Levine 1999 - Ihlanfeldt 2007 - Wu/ Cho 2007	Land values - Glaeson 1979 - Rose 1989
Owners of vacant land - Hamilton 1978 - Engle/ Navarro/ Carson 1992	Rental prices - Siegan 1970 - Sheppard 1988 - Chakrobety/ Knaap et al. 2010	Housing starts - Malpezzi 1996 - Mayer/ Somerville 2000 - Quigley/ Raphael 2005 - Xing/ Hartzell/ Godschalk 2010 - Schuetz/ Meltzer/ Been 2011	Home prices - Elliot 1981 - Noam 1983 - Frech/ Lafferty 1984 - Katz/ Rosen 1987 - Glaeser, Gyourko et al. 2005 - Cheung/ Ihlanfeldt et al. 2009
Enhanced utility - Cooley/ La Civita 1982 - Brueckner 1990 - Groves/ Helland 2002	Land conversion - Moss 1977 - White 1988 - Pollakowski/ Wachter 1990		

Illustration 7: Meta-analysis groups and articles

### 4.3.1 Beneficiaries

If zoning rules are being enacted, this suggests that there are parties profiting from these rules, whilst others do not do. The beneficiaries of zoning are named by the following authors; they also state why zoning is supported by these beneficiaries.

#### Tax redistribution

Two articles find out that raised housing prices have impacts on tax payers. Existing homeowners profit from higher property taxes (due to higher prices for residential units) that newcomers have to pay, thus subsidising the provision of public services for old residents:

White (1975) develops a two-sector urban model of a centre city and suburbs in which the effect of suburban large lot zoning on metropolitan area size can be determined. She intends to compare the utilities of centre residents to those in the suburbs. In her model, zoning is only enacted in the suburbs with effects on the central residents. White says that certain older suburban residents gain from zoning at the expense of newcomers. Thus, all newcomers must buy large houses on large lots and pay higher property taxes than the older residents. They therefore subsidise the local public services consumption of the older residents by paying more for the same services. In addition, the large lot requirements make small lots scarce, since their supply is fixed. This allows the older residents to make capital gain when they sell. Thus, zoning benefits a few suburban residents who at one time had monopoly power in determining zoning requirements.

Pogodzinski and Sass (1994) develop a model where jurisdictions compete through their choice of tax-expenditure packages and zoning regulations. In the model, governments are expected to maximise political support. Thus, voter preferences ultimately determine the tax-expenditure package and zoning regulations. Their model is based on a hedonic sample of single-family homes in the San Jose MSA. Taxes, demography and geological data are parts of the model. The result suggests that zoning is consistent with fiscal, externality and exclusionary motives. They find evidence that voters make a trade-off between the tax base and the tax rate when choosing zoning and tax rates. Furthermore they find that zoning tends to follow the market, allocating more land to single-family use when that would tend to be its most valuable use, and that zoning has a significant influence on housing values.

### Owners of vacant land

Land use regulations separate the space into two zones. The owners of vacant land are being disadvantaged by land use regulations as they cannot develop their lots. Their land is almost worthless, thus lowering their utility:

Hamilton (1978) focuses on the exercise of monopoly power in thirteen MSAs in the North East and turns out that the extent of zoning differs with the amount of jurisdictions by saying that the lower the number of jurisdictions, the greater the extent of zoning restrictiveness. He argues that homeowners seek to maximise their property value, thus persuading governments to exercise their monopoly power by zoning more restrictively and in consequence creating scarcity. By extension of zoning, owners of vacant land suffer a loss as they cannot react to increased demand. They are denied the opportunity of using their property in its most profitable way. When the zoning authority is concentrated, all home owners favour restricted supply and renters are indifferent. As shown above, the only class of people opposed to stricter zoning are those who own vacant land.

Engle, Navarro and Carson (1992) create an amenity model underlying the assumption that all households are identical and rent exactly one housing unit. They show that growth controls, in the presence of external factors, are welfare improving as prices of land and housing increase due to scarcity effects. Their model implies that the primary beneficiaries of growth controls are owners of developed land, while the primary losers are owners of undeveloped land.

### Enhanced utility

Three authors expect land use regulations to redistribute wealth from new to old residents. The utilities of newcomers are lower, making them worse off. The newcomers need to pay more for their homes as growth controls raise the values of existing homes:

Cooley and La Civita (1982) construct a microeconomic model of decision making that illustrates a possible motivation for growth controls. Their model contains congestion effects and analyses how these influence the optimal population size. Furthermore, the model takes into account effects of what they call “tax subsidy” to owner-occupied housing. Analysing the optimal population they find out that individuals in a certain

place seek to maximise their utility by imposing growth controls as these raise the value of existing housing. They conclude by saying that growth controls transfer wealth from new residents to original homeowners. A new resident's utility is lower, as he first needs to buy a house in a place underlying growth controls, whilst existing homeowners already profit from increased land values thus having a higher utility.

Brueckner (1990) analysis growth controls in the context of a standard open/ closed city model. The model contains variables such as distance or commuting costs. In the closed city model he identifies gainers and losers as owner of developed and undeveloped land and introduces a new group of losers, consumers. After the imposition of growth control their utility is lowered as a consequence of the increase of urban land rents following from spatial constriction of the city.

Groves and Helland (2002) estimate the transfer of wealth between owners of existing homes that results from zoning, by means of a regression analysis including externalities. They focus on Harris County in Texas by comparing a zoned jurisdiction to adjacent municipalities hitherto unzoned. They find out that homes with more desirable commercial locations experience a decline in their sale prices after the enactment of a zoning ordinance. In contrast, homes with very desirable commercial locations experience value increases due to the protection against externality producing development such as commercial ones. They conclude that zoning redistributes wealth between existing homeowners as alterations in the zoning ordinance change property values due to the surroundings. Furthermore, they identify that zoning changes the option value of a property by removing the option of future commercial development. In saying that, those properties best suited to residential use will be better off compared to properties better suited to commercial use. The beneficiaries are owners of properties best suited to be residential, as zoning protects them from nearby future commercial development.

Summarising the articles, it turns out that beneficiaries of zoning are home owners and owners of developable land. They seek to maximise their property value by voting for stricter zoning rules that reduce land supply thus causing scarcity or supporting a distinct separation of use zoning, preventing them from developments seen as not desirable. On the other hand, owners of land excluded from (best matching) development, have low or almost no utility from zoning. Their unzoned land lacks any future devel-

opment option thus making the land almost worthless. Immigrants, even if they are from adjacent regions, are disadvantaged as they need to pay higher prices for their desired home thus not benefitting from high real estate values. Furthermore zoning has a distributive effect, as existing homeowners benefit from the higher property tax levels of immigrants financing public services.

#### 4.3.2 City shape and density

Zoning authorities intend to influence the way a geographic entity is supposed to look . They enact zoning in order to mitigate high densities or for motives of city beautification (chapter 2.6.2). The following articles deal with the appearance of cities under the influence of zoning policies.

##### Uniformity premium

Zoning policies cause homogeneous neighbourhoods with similar residents. This uniformity is regarded as an amenity by many consumers, hence they are willing to pay a premium in order to live in such areas:

Jud (1980) employs a hedonic price model to explore the effects of zoning on single-family homes. His model differs from others by defining the dependent variable as the market price per square foot of structure, rather than the total market price. His data derives from the tax supervisor and focuses on the city of Charlotte. The sample includes new and used housing. Jud classifies two zoning dummy variables, depending on the lot size. His land use variables present the percentage of non-residential land use in neighbourhood land. His regression indicates an increased square foot value (11%) caused by residential zoning and concludes that consumers of residential housing are willing to pay a considerable premium in order to live in a homogeneous neighbourhood.

Dowall and Landis (1982) analyse the effect of land use controls on housing markets in the San Francisco Bay Area. In their analysis they employ housing sales records for single-family houses. They distinguish between stable and growing cities based on the population growth rate between 1976 and 1980. Their results indicate that new home prices in stable communities are higher than in growing cities. They explain this difference by higher land prices in the stable communities as well as the fact that consumers

place a premium on living in more established areas. Furthermore they favour the explanation that the general level of new home construction is lower in stable communities and the level of price competition is comparably lower. Accordingly, developers who do gain access to developable lots within a stable community are in a position to set higher prices.

Kahn, Vaughn and Zasloff (2010) investigate the effects of the California coastal boundary zone created in 1976. They assume that if coastal land is scarce whilst amenities are superb, prices will be high. Kahn et al. compare the housing market in the coastal zones of the counties of Los Angeles and San Diego. They use two different data sets, four census tracts for demographic issues and transaction data for properties sold in 2008, and a regression discontinuity strategy to test the consequences of the California coastal boundary enactment. They compare sales transaction data for homes inside and outside the California coastal boundary. As a first result they turn out that population density is much higher outside the boundary than inside. Continuing, they find out that homes within the California coastal boundary zone sell for over a 20% price premium as buyers within the California coastal boundary zone gain access to a unique environmental amenity resulting from lower densities and proximity to wealthy neighbours. They also need not be concerned about potential developers seeking to build unwanted structures near their homes. They conclude that population density has declined within the California coastal boundary zone area.

### Rental prices

The prices of rental units are being affected by zoning policies. Three authors reveal that rents would be lower if zoning regulations were absent:

Siegan (1970) sets forth pertinent facts about Houston and describes the land and property use controls in this city and compares them with those found in zoned communities. He points out that Houston has never adopted a zoning ordinance, but it does have subdivision controls and a building code. In his concluding remarks, Siegan states that Houston, although unzoned, does not differ from what it would be if it were zoned. He then identifies three characteristics that distinguish the non-zoned city from the zoned one as follows: 1. The relative absence of restrictions on apartment development has allowed the market to satisfy the demand for apartments to a much greater degree than

could occur under zoning controls. Rents are probably less for most tenants. 2. More areas adjoining major thoroughfares are being used for all varieties of commercial and multiple-family purposes than would be the case under zoning. 3. There are probably more non-home uses in “interior” single-family areas than would be present if these areas had been zoned for single-family.

Sheppard (1988) investigates space supply restrictions and containment policies in the context of a monocentric urban model. In his partial equilibrium model the only endogenously determined prices are rents, whilst all other prices are assumed to be fixed. His conclusions are that in the absence of binding containment policies, an increase in space available results in lower rents, increased suburbanisation and increased utility. Sheppard goes on by turning out that inward expansion leads to lower rents outwards but higher rents in centres.

Chakraborty, Knaap, Nguyen and Shin (2010) present an empirical analysis of the effects of high-density zoning on multifamily housing construction from 1990 to 2000 in the suburbs of six metropolitan areas. Zoning constraints are measured as the total number of high-density units allowed in residential or mixed use zones, by each jurisdiction. Their data derives from regional government officials based on GIS data or comprehensive plan designations. To identify the effects of high-density zoning on multifamily housing they collected US Census data from 1960, 1990 and 2000 and obtained a variety of demographic variables, including population and income, as well as data on multifamily housing stocks. The dependent variable is the change in the number of multifamily housing units over the period from 1999 to 2000. To address the potential endogeneity of zoning they use two-stage least squares in addition to ordinary least squares estimation. In their conclusion they find that zoning in part reflects market considerations. This means that the number of units zoned for high-density development declines with distance from the central business district. They find that zoning also restricts the supply of the most affordable type of housing and thus affecting low-income residents. On-going, they conclude that zoning contributes to urban sprawl as it lowers overall development densities and causes metropolitan areas to expand beyond market-determined levels.

### Land conversion

A city's appearance is being influenced by regulatory demands. If minimum lot size or other density rules are set, the conversion of land will be more expensive or at least less efficient:

Moss (1977) uses two and three sector models to determine the effects of land use controls such as minimum lot size, maximum density and maximum bulk requirements on urban land and housing markets. The employed exogenous variables are the price of capital, supply of land, production functions, restrictions and property taxes, whilst endogenous variables are output levels, output prices and land prices. His results are that minimum lot size requirements may increase land prices and housing costs. If minimum lot size requirements are increased this accentuates rural urban land conversion because of its effects that are analogous to decreasing the supply of land and the decreased density that results from the increased land input to urban housing.

White (1988) addresses the two questions of how subdivision costs are related to lot size and whether or not suburban large lot zoning is a binding constraint on the residential land market. He then creates a hedonic price model for vacant land based on sales prices of single family homes. His conclusion is that zoning either causes an inefficient factor combination in housing production or that land is inefficiently allocated between uses.

Pollakowski and Wachter (1990) estimate the direct and spill over effects of zoning controls along with other growth restrictions on housing prices. They focus on owner-occupied single-family housing in a Maryland Washington D.C. suburb. They construct a housing price index, employing housing transaction data based on transaction prices. The results of their study confirm that land use regulations raise developed land prices within a locality. They also demonstrate that spill over effects exist across localities and land use restrictions in adjacent areas contribute to higher prices. They turn out that restriction and concentration of development has contributed to higher population growth rates of more peripheral rural counties.

Zoning determines the shape and density of a city. It leads to lower densities and more uniform neighbourhoods, not only in the way of construction but also in the groups of

residents. If lower densities and homogeneous surroundings are interpreted as amenities, several consumers are willing to pay higher prices to live in such areas.

Minimum lot size requirements raise the value of developable or already developed land as the number of structures to be built on a certain area of space is lower. By lowering densities, zoning also contributes to urban sprawl.

Furthermore, zoning contributes to misallocation of uses and therefore causes economic losses (Siegan 1970).

#### 4.3.3 Development and construction

Jurisdictions enact regulations in order to control new development hence the amount of construction within a geographical setting. Many studies focus on the changing of the housing stock in order to measure growth management effects. Development of new housing depends on the regulatory surrounding, thus it is influenced by authorities decisions on land use.

##### Reduction of land

If land is withdrawn from development due to artificial regulations, this causes scarcity and hence should lead to higher land prices. Comparisons between jurisdictions (Peiser 1981, Rosen/ Katz 1981) show that prices in less regulated communities are lower. These price differences can lead to spill over effects (Levine 1999) as consumers shift to less regulated communities. Six articles investigated the consequences of land supply reduction:

Peiser (1981) measures the impacts of regulation on lot prices in the two cities of Dallas and Houston. Each of those two cities has evolved a different approach towards development control and regulation. Dallas relies on zoning to control land use and development density, whilst Houston has no such zoning policies. Peiser then illustrates a case of the full costs of development for two comparable subdivisions in Dallas and Houston. He reports that several homebuilders have operations in both places and are even planning the same floor layouts. The combined private and public sector costs were compared in order to determine the magnitude of the difference in regulatory costs between Dallas and Houston based on the full cost to the homebuyer. The comparison reveals that development regulation in Dallas is more costly than in Houston through a reduction in the supply of developable land. The most significant differences relate to

the provision of utilities and to land use control. The regulatory schemes place more initiative for development in the hands of the developer in Houston, whereas the density of development and its interconnection with existing utilities is more controlled in Dallas.

Rosen and Katz (1981) develop a case study in an outlying part of the San Francisco Bay Area after the application of a strong new growth policy. In their case, a developer faces several zoning demands he needs to fulfil in order to obtain a building permit. The result of the time consuming process, including negotiations with authorities and several layout changes, shows that homebuyers face higher prices and less selection in the end. The regulations have significantly diminished the availability of development opportunities and forced builders to make major changes in the way they do business and costly alterations in their development projects. They conclude by saying that building moratoria, growth management systems and restrictive zoning practices have helped lead to significantly increased house prices in those communities in which they are present.

Knaap (1985) uses cross section data to measure the effects of an urban growth boundary in the two counties of Clackamas and Washington in the Portland MSA. By means of hedonic price estimation, Knaap develops a partial equilibrium model analysing urban and non-urban residential land. The single family home transaction data were recorded in 1979/ 1980, four years after the urban growth boundary was originally drawn. A dummy variable captures the location of a parcel, either inside or outside the urban growth boundary; the coefficient is interpreted as the decrease in price per acre of a parcel outside the urban growth boundary compared to a parcel inside. He adds one additional variable called the intermediate growth boundary. This intermediate variable identifies parcels in areas designated as future urban zones as if they were a growth boundary with expiration. The measure concludes by stating that the urban growth boundary was found to have a significant influence on land values. In Washington County with more stringent rules, urban land values were higher than non-urban land values. In Clackamas County, where the instruments of urban growth boundary were flexible, only the land use restrictions on future urban development were found to affect land values. The intermediate position provided evidence regarding the effects of growth boundaries on urban land value. In Washington County, the effects were generally strong and not divergent, in the flexible county of Clackamas, urban land values

were shown to be divergent in the urban growth boundary but not in the intermediate position.

Levine (1999) examines the effects of local growth-control enactment between 1979 and 1988 in California on net housing construction between 1980 and 1990. The study is based on two surveys of local jurisdictions. The survey results have been added to a data-set and were matched with demographic and housing data. He then designs eighteen different measures in three categories (residential, commercial and others with vacant land). In his model Levine investigates whether local land use regulation displaces the demand for housing to adjacent jurisdictions. The investigation first states that local growth-controls that are removing land from development or require less intense development have effects in reducing rental and ownership housing. The reduction is interpreted as a shift towards less controlled jurisdictions rather than an absolute decrease in housing units. Secondly, the effects of displacing the growth of new housing, have impacted consumers who depend more on rental housing (low income households and minorities). He finds out that during the 1980's, there was a rapid movement of minorities away from the metropolitan areas motivated by the search for affordable housing. As a third result Levine mentions that growth-encouragement policies are significantly related to net housing change. The restrictions appear to be more powerful mechanisms in affecting housing production than policies supporting affordable housing.

Ihlanfeldt (2007) investigates the effects of land use regulation restrictiveness on house and vacant land prices in Florida. He treats the index of restrictiveness as an endogenous variable. Cross-sectional price equations are using individual sales transactions of single-family homes and vacant residential land from 2000 to 2002. The test variables come from a chief planner questionnaire. Ihlanfeldt includes demographic issues as well as public service expenditures. His conclusions are that land use regulation has important effects on the prices of housing and vacant land. He finds evidence that newly constructed homes are larger where regulation restrictiveness is higher. Restrictive land use regulations are also identified to reduce the affordability of single-family homes (depending on the number of competing jurisdictions). Where the choice of homebuyers is limited, as in Florida, they will bear the main share of restrictiveness increased development costs. He does not directly investigate the price effects of restrictiveness but his findings suggest that an increase in land use regulation restrictiveness strongly affects

developer's costs. This is explained as regulations tend to increase costs by more than the increase in housing price.

Wu and Cho (2007) estimate the effect of local land use regulations on land development. The data on land use was taken from a local government survey on county land use in five western states. Their empirical models are used to determine the amount of acres removed from development due to local land restrictions and find that local land use regulations had a significant effect on land development. Local land use regulations reduced the total supply of new developed land by 10% in the observed states.

#### Housing starts

Limited land supply heavily impacts the number of new housing starts. High prices for land may lower the number of new starts. Mayer and Somerville (2000) turn out, that more restrictive regulated cities have up to 45% lower starts:

Malpezzi (1996) analyses the determinants of housing prices with a particular focus on the effects of regulations on land and housing markets. He constructs an index that reflects regulatory regimes in different markets. His data relies on previous research about regulatory practices. He then applies a method of principal components and constructs a series of dummy variables (on the state level) on the presence or absence of factors like coastal zone managements or comprehensive land use planning. He also includes income, congestion and demographic variables as well as the distance to a coastline (seen as geophysical constraint). His results suggest that regulation raises housing rents and values and lowers homeownership rates. This is being sorted out as regulations raise rents and values, but values are raised more than rents, thus the negative homeownership effect of regulation through an increase in value is greater than rents increased by regulation. Increased housing prices effect construction and development as the number of housing starts, due to high prices, is reduced.

Mayer and Somerville (2000) describe the relationship between land use regulation and residential construction in 44 U.S. MSAs from 1985 to 1996. They develop a model depicting the changing in housing stock and measure house price movements of new construction as well as land use regulation (based on local planner surveys). They find that land use regulations lower the level of new construction and estimate that building

starts in cities with more extensive regulations can be up to 45% lower. In addition, more regulated areas have price elasticities that are more than 20% lower than in areas with less regulation.

Quigley and Raphael (2005) explore the linkages between land use regulations, growth in housing stock and housing prices in California cities. They develop a city-level index of regulatory stringency based local house prices in 1990 and 2000. Their regression analysis documents that land use regulations increases housing costs in the observed cities. They find evidence that new housing construction is lower in more regulated cities relative to less regulated cities. Holding constant the change in the price indices over the observed decade, they discover that changes in housing stock, arising from new constructions, are smaller in more regulated cities.

Xing, Hartzell and Godschalk (2010) examine the impacts of land use regulations on cross-metropolitan variations in housing prices, rents and housing starts. Based on a 2002 national survey of local jurisdictions' land use regulations, two indices of regulatory stringency are created. The first measures the use of growth management tools, the second measures the impacts of development process administrative practices. With regards to housing prices they conclude that development tools appear to have a significant and positive impact on housing prices. They find that the impacts are not strong but still positive for housing rents. Turning to housing starts they reveal that housing starts (single and multi-family) are being reduced due to regulation when the long-term population growth of an MSA is faster than average.

Schuetz, Meltzer and Been (2011) analyse how the policy of inclusionary zoning affects the prices and production of market-rate housing in Boston and San Francisco. Their data derive from previous surveys in the case of San Francisco and from an institutional data base in the case of Boston. Results of regression analysis for Boston suggests that inclusionary zoning has increased prices and lowered production. When the regional housing market is soft, inclusionary zoning has no effects. The analysis of San Francisco shows no effect of inclusionary zoning on production levels. They explain their weak evidence of inclusionary zoning effects by the already existing highly restrictive regulatory environments for development in both places.

If development of new housing is restricted, this leads not only to higher prices of housing, it also effects new construction and in consequence the distribution of population. The production of rental units is diminished as the number of housing starts is constrained, thus the number of new housing comes along with the restrictiveness of the planning authority. If housing in one place is regarded as too costly, consumers settle in communities with lower prices. Moreover, developers seek to minimise their costs, hence avoiding highly restricted communities by also shifting to more flexible jurisdictions or turning over higher costs of development onto their customers. Furthermore, restrictions on new development also impact the homeownership rate which is lower, if restriction is abundant.

#### 4.3.4 Quantification

When zoning and land use regulations are imposed, it should be possible to measure the extent of these policies on housing prices compared to jurisdictions where there are no or lesser rules. The following authors took efforts to quantify the changes in price or developable land resulting from regulatory policies.

##### Land values

Vacant, developable land is assumed to rise in value when regulations are enacted. Two articles investigate value changes of developable land:

Gleeson (1979) tests the effects of growth management systems on land values by using an actual growth management system in a Minneapolis suburb. His method consists of a sample of unimproved and un-subdivided parcels of land. The market values of the parcels were estimated by local city assessment records. A major determinant of land value is the accessibility of a site, thus Gleeson measured the time of travel from each investigated parcel to a central location in the town. His examinations turn out that the segmenting of a land market into developable and undevelopable portions has had sizeable effect on land values. In 1972, the mean per-acre value in the developable portion was 200% greater than in the undevelopable one. More than two-thirds of the difference (135%) in mean value between the developable and undevelopable parcels can be attributed to the growth management system. His findings only hold for larger parcels, subject to growth controls, whereas smaller parcels not underlying the growth control

show no difference in mean values between the two portions of the city after other factors are taken into account.

Rose (1989) turns to the supply side of urban land markets by indentifying and measuring monopoly power zoning restrictions on land supply as well as natural constraints due to large bodies of water. He then tests their ability to explain interurban land price variation. Urban land is measured by weighted land units around the urban centre, based on rental prices to reflect its relative contribution to the supply. He suggests that a body of water close to the centre decreases the urban land supply and increases the price more than does more distant water. The study goes on by testing the monopoly power of zoning by measuring the land price. The results of the observations made show that land supply coefficients are significant whereas the monopoly power zoning coefficients are less significant. However, both coefficients explain price differentials of 40% of the mean. Around three quarters of this explanation is commonly due to natural restriction and one quarter to contrived (man-made) restriction.

#### Home prices

The remaining articles focus on the change of housing prices. Following Noam (1983) housing values are positively related to regulatory stringency. Elliot (1981) finds out that prices in restrictive regulated markets are up to 35% higher. Glaeser et al. (2005) introduce a “regulatory tax” in order to quantify price changes followed by regulation policies:

Elloit (1981) examines the impact of growth controls on the price of new single-family homes. He uses a regression analysis based on sales prices of communities in California and examines the diversity of controlling and non-controlling cities and counties in order to determine the impact of the scale of growth regulations on housing price increases. Elliot reveals that in regions where housing is not extensively regulated, growth controls have little price effect. In extensively regulated markets, like the San Francisco Bay Area, the housing price increase within seven years (1969-1976) was 35% higher.

Noam (1983) analyses the effect of restrictive building codes on the price of housing. His data derives from a survey including details on building codes and on the agencies enforcing them. He defines an index of restrictiveness, an aggregate of the number of

restrictions, weighted by the relative costliness to builders. His results can be expressed in terms of dollars as he defines a strict code and compares it with the mean strictness of codes prevailing nationwide. This comparison turns out that housing values increase to 4.9% over the national mean. He concludes by saying that housing values are positively associated with regulatory strictness or in other words, high housing value localities are observed to have stricter building codes than lower-housing value places.

Frech and Lafferty (1984) test the effect of the California Coastal Commission on the price of single family housing in parts of the Los Angeles MSA. In order to estimate effects they use hedonic price regression analysis of housing prices to isolate the price change attributable to the Coastal Commission. Their data derives from sales of individual homes in the area from 1966 to 1975, based on multiple listing services of local realtors. Their results show that the restrictions raised the amenities of some homes close to the coast and near to undeveloped land, whilst these effects were absent farther inland and price changes are interpreted as a scarcity, rather than an amenity effect. The Commission's actions are estimated to raise the prices of homes in the area at least \$990 and for some homes the price rise is estimated to be \$5,043 (in 1975 dollars). Much of the price rise occurred as far as thirteen miles inland. Most of the price rise is attributable to the reduction of area-wide residential land, rather than improved amenities.

Katz and Rosen (1987) investigate the effects of local land use regulations on house prices in the San Francisco Bay Area. They focus on interjurisdictional effects of land use and growth controls which are analysed within the context of a cross-sectional hedonic house price model consisting of single-family house sales in 1979. Their analysis shows that land use regulations appear to have had substantial effect on house prices. Their regression analysis indicates that housing prices are between seventeen and thirty-eight percent higher in those communities in which growth moratoria and/ or growth control plans are present.

Glaeser, Gyourko and Saks (2005) measure the difference between real estate prices and the costs of producing the marginal apartment and to use that differential to measure distortions in the housing market. They use the term "regulatory tax" to reflect the increase in costs imposed by regulatory restrictions. Data base are condominium sales records in New York, Manhattan, represented by deeds records and transaction prices

from 1984-2002. Glaeser et al. find a positive relationship between housing prices and regulation. In unregulated markets, building heights increase to the point where the marginal costs of adding another floor will equal average costs (the market price). With regulations, prices and average costs will exceed marginal costs. By limiting the number of storeys in new buildings, these regulations have helped constrain the supply of new housing units in Manhattan. Condominium prices in Manhattan are two times the amount of conceivable value of construction costs regarded as maximum. They assume that at least one-half of the value of a condominium can be thought of as arising from some type of regulatory constraint preventing the construction of new housing.

Cheung, Ihlanfeldt and Mayock (2009) apply the concept of the regulatory tax (Glaeser et al. 2005) to house-level data from Florida. Their regulatory tax is calculated by estimation of the intensive value of land and relies on sale prices of single-family homes between 1995 and 2005. They find that home values increased substantially over the decade analysed. The regulatory tax is regarded to be an important component of the home prices in Florida. They explain increases in house prices ranging from 5% to 50% with the stringency of the regulatory surrounding. The impact of some regulations (e.g. urban growth boundaries) grows over time, as the constraint imposed by regulations becomes more binding. Hence, even without more regulations, with growing demand, more of the increases in housing prices can be attributed to extant regulation.

The previous studies show that under certain circumstances, costs of a regulatory building policy can be measured and quantified in price differences. Due to local restriction of developable land or limiting the number of storeys, housing prices increase in communities with land use regulation policies compared to communities with lesser rules. Glaeser et al. (2005) take a different approach by estimating a regulatory tax. However the effects shown indicate that a regulatory surrounding constrains the supply of housing units thus driving up prices for condominiums.

The results of the meta-analysis will be summarised in the following chapter. Methodological obstacles and pitfalls, especially those occurring when authors attempt to quantify the extent of zoning policies on housing affordability, will be looked at in more detail in chapter 4.5.

#### 4.4 Results

The discussion within and between the groups shows that all articles tend to the result that zoning and land use regulations have a positive, thus price increasing, effect on residential real estate.

Analyses are able to determine the “winners” and “losers” of regulations. Owner of existing homes are better off through zoning, as their housing values increase. Another effect of increased home prices is the exclusion of undesired uses and users. Hence they have a strong incentive to vote for stricter zoning ordinances. Consumers willing to move to an area with restrictive zoning are disadvantaged; they need to pay higher prices for housing and in consequence, higher property taxes thus subsidising older residents. However, existing homeowners hardly profit from their increased home values, as they need to live somewhere. Thus they only gain, if they sell their property and move to a cheaper one or abroad. As long as they do not sell their home, their increased benefit just exists on paper. Albeit they still profit from the exclusionary effects mentioned above.

The influence of zoning on a city’s appearance is clearly demonstrated. Heavily zoned cities tend to be less dense, as single-family housing is the preferred type of housing not only by consumers but by authorities as well. Separation of uses strictly divides the city into zones where only one purpose of development is permitted. This separation creates uniform neighbourhoods and leads to higher traffic, as residents still need to go to work, school or retail stores which thanks to zoning are farther afield. Thus zoning remarkably enforces urban sprawl characterised by long distances and large lots.

It is also shown that there is a link between regulatory stringency and the production of new housing. The more stringent a community zones, the smaller is the outcome of additional residential units. Stricter zoning regulations turn developers and subsequent consumers to move to less regulated locations.

Various authors find evidence that zoning changes the values of housing whereas others undertook efforts in order to quantify the amount of price changes. Due to artificial scarcity of land supply, existing homes become more valuable. Comparisons between

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restrictive zoned and lesser or even unzoned communities reveal, that prices in heavily zoned communities can be up to 50% higher.

The examined articles find evidence that the imposition of land use regulations and/ or zoning rules contributes to higher housing prices. As economic theory suggests, regulations cause scarcity in the supply of land and in consequence limit or frustrate the production of new housing units. The lack of additional residential space thus raises the price for residential living to a level beyond that which it would have been without such rules. If the market would have been allowed to regulate supply and demand of housing without government interference, as demonstrated in Houston, the demand could have been entirely fulfilled at lower housing prices.

Although the approaches and ways of investigation differ from study to study, the results come to the same conclusion, with different magnitudes of course. The next chapter will look closer at the approaches and subjects of investigation in order to reveal possible differences in the diversity of studies.

## 4.5 Criticism

The previous discussion of meta-analysis articles revealed that land use regulations prevent the market from constructing more homes. Out of the investigated articles, all come to the conclusion that, as economic theory suggests, housing prices increase when supply of new housing is restricted.

Hitherto the articles have been summarised, but not critically reviewed. It would lead too far to analyse every single article in order to find possible fallacies or putative wrong approaches. As a total number of 35 articles come to the same conclusion they either all contain fallacies or they seem to confirm the theory that scarcity leads to increased housing prices. It is part of this chapter to deliver a critical over all view on the examined articles and their bodies of investigation.

Investigations of the effects of zoning and land use regulations on housing prices require the isolation of these effects. This is a first pitfall as the measurement of such effects is complicated. Other existing factors like housing quality (size, architecture, facilities), amenities (open space, sea view) and public services (schools, roads) affect housing prices as well. In order to make an unbiased estimation of regulatory effects, it is essential to control these additional factors.

Schwartz, Zorn and Hansen (1986)<sup>95</sup> find that studies in order to measure the impacts of regulations are based on three comparison strategies:

1. A one-time comparison of housing between communities with and without regulations policies after these are enacted (post-test only comparison with the non-zoning community serving as control group).
2. A before-after comparison in the regulated community only (pre-test post-test comparison without control group).
3. A before-after comparison between the regulated community and a non-regulated community (pre-test post-test comparison with control group).

These three strategies of comparison determine the type of data needed. Type 1 requires cross-section data, type 2 requires time series and type 3 requires both of them.

They continue by analysing the tests, stating that the post-test only cannot control for the differences between communities and any differences existing before the regulation

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<sup>95</sup> Schwartz, Zorn and Hansen 1986

program will be incorrectly attributed to the regulatory policy. With regard to the pre-test post-test comparison in the zoned community they note that it cannot control for changes in price over time that are not due to regulations (e.g. interest rate changes or financing terms). The mentioned falsity of both the comparisons in part effect the pre-test post-test comparison as it measures the effect between regulated and unregulated communities minus the pre-test difference. Even though the pre-test post-test comparison is the strongest method of the quasi experiment, it too has potential sources of bias, for instance, if the level of service changes in the regulated and the non-regulated community. Schwartz et al. conclude by saying that “researchers are frequently unaware of the methodological issues associated with these alternative designs. As a result, the majority of studies utilize a design that introduces biases into their estimate of the growth control effect.”<sup>96</sup>

Another difficulty is the fact that it is almost impossible to measure the share of regulatory effects. “A problem in analysing the impacts of land use regulation is the identification of what share of costs may be attributed to regulations.”<sup>97</sup> Although it is not disputed that zoning heavily contributes to raising prices, it is hard to say what extent of higher prices is caused by zoning and what share can be assigned to other factors. As shown, zoning policies lead to lower densities, larger lots, uniform neighbourhoods and other occurrences that residents in single-family zoned areas might regard as amenities and so are probably willing to pay a premium for (Jud 1980, Dowall and Landis 1982). Thus these amenities may also embody a certain part of higher prices.

It is not only the mentioned amenities contributing to higher prices. Other amenity issues like infrastructure, schools, safety, and landscape also have to be observed as they should be expected to have price impacts as well.

The example of almost unregulated Houston (Siegan 1970) demonstrates that an unzoned city very much looks like a zoned one. Thus amenities are a price element, as they occur in both regulated and unregulated cities; otherwise all houses comparable in size and facilities in an unzoned community should have nearly the same price.

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<sup>96</sup> Schwartz, Zorn and Hansen, p. 232

<sup>97</sup> Cheshire and Hilber 2008, p.187

The effect of zoning is measured by means of variables. The variables set differ from study to study. There are studies containing externality effects (Engle et al. 1992, Groves and Helland 2002s), whilst others do not employ them (Cheung 2009, White 1988). A difficulty in the studies containing external effects is that they cannot attribute the extent of externalities on price changes. On the other hand studies not containing externalities do not face this problem. Here, external effects are just an invisible component of price changes. It would be a challenge for future research to unambiguously clarify the share of price changes attributable to externalities and the share of zoning effects.

An important demerit is that zoning is not uniform. As shown in chapter 2.5 and 2.6, practically no two zoning regulations are the same. Comparisons between communities, based on differing zoning policies are problematic. These comparisons turn out that communities are zoned, but the extent of restrictiveness may differ, thus price effects should be expected to differ as well. Assuming that a restrictively zoned and a flexible zoned community are adjacent, undoubtedly, spill over effects will arise. Those consumers not willing or unable to pay the higher prices in the restrictive community in consequence shift to the less regulated one. Thanks to increased demand in the less regulated city, the prices in short term should rise. In other words, the restrictive zoning policy of the first community affects the other community as well, even though the second one has little or even no such regulations.

Articles dealing with urban growth boundaries (Knaap 1985) face another problem. The observation that land outside the growth boundary is not far from being worthless is correct, as this land has no future option for any development. The land can only be used for agricultural uses; hence the price is remarkably lower than the value of a developable lot. It can consequently be assumed that there is no market even for unzoned land, thus making it almost impossible to state the price of unzoned land. If there is no transaction data available, government data or land owner's estimations are employed. These data are collected from a very subjective point of view making their use in studies problematic.

Most studies focus on single-family housing. Only few of them (e.g. Chakraborty 2010, Levine 1999) employ the multi-family housing market. This means that only a part

(even though the larger part) of the residential market is being considered in the studies. As most communities tend to zone for single-family purposes instead of multi-family homes, it should be expected that zoning regulations have a stronger impact on multi-family housing prices although the number of possible observations is smaller.

In their 2005 study Quigley and Rosenthal claim that most studies ignore the endogeneity of regulation effects. They criticise that a statistical association may just show that wealthier, more expensive communities have stronger incentives for regulations and that research tends not to recognise the complexity of local policymaking and regulatory behaviour. Their main demur is that regulatory surveys are administered sparsely and infrequently. Hence, current studies are often forced to rely on outdated land use proxies and static observations of house price movements. Although their observations apply, this criticism strikes all articles examined. Researchers must have certain reasons not to investigate the market as thoroughly as suggested by Quigley and Rosenthal. However, even relying in older or not that complex gathered data, basic economic principles are still valid, thus the results may differ in extent but not in general.

Peculiarly, most studies examine housing markets in MSAs on the coastline. Thus metropolitan markets in Massachusetts, Florida, Oregon and California are documented well. An often used inland exception is Texas, due to its comparably lax regulations. It would be of interest to better investigate the large MSAs in Illinois, Georgia, North Carolina or Ohio. Most MSAs in these states, besides Chicago located at Lake Illinois, do not feature large bodies of water. The amount of developable land is not restricted by natural constraints thus enabling a city to expand in each direction. Furthermore, the absence of a coastline may withdraw possible biases from studies, as the amenity of proximity to the seaside just does not exist and hence this coastal price effect can be clearly sorted out. The assumption is that this coast effect corrected investigation will probably more realistically depict the share of man-made land restrictions on housing prices.

## 5 Summary

After having examined articles that investigate the price effects of land use regulations and zoning this section will assemble the theory section and the findings of the meta-analysis in order to achieve a common conclusion.

### 5.1 Review

Zoning and land use regulations are a powerful instrument used by (local) governments in order to mitigate undesired effects like high densities, provision of additional public services or the protection of agricultural or recreational areas. Thus the land is separated into zones of certain uses. On the one side there are zones where development is possible, on the other side there are areas where the construction of a structure is outlawed. The local zoning ordinance determines what is allowed in each zone and what is permitted. “Government interventions affect land use outcomes in cities [...]. These interventions are often well-meaning, being designed to achieve ends that are thought to be socially desirable. However, [...] land use interventions often generate subsidiary effects that are unanticipated by policy makers. These effects can be undesirable, offsetting the benefits that the interventions were intended to capture. The result can then be a net social loss, so that the land use intervention leaves the urban economy in a worse position than where it started.”<sup>98</sup>

Regulatory interferences such as zoning and land use regulation are shown to affect housing prices. Amongst natural restriction these man-made regulations cause scarcity in land supply and thus limit the number of new housing production. “There are two ways scarcity can arise. First, land use restrictions may prevent developers from building enough new homes to align prices with construction costs. Second, scarcity can arise naturally.”<sup>99</sup>

Thanks to stable or growing housing demand, prices for homes are increasing in consequence. Zoning influences not only housing production, it also divides a community into “winners” and “losers”. With regard to the beneficiaries of zoning, Hilber and Vermeulen (2010) in a study on communities in England reveal that “(t)he stylised fact

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<sup>98</sup> Brueckner 2006, p.1

<sup>99</sup> Davis and Heathcote 2007, p. 2618

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that real house prices have grown stronger in England over the last 40 years than in any other European country implies that young households [...] who want to get their feet on the (owner-occupied) housing ladder are hardest hit by the affordability crisis, whereas many older households who became home owners decades ago and have now accumulated – at least on paper – significant financial wealth in their property are the seeming beneficiaries of the long-standing British house price expansion. The gains for elderly home owners are in fact smaller than one might think as they have to live somewhere and cannot realise any gains unless they sell their house and move abroad, significantly downsize their housing consumption or give up owner-occupation and rent.”<sup>100</sup>

In direct democracies like the U.S. and Switzerland, voters can influence the planning process by taking political action. By means of their vote, they have a vital interest to maintain their status quo and to keep their home values high. The possibility of taking influence on regulatory setting makes old residents rather powerful in comparison to newcomers. Thanks to restrictive zoning policies, existing homeowners experience a windfall, meaning that thanks to zoning, prices of their homes increase. This causes an asymmetric situation disadvantaging newcomers. If governments are concerned with equal opportunities they should be aware of this fact.

Today most cities enact zoning ordinances in order to control new construction. The grade of restrictiveness however differs between municipalities. The higher the competition between adjacent communities the less restrictive the regulations are, whereas in a monopoly, zoning surrounding the regulations are tighter. “Over time, more and more cities have [...] implemented policies to slow further development. Thus growth in the supply of desirable residential land has not been sufficient to accommodate growth in demand for housing, and land and house prices have risen.”<sup>101</sup> Developers and in consequence, consumers, elude restrictions (and rising prices) regarded as too severe by moving to less regulated jurisdictions. These jurisdictions are usually to be found in the outskirts of metropolitan areas, thus zoning also contributes to urban sprawl and causes more traffic with longer commuting distances - a fact actually sought to be avoided by zoning policies.

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<sup>100</sup> Hilber and Vermeulen 2010, p. 61

<sup>101</sup> Davis and Heathcote 2007, p. 2619

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The development of new housing units is thwarted by restrictive zoning policies. As land is withdrawn or other rules like floor-area-ratios or height restrictions are set, developers are hardly able to satisfy the demand for housing. “Over the last 25 years, greater Boston has seen a remarkable increase in housing prices and a decline in the number of new units. This change reflects increasingly restricted supply. The reduction in supply doesn’t reflect an exogenous lack of land. [...] (T)he decline in new construction and associated increase in price reflects increasing man-made barriers to new construction.”<sup>102</sup>

As shown in chapter 2.6.2 communities enact zoning regulations when they strive for beautification or other amenities such as open space, large recreational areas or low densities. These policies are famous though costly. “Growth controls and other aggressive extensions of land use regulations probably impose costs on society that are larger than the benefits they provide. The higher housing prices associated with communities that impose growth controls are more likely the result of wasteful supply constraints than benign amenity production”<sup>103</sup> In this case, governments should again scrutinise to see if their policies are expedient as they rather seem to fulfil the original intention of their good notions. Brueckner comes to a similar result “(T)he negative effects of such interventions, identified in the economic analysis, may overwhelm any anticipated benefits, leading to a social loss. This message is reinforced by the recognition that land use interventions can hurt businesses as well as consumers.”<sup>104</sup> If the costs of regulatory policies imposed on citizens and business, as Fischel and Brueckner conclude, are higher than the putative amenities they are intended to cause, society should be better off without such regulations. Amenities, of course, would still exist; they were not a product of political planning processes but of consumer’s preferences.

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<sup>102</sup> Glaeser and Ward 2009, p. 19/20

<sup>103</sup> Fischel 1990, p. 53

<sup>104</sup> Brueckner 2006, p. 28

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## 5.2 Application of the results to Switzerland

The attempts of zoning made in Switzerland, even though the reason for zoning is mostly seen in protecting putative necessary agricultural or recreational land and open space from being built on, have a distinct exclusionary effect. Regulations like minimum lot size can be hardly seen in Switzerland and in comparison to U.S. the number of zones for multi-family housing or mixed uses is remarkably larger. However, the restrictive zoning policies of Swiss communities in the current situation of strong population growth heavily affect housing affordability. The high prices for buildable land are a direct outcome of zoning restricted land supply. These policies keep housing prices at very high levels, thereby ensuring that only few people can afford to build single-family homes in certain communities. “Thus, a city facing higher development costs due to various government interventions has higher housing prices, smaller dwellings, taller buildings and a smaller spatial area than a city without such interventions. Because of higher housing prices, city residents are once again worse off.”<sup>105</sup> This exclusionary effect keeps low-income households away from such places, whilst good earning (tax-paying) citizens may preferably settle in these places. Thanks to these effects, many Swiss communities on the one hand reap affluent people’s taxes, whilst avoiding having to subsidise low-income households. As the communities do not grow to large extents, they also save money for additional infrastructure such as roads or sewage. Unsurprisingly, higher prices do not lead to increased family settlement; hence even additional costs for schools can be avoided by these means. Finally, there even may be a prestigious incentive for keeping real estate prices high, the community appears more exclusive and thus is endowed with a higher reputation.

The debate in Switzerland should not only focus the demand but also the supply side of housing. Undoubtedly, less restrictive zoning policies and thus a raised amount of developable land could contribute to reduced housing prices and rents.

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<sup>105</sup> Brueckner 2006, p.12

### 5.3 Conclusion

The findings of the meta-analysis clearly point out that housing prices are being raised by zoning and land use regulations. However, studies hitherto made are not able to determine the share of price impacts caused by limited land supply or by amenities deriving from zoning policies. Nevertheless, observations between cities with different degrees of regulation indicate that the limitation of land supply factor is a main contributor to increased housing prices.

The original intention of land use regulations is to improve a cities appearance and to mitigate externalities regarded as negative. Thus a city is divided into areas of certain uses. This division has not only effects on the price but also social and demographic effects not being investigated in this thesis.

According to numerous studies, San Francisco is a city of high regulation and of high housing prices. Katz and Rosen <sup>106</sup> find that prices in regulated communities in the San Francisco MSA are 17-38% higher than in lesser regulated communities. Glaeser et al. <sup>107</sup> measure a regulatory tax in San Francisco of 53%. Due to natural constrictions, San Francisco as a peninsula (just like Boston or Manhattan) has only one major way to expand, the vertical one. Building higher houses might be a logical answer in order to satisfy demand. If height restrictions prevent developers from building higher, natural restrictions combined with artificial restrictions will be expressed in even more scarcity leading to enforced higher housing prices.

In his 1981 study Peiser <sup>108</sup> faces the unzoned city of Houston to the comparatively lax zoned city of Dallas. The comparison between Houston and Dallas is an appropriate one, as both cities are located in the same state and are similar in their city shape and economic constitution. But even in this case, it comes out, that housing prices in Houston thanks to the lack of zoning are still below the Dallas level.

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<sup>106</sup> Katz and Rosen 1987

<sup>107</sup> Glaeser, Gyourko and Saks 2005b

<sup>108</sup> Peiser 1981

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Comparing Dallas or Houston to cities like Boston, New York City or San Francisco is not that easy, as both Dallas and Houston are located in flat plains, not surrounded by large bodies of water or steep mountains. The supply of developable land in cities located on a coastline is reduced due to natural restrictions; hence land prices are not only being influenced by zoning policies. However, if land would be withdrawn from development by natural restrictions only it would still be less costly than with an additional regulatory tax component. As mentioned before, one way to escape natural restrictions might be higher houses accommodating more residential units.<sup>109</sup>

Zoning and land use regulation polices drive up the cost of housing as they artificially restrict the amount of developable land. There is only one way to make more or even better housing available to the consumers demanding that: the supply of land (and therefore the production of housing) has to be extended.

### 5.3.1 What can be done to make housing more affordable?

The costs for residential real estate are often regarded as high or even too high. Hitherto in most industrial countries any employed people live on the streets as they cannot afford to live in an apartment. This suggests that housing can be costly but not totally unaffordable to a large number of people.

A comparison between the twenty largest MSAs in the U.S.<sup>110</sup> shows that the average rent for a two bedroom apartment is at \$1,391, representing 32% of the U.S. gross average income. Looking at the share rent to income, out of the twenty cities, fourteen are average or below average. The six cities above average are the usual suspects such as New York (87%), Boston (47%) and San Francisco (44%). Assumed that the average rent to income share of 32% may be exceeded by one quarter, rents above 40% can be regarded as high. Yet it is a fact that income in the five remaining high rent places is higher, but not at a rate of 62% which would be the rental difference between New York City (highest) and average.

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<sup>109</sup> With regards to New York City, Glaeser, Gyourko and Saks 2005b reveal that people willing to live in Manhattan regard high rise buildings and a dense surrounding as an amenity.

<sup>110</sup> Table 7: Income and rents in the 20 largest U.S. MSAs

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If governments were concerned about the high cost of housing, they would not subsidize rents, build state run apartments, force developers with inclusionary policies or limit immigration. The simplest thing they could do would be to increase the supply of developable land. “Increasing supply is a much more natural policy response to high housing prices than reducing demand.”<sup>111</sup> A deregulation in zoning policies would be a main contributor to lower costs of housing.

### 5.3.2 Final remarks

A city is a dynamic body and has always been. Cities grow and shrink, their appearance changes every day. New structures are being built; old ones are being transformed or demolished. People move to a city as new residents, they move within the city or they leave the city in order to settle elsewhere.

It is questionable whether it is appropriate to hamper the dynamic development of a city structure by setting a static framework such as zoning and land use regulations. If a city is not entitled to develop freely, this causes disadvantages for most citizens. Separating a city into zones for different uses means that the distances from home to work, to school or to retail are longer, thus congestion is enforced. Neighbourhoods appear all the same, having little distinguishing facilities<sup>112</sup>. As no shops are allowed, people seldom meet in their neighbourhood but in the mall located on the next thoroughfare. Social interaction and control can hardly be achieved by strict separation of uses. It is obvious that many residents seek to avoid undesired occurrences like commercial uses, heavily trafficked roads or low income households but these can be avoided by other means as well. Private covenants almost cause the same effects even though they are not mandatory<sup>113</sup>.

The city of Houston best demonstrates that without binding zoning codes any chaos breaks out. The city still remains tangible by human definitions. A major difference between Houston and zoned cities is that builders in Houston are free to develop. They are just able to fulfil market demand with small time lags thus keeping the price level

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<sup>111</sup> Glaeser and Gyourko 2002, p. 11

<sup>112</sup> Qian 2008, p. 110

<sup>113</sup> Ellickson 1973

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comparably low <sup>114</sup>. In contrast to heavily regulated cities like Boston or San Francisco, growth and development strategies in Houston depict a free market philosophy; hence land use regulations are being regarded as a “violation of private property and personal liberty”. <sup>115</sup>

In his documentation on non-zoning in Houston Siegan <sup>116</sup> points out that the market provides economic incentives for the separation of uses and produces development patterns comparable to what is found in zoned cities.

In an unzoned city, large retail stores presumably are not to be found in low dense single-family residential zones as they need to be located where plenty of potential clients are. Petrol stations will preferably settle on main thoroughfares, as these are well frequented, whilst residential use will hardly be built in such places. Industrial facilities will not occur next to single-family dwellings, the land price is just too high in these areas. High rise buildings will remain in city centres or on central intersections, lots in residential areas are too small and so are the streets.

At the beginning of the 19<sup>th</sup> century most cities in Europe levelled their city walls in order to enable city growth and to enforce trade relations. By removing these brick belts cities were able to accommodate population growth and to house industrial facilities. Thanks to population growth and industrial production, citizens and cities became wealthier than in the dark days of the middle age.

Today, plenty of cities worldwide erect new city walls in appearance of land use regulations or growth boundaries, constricting their development by seeking a state of permanent stability, ignoring that a city is built of stone but not inhabited by stones.

“In the universe there is never and nowhere stability and immobility. Change and transformation are essential features of life. Each state of affairs is transient; each age is an age of transition. In human life there is never calm and repose. Life is a process, not perseverance in a status quo. Yet the human mind has always been deluded by the im-

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<sup>114</sup> See Siegan 1970

<sup>115</sup> Qian 2008, p. 40

<sup>116</sup> See Siegan 1972

age of an unchangeable existence. The avowed aim of all utopian movements is to put an end to history and to establish a final and permanent calm.”<sup>117</sup>

There is no doubt, that this permanent calm sought by governments in order to control city development causes more negative outcome than the chaos actually sought to be avoided by means of a regulatory framework.

### 5.3.3 Future research

As shown in chapter 4.5, hitherto it is not clear which share of price changes can be attributed to zoning regulations and which part derives from externalities. Even if these externalities are a direct outcome of zoning policies it would be desirable to distinguish between these two factors of influence.

Another approach is the aforementioned price bias in coastal areas. If a city is free to develop without land supply restrictions due to large bodies of water, the share of man-made price effects caused by government imposed land withdrawal should be more clearly addressable.

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<sup>117</sup> Mises 1958, p. 106

## Appendix 1 Table 1: Metropolitan Statistical Areas in the U.S

### The 51 largest Metropolitan Statistical Areas (more than 1 m. inhabitants) in the U.S.

Population 2000 and 2010 with population change

Metropolitan Statistical Area	2010 Pop	2000 Pop	Change
Atlanta- Sandy Springs- Marietta; GA	5'268'860	4'247'981	24.03
Austin- Round Rock- San Marcos; TX	1'716'289	1'249'763	37.33
Baltimore- Towson; MD	2'710'489	2'552'994	6.17
Birmingham- Hoover; AL	1'128'047	1'052'238	7.20
Boston- Cambridge- Quincy; MA/ NH	4'552'402	4'391'344	3.67
Buffalo- Niagara Falls; NY	1'135'509	1'170'111	-2.96
Charlotte- Gastonia- Rock Hill; NC/ SC	1'758'038	1'330'448	32.14
Chicago- Joliet- Naperville; IL/ IN/ WI	9'461'105	9'098'316	3.99
Cincinnati- Middletown; OH/ KY/ IN	2'130'151	2'009'632	6.00
Cleveland- Elyria- Mentor; OH	2'077'240	2'148'143	-3.30
Columbus; OH	1'836'536	1'612'694	13.88
Dallas- Fort Worth- Arlington; TX	6'371'773	5'161'544	23.45
Denver- Aurora- Broomfield; CO	2'543'482	2'179'240	16.71
Detroit- Warren- Livonia; MI	4'296'250	4'452'557	-3.51
Hartford- West Hartford- East Hartford; CT	1'212'381	1'148'618	5.55
Houston- Sugar Land- Baytown; TX	5'946'800	4'715'407	26.11
Indianapolis- Carmel; IN	1'756'241	1'525'104	15.16
Jacksonville; FL	1'345'596	1'122'750	19.85
Kansas City; MO/ KS	2'035'334	1'836'038	10.85
Las Vegas- Paradise; NV	1'951'269	1'375'765	41.83
Los Angeles- Long Beach- Santa Ana; CA	12'828'837	12'365'627	3.75
Louisville/ Jefferson County; KY/ IN	1'283'566	1'161'975	10.46
Memphis; TN/ MS/ AR	1'316'100	1'205'204	9.20
Miami- Fort Lauderdale- Pompano Beach; FL	5'564'635	5'007'564	11.12
Milwaukee- Waukesha- West Allis; WI	1'555'908	1'500'741	3.68
Minneapolis- St. Paul- Bloomington; MN/ WI	3'279'833	2'968'806	10.48
Nashville- Davidson- Murfreesboro -Franklin; TN	1'589'934	1'311'789	21.20
New Orleans- Metairie- Kenner; LA	1'167'764	1'316'510	-11.30
New York- Northern New Jersey- Long Island; NY/ NJ/ PA	18'897'109	18'323'002	3.13
Oklahoma City; OK	1'252'987	1'095'421	14.38
Orlando- Kissimmee- Sanford; FL	2'134'411	1'644'561	29.79
Philadelphia- Camden- Wilmington; PA/ NJ/ DE/ MD	5'965'343	5'687'147	4.89

**Table 1 cont.**

Metropolitan Statistical Area	2010 Pop	2000 Pop	Change
Phoenix- Mesa- Glendale; AZ	4'192'887	3'251'876	28.94
Pittsburgh; PA	2'356'285	2'431'087	-3.08
Portland- Vancouver- Hillsboro; OR/ WA	2'226'009	1'927'881	15.46
Providence- New Bedford- Fall River; RI/ MA	1'600'852	1'582'997	1.13
Raleigh- Cary; NC	1'130'490	797'071	41.83
Richmond; VA	1'258'251	1'096'957	14.70
Riverside- San Bernardino- Ontario; CA	4'224'851	3'254'821	29.80
Rochester; NY	1'054'323	1'037'831	1.59
Sacramento–Arden- Arcade–Roseville; CA	2'149'127	1'796'857	19.60
Salt Lake City; UT	1'124'197	968'858	16.03
San Antonio- New Braunfels; TX	2'142'508	1'711'703	25.17
San Diego- Carlsbad- San Marcos; CA	3'095'313	2'813'833	10.00
San Francisco- Oakland- Fremont; CA	4'335'391	4'123'740	5.13
San Jose- Sunnyvale- Santa Clara; CA	1'836'911	1'735'819	5.82
Seattle- Tacoma- Bellevue; WA	3'439'809	3'043'878	13.01
St. Louis; MO/ IL	2'812'896	2'698'687	4.23
Tampa- St. Petersburg- Clearwater; FL	2'783'243	2'395'997	16.16
Virginia Beach- Norfolk- Newport News; VA/ NC	1'671'683	1'576'370	6.05
Washington- Arlington- Alexandria; DC/ VA/ MD/ WV	5'582'170	4'796'183	16.39

Source: U.S. Census Bureau 2010 Census

Washington D.C. (April 2011)

Table 1: Metropolitan Statistical Areas in the United States

**Appendix 2 Table 5: Articles used in the meta-analysis**

Author(s)	Journal	Year	Geographic area	Results	Group
Bueckner, J.	LE	1990	Open city model	Growth controls in an amenity-based model may raise the value of undeveloped land in some locations. Housing prices are indirectly affected as quality of living is improved through limited population growth. Land near the urban boundary rises in value when control is imposed.	Beneficiaries
Chakraborty, A./ Knaap, J. / Nguyen, D. / Shin, J.	JUS	2010	Boston, Miami, Minneapolis- St. Paul, Portland, Sacramento, Washington	Results confirm suspicions that zoning contributes to housing affordability. Zoning restricts supply of the most affordable type of housing (multi-family housing) and contributes to sprawl.	City shape and density
Cheung, R. / Ihlanfeldt, K. / Mayock, T.	JHE	2009	20 MSAs in Florida	Regulation plays an important role in rising house prices. The impact of regulations grows over time, as the constraint becomes more binding. Increases in housing prices can be attributed to extant regulation.	Quantification
Cooley, T. / La Civita, C.	JUE	1982	-	Growth controls transfer wealth from new residents to original homeowners. Renters suffer because of increased rents caused by higher housing prices.	Beneficiaries
Dowall, D. / Landis, J.	AREUEA	1982	San Francisco Bay Area, CA	Growth controls result in higher housing prices. Policies which restrict new construction and/or densities are found to be inflationary. If local governments in the San Francisco Bay Area are committed to reducing housing costs, they should consider loosening density restriction or other controls.	City shape and density
Elliott, M.	AREUEA	1981	51 communities in California, focusing on the San Francisco Bay Area	The housing price increase in growth control communities located in extensively regulated housing markets is significantly above no-control communities. When demand is strong and the housing market is extensively regulated, policies that directly limit growth drive up the price of housing.	Quantification
Engle, R. / Navarro, P. / Carson, R.	JUE	1992	Model city	Prices of land and housing appear to increase where growth controls are imposed. The primary beneficiaries are owners of developed land, while the primary losers are owners of undeveloped land.	Beneficiaries

Author(s)	Journal	Year	Geographic area	Results	Group
Frech, H./ Lafferty, R.	JUE	1984	Oxnard, Ventura, Camarillo, Port Hueneme; CA (Los Angeles MSA)	Substantial increase in housing costs even distant from the coastal amenities, existing residential units grew in value by 8 to 13%. Estimation that prices are being raised between \$990 and \$5,043 (in 1975 dollars).	Quantification
Glaeser, E. / Gyourko, J. / Saks, R.	JLE	2005 b	New York Manhattan; 21 MSAs	There often is a substantial gap between the price of housing and construction costs. This gap suggests the power of land use controls in limiting new construction. The restriction tax ranges from 0% (Houston, Philadelphia) to 47% (San Jose) and 53% (San Francisco).	Quantification
Gleeson, M.	LE	1979	Brooklyn Park, MN (Minneapolis MSA)	The mean per-acre value in the developable portion was 200% greater than that in the undevelopable portion. More than two-thirds of this increase is due to the segmenting of the market. Parcel subject to growth management are affected, parcel not subject to regulation show no differences.	Quantification
Groves, J. / Helland, E.	LE	2002	Harris County, TX (Houston MSA)	Zoning raises the value of properties best suited to residential use by protecting them from the treat of nearby future commercial development.	Beneficiaries
Hamilton, B.	JUE	1978	13 MSAs in the North East e.g. Minneapolis, MN	Homeowners seek to maximise their property values, thus favouring stricter zoning rules. By extension of zoning, the owners of vacant and unzoned land, the owners face a loss.	Beneficiaries
Ihlanfeldt, K.	JUE	2007	112 cities in Florida	Housing affordability depends on the number of competing jurisdictions. An increase in land use regulation restrictiveness strongly affects developer's costs. Regulation tends to increase costs by more than the increase in housing price.	Development and construction
Jud, G.	LE	1980	Charlotte, NC	Consumers are willing to pay a premium for a uniform neighbourhood. Large-lot zoning lowers the cost of single-family residential housing constructed on large lots. Regulators in Charlotte tend to set minimum lot size above the market equilibrium, thus increasing the supply and reducing the price.	City shape and density
Kahn, M. / Vaughn, R. / Zasloff, J.	JHE	2010	Los Angeles and San Diego, CA	Home prices have increased by much more inside the California coastal boundary. The average sale in the zone is roughly double in price compared to the average home not in the zone. Population density outside the zone is much higher. Entry barriers will prevent neighbourhoods from unwanted structures so purchasers will bid more.	City shape and density

Author(s)	Journal	Year	Geographic area	Results	Group
Katz, L. / Rosen, K.	JLE	1987	64 communities in the San Francisco Bay Area, CA	Land use regulations appear to have had a substantial effect on house prices. Their regression analysis indicates that housing prices are between 17 and 38% higher in communities with growth control plans.	Quantification
Knaap, G.	LE	1985	Washington County, Clackamas County; OR (Portland MSA)	The urban growth boundary was found a significant influence on land values. Effects significant in Washington County due to stricter rules but insignificant in Clackamas County with more flexible rules. After the enactment of urban growth boundaries, vacant land prices were lower outside the boundary than within it.	Development and construction
Levine, N.	JUS	1999	California	Growth control measures removing land from development have effects in reducing housing units as consumers shift to less regulated communities.	Development and construction
Malpezzi, S.	JHR	1996	56 U.S. MSAs	Regulation raises housing rents and values and lowers homeownership rates. The number of housing starts is low due to increased prices of land.	Development and construction
Mayer, C. / Somerville, C.	RSUE	2000	44 MSAs	Land use regulations have significant effects in lowering the level of new construction and reducing the responsiveness of local supply to price shocks. Metro areas with greater regulation have price elasticities that are more than 20% lower than in cities with less regulation.	Development and construction
Moss, W.	JUE	1977	-	Minimum lot size requirements may increase land prices and housing costs. Large lot zoning with lower land supply raises land prices.	City shape and density
Noam, E.	AREUEA	1983	-	The empirical results confirm that buildings codes are associated with higher housing values and as such, appear to have an intended or unintended exclusionary effect.	Quantification
Peiser, R.	AREUEA	1981	Houston and Dallas, TX	Development regulation in Dallas is more costly than in Houston through a reduction in supply of developable land. Higher housing costs in Dallas (compared to Houston) can be attributed to higher lot prices.	Development and construction

Author(s)	Journal	Year	Geographic area	Results	Group
Pogodzinski, J. / Sass, T.	RSUE	1994	Santa Clara County, CA (San Jose MSA)	Zoning is consistent with externality and exclusionary motives. Zoning tends to follow the market thus producing more single-family homes.	Beneficiaries
Pollakowski, H. / Wachter, S.	LE	1990	17 communities in Montgomery County, MD (Washington D.C. MSA)	Spill over effects contribute to higher prices in adjacent areas. Restriction and concentration of development contributes to higher population growth rates of peripheral communities.	City shape and density
Quigley, J. / Raphael, S.	AER	2005	California cities	Land use regulation increases housing costs in California cities. They find a positive relationship between the degree of regulatory stringency and housing completion for both owner-occupied and units and residential units.	Development and construction
Rose, L.	JUE	1989	45 MSAs	Interurban price differences of 40% of the mean can be explained. About three-fourths of this explanatory power is commonly due to natural restriction and one-fourth to contrived restriction.	Quantification
Rosen, K. / Katz, L.	AREUEA	1981	San Francisco Bay Area, CA	Regulations had a substantial impact on the housing market. Regulations have diminished the availability of developable land and forced builders to costly alterations in their projects. Growth management systems and restrictive zoning practice lead to significantly increased house prices.	Development and construction
Schuetz, J. / Meltzer, R. / Been, V.	JUS	2011	San Francisco, CA MSA; Boston, MA suburbs	The analysis of how IZ has impacted housing prices and permits offers a certain amount of evidence that IZ has constrained housing supply and increased prices although the effect is relatively small. IZ does not contribute to increased sales prices of existing single-family homes.	Development and construction
Sheppard, S.	JUE	1988	-	In the absence of binding containment policies rents are lower, the city is more compact, the utility increases. Outward expansion leads to lowered rents outwards but higher rents for less centrally located units. Inward expansion leads to lower rents outwards but higher rents in centres.	City shape and density
Siegan, B.	JLE	1970	Houston, TX	Houston does not differ from what it would have been, if it were zoned. As policies are more developer friendly, market demands in short term can be satisfied, keeping prices at a low level.	City shape and density

Author(s)	Journal	Year	Geographic area	Results	Group
White, J.	JUE	1988	Ramapo, NY (New York City MSA)	Zoning is binding and lot production costs are inversely related to lot size. Zoning impacts a price difference depending on the lot size. Smaller lots are more costly.	City shape and density
White, M.	JUE	1975	Unspecified Met- ropolitan Area	Newcomers subsidise older residents in consumption of public services. Older residents can make capital gains when they sell, if large-lot zoning is set and their supply is fixed.	Benefi- ciaries
Wu, J. / Cho, S.	RSUE	2007	MSAs in the Western States of CA, ID, NV, OR, WA	Local land use regulations reduced the total supply of new developed thus developable land by 10%.	Devel- opment and con- struction
Xing, X. / Hartzell, D. / Godschalk, D.	JHR	2010	Large MSAs	Development tools have a significant and positive impact on subsequent housing prices. Housing starts are being reduced due to regulation when the population growth is faster than average.	Devel- opment and con- struction

Table 5: Articles used in the meta-analysis

**Appendix 3 Table 6: Median house prices in the U.S.****Median Sales Price of Existing Single-Family Homes for Metropolitan Areas**

(in 1,000 USD)

Metropolitan Area	2008	2009	2010.I	2011.I	%Change
<b>Atlanta</b>	149.5	123.5	110.1	99.8	-33.2%
<b>Austin</b>	188.6	187.4	182.5	188.2	-0.2%
<b>Baltimore</b>	274.1	251.2	234.9	212.6	-22.4%
<b>Birmingham</b>	153.9	146.1	135.1	132.4	-14.0%
<b>Boston</b>	361.1	332.6	321.8	322.1	-10.8%
<b>Buffalo</b>	105.4	113.6	106.6	118.1	12.0%
<b>Charlotte</b>	197.8	189.1	173.9	195.1	-1.3%
<b>Chicago</b>	245.6	199.2	175.5	155.0	-36.9%
<b>Cincinnati</b>	131.8	125.8	121.9	112.8	-14.4%
<b>Cleveland</b>	108.5	106.8	108.3	87.0	-19.8%
<b>Columbus</b>	139.3	134.9	125.8	114.4	-17.9%
<b>Dallas-Fort Worth</b>	145.8	140.5	141.1	143.1	-1.9%
<b>Denver</b>	219.3	219.9	224.8	223.8	2.1%
<b>Hartford</b>	246.2	232.0	225.9	213.6	-13.2%
<b>Houston</b>	151.6	153.1	150.1	148.5	-2.0%
<b>Indianapolis</b>	111.2	114.2	115.0	109.9	-1.2%
<b>Jacksonville</b>	174.6	145.9	140.7	127.4	-27.0%
<b>Kansas City</b>	144.3	140.7	130.7	125.3	-13.2%
<b>Las Vegas</b>	220.5	142.9	137.0	128.3	-41.8%
<b>Los Angeles</b>	402.1	333.9	298.7	292.7	-27.2%
<b>Louisville</b>	132.2	131.1	127.7	125.0	-5.4%
<b>Memphis</b>	119.3	119.2	113.9	104.2	-12.7%
<b>Miami</b>	285.1	211.2	191.2	153.6	-46.1%
<b>Milwaukee</b>	212.3	193.4	203.8	181.4	-14.6%
<b>Minneapolis-St. Paul</b>	202.0	177.7	162.0	140.6	-30.4%
<b>New Orleans</b>	160.5	160.1	154.6	147.9	-7.9%
<b>New York</b>	437.9	381.4	380.4	375.9	-14.2%
<b>Oklahoma City</b>	128.1	140.5	140.7	129.3	0.9%

Metropolitan Area	2008	2009	2010.I	2011.I	%Change
<b>Orlando</b>	208.9	147.4	129.5	119.7	-42.7%
<b>Philadelphia</b>	231.4	215.9	209.8	199.1	-14.0%
<b>Phoenix</b>	191.3	137.0	140.9	126.7	-33.8%
<b>Portland</b>	280.1	244.1	237.4	213.4	-23.8%
<b>Providence</b>	250.6	218.5	211.9	208.5	-16.8%
<b>Raleigh</b>	223.4	215.4	219.9	229.9	2.9%
<b>Riverside</b>	234.2	169.7	174.0	173.4	-26.0%
<b>Rochester</b>	117.0	116.4	112.2	114.1	-2.5%
<b>Sacramento</b>	216.7	180.5	179.4	169.4	-21.8%
<b>Saint Louis</b>	133.2	127.1	116.1	107.4	-19.4%
<b>Salt Lake City</b>	229.6	217.0	203.8	190.5	-17.0%
<b>San Antonio</b>	152.8	149.3	142.2	148.5	-2.8%
<b>San Diego</b>	385.6	359.5	379.0	374.8	-2.8%
<b>San Francisco</b>	622.0	493.3	483.1	465.9	-25.1%
<b>San Jose</b>	668.0	530.0	560.0	545.0	-18.4%
<b>Seattle</b>	357.2	306.2	302.6	287.1	-19.6%
<b>Tampa</b>	173.0	140.7	133.9	113.6	-34.3%
<b>Virginia Beach</b>	220.0	210.0	195.0	178.0	-19.1%
<b>Washington</b>	343.4	308.6	292.6	294.8	-14.2%
U.S.	196.6	172.1	166.4	158.7	-19.3%

All areas are metropolitan statistical areas (MSA) as defined by the US Office of Management and Budget as of 2004. They include the named central city and surrounding areas.

Price changes from 2008 to 2011 in 1,000 USD.

Note: MSAs where there was no data available have been removed from this table.

Source: 2011 National Association of REALTORS®

Table 6: Median house prices in the United States

**Appendix 4 Table 7: Income and rents in the 20 largest U.S. MSAs**

Gross U.S. Income annually <sup>1)</sup>	\$ 51,495
Gross U.S. Income monthly	\$ 4,291

City	Rent <sup>2)</sup>	Share rent	Rent <sup>2)</sup>	Share rent
	2 bedroom \$	income %	3 bedroom \$	income %
New York	3,735	87	4,663	109
Washington	3,077	72	3,931	92
Boston	2,011	47	2,795	65
San Francisco- Oakland	1,876	44	2,660	62
Los Angeles- Long Beach	1,780	41	3,294	77
San Diego	1,416	33	2,008	47
Chicago	1,360	32	1,820	42
Miami- Fort Lauderdale	1,353	32	1,671	39
Baltimore	1,187	28	1,478	34
Philadelphia	1,155	27	1,706	40
Riverside- San Bernardino	1,082	25	1,376	32
Minneapolis- St. Paul	989	23	1320	31
Dallas- Fort Worth	980	23	1347	31
Houston	876	20	1274	30
Seattle	860	20	1313	31
Atlanta	846	20	1085	25
Tampa	832	19	1122	26
St. Louis	813	19	1336	31
Phoenix	800	19	1150	27
Detroit	792	18	1043	24
<i>Average</i>	<i>1,391</i>	<i>32</i>	<i>1,920</i>	<i>45</i>

<sup>1)</sup> OECD Employment outlook, Paris 2009

<sup>2)</sup> 3D Listing LLC, Superior CO (2009 figures)

Table 7 Income and rents in the 20 largest U.S. MSAs (2009)

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**Ehrenwörtliche Erklärung**

Hiermit erkläre ich, dass ich die vorliegende Masterthesis

*„Are housing prices in U.S. metropolitan areas  
being raised by zoning and land use regulations?“*

selbst angefertigt habe.

Die aus fremden Quellen direkt oder indirekt übernommenen Gedanken sind als solche kenntlich gemacht.

Das Übernehmen wörtlicher Zitate aus der Literatur ist an den entsprechenden Stellen der Arbeit als solches gekennzeichnet.

Die vorliegende Arbeit wurde bisher weder einer anderen Prüfungsbehörde vorgelegt noch veröffentlicht.

Zürich, den 12. August 2011

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**Patrick Harsch**