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Master Thesis

The Second-Home Initiative:
Did Prices of Vacation Homes Increase?

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Abstract

The goal of this master thesis is to examine the effect of a direct supply restriction on prices of vacation homes in Switzerland. The restriction is the consequence of the acceptance of the initiative by the people named "Stop the endless construction of vacation homes". The assumption underlying this thesis is that price increases are expected to have occurred already before the vote and the implementation of the new by-law, due to adaptive behaviour of the market participants as a result of their expectations about the future.

It could be found that prices of second homes of affected regions, which are regions that have higher vacation home densities than 20%, have increased due to the growth restriction. Also the price increases have been found to have occurred already before the restriction was applied to the market, wherefore the underlying assumption could be verified.

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1 Introduction

This master thesis examines the consequences of an initiative by the Swiss people regarding its effects on prices of vacation homes. The initiative named "Stop the endless construction of second homes" was accepted by the Swiss people on March 11th 2012 and imposes severe restrictions on the construction of second homes within affected regions (Credit Suisse, 2012). It limits the percentage of vacation homes in a municipality to 20% or the percentage at the time of validity of the new law, if a municipality's vacation home density is higher than this threshold. Until the 31st of 2012, building applications were allowed and were treated with the old regulations. From the 1st of January 2013 all building applications for vacation houses were treated as invalid if the threshold of 20% has been met. Owners of vacation homes will still be able to sell their homes as vacation homes, but due to a lack of possibility to build another vacation home, they are assumed to only sell for substantially higher prices. Due to this restriction of supply that is applied to the market, the prices for vacation homes in affected regions are expected to rise. The important assumption underlying this thesis is that prices already increased before the vote and before the new law went into force, which is due to adaptive behaviour of vacation home owners and investors, as a result of their future expectations. Therefore, during the time of legal uncertainty, a current owner will only be willing to sell for a higher price, because he might fetch a higher price if the new law comes into force. An investor assuming future price increases will also be willing to spend more on a home, since his expected future return is higher.

The main contribution of this master thesis is to examine the effect of the initiative on prices of second homes in Switzerland. The effects of this law change are interesting for several parties, especially because this change of law is based on interests of the Swiss population and not necessarily required due to economic issues or slowing restrictions needed. It is of great interest for the people involved in the Swiss property markets, the law makers as well as the people living in affected regions, to have an understanding of how the prices changed since the initiative has been launched. The fact that more than a year has gone by since the by-law is in force is not only a justification that there is enough data available at this point in time to get a representative image of the effects of the initiative. The time passed is also short enough that the academic work on the effects of this initiative is still very rare, if not inexistent. Of course there is research of the effect of other governmental restrictions on property prices, which will be lain out in a following chapter, but an adaptation on the present case has not been made. The research question to be evaluated is:

Did the initiative for limiting the amount of vacation homes effect prices of vacation homes in affected regions? Did prices already adjust before vote or the by-law went into force?

The research question will be examined using a hedonic transaction price model using data that includes different characteristics of the dwellings sold. Such data could be gathered from the SRED - the Swiss Real Estate Datapool (SRED, 2014). SRED is a project that was launched by leading Swiss banks and compiles

data about residential properties from completed mortgage contracts (SRED, no date). The data used includes the transaction prices, which effectively have been paid. Besides quantitative characteristics, all the transaction data also includes information about qualitative characteristics of the properties (micro location, quality of construction, condition, house type) and especially important for the research goal of this master thesis, they include the specification if a property is registered as a main residence or secondary residence. Furthermore, all the transactions dispose of geocoding, wherefore the effects can be examined location specific.

This master thesis is outlined as follows. First, the law-launching-process through an initiative by the people is explained and then divided in different phases, which represent different stages of the process, whereby for every stage the probability of the law going into force is rising. This segmentation of the process is necessary to see in what magnitude and what period of the law process price increases occurred. Thereafter, the second home initiative is analysed in detail in order to gather an exact understanding of how it is expected to affect the housing market and which municipalities it will affect, since the law only applies if a municipality's density of second homes is higher than 20% of total dwellings. Also the demand of second homes will be examined, because demand changes could affect the equilibrium price of second domiciles as well. In the following chapter the supply restriction theory is analysed. The existing literature is portrayed and the connection to this thesis is explained. In the methodology part, the model used is introduced and the hypotheses, which follow from the research questions above, are elucidated. Subsequently, all the data used – several sources were needed – is explained by its composition, where it could be accessed and descriptive statistics are posed, in order to provide the reader with a feeling for the data. The results of this thesis including the main regression tables are posed thereafter and at the very end, conclusions are drawn, restraints of the study explained and implications for future research are expounded.

2   The initiative: "Stop the endless construction of second homes"

2.1 Process of law making in Switzerland through an initiative by the people

The Process of law making through an initiative by the people is important to be considered in order to decompose it into different phases. Those phases are regarded as different probabilities for the initiative to achieve legal validity, which in turn is important because this thesis is based on the assumption that price increases already occurred during the process of launching the initiative.

Switzerland's political system is known for its direct democratic functioning, which allows people to actively take part in political decision making and legislation. One tool the Swiss people can make us of for changing the federal constitution is an initiative by the people (Swiss Federal Chambers [SFC], no date). It allows eligible voters to demand changes of laws of the federal constitution and it can be formulated in the form of a general suggestion, which is most common, or in the form of an explicit elaborated text, whose wording cannot be changed anymore by the parliament or the federal council. In order to come into existence an initiative has to obtain 100'000 signatures of eligible voters within a time period of 18 month. If the initiative is handed in and declared accomplished, the authorities have the possibility to elaborate a counter draft, if they are not in overall agreement with the initiative and they believe that there is a realistic chance of the initiative being accepted by the people. With or without counter draft, the federal convention will at some point communicate their advice of how an initiative should be voted on including their reasoning (SFC, 2014). The initiative then will be voted on by the people and the representatives of the states and if it is accepted, the parliament must elaborate a by-law and at the end come up with the final law to implement the provisions of the initiative into the legislation.

The second home initiative was handed in on the 18.12.2007 in form of a general suggestion, wherefore no exact wording for the new law was compiled by the creators of the initiative. On the 18.01.2008 it was declared valid in regard of the requirements of launching an initiative with 108'497 signatures of eligible voters (SFC, 2008a). This message was communicated in several governmental documents as well as in the media, which is why the date of the 18.01.2008 is taken as the beginning of phase 2: when the Swiss people received the information that the initiative regarding the limitation of second homes has gathered enough signatures. On the 29.10.2008, the Swiss Federal Council publicised their resolution that they advise the people and the representatives of the states to defeat the initiative and they requested that the Federal Convention should accept the initiative and that they should let it go to vote (SFC, 2008b). The Federal Convention afterwards also declared the initiative as legally valid and ratified that the initiative should be voted on. The initiative was then accepted by both of the voting parties, the people and the representatives of the states, on the 11.03.2012, in a very close race (SFC, 2012). The by-law was elaborated thereafter and went into force on the 1st of January 2013 and is currently providing the legislative content, until the new law text is completed and implemented into the legislation, which is not

seen as realistic to happen before the year of 2015, according to economists from Credit Suisse (Rieder & Hasenmaile, 2012).

Below, an overview of the different phases of the initiative is set out. Again, there is to mention that the phases from left to right are seen as rising probabilities that the new law and its restrictions on the supply of vacation homes will be adopted. Since the expectation is that price increases already have occurred before the vote, it will be interesting to examine if this really was the case and if so, in what magnitudes and during what phases they occurred.
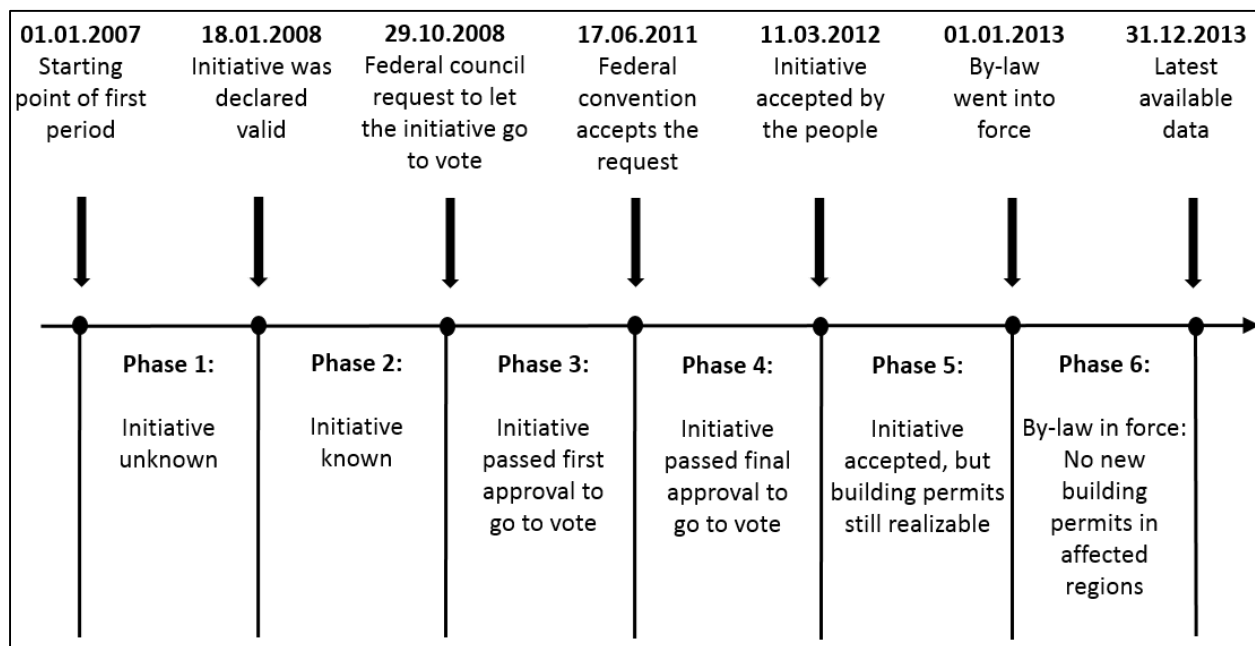
Figure 1: Phases of the second home initiative – own illustration

2.2 Why the initiative was launched

Reasons for why the initiative was launched can be found in the rows of the supporters of the initiative (Second Home Initiative, no date). The name of the initiative: "Stop the endless construction of second homes", already contains the main point of argument, which is that the amount of vacation homes currently existent is too high. According to the homepage of the campaigners, they mention that there is a total amount of 600'000 vacation homes that are most of the time empty. To put this number into relativization, economists estimate a total number of vacation homes of 500'000 (Kaufmann & Rieder, 2012). Whatever the exact amount may be, those empty apartments are seen as harming the atmosphere of towns, if they appear in high density and the term "ghost town" is used in their propaganda (Second Home Initiative). Furthermore, the protection of the alpine world, rapidly rising housing prices and speculation are reasons mentioned of the pro faction, for why this development must be prevented. It must be kept in mind that those arguments are coming only from promoters of the initiative, however, since the law has been accepted, there must be a majority of voters, who were at least in some accordance with their views.

The arguments given above are the ones directly oriented on the initiative and do not contain the reasons why regulation on the housing market is applied in general. In order to give a more extensive insight into the fundamental reasoning, the general point of view regarding regulation will be outlined in the literature review chapter.

2.3 Implementation of the by-law and consequences

At the current point in time only the by-law is in force, wherefore it is seen as essential to analyse it regarding its exact wording and implementation into practical law. In this sub chapter the most important implications of the by-law will be posed and also the expected consequences of the law will be discussed through analysis of the opinions of economists.

2.3.1 The by-law of the second home initiative

To make the link to the phases of law implementation of the second home initiative, which were stated in chapter 2.1, this by-law of the second home initiative went into force on the 01.01.2013, which is the beginning of the last phase of the process. The particular articles of the by-law will not be reproduced word for word. The articles are rather summarized in order to have a comprehensible overview of the law content (Federal Office of Spatial Development, 2012):

Area of validity:

The by-law applies in municipalities which have densities of vacation homes of more than 20 percent as a share of a municipality's total amount of dwellings. The municipalities that are expected to have higher densities than 20 percent are stated at the end of the by-law and they have the possibility to proof that they do not exceed the threshold, in order to get exempt of the new restrictions. The Federal Office of Spatial Development (FOSD, 2012) is in charge of gathering the data of the second home density of all municipalities. It has the duty to update the data with regards to evidence received from municipalities that already presented proof of having lower than threshold densities, and data coming from the Federal Office of Statistics on a yearly basis.

Both, the municipalities mentioned in the by-law and the density data from the Office of Spatial Development will be used for assessing the affected municipalities and will be posed at a later stage.

Characteristics of second domiciles:

A vacation home/second domicile is a dwelling that is not permanently used by people as their first domicile or for the purpose of work or education.

Existing dwellings:

Dwellings that had been built or legally approved before March 11, 2012, which is the date when the initiative was accepted, can be converted from first to second domiciles or from second to first domiciles under provision of certain restrictions of usage.

Construction of new dwellings:

If a municipality has a density of vacation homes of higher than 20 percent, permissions can only be granted for buildings with the purpose of being first domiciles. However, there is an exception for second domiciles, in case they are not individually used and have the purpose of being rented out for only short-term periods for market rents or if the owner is living in the same housing unit.

Transfer terms:

Building permits can be granted based on a building specific special usage plan in the case it was approved before the 11th March 2012 and if it includes essential elements of the planned construction as for example location, size, design and usage etc.

Building permits which will be granted after January 1st 2013 until the final implementation law goes into force are invalid. As stated before, January 1th 2013 is the date the by-law went into force.

2.3.2 Expected consequences

The new restrictions on the construction of second homes are expected to influence the housing market strongly in municipalities that are affected. The new law is not only anticipated to affect prices of vacation homes, also first domiciles and land prices are expected to be under the influence of the law.

Second homes:

The new law will have the consequence of severe restrictions on the supply of vacation homes in affected regions (Rieder & Hasenmaile, 2012). For current owners in such regions this means that if they sell their vacation home now, there will be almost no possibility anymore to build a new second home in a touristic destination in the future. This is why Rieder and Hasenmaile find it unlikely that current owners are willing to sell their second home, if they will not receive noticeably higher prices. As a conclusion, also the liquidity on the market for such homes is expected to decrease, because of the lacking willingness of current owners to sell (Kaufmann & Rieder, 2012).

The positive price trend in the years before 2012 has been the expression of a national and international demand for owning a property in the Swiss mountains, and therefore is not seen as the result of local demand and supply (Kaufmann & Rieder, 2012). Restrictions, as contingents for foreign buyers, have been implemented in some states already in the past years, wherefore the supply was limited for foreigners to some extent already. With the Second Home Initiative a further restrictions is applied to the market, which

accounts for all market participants in affected regions to the same extent. If the national and international demand will stay at the current high level the prices are expected to keep on rising. Because of the fact that not only the supply, but also the demand is an essential factor of the market price, they are examined in more detail in a separate chapter.

First homes:

Firstly, there is an important distinction to set out about the housing segments, because the housing market is not only segmented into a first and second home market, there are also properties which are not registered as one of them and for which in the following the wording "unregistered" will be used. In case a dwelling is existing and registered as first domicile already, or in case it will be built with the permission of being a first domicile, possible price changes are seen as only moderate and falling (Rieder & Hasenmaile, 2012). This is because the new law as well as the by-law have the consequence that the real option of the buyer/owner of a first domicile to sell it as a second domicile, does not exist anymore. Before, a seller could ask the same prices to locals as a tourist with a usually higher purchasing power. Making house prices payable again for the local population was in the end also one of the reasons the founders of the initiative mentioned as a pro-argument. The magnitude of the relative price decreases, Kaufmann and Rieder see as very much depending on the location, since some are still more attractive for owning a first home then others of course, but since the local demand will determine first domicile prices in the future, they expect prices to adjust towards prices of not affected regions, but not in the amount of a full convergence (2012). The timing of adjustment of first domicile prices they only see likely to occur after the phase of legal uncertainty, which is when the exact wording of the final law is known and implemented.

Unregistered homes:

Unregistered homes, in the meaning as stated above, are not affected by the conversion restraint as the first domiciles are, wherefore they can be used and sold as a first or second home (Rieder & Hasenmaile, 2012). Because the new law will make a conversion to a second domicile beneficial, the law will lay the authority to regulate this issue into the hands of the governments on state and municipality level, who will be required to prevent abuse and unsatisfactory developments. Weather and to what extent those developments will be prevented is one of the big challenges of this initiative and is a topic the implementation law will have to regulate. If unregistered home owners will keep the freedom of choosing how to use the dwelling, then prices are not likely to decrease of course. Since there is still legal uncertainty prevailing, noticeable price effects for unregistered homes are not expected to occur until there is more legal clarity.

Land prices:

As land prices are closely related to housing prices also the category of land is expected to be affected by the initiative. Owners of undeveloped land in affected regions have to face the prophecy that the prices for such land will most certainly decrease, because the demand for construction land from higher income demanders, who would have used the parcel for building a vacation home, will fall away. From the developers point of view the amount remaining to spend on land will shrink, since construction costs are seen as more or less stable, but margins will be smaller than before the initiative (Kaufmann & Rieder, 2012).

2.4 Foreign demand and supply of vacation homes

The question of supply and demand for second homes was only slightly elucidated so far. Whereas the initiative represents an extensive supply restriction for affected regions, there is already a major further restriction on the supply of second homes in force, which only applies to foreign demanders. It will be explained hereinafter. The demand coming from buyers outside of Switzerland was also already addressed and will be analyzed in more detail as well, because the balance between demand and supply determine in the end what the market price will be.

2.4.1 Contingents on the supply towards foreigners – The Lex Koller

Owning a vacation home in the mountains of Switzerland is a desire, which is definitely not considered a new phenomenon and neither this desire is only voiced by Swiss citizens, it is a fact that a great stake of demanders for second homes in such locations come from abroad. It is therefore not incomprehensible, that in order to regulate overshooting prices, measures have been taken already in earlier times.

The acquisition of properties by foreigners in Switzerland is regulated by the Lex Koller (Häggi, 2003). The purchase through this group of demanders in principal must be permitted and since the year of 1979, the issuance of such permissions has been subjected to a quota, which is a certain contingent of permissions a state is allowed to exhaust on a yearly basis. In the year of 2002, the total quota for allover Switzerland was set to 1420 permissions towards foreigners and those contingents were allocated to states which had the needed legal requirements in their laws. As at the year of 2012, the contingents had been set to the number of 1500 per year, which were distributed among 17 states that fulfilled those legal requirements (Gramegna, 2012). Since changes of the contingents could influence this study because they represent another supply restriction that affects the market of second homes, they must be considered in order to find the true causal effect of the initiative. Fortunately, those contingents have only been changed very slightly during the data period underlying this thesis – 2002 until 2013 – and therefore can be disregarded. However, because of the fact that only certain states are allowed to issue permissions towards foreigners, all the other states are dropped from the data used, so it is comparable in the way that all the remaining states have a demand coming from foreigners.

2.4.2 Demand for vacation homes from foreigners

The Lex Koller does also provide quantitative data about the foreign demand, because the Federal Office of Justice is forced to collect data about several key factors regarding the permission towards foreigners, which knowledge is seen as very important for the course of this study, since demand changes during the period of interest occurred and could have affected the market equilibrium as well. Unfortunately, exact data about the yearly awarded permissions per state could not be accessed, however, there was country wide data available, which will be set out hereinafter.

The data contains the rates of exhaustion of the contingents on national level over the period from 2002 until 2012 (Gramegna, 2012). It shows that the demand from foreigners rose slightly from 2002 until 2004. From 2005 until 2008, almost continuously all the contingents were used by foreign demanders, which can be seen as a
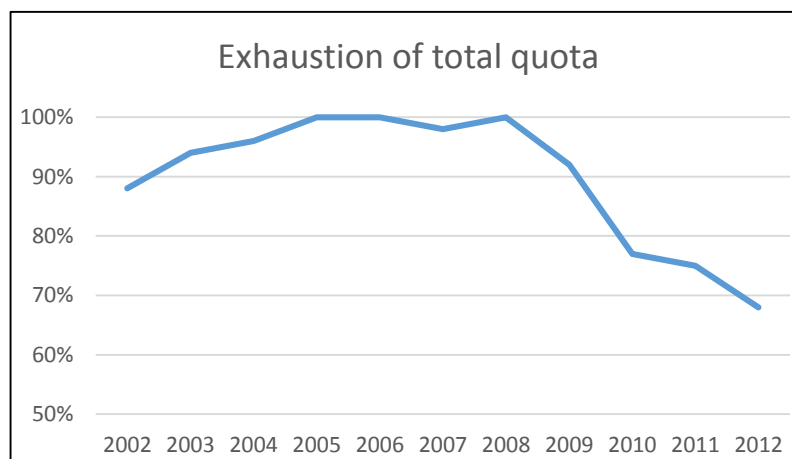
Figure 2: Exhaustion of total quota for foreigners – own illustration

constant higher demand, but due to the fact that there is no overshooting possibility above 100 percent, a more exact statement about the demand during those years in not possible. After the year of 2008 the permissions given to foreigners declined sharply to under 80 percent in 2010 and to 68% in 2012. To put this chart into some relativization: if a permission is granted this only means that the grantee is allowed to purchase, it doesn't necessarily mean that he will do so. Summarizing, Figure 2 above shows a sharp decline of the demand after 2008, but has the drawback that for the years for which the contingents were fully assigned, the demand cannot be quantified accurately, due to no overshooting possibility of the scale of 100 percent. As a conclusion more accurate data for explaining demand changes is needed.

Data about changes of foreign ownership of the year 2012 hereby offers further insights (Gramegna, 2012). It contains data about the origin of foreigners and to what extent they purchased second domicile property in Switzerland. Although the data only sheds light into the conditions in year 2012, the origin of foreign demanders is not seen as highly alternating, which can be undergird with an article of Häuptli, which states that since years most of the purchases are made by European citizens (2013). Furthermore, the article finds that the decline in demand for vacation homes by foreigners was caused by the economic crisis, the strong Swiss Franc and the legal uncertainty due to the Second Home Initiative. To make the link to why the foreign ownership data is considered as helpful for further demand indexation, the connection is made

between the origin data and the fact that the exchange rate with the Swiss Franc is considered a particular reason for the lower demand.
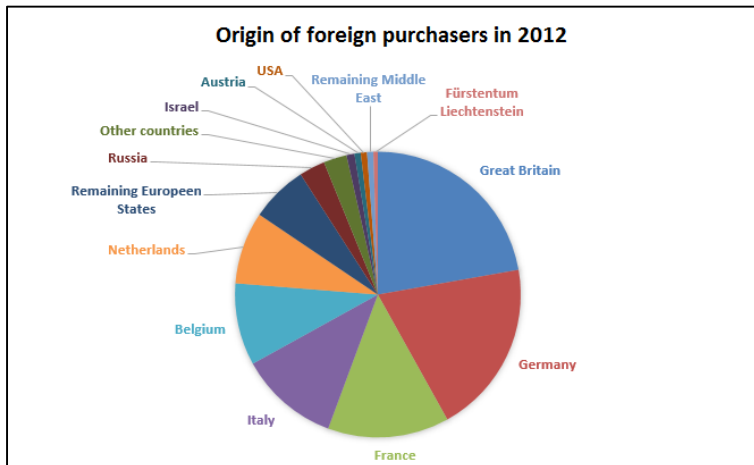
Figure 4: Country of origin of foreign purchasers in 2012 - own illustration
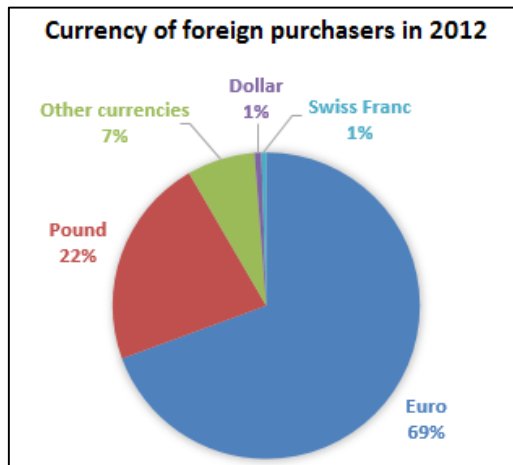
Figure 3: Currency of foreign purchasers in 2012 – own illustration

Out of the total 990 purchases by foreigners in the year of 2012, a great part is made by people with European citizenship, as presented in the Figure 4. When those purchases are matched with the corresponding currency, foreign purchases account to 69% to people coming from countries using the Euro as currency. As a conclusion of the above, the exchange rate between Swiss Franc and Euro seems to be a possible indicator for the demand of foreigners towards second homes in Switzerland.
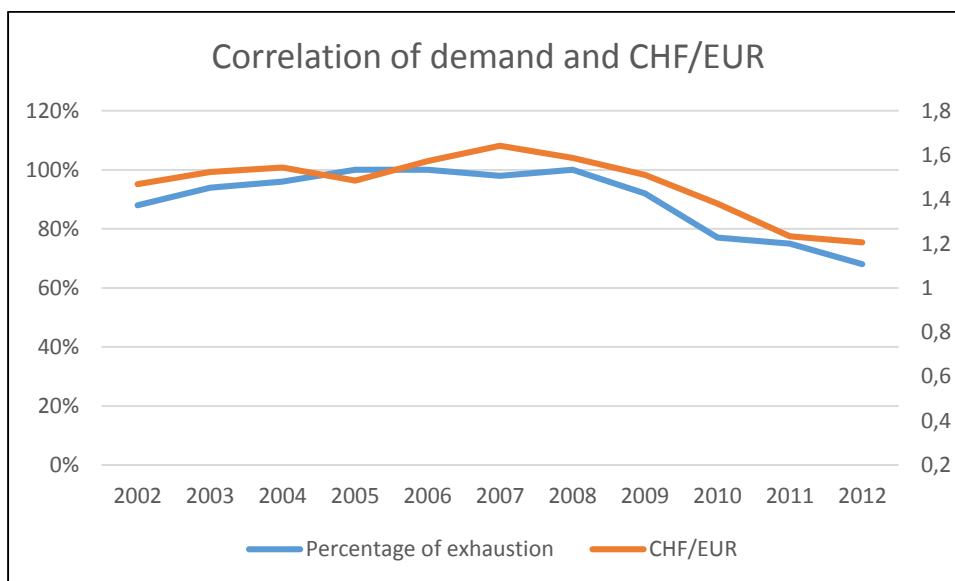
Figure 5: Correlation between exhaustion of contingents and CHF/EUR - own illustration

The expected high correlation between the CHF/EUR and the foreign demand measured through issued purchase permissions is clearly evident. Furthermore the exchange rate keeps increasing where the permission scale has its upper limit, which is why it is seen as a better indicator of the demand. Finally, using the CHF/EUR as a foreign demand index is seen as justified; it's implications for this study will be posed in a subsequent chapter.

2.5 Affected municipalities

The initiative regarding vacation homes only implies restrictions for municipalities that have more than 20 percent of vacation homes as a share of the total amount of housing units. The data about the second home density was gathered by the Spatial Development Office, which has the duty to update the data coming from the Federal Office of Statistics as well as from municipalities, because they have the opportunity to proof that their second home density is lower than was estimated and can get relieved from the new restrictions. This is what has been explained so far and further details about the density data used throughout this thesis will be given in Chapter 5. For the time being, the amount of municipalities which are affected by the law is 439. This, however is subject to change in the future due to the relief opportunity stated above. In order to provide an overview where those municipalities are located, the Swiss map presenting the affected and not affected municipalities is set out below.
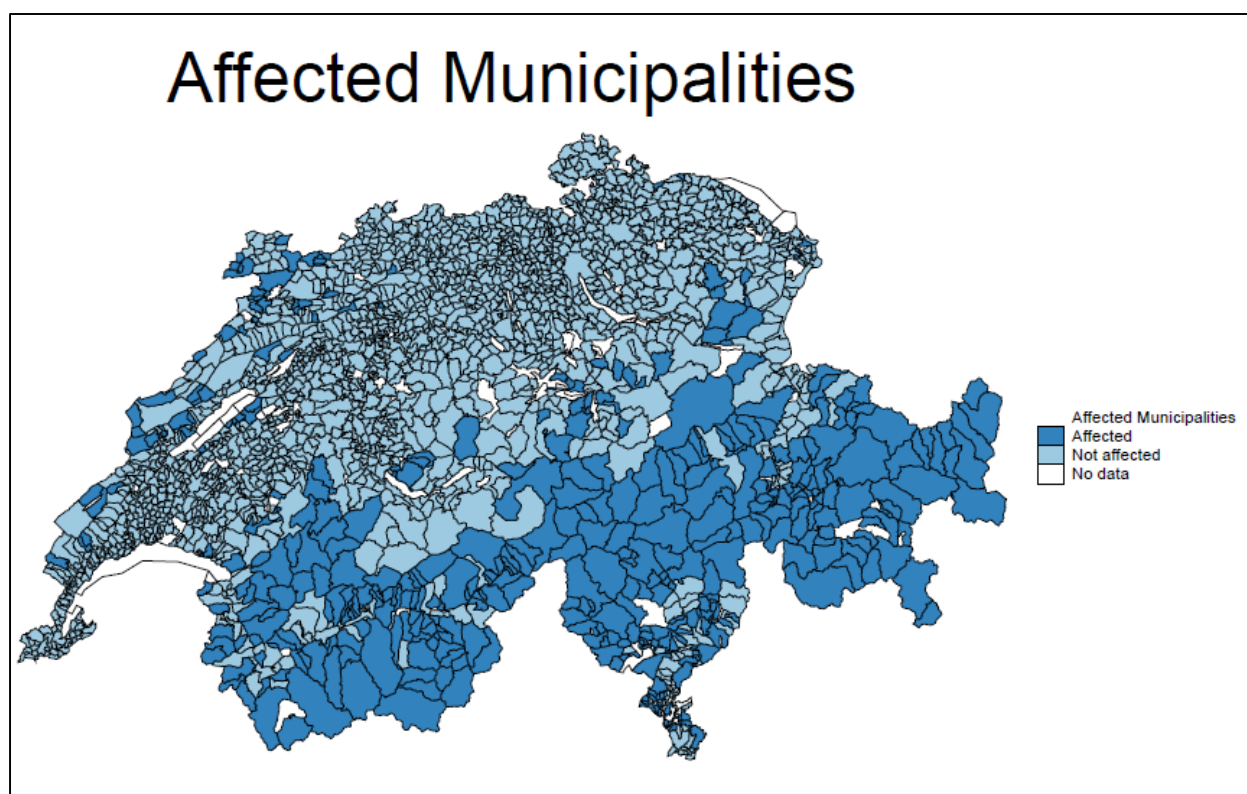
Figure 6: Affected municipalities - own illustration

It appears that the affected municipalities are not at all evenly spread, they almost all are located in the southern part of Switzerland, which is where the higher situated regions of the Alps are. The Alps are highlighted in brown in the figure to the right. Regarding what has been stated before, this distribution is not surprising, since owning a house in the Swiss mountains is a common desire of purchasers of second homes in Switzerland.
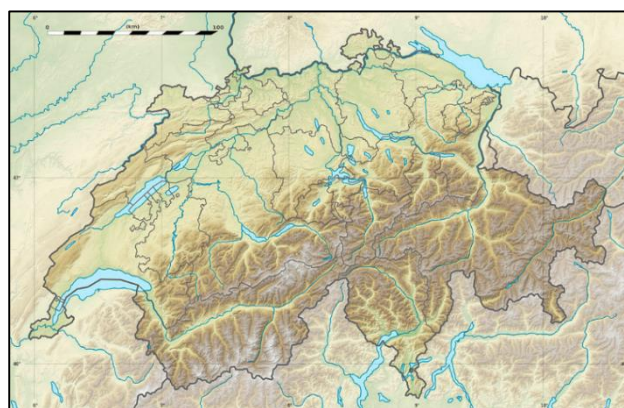
Figure 7: The Alps in Switzerland - illustration by Eric Gaba

3 Literature review

As has been mentioned before, the second-home initiative has the consequence of severe supply constraints for the market of vacations homes of affected regions. Such supply restrictions are expected to increase prices of affected homes, which will be examined in this thesis. Related literature can be found in the field of house price studies, which has been heavily researched since decades (Maclennan, 1977).

According to Maclennan, there are four main purposes why house price studies are of great interest (1977). House price studies allow to statistically explain determinants of prices as well as to explore the relative importance of various housing components. Further, they enable researchers to identify demand functions or test theories of how geographical locations affect price levels. The outcomes of such studies are very important for appraising and forecasting of relative house values as well as to assess the implications of direct policy making. Since this master thesis examines a regulatory intervention for the market of second homes, the focus of the literature review will rely on the effect of regulations on housing prices.

Land regulation is a very challenging intervention into the housing market and can strongly affect the future residential development of an affected region (Quigley & Rosenthal, 2005). In their detailed analysis of the effects of land use regulation on prices of housing, Quigley and Rosenthal found that the literature varies largely regarding the quality of research approach used, as well as the fineness of results. In consideration of the literature, it appears that the articles also vary regarding type of regulatory interventions examined, which will be differentiated before further deepening. It became apparent that researchers are not in accordance with the categorization of regulatory interventions, although there are a lot of similarities among them. The following elucidation is seen as extensive enough to ensure a broad understanding of the spectrum of regulatory interventions and their categorization is seen as the most suitable for the purposes of this master thesis.

As part of an advisory commission for regulatory barriers of affordable housing, Downs reported the accomplishments of the commission from the perspective of a housing specialist with many years of experience (1991). One of the duties of the commission was to elaborate on the different types of regulations, without the goal of condemning them, but to reveal more understanding what kind of regulations cause higher housing prices. The report found a huge amount of different regulatory interventions: zoning regulations for lot/house/side yard sizes, zoning regulations for type of property usage, building codes regarding methods/materials, environmental regulations, labour regulations for paying union wages, subdivision regulations for quality of local improvements, regulations for home builders and developers, historic preservation, permitting and processing procedures that consume a lot of time, state or local ordinances or constitutional provisions, several kind of fees and rent controls. This wide spectrum of interventions Downs categorized into three different ways of how housing costs are raised, whereby not all interventions can be assigned to one category only:

1. **Direct restrictions on housing supply:** zoning limits, yearly numerical caps and allocation of land to agricultural use only.
2. **Direct cost increases:** requirements of expensive components or methods which don't have better performance than cheaper materials or methods as well as fees for preservations of special buildings.
3. **Delay-causing requirements:** long permit and review processes.

Direct restrictions on housing supply represent the category, which also the second-home initiative can be classified with. The initiative is seen as a yearly numerical cap in the special case that the amount allowed to be build is equal to zero for new vacation homes, if a region is affected.

Answers to why growth controls are applied to the property markets can be found in the work of Glickfeld and Levine (1992). They conclude that growth control is used to cope with population growth, to plan growth patterns at the edge of cities and to handle the development of traffic, congestion and the quality of life, which is why such programs are widely supported by homeowners and local officials (Schwartz, Hansen, & Green, 1981). Those reasons are in line with the pro-arguments of the supporters of the initiative as posed earlier.

The effects of growth control regulations vary a lot and have been examined in numbers of articles, according to Mitnick et al. (1980). They summed up the generally accepted expected effects of growth controls as follows. Regulations towards a certain controlled growth pattern have the effect of increasing cost of land, decreasing density in new developments, shifting costs regarding newly built public services towards developers, shifting costs for local environmental preservation to newly incoming market participants, delaying projects, and, as a consequence, increasing prices of newly built homes. Those effects, which were mostly the outcome of the work of Bernard J. Frieden, are findings that most former studies of that time agree with (Elliott, 1981). The point of increasing cost of land may seem to contradict the expectations of economists mentioned earlier in this thesis. It is of course only the cost of land that is affected by the restriction and therefore land where a second domicile is located on or which can be still used to build a second domicile on for whatever reason.

As this master thesis examines the effect of a direct supply restriction on prices, the literature scanned is composed of several different governmental interventions that entail a direct restriction on supply - such as zoning, growth control regulations and urban growth boundaries - and their effect on housing prices.

There have been several articles about the impact of zoning regulations on housing prices. Where early zoning studies were focussed on the effects of different types of zoning areas (Adams et al., 1968, see also Downing, 1973; Peterson, 1974), later studies were more focused on the impact of a certain amount of restrictiveness on housing prices. Pollakowski and Wachter examined direct spillover effects of zoning provisions and other growth regulations on housing prices (1990). They could confirm former results that restrictions regarding land-use have the effect of increasing prices of housing and developable land within

a locality. Further they found evidence that spillover effects existed between different regions. Other studies used urban growth boundaries (UGB) to find the effect of supply restrictions on housing prices. Since an UGB per definition is a regional boundary that has the goal of controlling the urban growth in a way that the density of the population within the boundary can be higher than outside of the boundary, it is counted to the category of zoning. Knaap made a study about the effect of UGB's on vacant single family land values in the region of Portland, Oregon (1985). He could conclude that the land outside of the boundary was priced significantly less than the land inside the boundary, although a more recent study of Jun (2006), which also examined the effect of UGB's on land prices in Portland, came to the result that the UGB did not have a significant effect on prices when controlling for other variables. Jun mentioned structural accessibility and amenity factors as determinants of housing prices outside of the UGB. Other authors shed light into this topic through usage of indexes that reflected the amount of restrictiveness of housing supply. Malpezzi et al. discovered that the prices of housing for either owners or renters are related to their physical constraint, income, population and demographic variables (1998). Further regulation was found to have an increasing effect on quality adjusted rents and house prices. An article of Monk and Whitehead researched the effect of restrictiveness of regulation on prices by comparing different districts surrounding London, which differ in their levels of supply restrictiveness (1999). They found that the prices were higher in the districts with more restrictions and that the development of prices was the same regardless of the restrictiveness.

In view of the literature and the different regulations that directly affect the supply of housing, it got apparent that most of them found a positive effect on prices as a consequence of higher restrictions. However, in respect of the impact of the effects on housing prices, the studies show wide ranges of the effect, which Elliot explains by differences in regulations and markets that were studied (1981). The type of growth control and the characteristics of the community affected are key factors of the price effect and therefore a reference towards those aspects is highly needed, what is a shortcoming of previous studies, says Elliot. He solves the need of clearer classification of growth controls with a typology that divides the "function" and the "scale" of a growth regulation into two separate characteristics for each.

Elliot divides the "function" of growth control regulations into "rate" and "quality" controls, and the "scale" of regulation into if the regulation was implied to a "single region" or if "also neighbouring regions are growth controlled" (1981). He uses OLS with average house prices of selected communities in California and regresses their price increases following the impact of growth restrictiveness with an index that reflects the amount of restrictiveness of the surrounding county. He finds that if a county is strongly regulated a local growth regulation will account for 22% of the increase in price. If the local regulation occurs within a country that is only lightly regulated, the regulation accounts for only 3-5% of the house price increase. Those results are perfectly in line with Elliot's hypothesis, which was that the effect of a regulation does not only depend on the amount of restrictiveness within the jurisdiction of regulation, it also depends on the supply and demand of housing in surrounding jurisdictions, which the local price-

elasticity is effected by. This is the case because a neighbouring region can provide substitutes to the local housing market, which can cause spillover effects to those neighbouring markets, mitigating the effect of the regulation within the local market. Further Elliot shed light on the differing functions of growth control that he expected to affect prices differently. In addition to a strong demand for housing and a market that is highly regulated, growth regulations that directly limit the supply of housing through a certain "rate" will have the effect of increasing the supply-demand imbalance, which will have the effect of increasing prices. This effect he calls the "demand-pull" effect. If the growth control is steered through stipulations regarding design, quality and subdivision, the regulation may also have a "cost-push" effect, due to rising prices of newly built housing. If housing prices rose more in jurisdictions with rate controls than jurisdictions with quality controls could not be significantly determined due to a too small sample. Though, it could be found that the type of regulation, quantity or quality, has significantly different effects on housing markets. For the matters of this master thesis especially the fact that Elliot could prove that there are spillover effects to other jurisdictions mitigating the price increase in the local community needs to be addressed. Since only the price increases in affected regions are part of this study and not affected regions shall be used as control groups, it is very important to choose not affected regions, which will not experience spill-over effects from the new regulation. Further the goal of this thesis is to discover what Elliot calls the demand-pull effect and not the cost-push effect, since the initiative only applies quantitative restrictions on the supply of vacation homes.

Schwartz et al. examined the effect of a growth control program of Petaluma, California, on housing prices (1981). In contrast to the former studies that mostly explored the effect of growth restrictions through phased zoning, development densities and higher costs of development, Schwartz et al. studied the effect of a direct restriction on the number of housing units permitted on housing prices. They used reported transaction prices as well as constructed housing prices of three cities, Petaluma, Santa Rosa and Rohnert Park of 1969 until 1977 and regressed price effect differences using OLS. The growth management program, which was implemented in Petaluma in the year 1972, had the purpose of controlling the number of newly built multifamily and single family homes with a cap of 500 a year including provisions for location. Regarding the ways that growth control increases housing prices, Schwarz et al. are in line with the findings of Elliot, who divided the provisions into "rate" and "quality" controls. Also they confirm the existence of spillover effects to neighbouring regions, when they provide acceptable housing substitutes. In their study they use a hedonic model to compare price increases in Petaluma from before and after introduction of the growth management program with the two control cities. The hedonic model was used to estimate prices of only new houses, which had the consequence of controlling for environmental quality factors as well as for age. Also they included statistical controls such as house characteristics and sample selection, which allowed to control for age, zoning and environmental quality. The characteristics used were based on the findings of previous studies and consisted of floor space, lot area, number of built-in appliances, e.g. air conditioning, the number of fire places and the quality and condition of the buildings. Further they

used a dummy for time to account for the different periods of before and after implementation of the growth management program. In short, their findings showed that the prices in Petaluma rose significantly more than the prices in Santa Rosa, but on the other hand they didn't rise significantly more than in Rohnert Park. They explained this outcome with the possibility that the market of Petaluma and Rohnert Park where highly interdependent and questioned the goodness of Rohnert Park as a control group. They could then find evidence that the interaction between the two cities was strong and tried to find further evidence through analysing the effects on prices through including the so far omitted variables – development fees, property taxes and travel cost – but without finding clear evidence. Very important is the finding that the price increase in Petaluma was also the consequence of quality increases of newly built homes, which made the development of starter homes fully disappear. Summarizing it can be said, that the price increases could only partly be explained as the effects of the growth control program. Though, the increases in quality following the growth regulation could be confirmed with substantial evidence. The goal of finding the "pure effect of growth control" they declared as not possible and additional studies should be undertaken to underpin the existence of growth control effects. In the light of this master thesis, this study provides several inputs. Firstly, the model which will be used in this thesis, a hedonic model and OLS, has a lot of similarities with the model used in their article, whereby the theoretical details and justification will be presented in the methodology part. Further, it appears in the article that the choice of control groups and control variables is very important in order to find evidence for the true price effect of the growth regulation. Choosing a nearby control group is in view of the findings of Elliot not desirable and is seen as a questionable approach.

Schwartz et al. undertook a further study about the effects of the Petaluma growth controls to shed more light into its effect on the production of moderate-priced housing (1984). They could strengthen their previous results that small and lower-priced housing vanished from Petaluma after the growth restriction and could gain further insights on the reasons for this occurrence. Firstly, they found that the criteria for awarding housing permissions comprised a lot of quality items and secondly the city council made the point clear to the developers that the goal of the city was to achieve a high quality of subdivision. Those findings are seen as a relativization of the effects of growth control on the quality as found in the previous article, because the effect didn't only result from the direct growth control, it also resulted from quality restrictions which were part of the growth control provisions. Such quality restrictions are not included in the law of the second home initiative, wherefore a raise of quality, if it appeared, would be the result of the effect of the direct growth control based on quantitative restrictions.

Besides those two studies mentioned in detail above, because of their close relation to this master thesis, and the short summary of different important articles regarding supply restrictions, the effect of regulation on prices has been examined with great extant and in many more papers. Also studies exist, which investigated the past work in this field; one of them and probably the most extensive one is the work of Quigley and Rosenthal (2005). They also come to the conclusion that the different types of regulation

mostly have a positive effect on prices. However, they criticise the failure of the literature to assess a strong direct causal relationship, which is seen as consequence of the fact that generalizations can only be undertaken in a very limited scale. This is also in line with Downs conclusion, who stated that an important limitation of the literature's results is their applicability on other settings, because the effects are very much limited to the communities under study and generalizations cannot be made due to regulatory traits – local amenities, local economy and the socioeconomic population level – which are very different depending on the place of the study (1991).

Further the literature misses to asses key empirical challenges (Quigley & Rosenthal, 2005). Those include ignoring investigating the "endogeneity" of regulation and price, which could be the case if it is not the regulation forcing the prices to rise, it could be that communities with higher priced housing are fonder of regulations. Another shortcoming of the research is that it has a disposition to missing to include the complexity of local policy and regulation, because mostly there are several regulating instruments influencing the market and only examining one of them, does not show the true effect of the one regulation. Then there is the fact that there is often the reliance on out of date land use proxies and static observations of housing price movements. As a last point of critique they mention the usage of price indexes that correct for biases in price means and medians, which are normally reported. Besides those shortcomings, Quigley and Rosenthal also discuss characteristics of a useful study and they point out, besides further points, that such studies should be undertaken on national level with different size jurisdictions included and measure the outcomes of regulatory processes at the local level with the goal of extracting the effect of regulation on supply and on the price of housing. Finally, a good study should control for housing characteristics as age, maintenance, size and amenities to see how they affect the increase of housing prices.

The above paragraph and the shortcomings of previous articles as well as the recommendations for further articles are leading the way of this master thesis. The peculiarities of the law change leading to a "full" supply stop in certain affected regions, is seen as ideal scenario to undertake a house price study. The doubts about endogeneity issues can be put aside, because the regulation is implemented on a national level and only determined by the density of vacation homes of a municipality. It is therefore not the case that this study used the restrictiveness of regions and compares their prices, wherefore it could be the higher prices regions are fonder of restrictions. A problem that could arise, however, is that the municipalities that are affected and the ones that are not affected differ from each other, because they are not randomly assigned. Since they are determined by their density of vacation homes, it is seen as likely that more touristic regions have other drivers than not touristic ones. The aspect of local policy making and other restrictions that could affect the supply have been taken to account with analysing the restrictions trough the Lex Koller and adjusting the data so all included municipalities have the same supply restrictions towards foreigners as well as the ability for foreigners to by vacation homes. Further the data used is consisting of real market transaction prices and characteristics, which are included as controls.

Another peculiarity of the second home initiative, which is the fact that it is based on a referendum by the people, shall be part of this study. Since this regulation has been voted on by the people, they knew of the possibility that the new law could go into force before it actually did. This led to the expectation that some market participants were anticipating the law change before the time of the vote, which probably led to increasing prices during the different periods of the law-launching-process. The process of launching the initiative is regarded in different phases of rising probability for the law being applied, as explained earlier, which are used as time dummies. Examining phases of the law-making-process and assessing price increases during those periods, is seen as an extension of the literature. The findings are seen as very interesting especially in order to understand the influence an initiative on the real estate market can have on the behaviour of market participants already during the time of its emergence.

In regard to existing literature the article of Kiel and McClain is in some accordance with the "phases of a law process approach" of this master thesis (1995). They examined that house prices varied in different phases of an incinerator plant project through using a hedonic model that included different time dummies for all the different phases of the construction of the plant. They found different effects of the construction phases on pricing and adaptation of prices already during the time of construction, however, those results do not strengthen the belief that also the law implementation phases will show different effects on prices and will proof that prices already adjusted before the time of vote. What the study of Kiel and McClain does, is offer important inputs for the methodology part, which will be explained in the following chapter.

4 Methodology and Hypotheses

4.1 Methodology

In order to assess the price increase through regulation, the past literature shows that several methodologies can be used to investigate the effect. The literature judging the quality of those methodologies is seen as helpful in order to determine the methodology to use, which is also depending on the data available, and to gain insights about the limitations and shortcomings of each model type.

According to Schwartz et al., the best method to examine the true effect of the regulation would be the randomized controlled experiment, which would always be the economist's first choice, but often is not applicable due to the requirement of random assignment to both, the control group and the experimental group, and the further requirement that the two groups should be identical for all other factors but the determinant of interest, which is in most cases not given (1981). This is why usually a sample of houses where the growth regulations are applied and a sample of houses where they are not applied is chosen and the effect on prices in both groups are compared as if everything else would be equal. Another possibility would be to compare the same region's prices of before and after growth regulation, which has the shortcoming that other factors that could affect prices are not controlled for. However, for the last two methods mentioned, the results can be improved by using control variables. Another possible model for assessing the topic concerned would be the "repeat sales model", which is based on transaction prices and makes it possible to avoid the omitted variables problem, due to the fact that the price changes are estimated at least twice for the same house (Malpezzi, 2003). A drawback of the repeat sales model is that it does not give insights on the value of different house characteristics.

Regarding the methodology used in this thesis, a hedonic price model, it gets apparent that several articles use it to discover the effect of growth regulation on prices. The literature on hedonic models goes far back in time and is mostly based on the findings of Maclennanm (Malpezzi, 2003). Hereinafter, the development of the literature regarding hedonic models will not be discussed in detail. The focus will be on the reason for using them and what kind of hedonic model best fits the requirements of this thesis. A hedonic model is basically a regression of values on characteristics of a house, what makes it possible to estimate the indirect price of a characteristic. The dependent variable on the left hand side of the equation for this thesis will be the price of housing, which can be based on several different sources of price information. Malpezzi points out that values taken from observed transactions are better than for example self-assessments from current owners, because they include less biases and are more precise. As dependent variables a lot of characteristics offer themselves and they are of course also determined by the available data. The hedonic regression model used in this thesis is using data of transaction prices of vacation homes as well as first domiciles, which also includes housing characteristics. As discussed in the literature review, some characteristics have proven to be important variables that have significant effects on house prices, e.g. the size, lot area or quality and condition of the building. Which characteristics to use

of course depends on the available data again an also on the fit of the model used to examine the effect on prices. The literature shows that most of the articles using hedonic models use dummies for houses which are either part of a growth controlled jurisdiction or not controlled jurisdiction and use the difference of both of them to discover the effect on house prices (Schwartz et al., 1981). A drawback of using this way to find the impact of growth regulation is that differences which have existed before the growth regulation are neglected. This leads again to the conclusion that choosing the right control group is essential. Not only to prevent the control groups from being affected by spillovers, also to make sure that other influential determinants of housing prices are equal, but more to this topic subsequently. A further drawback of previous hedonic models that examine the effect by using an affected and a control group is that they assume that implicit prices are equal between both groups, without having evidence (Schwartz et al., 1981). Using separate equations is regarded as useful to see if the implicit prices differ among both groups and this will be applied in this thesis. The difference of the two separate models will thereafter reveal the price changes in deviation of the control group.

4.2 Control variables

Since the method used in this thesis will be a hedonic model that compares the effects within affected regions with the effects in not affected regions, the control variables used in the literature of regulations' effects on housing prices need further examination. This is the case, because in order to find the causal effect of the law change, the two groups have to be similar in other aspects that influence the dependent variable and ideally show a common trend before the event of interest occurred.

A summary of such determining variables can be found in the work of Quigley and Rosenthal, who state repeatedly used covariates (2005). Those are the income and income change, population, demographic change and density. Also they mention regional macroeconomic conditions which are implemented into the models as: employment levels, health of local business and commence, and capital costs. Land use patterns are also often included in the form of land proportions, geophysical barriers and the proximity to mass transit as well as the distance to the central business district. As mentioned, those controls are the result of analysing articles that examine the effect on housing as a whole, sometimes in form of subdivisions as for example multifamily units or single family units, but never in the special case of vacation homes, which is the goal of this study. Because of this fact the results listed above are seen as only partly applicable, because the demanders of vacation homes do not consist of local citizens in most cases, wherefore e.g. the local income, the population or the demographics are not expected to have a strong effect on the demand of buyers coming from outside the region or even outside of Switzerland. This brings us to the next topics to shed light in, which is the determinants of second home prices in Switzerland.

Of course in the end those determinants affect the demand for vacation homes, what already has been discussed in Chapter 2 of this thesis and where the focus was only on foreign demand. There is also demand for second domiciles from people within Switzerland, but since there is no data existing or at least no data available that states who the owner is and where he comes from, because this data is very sensitive, the above mentioned covariates that are usually used cannot be applied to the setting of this thesis. This is, however, not seen as a dramatic drawback, since economic conditions within Switzerland are not expected to differ much between affected group and control group, because the economic system of such a small country is highly integrated and therefore changes are expected to take place with high correlations between different regions. In case of the foreign demand, it was mentioned so far that it is depending e.g. on the economic conditions in the countries of origin of the demanders, the exchange rate of their currency to the Swiss Franc and also the legal uncertainty created through the change of law. The CHF/EUR exchange rate has been chosen as demand index and the important question to ask is, if the not affected regions are equally effected by foreign demand as the affected regions are, which is highly doubted. The problem again is that no data was available to gather insights into foreign demand per municipality and the demand index was selected on countrywide average data. To ensure, that all states and therefore all municipalities used in the data of this thesis have the legal opportunity to sell to foreigners, all states which are not part of the contingent system where dropped, so there is at least the possibility of the foreign demand to affect all municipalities in the data set used.

4.3 Model

The methodology applied in this thesis is based on: literature about different methodologies in theory, literature about growth regulations as set out in the literature review part and of course the type of data available for the course of this study. The reasoning why a hedonic model using affected and not affected regions is used in order to find the price effects of the second home initiative has been posed already. What is still to be defined are the characteristics of the main model used, which will be explained subsequently.

$$\ln(price) = \beta_0 + \beta_1 * \ln(dwelling\ size) + \beta_2 * garage_2 + \beta_3 * quality_3 \qquad (1)$$
$$+ \beta_4 * time\ period_4$$

Where: price   = transaction price in CHF
           dwelling size = square meter of livable space
           garage   = dummy for the number of garages [0; 1; 2; >2]
           quality   = dummy for quality of dwelling [bad; average; good; very good]
           time period   = dummy for yearly time periods [2002 - 2013]

The above equation represents the main model, which will always be applied to the affected and the control group separately. After the implicit price effects and the fit of the model have been analyzed, the

yearly price effects will be examined, and the difference will be used in order to see if the law had an evident effect on prices of affected second domiciles in deviation of the effects found in the control group. The model has been selected through testing many other models, which were mostly unsatisfactory due to the data about not affected regions, which led to a lot of not significant coefficients.

4.4 Hypotheses

4.4.1 Hypothesis 1: The new law will lead to higher transaction prices of vacation homes in affected regions

Hypothesis 1 has the goal of finding the effect of the supply restriction of the new law on transaction prises of vacation homes in affected regions. This will be examined through controlling with unaffected regions, whereas the difficulty is to find control regions that are not effected by spill-over effects of the law and are equal in the sense that they are effected by the same determinants during the whole period of study, so no another influencing factor causes a change in price. Ideally, the two groups further show a common trend before the time of the event. Those requirements are analysed in several steps and also with different control groups, because the control group of not affected second domicile prices has proven to be flawed. This, unfortunately, could only be examined when the data was accessed, which was after payment for the data usage and in the offices of the Swiss Real Estate Institute in Zurich. As a consequence of the lacking usage of not affected second domiciles, which is going to be explained in detail, first domicile prices of affected regions are also used as a control. Furthermore, the demand index is compared with second domicile prices in order to assess the results from a demand perspective as well. Finally, besides the main models of analysis, different data inputs are applied, which allow to gather deeper insights into the robustness of the results.

➢ **Using second domicile prices of not affected regions as control group**

By using this first control group, the price increases of vacation homes of affected regions and of not affected regions are compared with each other. The difference in their price increase after the start of the law launch is expected to show the casual effect of the restriction on the supply of second homes. The hypothesis of those results is that the prices of second homes in affected regions are higher after the launch of the initiative process than before in deviation of prices in not affected regions.

To assess the change in prices, the regions are compared over a longer period of time (2002-2013), so their trend before the event can be analysed with the hope of finding a common trend. Since there is no data available about the demand of foreigner per municipality, which has been found to be a very important driver of vacation homes prices, there can be no statements made about how the demand differs among them. Using not affected second domicile prices therefore is based on the assumption that demand changes apply relatively evenly to the affected and the control group.

> ➢ **Using first domicile prices of affected regions as control group**

In view of the expected consequences of the new law in affected regions, the group of first domiciles offers itself as a control group, because economists do not expect price effects of first domiciles to occur before the implementation law is final. The usage of first domiciles of affected regions is also seen as reasonable, because prices of different housing sub segments in the same regions are likely to have a comparable price trend. Therefore examining trends before and after the launch of the initiative could lead to further insights about the effect on second home prices when using first domiciles as the control group. Questionable also in this scenario is that first domiciles are similarly affected by the foreign demand, however, since before 2013 conversions from first domiciles to second domiciles were still possible, first domiciles could also be sold to people who wanted to use them as their second domicile, which means that there is a possibility that the demand impacts also occurred in first domicile prices. Further evidence for this can be found in the fact that the initiative was launched because first domiciles prices have increased strongly, which made them not affordable for the local population anymore and for what phenomenon the demand of second homes purchasers was accused.

The assumption underlying this control group is therefore again that they were evenly dependent on the foreign demand. The hypothesis therefore is that because only second domiciles are affected by the new law and first domicile prices are not expected to decrease before the final law is implemented, that the difference of second home prices compared to first home prices reflects the causal effect of the supply restriction, and of course prices are expected to increase more for second homes.

> ➢ **Using CHF/EUR as demand index**

In the third approach to find the price effects of the new law, the average yearly exchange rate of the CHF/EUR is used to examine the influence of supply/demand imbalances during the period of interest. The CHF/EUR has been proven to be a good indicator of demand changes in Chapter 2. Also the supply restrictions from the Lex Koller were analyzed and found to be very much stable since 2002. Since it is the only other countrywide supply restriction, the supply only changed abruptly for the year of 2013, when construction of new second homes and conversion of registered first domiciles has been prohibited. However, this doesn't mean that the supply has gone directly to zero in year 2013, because all the buildings that had received the permission for construction before 2013, were still allowed to be built after the by-law went into force. Whatsoever, the basic assumption of this thesis is anyway that the price effects already occurred during the time when the initiative was launched. The usage of CHF/EUR shall make it possible to find in what way the prices of second domiciles are dependent on the foreign demand and to find implications for judging the price effects of the initiative also in view of the development of first domicile prices.

4.4.2 Hypothesis 2: Different phases of the law making process will have different effects on vacation home prices

In Hypothesis 2, the focus lies on the expectation that price adjustments already have happened during the process of launching the initiative by the people. It is expected that the possibility of a positive outcome of the initiative leads to higher prices already before the vote, because owners are making expectations about the outcomes themselves and rather wait before selling their second domicile, or only sell for higher prices. This can also be expected because there is a chance that they will not be able to build or buy another vacation home in a touristic region in the future again. The different phases which represent rising probabilities of the law coming into force, are set out below again. Hypothesis 2 differs from Hypothesis 1 in the sense that the total time period of analysis is shortened to the years starting from 2007 until 2013 and the time dummies used are now dummies constructed for each period and not yearly time dummies as used before.
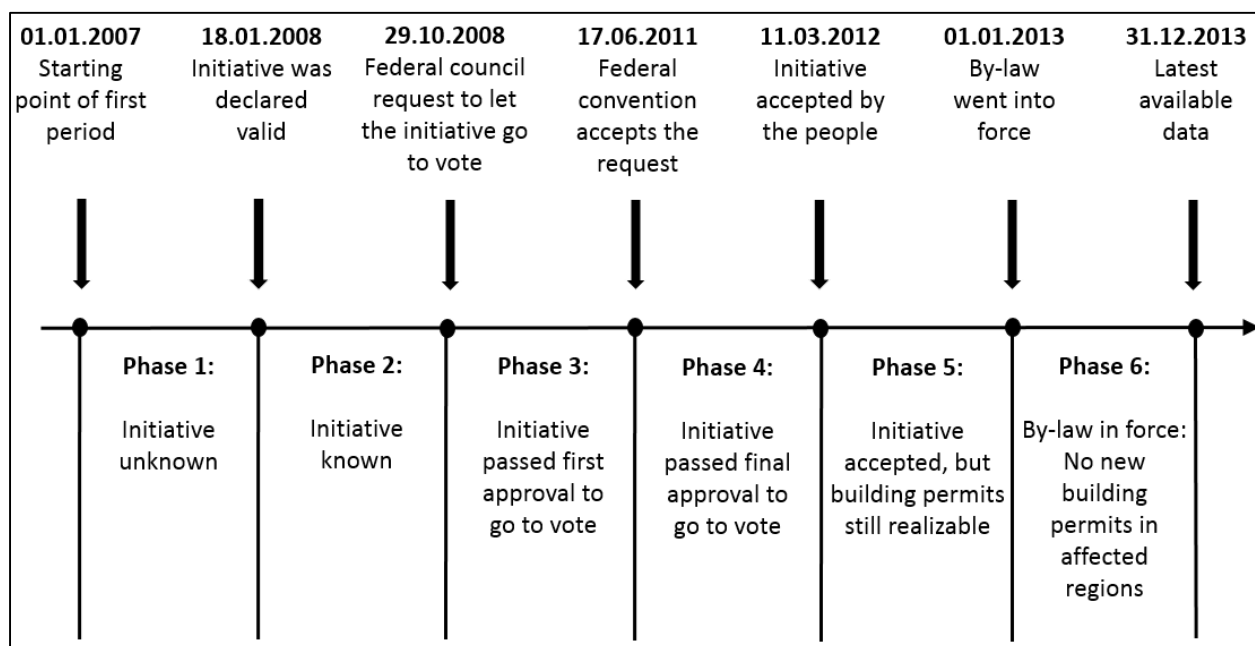
The reason for using dummies for the different phases of the law-process is that in this hypothesis the expectations are that prices already adjusted during the different periods of the process and more explicitly the goal is to find in what periods the price adjustments have arisen to what extent, to gain understanding of when prices started to adapt to the new law.

5   Data and descriptive statistics

5.1 Second home density data

As mentioned in Chapter 2, the number of affected municipalities is the outcome of two different data sources. Important in consiederation of the usage of the data is that the densities of vacations homes per municipality, which come from the officially used dataset, were calculated based on not complete data and therefore lack precision. The municipalities, which could proof that they have less then 20% vacation homes, were discounted from the 450 stated in the appendix of the by-law. Also the ones estimated to have less then 20% accoding to the density dataset, were deducted, which led to 439 affected regions at the time of this study. That amount is likely to change afterwards, because the way the density was calculated by the Fedeal Office of Spatial Development is likely to result in overestimated numbers, which was confirmed by the responsible person of the office. He mentioned the lack of data as the reason to do so and also stated that there is the possibility for municipalites to get freed from the restrictions through handing in proof of having lower then treshold densities.

Table 1: Second domicile density per municipality

Per municipality:	Obs	Mean	Std. Dev.	Min	Max
Number of flats	2352	1776	6350	14	211 942
Flats occupied	2352	1494	5591	9	187 576
First domicile	2352	1477	5471	9	183 118
Share first domicile	2352	0,81	0,17	0,12	1
Assumption second domicile	2352	0,19	0,17	0	0,88

Table 1 above shows a summary statistic of the data gathered from the Federal Office of Spatial Development (2012). At January 1st, 2014, there were 2352 municipalies in Switzerland, which is reflected by the number of observations (Statistik Schweiz, 2014). The mean for the number of flats reflects the average number of dwellings of all the municipalites in Switzerland, which is 1776. The municipality(s) with the lowest number of dwelling has 14 flats, whereas the maximum number of flats is 211'942.

For the calculation of the densities, for each municipality the number of total flats, the number of flats occupied and the number of first domiciles were taken as data imput. The share of first domiciles was then taken from the total numbers of flats and not the flats occupied, wherefore the percentage of first domiciles is smaller than in reality, because it also includes a certain amount of unoccupied flats, which usage could be both, a second or first domicile. As a conclusion the share of second homes is estimated higher, since it is just the difference of the share of first domiciles to a hundred percent. This bias, as said before, has been confirmed. Concequently, the density data has to be consumed and used with restraint, however, for the 439 affected municipalites the by-law is in force now. The estimated densites for first domiciles are between 12-100% and the share of second domiciles on the other hand between 0-88%.

Table 2: Affected municipalities

Affected	Freq.	%
"0"	1 753	74
"1"	439	19
"2"	178	8
Total	2 352	100

Because of the lack of precision of the data it has happened quite often that a municipality was expected to be affected, but then afterwards was freed from the affected regions again. Since there may have been price effects during the period they have been considered as effected, which happened to 178 municipalities so far, those municipalites are named as affected "2" . The affected municipalites are marked with a "1" and the not affected with a "0" which are 1753 at the time of this study. Since the affected "2" regions have densities of close to 20%, most of them are located in the same regions as the affected regions are located, which is in the Alps in southern Switzerland. As has been found in several articles stated in the literature review of this thesis, regions located close to regions, where the regulation under study was applied, were affected by it as well, when they contained housing substitutes. Since their close to 20% density of vacation homes, the location must have offered substitutable second domiciles. As a conclusion the exclusion of affected "2" regions is also in accordance with previous findings, because due to their close locations and substitutable housing supply, those regions are likely to also be effected by spillovers of the regions, where the by-law is in force.

5.2 Shapefile data set

In order to show the affected regions on the Swiss map "Shapefile" data was obtained from the Federal Office of Topography, which fortunately, provides those datasets as a downloadable file for free (2014). The Shapefile data was then merged with the "density data set" of the subchapter above, which allowed to mark regions on the map. The affected regions have been shown in Chapter 2 already, hereinafter the second home density of all municipalities (where data existed) is shown, to provide some insights about the distribution of the densities in their magnitude and location.
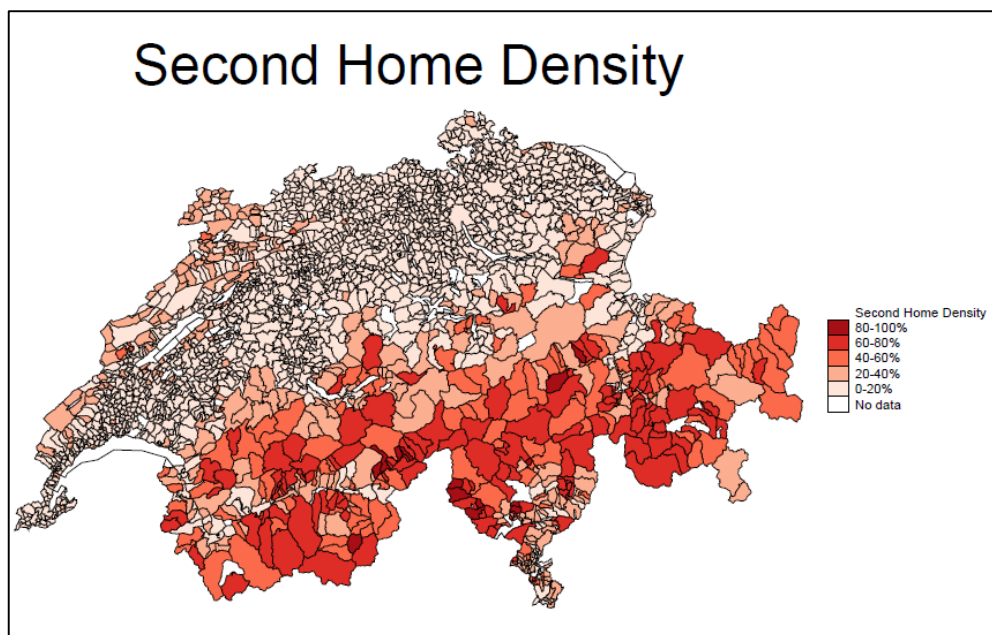
Figure 8: Second home density per municipality – own illustration

5.3 Transaction Data

The main data used in this master thesis was purchased from SRED, the Swiss Real Estate Datapool (2014), and contains all the needed information in order to examine the topic of interst with the model explained in the previous chapter. SRED is an association, launched by three Swiss banks – Credit Suisse AG, UBS AG and Zürcher Kantonalbank – and has the goal of making the Swiss real estate market more efficient and transparent (SRED, no date). The Data collected by the pool is solely descended from real estate mortgages that have been provided by the three banks and they contain effectively paid transaction prices. Further, the pool shall be used for creation, progression and advancement of valuation models based on hedonic regressions, which is why the data pool is ideal for the usage in this master thesis. To give some insights into the scale of the informations gathered by the datapool, followingly there will be an overview posed of the data charachteristics it contains.

1. Transaction details: quaterly date of transaction, transaction prices
2. Location: Zip code, domicile, neighbourhood, municipality, state, district, MS-region, micro location
3. Housing characteristics:
   a. House type: Multyfamily (single/detached), apartment
   b. Age: construction year
   c. House size: space in m^2
   d. Cubature: volume in m^3
   e. Plot size: total size in m^2
   f. Space: quantity of rooms, bath rooms,
   g. Garage: number of garage parking spaces
   h. Micro location quality: bad, average, good, very good
   i. Building condition: bad, average, good, very good
   j. First/second domicile

In the first step, the data accessed from SRED was data of all second domicile transactions between 2002 and 2013 of allover Switzerland. Because the control group of second domiciles had proven to have some drawbacks, also data about first domiciles was accessed, but only for the states of Graubünden (GR), Wallis (VS) and Tessin (TI). Those states, however, are also the ones which were highly affected by the initiative, what will be shown subsequently, and wherefore their transaction data is seen as very useful for the present case.

The two mentioned datasets were merged together and the duplicates were dropped. Also single family homes were dropped, since almost all of the transactions of second domiciles were related to apartments. After generating all needed variables the SRED data set was merged with the second home density data

set, which was explained before. Thereafter, all the states which did not fall under the laws of the Lex Koller and therefore were not allowed to sell land to foreigners, were dropped.

For the desctiptive statistics the two data sets used (second and first domiciles) are explained separately, because they differ in geographical location and types of domiciles they include.

5.3.1 Second domiciles of all over Switzerland

First of all, the second domicile dataset was used in order to assess the interrelationship of prize and size, which has been found to be non-linear in previous literature. A scatterplot using fitted values and including the prize of apartments on the y-axis and the size on the x-axis shows that their relation is in fact very likely to be non-linear. Using the logarithm of size and prize in the model is therefore seen as justified.
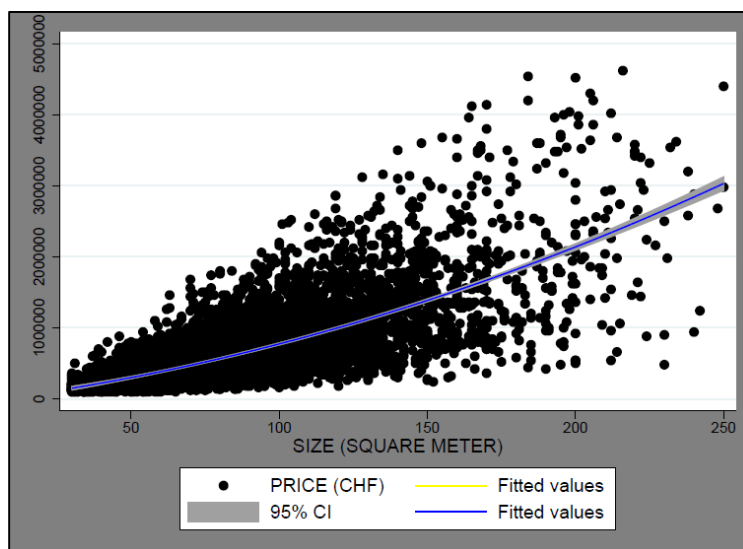
Figure 9: Non-linearity of dwelling price and size – own illustration

Table 3: Second domicile transactions per year

Transaction year	Affected "0"	Affected "1"	Affected "2"	Total
2002	21	462	36	519
2003	19	680	60	759
2004	14	795	59	868
2005	18	908	70	996
2006	20	720	78	818
2007	17	593	46	656
2008	8	502	38	548
2009	11	548	29	588
2010	8	542	43	593
2011	8	559	51	618
2012	15	521	44	580
2013	5	478	42	525
Total	**164**	**7308**	**596**	**8068**

Table 3 presents the number of transactions per year and divides them into the different types of affected municipalities. It gets apparent that the total amount of transactions per year are quite stable over the years. The group of affected "0" (A0), which are transactions of not affected municipalities, unfortunately, show a very low total number of transactions. The conclusion is that only very little second domicile transactions have happened in not affected municipalities. This could only be found after the "density data

set" was merged with the data from SRED in their offices in Zurich and sadly the low amount of transactions has proven to be a problem regarding the usage of the not affected regions as a control group.

Table 4: Second domicile transactions per state

State name	Affected "0"		Affected "1"		Affected "2"		Total
	Freq.	%	Freq.	%	Freq.	%	
Aargau	10	6,1					10
Appenzell Ausserrhoden	1	0,6					1
Basel-Landschaft	5	3,1					5
Bern	30	18,3	267	3,65	320	53,69	617
Fribourg	6	3,7	18	0,25	2	0,34	26
Glarus			4	0,05			4
Graubünden			2684	36,73			2684
Luzern	1	0,6	12	0,16			13
Neuchâtel	5	3,1					5
Nidwalden	5	3,1	11	0,15	6	1,01	22
Obwalden	1	0,6	83	1,14	6	1,01	90
Schaffhausen	1	0,6	29	0,4			30
Schwyz	15	9,2			2	0,34	17
Solothurn	3	1,8					3
St. Gallen	8	4,9	76	1,04	4	0,67	88
Thurgau	2	1,2					2
Ticino	19	11,6	490	6,7	209	35,07	718
Uri			23	0,31			23
Valais	16	9,8	2903	39,72	45	7,55	2964
Vaud	33	20,1	708	9,69	2	0,34	743
Zug	3	1,8					3
Total	164	100,0	7308	100	596	100	8068

In Table 4, the transactions are shown per state to get some understanding of where they occurred and if they occurred in affected municipalities or not. Spillover effects so far have been treated in the sense that the group of affected "2" (A2) has been created. When comparing affected "1" (A1) municipalities and A0 municipalities, it appears that for some states, where A1 transaction occurred, also A0 transactions took place, e.g. for Bern, Fribourg and Vaud and so on. Since municipalities of the same state have a certain geographical near location to each other, such municipalities are seen as likely to get effected by spillovers of the municipalities with higher densities close to them. For this thesis this threat, however, is disregarded, because the number of A0 transactions is already very low. For the A1 municipalities it is interesting to see that some states show a lot of transactions, which are exactly the states in the Alps and the southern Switzerland. By far the most transactions happened in Valais (Wallis, VS), followed by Graubünden (GR), by Vaud (Waadt) and Ticino (Tessin, TI). In total A1 municipalities provided 7'308 transactions during the period of interest. A2 municipalities and their total of 596 transactions are disregarded for the main study, although they will be included into some regressions in order to check the robustness of results.

Table 5: Summary statistics of second domiciles in hedonic regressions

Variable	Mean	Std. Dev.	Min	Max
price	642 395	533 373	100 000	4 620 000
house_size	84	35	30	250
number_bathrooms	1,70	0,58	1	4
garage0	0,32	0,42	0	1
garage1	0,55	0,50	0	1
garage2	0,13	0,33	0	1
garage3	0,01	0,10	0	1
quality1	0,02	0,15	0	1
quality2	0,45	0,50	0	1
quality3	0,15	0,36	0	1
quality4	0,38	0,49	0	1
t_year2002	0,06	0,25	0	1
t_year2003	0,09	0,29	0	1
t_year2004	0,11	0,31	0	1
t_year2005	0,12	0,33	0	1
t_year2006	0,10	0,30	0	1
t_year2007	0,08	0,27	0	1
t_year2008	0,07	0,25	0	1
t_year2009	0,07	0,26	0	1
t_year2010	0,07	0,26	0	1
t_year2011	0,08	0,27	0	1
t_year2012	0,07	0,26	0	1
t_year2013	0,07	0,25	0	1

The summary statistics shown in Table 5 reflect the mean, standard deviation, minimum and maximum values of the variables used in the main formula, with the distinction that for the statistic above not the logarithms of price and size are used, in order to get a better hold of the data. A second home of the SRED data set costs in average CHF 642'395 and the high standard deviation indicates that they vary largely in price, which gets also apparent in view of the minimum transaction price of CHF 100'000 and the maximum of CHF 4'620'000. The vacation home sizes vary between 30 and 250 m² and the apartments have between 1 and 4 bathrooms. The remaining variables are all dummies and take values of 0 or 1. For those dummy variables the mean reflects the percentage of observations in share of the total observations of their variable group. Since all transactions of the data set are fully defined for every variable, it can be for example calculated for garage0: 0,32 * 8'068 (total amount of observations) = 2'582; which number indicates that 2'582 apartments did not have any garage spots included.

5.3.2 First domiciles

As stated before, first domicile transaction data could not be accessed for all over Switzerland. The data used for the comparison of first and second domicile prices is from the three states GR, VS and TI.

Table 6: Transactions of first and second domiciles per year in the states GR, VS and TI

Transaction year	First Domicile		Second Domicile		Total
	Freq.	%	Freq.	%	
2002	383	6,78	374	6,15	757
2003	598	10,58	581	9,56	1179
2004	602	10,65	669	11,01	1271
2005	663	11,73	731	12,03	1394
2006	582	10,3	587	9,66	1169
2007	423	7,48	500	8,23	923
2008	365	6,46	402	6,62	767
2009	458	8,1	444	7,31	902
2010	402	7,11	467	7,68	869
2011	421	7,45	491	8,08	912
2012	384	6,79	437	7,19	821
2013	372	6,58	394	6,48	766
Total	**5653**	**100**	**6077**	**100**	**11730**

As was found in a previous sub chapter, the states GR, VS and TI had a lot of transactions of second domiciles, whereof the total number of transactions sums up to 6'077 during the period of interest and on the opposite 5'653 transactions were recorded for first domiciles. When thinking about reasons of why the transactions have been less for first homes, one should not lose sight of the fact that only apartments are compared in this dataset and first homes very often exist in the form of single family homes. The total frequency of transactions seems to drop a bit starting in 2007, which may also be due to the legal uncertainty caused by the initiative, what may have had a negative impact on transactions volumes, however, this is not the main topic of concern. The yearly amount of transactions of each of the two domicile types are quite high and therefore good for the usage of a hedonic model.

Table 7: Transactions of first and second domiciles per state in GR, VS and TI

State	First Domicile		Second Domicile		Total
	Freq.	Percent	Freq.	Percent	
Graubünden	2146	37,96	2684	44,17	4830
Ticino	1415	25,03	490	8,06	1905
Valais	2092	37,01	2903	47,77	4995
Total	**5653**	**100**	**6077**	**100**	**11730**

When taking a closer look at the distributions of second domiciles among the three states, it appears that the state of Ticino had by far the smallest amount of transactions. Again, the most probable reason for this is, besides that this state is smaller in size, that winter tourism is the main reason for buying a second domicile, wherefore the other two states that are located in the middle of the alps show way more

transactions than TI, which is located in the very southern part of Switzerland and only has a small area of the alps in its territories.

Table 8: Summary statistics of first and second domiciles in GR, VS and TI

Variable	First Domiciles				Second Domiciles			
	Mean	Std. Dev.	Min	Max	Mean	Std. Dev.	Min	Max
price	553 320	428 191	100 000	4 700 000	662 472	555 525	100 000	4 540 000
house_size	90	36	30	250	84,10	34,79	30	250
number_bathrooms	1,69	0,57	1	4	1,70	0,59	1	4
garage0	0,32	0,39	0	1	0,32	0,38	0	1
garage1	0,53	0,50	0	1	0,53	0,50	0	1
garage2	0,13	0,34	0	1	0,13	0,34	0	1
garage3	0,01	0,11	0	1	0,01	0,11	0	1
quality1	0,02	0,15	0	1	0,02	0,15	0	1
quality2	0,43	0,50	0	1	0,44	0,50	0	1
quality3	0,23	0,42	0	1	0,15	0,35	0	1
quality4	0,31	0,46	0	1	0,39	0,49	0	1
t_year2002	0,07	0,25	0	1	0,06	0,24	0	1
t_year2003	0,11	0,31	0	1	0,10	0,29	0	1
t_year2004	0,11	0,31	0	1	0,11	0,31	0	1
t_year2005	0,12	0,32	0	1	0,12	0,33	0	1
t_year2006	0,10	0,30	0	1	0,10	0,30	0	1
t_year2007	0,07	0,26	0	1	0,08	0,27	0	1
t_year2008	0,06	0,25	0	1	0,07	0,25	0	1
t_year2009	0,08	0,27	0	1	0,07	0,26	0	1
t_year2010	0,07	0,26	0	1	0,08	0,27	0	1
t_year2011	0,07	0,26	0	1	0,08	0,27	0	1
t_year2012	0,07	0,25	0	1	0,07	0,26	0	1
t_year2013	0,07	0,25	0	1	0,06	0,25	0	1

The summary statistics of the data for the regressions of first and second domiciles follow the same understanding as the ones explained in the last sub chapter. Interesting is to see that the apartments that are used as second domiciles have in average higher prices as the ones occupied by people for their main residence, even though the second domiciles are smaller in their average size. It can be therefore concluded that on average, the apartments purchased for reasons of touristic usage differ from the ones used as first domiciles. This may have some implications on the possibility of conversions, since vacation flat purchasers seem to impose other requirements on their housing standards. The number of bathrooms are very much similar between the two domicile types; they have in average 1,7 bathrooms and also the dummy variables appear to be distributed very evenly under the two different domicile types.

6 Empirical results

6.1 Hypothesis 1: The new law will lead to higher transaction prices of vacation homes in affected regions.

Hypothesis 1 will be examined in three different parts, as explained in Chapter 4.4.1, which is needed, because the control group of not affected second domiciles does not fully satisfy its requirements.

➢ **Using second domicile prices of not affected regions as control group:**

The assumption underlying the usage of not affected regions as control group is that they are similarly affected by changes in the demand for vacation homes. In order to have only states in the data set that can sell second domiciles to foreigners, all the states which are not part of the Lex Koller contingent system were dropped. The supply restrictions from the Lex Koller only changed marginally during the period of interest and they are as a result seen as not influential. In the main model of this thesis the affected "1" regions are compared with the affected "0" regions, in order to find the causal effect of the direct supply restriction. Affected "2" regions, which are the ones that are very likely to have been influenced by spillover effects, are only used for examining the robustness of results. The existence of spillover effects for regions that are closely located to the restricted regions, have been found in multiple articles studied in the Literature Review.

In order to examine how prices changed during the whole period for each of the groups and in order to assess possible implicit price differences as well as the fit of the model, single models were used, whose outcomes are shown below.

Table 9: Regression of vacation home prices with yearly dichotomous variables

ln_price	Affected "1" second domiciles		Not affected "0" second domiciles		Not affected "0" and "2" second domiciles	
	Coefficient	t-Stat.	Coefficient	t-Stat.	Coefficient	t-Stat.
ln_size	0,981	56,50 **	0,902	10,27 **	0,746	18,68 **
number_bathrooms	0,060	5,50 **	0,050	0,90	0,132	4,84 **
garage1	0,126	12,16 **	0,079	1,27	0,025	1,03
garage2	0,339	20,39 **	0,227	2,46 *	0,198	4,74 **
garage3	0,481	8,19 **	0,468	4,57 **	0,543	3,56 **
quality2	0,196	5,50 **	0,352	3,35 **	0,290	2,13 *
quality3	0,380	10,52 **	0,487	4,22 **	0,478	3,52 **
quality4	0,587	16,19 **	0,718	5,54 **	0,698	5,06 **
t_year2003	0,026	1,17	0,044	0,53	0,045	0,80
t_year2004	0,122	5,73 **	0,105	1,10	0,135	2,23 *
t_year2005	0,148	7,16 **	0,102	1,15	0,170	2,97 **
t_year2006	0,239	10,89 **	0,275	3,00 **	0,245	4,26 **
t_year2007	0,404	17,44 **	0,364	3,41 **	0,381	5,94 **
t_year2008	0,408	16,84 **	0,539	2,61 **	0,452	6,13 **
t_year2009	0,415	17,50 **	0,310	2,79 **	0,329	5,10 **
t_year2010	0,471	20,17 **	0,238	2,45 *	0,475	7,55 **
t_year2011	0,501	20,60 **	0,452	3,16 **	0,462	6,92 **
t_year2012	0,552	22,52 **	0,591	6,12 **	0,503	7,92 **
t_year2013	0,593	24,51 **	0,578	3,69 **	0,574	9,01 **
constant	7,965	107,01 **	8,057	24,73 **	8,793	42,44 **
R-squared	0,715		0,811		0,729	
Root MSE	0,379		0,302		0,309	
Number of obs.	7308		164		760	

* = significant at the 5% level; ** = significant at the 1% level

First of all only the main analysis, which is between the affected regions and the not affected regions with the indication "0", shall be in the limelight. Regarding the implicit price impact of the variables chosen in the main model, it gets apparent that the two different regressions only show relatively little variations. A 1% increase in size for example, would increase the price by 0,981% in model A1 and by 0,902% in model A0. Also the impact of the different dummies for the number of garages are quite comparable. Not so much in line are the impacts of the quality dummies, which show higher effects of quality on price for not affected vacation homes than for the affected ones. In order to see if a coefficient is significant, two different levels will be distinguished in this study, the significance at the 5% level and at the 1% level. If those levels are not reached, the coefficient did not proof to be significantly different from zero at the levels of 1 or 5%. The coefficient of the size has proven to be highly significant for both of the regressions, which was also the case for all the other coefficients of the price model of A1 regions, but the coefficient on year 2003. As a conclusion the price increase in year 2003 did not proof to be significantly different from zero. For the not affected regions more coefficients did not satisfy the significance requirements. The number of bathrooms, garage1 and the years 2002-2004 did not show significant impacts on the price. This is most likely the case because there were not enough transactions in the not affected regions, which again only accumulated to 164 in total. The R-squared explains the goodness of fit of the model and can have a minimum value of zero and a maximum value of 1. If R-squared is 1, this means that the model explains 100% of the variability of the response data around its mean. For the A1 regions the R-squares is 0,715 and therefore it is lower than the R-squared of A0 regions, which is 0,811, wherefore the model used fits better to the A0 data than to the A1 data. There is to mention that also other models where tested that showed higher R-squared values for the A1 transaction data, however, the models had to be adjusted to the one used above mostly because A0 regions had a lot of not significant coefficients.

One of the tested models for example, which used additional dummy variables for the condition and age of the buildings, is set out in the appendix (Appendix 1). The additional dummies proved to have a lot of not significant coefficients. Also the usage of quarterly time dummies was tested and again the low number of transactions of the control group A0 were the reason for the not satisfactory outcomes (Appendix 2). In some quarters there were no transaction at all, which therefore were omitted and in addition the results showed high volatility over the years, which gets applicable when looking at the coefficients of the quarterly dummies. Furthermore, the lacking significance of the coefficients, made any interpretation of their magnitude pointless. Adding the observations of the not affected regions "2", lead to less volatility of the price effect and better significance. As a result of the A0 regression outcomes, the usage of quarterly dummies did not come into question for the main model.

The third regression in Table 9 on the right hand side is based on the distinction between not affected regions, which are divided in affected "0" or affected "2" regions. Since A0 regions only showed very few transactions, the two not affected groups were added together in order to see if this would change much of the outcome. It gets apparent that the number of observations now is 760 transactions, whereby their

distribution among the years and states are given in Chapter 5. An interesting difference in regard to the other two regressions is that the implicit impact of the size is smaller with a 0,746% price increase for a 1% increase of size and the impact of the number of bathrooms is higher with a 0,132% increase for the number of bathrooms by 1. The other coefficients, however, are quite comparable regarding their sign and magnitude. Regarding the significance levels, adding the affected "2" regions as well, has in most cases a positive effect on the significance of the coefficients and only in one case a negative impact. The total price increase compared to only using A0 regions in the year 2013 is pretty much similar with price increases of 57,8% (A0) and 57,4% (A0+A2). The expected spill-over effects for the A2 regions do not seem to have occurred over the whole period of analysis. An exact comparison of the differing price increases of the two groups does not make sense, because of the high volatility of the A0 group, wherefore its results do not lead to statistically convincing conclusions.

Now the robustness of results and the models used have been explained, the focus shall move to the main comparison of the price changes between A0 and A1 regions. In order to see the price changes found in the two main regressions above, the yearly changes of the single models are compared and the difference is calculated in order to make statements about their movements compared to each other. Since in the Literature Review direct supply restrictions have been found to have an increasing effect on prices, the prices of A1 regions are expected to rise in deviation to A0 regions.
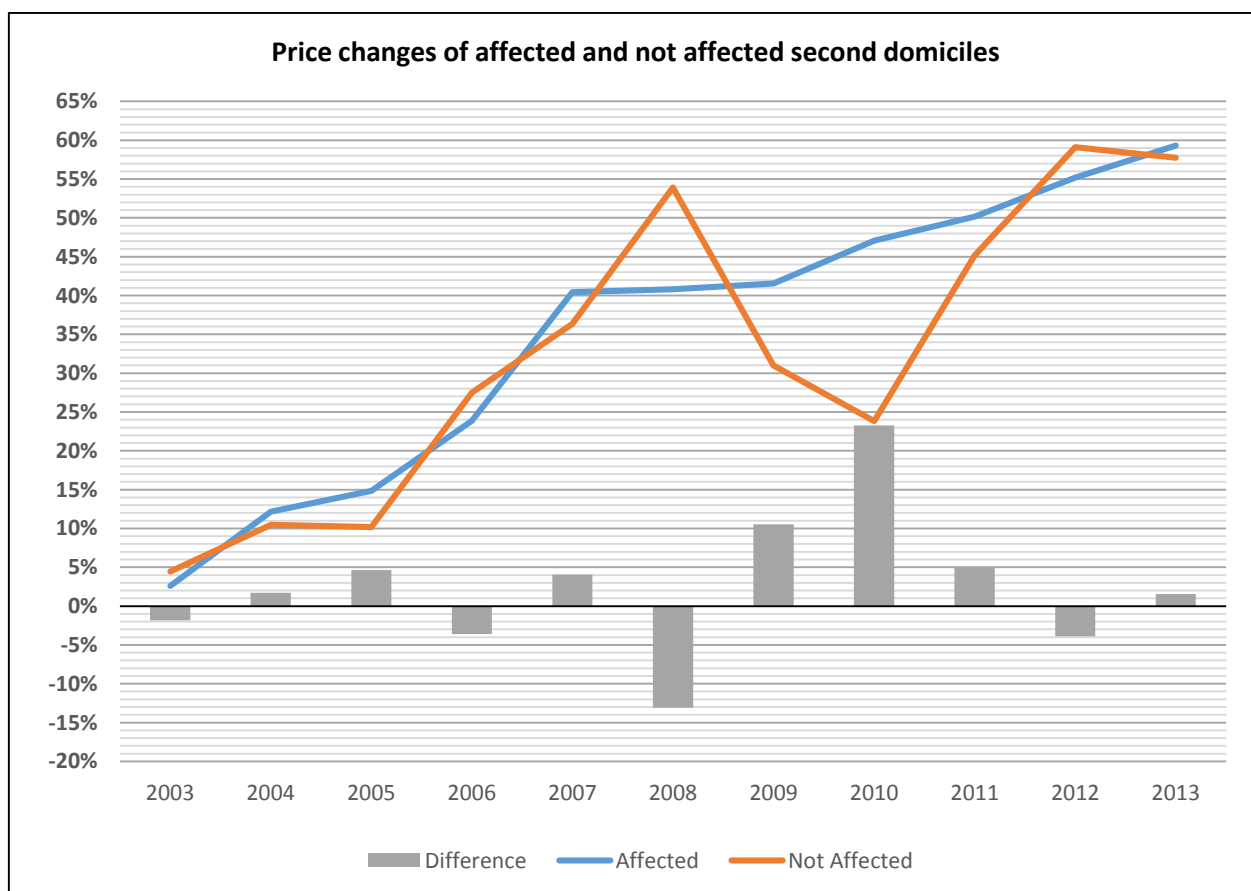

Figure 10: Yearly price changes of affected and control group – own illustration

The time period used has been chosen on purpose, so the period of analysis is long enough to see how the price development of the groups under study differed also before the time, when the initiative was launched. It is apparent that the two groups almost had the same total price increases over the last 12 years. It seems that in the years from 2002 until 2006, the two groups had a relatively similar development and then in year 2007 and 2008 the prices of A0 regions kept rising where A1 regions flattened out. In 2009 prices of not affected second homes (A0) decreased strongly, whereas the affected regions showed increasing growth patterns until the end of 2013. Looking at the difference between the two groups shows quantitatively, by how much affected domicile prices changed in comparison to not affected ones. It also shows that prices developed more evenly before 2007, had big differences from 2008 until 2010 and then developed more in line with each other again from 2011 on. An analysis with focus on the development on only the period of when the law was launched until the end of 2013 will be posed in the results of Hypothesis 2. What can be said so far is that A0 prices have changed with much higher volatility than A1 regions and that there is no clear increase in prices of A1 regions in deviation of A0 region after the launch of the initiative viewable.

In order to see how the prices moved in comparison with each other, a deeper statistical analysis of their movement is needed, wherefore the following formula is applied.

$$\frac{(\beta_{Ai} - \beta_{Bi})}{\sqrt{\sigma^2_{Ai} + \sigma^2_{Bi}}} \qquad (2)$$

The formula gives the t-statistic for the null-hypothesis that the coefficients are not different from each other. The table below poses the results of the formula for each year.

Table 10: Common trend analysis using not affected second domiciles as control group

	Affected "1" second domiciles		Not affected "0" second domiciles		t-Stat.
	Coefficient	Robust Std. Err.	Coefficient	Robust Std. Err.	
2003	0,026	0,022	0,044	0,084	-0,210
2004	0,122	0,021	0,105	0,095	0,174
2005	0,148	0,021	0,102	0,089	0,508
2006	0,239	0,022	0,275	0,092	-0,383
2007	0,404	0,023	0,364	0,107	0,372
2008	0,408	0,024	0,539	0,206	-0,630
2009	0,415	0,024	0,310	0,111	0,929
2010	0,471	0,023	0,238	0,097	2,322 *
2011	0,501	0,024	0,452	0,143	0,344
2012	0,552	0,025	0,591	0,097	-0,392
2013	0,593	0,024	0,578	0,157	0,097
* = significant at the 5% level; ** = significant at the 1% level					

The outcome of the table makes apparent that only the year 2010 shows a significant difference in price change on the 5% significance level. For all the other years it cannot be statistically followed that their price movement differed. The reason for that outcome again can be found in the low number of transactions of the not affected second domiciles, which resulted in high standard errors and had the consequence that the t-statistic values are low. It can be followed that there is not only no price increase of A1 regions compared to A0 regions visible, also their movement cannot be statistically differenced from each other.

To sum up the results of using not affected vacation home transactions as the control group, it can be concluded that there is no clear positive price trend of affected municipalities in deviation from the not affected ones apparent. The expected problem of the control group, which is that there were only very few transactions during the period examined, has affected the regression results strongly and is one of the drawbacks for using this control group. The volatility that is clearly evident in the control group is also very likely to be the consequence of the low number of transactions. Also the expected spillover effects were shortly analyzed when checking the robustness of results, however, the transactions from the year 2013 showed that over the whole period, a price increase didn't occur for A0+A2 regions compared to only A0 regions. Because of the high volatility of A0 regions also this conclusion has to be consumed with caution. A further issue that could also have had a negative impact on the comparability of the affected and the control group is that they are most certainly not evenly affected by changes in the demand, because the touristic density of a region determines if a region is affected or not. Therefore it can be expected that changes in the foreign demand will mostly affect the touristic regions and not the prices of the not affected regions, because they are not interesting for international tourism.

➢ **Using first domicile prices of affected regions as control group**

Because of the drawbacks of the control group used before, a further control group is needed and first domicile transactions were selected as a substitute. The first domicile transactions used took place in affected regions of the states Graubünden (GR), Wallis (VS) and Tessin (TI). Also the second home transactions were adjusted so they occurred in those states as well. Using the same regions for comparing second domicile and first domicile prices is seen as essential, if a similar price trend before the event is subject to be found. The assumption underlying this part of the study is therefore that first home prices have a common movement with second domiciles in the same regions. A typical and important driver , which could affect them differently is the foreign demand, what from first sight does not seem to be a driver of first homes. However, since before the year of 2013 conversions from first to second homes where still possible, it is likely to be the case that also first domicile prices are affected by the demand for second homes. As the too high prices of first domiciles were also one of the reasons why the initiative was launched in the first place, those prices must be in some connection with the prices of second homes.

Before the yearly price changes will be analyzed in detail, the regressions for first and second domicile prices of affected municipalities are examined.

Table 11: Regression of first and second domicile prices of affected municipalities

ln_price	Affected "1" second domiciles		First domiciles in affected "1" regions	
	Coefficient	t-Stat.	Coefficient	t-Stat.
ln_size	0,995	51,68 **	0,669	33,51 **
number_bathrooms	0,050	4,12 **	0,137	10,14 **
garage1	0,134	11,63 **	0,117	9,75 **
garage2	0,350	19,53 **	0,334	17,10 **
garage3	0,495	7,98 **	0,379	6,81 **
quality2	0,204	5,27 **	0,127	3,23 **
quality3	0,401	10,16 **	0,367	9,28 **
quality4	0,593	14,98 **	0,596	14,77 **
t_year2003	0,014	0,56	0,044	1,83
t_year2004	0,116	4,76 **	0,110	4,54 **
t_year2005	0,144	6,01 **	0,152	6,42 **
t_year2006	0,235	9,35 **	0,223	8,70 **
t_year2007	0,391	14,77 **	0,255	9,72 **
t_year2008	0,379	13,87 **	0,317	11,45 **
t_year2009	0,397	14,53 **	0,326	12,23 **
t_year2010	0,457	17,46 **	0,331	12,04 **
t_year2011	0,488	17,93 **	0,382	14,23 **
t_year2012	0,551	19,75 **	0,409	14,34 **
t_year2013	0,595	21,75 **	0,471	15,99 **
_cons	7,926	96,45 **	9,155	107,07 **
R-squared	0,711		0,622	
Root MSE	0,386		0,390	
Number of obs.	6077		5653	

* = significant at the 5% level; ** = significant at the 1% level

The implicit price impacts of the size and the number of bathrooms differ much more than in the main comparison before, where only second domiciles were compared with each other. The impact of the size on the price is higher for second domiciles than for first domiciles, but on the other hand the impact of the number of bathrooms is higher for first domiciles than for second domiciles. For the dummies for the number of garages and the condition of the dwellings, the implicit prices were very much in line with each other. In attention to the significance of the coefficients, it appears that all of them, but the dummy for the year 2003, were significant at the 1% level, which is very good to draw statistically relevant conclusions from them. The R-squared was higher for second domiciles than for first domiciles, wherefore the model fits better to the transaction data of second domiciles. Also in case of the analysis of first domiciles, different models were used and tested for their suitability for the data used and the one above has proven to give the best results, especially regarding the significance of the included coefficients. The total number of observations for both of the regressions was high and the drawbacks of the A0 control group did not occur in the case of first domicile transaction data.

In consideration of the price increases per year, again, what is important in order to make statements about their development in deviation from each other is that the two groups have a common trend before the event and that they differ after. The expectation based on the analyzed literature is that prices of

second domiciles will increase in deviation of first domicile prices after the launch of the law. From economists' expectations it could be found that they do not expect a decrease of first domicile prices before the final law is implemented, since there are still some important points that have to be settled. This is a very helpful assumption, since the difference of the price development therefore can be expected to be the causal effect of the supply restriction on second domiciles and does not also include the expected negative effect on first domicile prices.
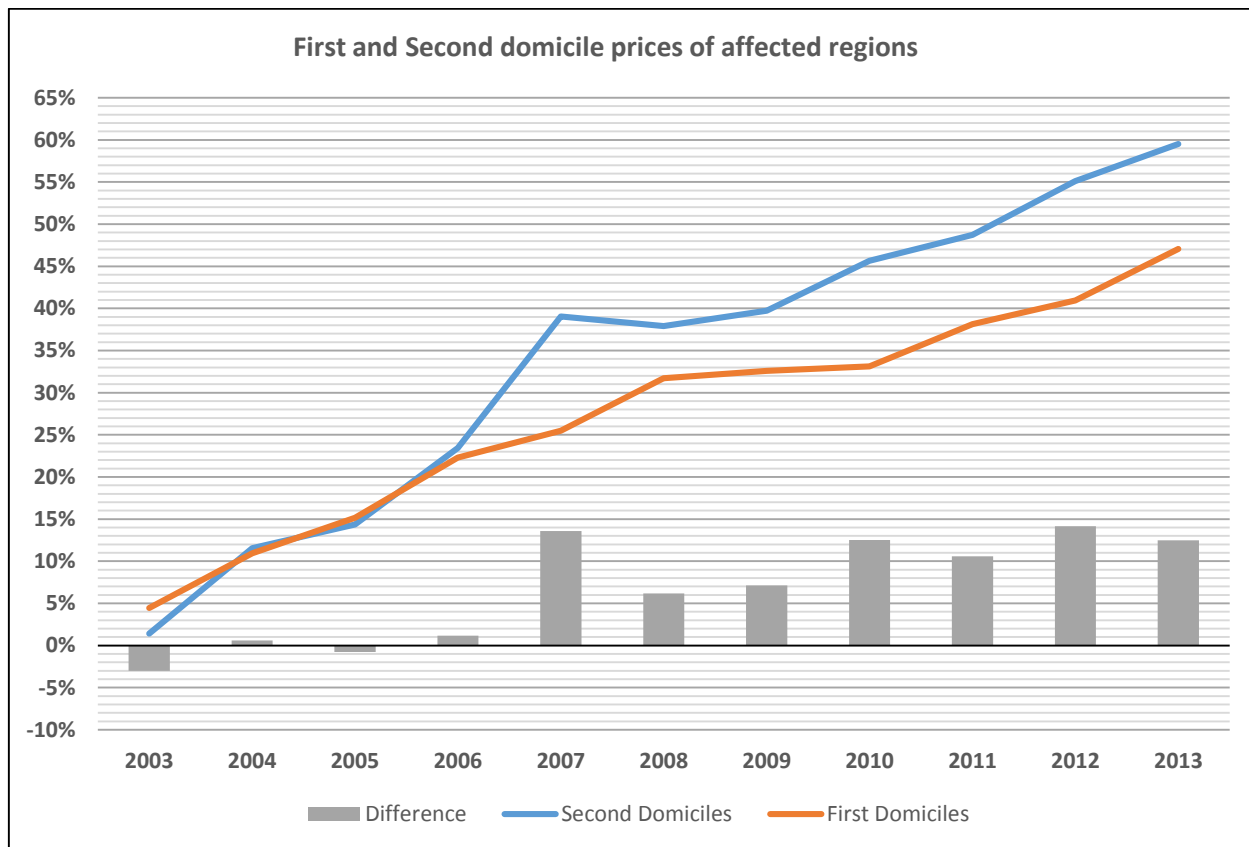
Figure 11: First and second domicile prices of affected regions – own illustration

In the years of 2002 until 2006 it seems that the prices of both groups have increased in the same percentage amounts, which leads to the assumption that the two groups had a common trend. After 2006, there was a sudden relative increase in prices of second domiciles, which was followed by a relative decrease in second home prices again in 2008. 2009 prices only increased slightly in comparison to first domiciles and in 2010, there was again a bigger increase apparent. In the years from 2011 until 2013 the prices changed from 11% up to 14% and back to a 12% rise in deviation of first domicile prices. This means that there is a change in price apparent, however, the significance of this change has to be examined before drawing further conclusions.

Table 12: Common trend analysis using first domiciles as control group

	Second domiciles		First domiciles		t-Stat.
	Coefficient	Robust Std. Err.	Coefficient	Robust Std. Err.	
2003	0,014	0,025	0,044	0,024	-0,866
2004	0,116	0,024	0,110	0,024	0,176
2005	0,144	0,024	0,152	0,024	-0,233
2006	0,235	0,025	0,223	0,026	0,325
2007	0,391	0,026	0,255	0,026	3,646 **
2008	0,379	0,027	0,317	0,028	1,586
2009	0,397	0,027	0,326	0,027	1,868
2010	0,457	0,026	0,331	0,028	3,297 **
2011	0,488	0,027	0,382	0,027	2,774 **
2012	0,551	0,028	0,409	0,029	3,550 **
2013	0,595	0,027	0,471	0,029	3,103 **
* = significant at the 5% level; ** = significant at the 1% level					

In the trend analysis of not affected second homes (A0) the standard errors were relatively high due to the low number of observations, which led to the problem that there was almost no significant difference in price increases apparent. In the table above, the standard errors of first homes are very much comparable with the ones of second homes and the issue of the previous control group does not arise anymore. For the years 2003 until 2006 there was no significant difference between the price increases of second homes and first homes viewable, which means that it cannot be said that they differed. Therefore this is seen as an indication of a common trend until 2006. In 2007 the t-statistic is significant at the 1%-level, wherefore the price increases differed from each other in that year. In 2008 and 2009 there was again no significant difference, nevertheless from the years 2010 until 2013 there was constantly a significant difference in price increase evident.

To put those outcomes into an economic meaning, a very important fact is that the initiative was declared valid early in the year of 2008. Since the first price difference occurred already in 2007, this could mean that prices already adjusted before the initiative was declared valid and would indicate a bad choice of periods of the initiative process. This, however, is seen as very unlikely, due to the big magnitude of price increase at such a low probability of the new law going into force. The significant increase in the year from 2010 onwards is seen as evidence that the initiative already impacted prices during its launch. The rise from the 6% difference in 2008 to around 12% in the year 2013 is seen as the effect of the direct supply restriction on vacation homes prices and they had a relative increase of about 6% until 2013. Over the whole period analyzed vacation home prices rose by 12% more than first home prices.

Because of the sharp relative price increase in 2007 that cannot be explained with the initiative, further examination is needed in order to draw more profound conclusions. It has been stated before that the assumption underlying the usage of first domiciles is that they also are affected by the foreign demand, since until 2013, there was the possibility of conversion of first domiciles into second homes. That the foreign demand is affecting first domiciles in the same magnitude as second domiciles is doubted though, wherefore the usage of the demand index, the EUR/CHF, shall lead to further clarity.

> **Using CHF/EUR as demand index**

Hereinafter, the demand for second homes is added to the overall picture. This is seen as important because of the market evidence found, which indicated that the demand decreased during the last years of analysis. As was described in chapter 2, the CHF/EUR is a good demand indicator for the period under study. The average yearly CHF/EUR is added in green to the graph used above and its rates are displayed on the right hand side of the graph.
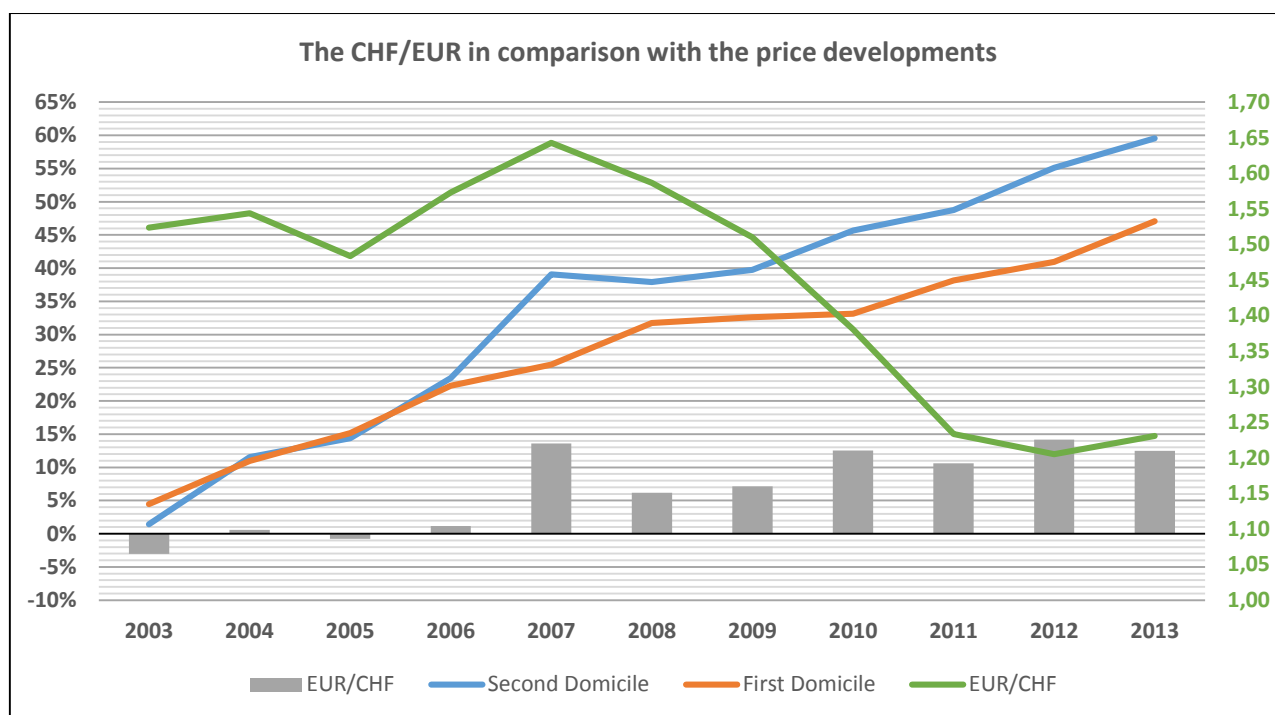

Figure 12: First and second domicile prices in comparison to the CHF/EUR – own illustration

First homes do not seem to be strongly affected by the foreign demand, however, second homes do seem to be affected in the years before 2008. Looking into the correlation between the affected second domicile prices and the CHF/EUR for the year of 2003 until 2007 the result is a correlation of 0,8284 and has the meaning that the demand and the prices of second homes move quite strongly in lockstep in the same direction. A correlation of positive 1 would mean that they move fully into same direction in the same percentage amount. This co-movement does make economic sense, since when the CHF/EUR increases, the CHF is getting cheaper against the EUR, wherefore it is getting cheaper to buy a vacation home in Switzerland. In the years of 2008 until 2013 the correlation of the CHF/EUR and the prices for second homes was -0,9131, which indicates a strong negative correlation between them. This is the opposite direction of correlation of the years before 2008. As the Euro weakens against the CHF the foreign demand for second homes is decreasing, but the second home prices are still increasing, which is seen as evidence, that something else must positively affect the prices of vacation homes and since they are remaining on higher levels than the first homes, this is seen as evidence, that the second home initiative did lead to increasing price levels of second homes already before the by-law was implemented.

To get back to the sharp relative price increase in 2007, now, after usage of the foreign demand index, it is seen as likely that the strong increase was due to the sharp increase of the CHF/EUR, wherefore the demand for second homes strongly rose and caused higher prices. The assumption that first homes are affected also by the foreign demand may be true in some extent, because of the possibility of conversion, however never in the magnitude it affects second domiciles. One reason for this can be found in Chapter 5, where the summary statistics of first and second domiciles showed, that second homes in average were not only much more expensive than first homes, they even were smaller. This is seen as indication that vacation home purchasers have differing requirements towards housing than first home owners. This could be for example higher standards towards conditions or locations, whereby there has to be kept in mind that there were only apartment prices used for this study. Due to this different requirements the conversion option does only apply to certain first domicile apartments. Another reason of the difference in demand of course is that a lot of first domicile owners are not willing to sell their dwelling because of their attachment to their place of living or that the conversion process through the local governments could be very effortful. This, however are just intuitions and probably there are additional reasons and a mix of all of them at the end cause first home prices to not really be affected by the foreign demand.

6.2 Hypothesis 2: Different phases of the law making process will have different effects on vacation home prices

In Hypothesis 1, the usage of first domicile prices and a demand index lead to the result of a positive price trend of the initiative, however, the prices were only compared regarding the basis year of 2002 and reflect the relative increase since that year. In Hypothesis 2, the focus will only rely on the period shortly before the law process was launched until the end of 2013 and the regression model was adjusted with dummies for the different periods that reflect rising probability of the law going into force. Since second domiciles were found to not be a useful control group, they will not be used for the examination of the effect during different phases anymore.

➢ **Using first domicile prices of affected regions as control group**

Again, single regressions for second domiciles and first domiciles of affected regions were run and afterwards their difference was calculated for the purpose of finding their effect in deviation of each other.

Table 13: Second and first domicile prices using different phases of the law process

ln_price	Second domiciles of affected regions		First domiciles of affected regions	
	Coefficient	t-Stat.	Coefficient	t-Stat.
ln_size	0,953	35,58 **	0,629	21,96 **
number_bathrooms	0,076	4,83 **	0,149	8,42 **
garage1	0,148	9,09 **	0,109	6,43 **
garage2	0,350	14,68 **	0,322	11,68 **
garage3	0,399	4,92 **	0,376	4,20 **
quality2	0,184	4,60 **	0,143	3,49 **
quality3	0,409	10,02 **	0,404	9,79 **
quality4	0,587	13,88 **	0,677	15,39 **
phase2	-0,021	-0,74	0,068	2,27 *
phase3	0,035	1,65	0,073	3,38 **
phase4	0,117	4,19 **	0,124	4,36 **
phase5	0,155	5,12 **	0,174	5,67 **
phase6	0,196	7,41 **	0,218	7,56 **
constant	8,466	77,39 **	9,535	82,36 **
R-squared	0,704		0,623	
Root MSE	0,390		0,395	
Number of obs.	3135		2825	
* = significant at the 5% level; ** = significant at the 1% level				

The implicit prices of the two regression outputs are very much comparable to the ones in Table 11, which is the logical consequence of only changing the time dummies and time period used, and hereinafter, they will not be compared anymore. In regard to significance levels of the periods, it appears that for the second domiciles for the periods 2 and 3 the price trends were not significant. All the other values were significant almost throughout at the 1% level. The R-squared is 0,704 for second domiciles and 0,623 for first domiciles and therefore the fit of the model suits better to the second domicile transactions than to the first domicile

data. The number of observations are again high for both regressions, which again is helpful for using a hedonic model, and of course the observations are less, because the time period of analysis has been shortened.
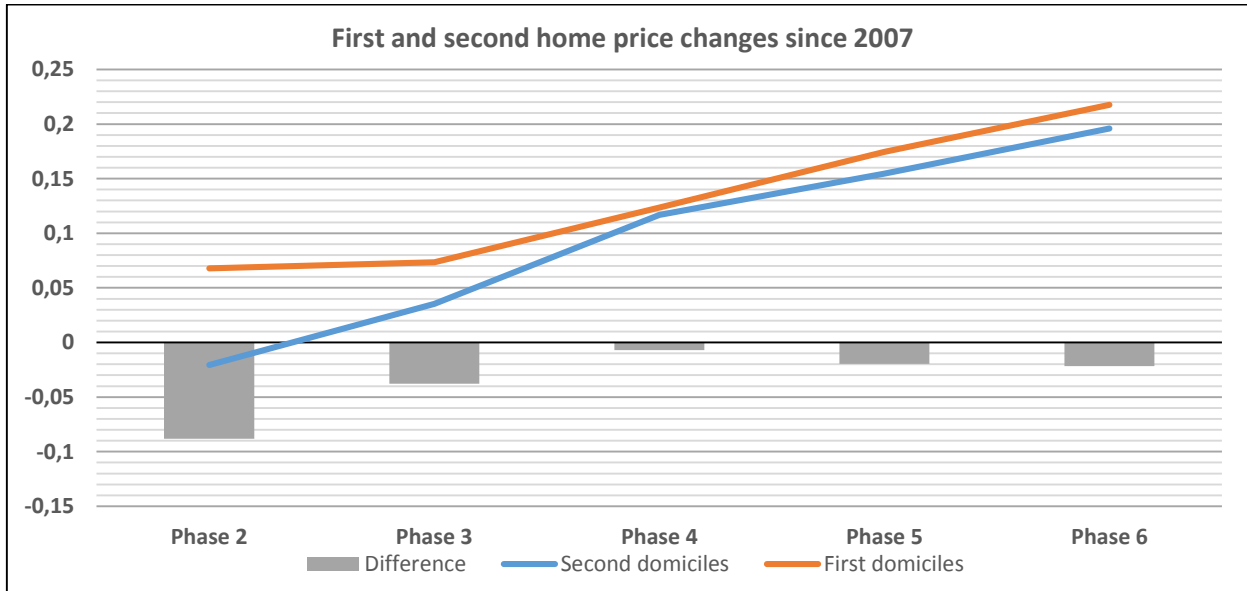
Figure 13: First and second domicile price changes since 2007 – own illustration

Taking a closer glance at the price increases regarding the different phases of the law process, they don't look promising at first sight, because the first domicile prices rose more since 2007 than second domicile prices did. What must be kept in mind is that prices of second homes rose strongly until 2007 and decreased thereafter, because of demand changes. This decrease is evident in the negative development of prices in Phase 2, which starts in the year of 2008. Taking into account that the demand decreased even further in the years after 2008 and by looking at the relative price changes in Figure 13, it is apparent that the prices increased in deviation from first home prices, which is seen as evidence that prices increased as a consequence of the initiative already before the law went into force.
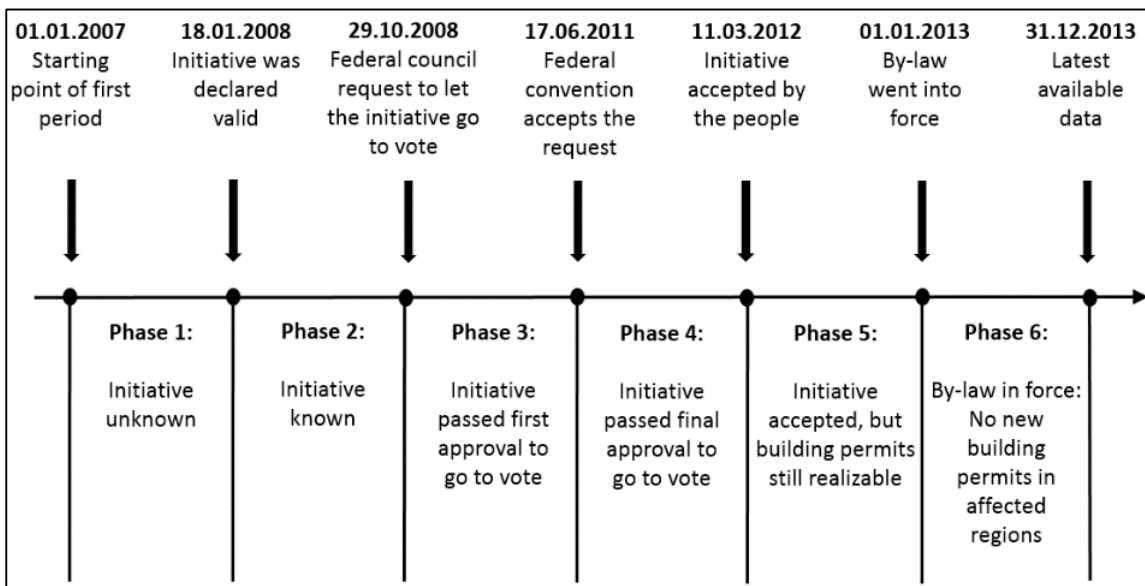
The price changes further can be interpreted that price increases, through expectations of a positive outcome of the vote on the initiative, occurred most in phases 3 and 4, because second domicile prices increased the most in deviation of first domicile prices. In phase 3, which is the phase that started when the initiative received its first approval by the Swiss Federal Council, the price increase in deviation was 5%. The next phase number 4 showed a relative price increase of further 3%, which phase started after the initiative got its final approval by the Federal Convention and therefore at that time it was definite that the Swiss people and representatives of the states will be voting on the new law. Those relative price increases, however, are only in comparison to first home prices and do not take into account the decreasing demand.

Making exact quantitative statements about the magnitude of price changes as the casual effect of the direct supply restriction is not possible based on the data used, even though a common trend was found in Table 12. First homes do not appear to have exactly the same determinants as second homes and in particular, first homes do not seem to be affected by the foreign demand for second homes in the same magnitude, even though there was the possibility of converting them. A further difficulty is the measurement of the foreign demand and finding the influence it may have had on first domicile prices. The fact that exact data about the permission of contingents per municipality were not accessible, had the consequence of not being able of correcting for it. Furthermore, for gathering an even closer understanding of the casual effect of the supply restriction, the number of conversions would have to be known as well, in order to also correct for them. In line with previous work in this field, this thesis comes to the conclusion that it is not possible to find the "pure effect of a growth control".

In view of the real change of second domicile prices, they have increased 19,6% since 2007, which is seen as quite a rise over 6 years. And looking at this increase in the light of a strongly decreasing demand, which in percentages of total permissions given to foreigners for buying a second domicile in Switzerland decreased from a 100% issuance of the maximum of 1500 permissions in 2007 to 68% of the same amount in 2012.

What could be found in this thesis is that direct supply restrictions have an increasing effect on prices of affected properties, which is in line with previous findings. Furthermore, it was found that those price adjustments already occurred to some extent before the restriction was applied to the market. This is seen as an extension of previous literature on the field of supply restrictions. For further studies in this field, which try to find the effect of a restriction of before and after it is applied to a certain market, a careful examination of the restricting legislation is seen as very important, so the possibility of earlier price adjustments due to expectations of the market participants can be taken into account. Since the effect in this thesis was measured by an initiative by the people, which is characterized by being very well communicated and known by most of the market participants, this was definitely as special case and other settings, where not such a transparent information distribution is present, may be less affected by earlier adjustments.

7   Conclusions and discussion

This master thesis examined the effect on prices of a direct supply restriction applied to vacation homes in affected regions in Switzerland, which are municipalities that have a higher density of vacation homes than 20% as a share of the total amount of dwellings. The main assumption underlying this study was that price adjustments already occurred during the law-launch-process of the initiative by the people called "Stop the endless construction of vacation homes", before the actual by-law and therefore the restriction went into force.

The main approach of finding the causal effect of the restriction was to use a hedonic model including different characteristics of the dwellings and running single regressions on vacation home transactions of affected regions and not affected regions. Suitable transaction data for this endeavour was provided by SRED – the Swiss Real Estate Datapool and only could be accessed in their offices in Zurich after payment of the dataset. After merging another data set that included data about the affected regions with the transaction data, unfortunately, it turned out that the not affected regions only had very few transactions during the period from 2002 until 2013, what turned out to have a major impact on the usage of this control group. Running the regressions and analysing the price increases of the affected and not affected regions has shown that the not affected regions had a very high volatility in prices and due to the high standard errors it could not be statistically verified that the price changes of the two groups differed. A further drawback of using this control group was that since the touristic density was the differentiator between affected and not affected regions, the two groups seemed very likely to be affected differently by demand changes, because the not touristic regions are not expected to be interesting for purchasers of second homes.

For the next approach, additional data about first domicile transactions of three of the most touristic states could be accessed from SRED, and the goal was to find the effect of the supply restriction with using first domiciles as control group. It turned out that first and second domiciles of affected regions had a common price trend from 2002 until 2006 and that prices of second homes increased strongly in deviation of first domiciles in the years after. The sharp rise of vacation home prices in 2007, however, was seen as too early in order to be counted to the effect of the initiative, since it came into existence in early 2008, when enough signatures had been collected. Furthermore, there again were doubts that the first domiciles where evenly affected by the strong foreign demand towards vacation homes, even though until 2013 there was the possibility of converting first domiciles to second domiciles, wherefore they could be sold as both.

In order to get deeper insights into the influence of demand changes, which have been found to have occurred during the period studied, the demand for vacation homes had been analysed and because especially the foreign demand has been found to be crucial, the CHF/EUR exchange rate could be verified as a good indicator for the foreign demand and was applied to the previous outcomes. It got apparent that

there was a very strong positive correlation of second home prices and the demand index before 2008 and a very strong negative correlation after 2008. The price increases of second homes due to the supply restriction therefore could be underpinned, since they have occurred even though the demand for second homes has strongly decreased. First homes have not proven to be affected by the foreign demand, even though the conversion option existed.

The next hypotheses examined the effects of the restriction with using different dummies representing different periods of the law-making-process of the initiative. With every phase, the probability of the initiative going into force is getting higher and the reason for using those phases was to find in what magnitude and in what phases prices began to adjust. This is seen as very interesting since the assumption of this thesis is that prices increased before the by-law was applied, because of adaptive behaviour of current owners and investors due to their expectations about the outcome of the initiative. From comparing the second domicile price increases with the ones of first domiciles, it got apparent that the highest relative increase occurred in phase 3, after the initiative got its approval of the Swiss Federal Council and in phase 4, after the initiative got its final approval of the Federal Convention and it was definite that it would be voted on. Since there was no data accessible about the demand decrease per municipality over the years under study, it could not be corrected for it, wherefore these outcomes have to be regarded as not reflecting the "pure effects of the growth control", which is not seen as possible to discover, what is in accordance with previous findings.

Further in line with previous related literature is the finding that applying a direct supply restriction to a real estate market leads to increasing prices of affected dwellings. Since in the literature various types of supply restrictions were differentiated, the one discovered in this theses was the "demand-pull" effect of a direct supply restriction that only applied quantitative restrictions to the market. The presence of spillover effects to other nearby located regions could not be verified, however, this was also just partly included into the analysis. Because of the fact that previous literature has found such effects, regions which were likely to be affected by spill overs were excluded from the control group consisting of second domiciles of not affected regions, as far as it was possible. In addition, a lot of shortcomings of previous articles have tried to be avoided. One issue raised was the possibility of endogeneity, because higher priced regions could be fonder of restrictions, did not apply to the setting under study, since the restriction was applied depending on the density of vacation homes of a region. Other differences between the affected regions and the control groups than the supply restriction have been analysed, and especially the foreign demand as well as further supply restrictions were included into the examination, since in the end the equilibrium of supply and demand determine market prices. As an extension of previous work, it has been found that prices already adjusted before the actual restriction was applied to the market. The assumption that investors and owners of second homes would adapt their behaviour due to their expectations of the outcome of the initiative and that this would increase prices already before the time of vote and the implementation of the law, could therefore be verified.

The limitations of this thesis are mostly the consequence of lacking data for finding the "pure effect of the growth control" as closely as possible. First of all, the control group that was expected to be the most useful, the not affected second domiciles, did not consist of enough transactions to draw serious statistical conclusions based on it. The control group of first domiciles did prove to have a common trend with the second domicile prices before 2007, however, there may be a lot of other determinants influencing their prices. A very important driver of second home prices was included by using the CHF/EUR as a demand index, which also has been justified in this thesis. However, there was no data available that would reflect the change of foreign demand per municipality. Furthermore, there is the possibility that also fist domicile prices are affected by the foreign demand, since there was the option of converting them into second domiciles. Data about conversions per municipality would therefore also help to look deeper into this topic as well. An alternative interpretation of the findings could be that first domicile prices already decreased during the period under study as a consequence of the initiative. Economists expect this to only happen after the final law is implemented, nevertheless, if it has occurred already, the effect that is seen as the causal effect on second domicile prices could then be smaller as it has been estimated.

The literature review has shown that a very important limitation of growth control studies is that they are very much limited to the communities under study and generalizations cannot be made due to regulatory traits, which are very different depending on the place of the study. The findings of the special setting present, where prices already adjusted before the initiative actually had been voted on or the new law was implemented, is regarded as applicable also in other settings, if the transparency level is high and the potential occurrence of the new law is extensively communicated. Knowing this effect may be interesting for all kind of players on the property markets, since and early reaction of a future restriction could be beneficial.

Future research should take the possibility of early price increases due to future supply restrictions into consideration, especially when the goal is to discover the "true" price effect by comparing prices of before and after the restriction is applied. Also the present topic of the Second Home Initiative is seen as very interesting for future research, since by now only the by-law is in force and the final law is still to be implemented, what is not expected to happen until the year of 2015. Therefore, another study about the same topic could examine the long term effects, whereby also the effects on other topics of interest could be analysed. This can be land and first domicile prices, since they are both expected to decrease as a result of the new law or the local economies of the affected regions, because they are expected to suffer from the resulting downturn in the construction industry. Further analysis of the demand elasticity and gathering data about foreign demand for example through numbers about contingent usage by municipality or state over the whole period of interest is regarded as highly helpful for examining the supply-demand balance in more detail.

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Appendix

1. Regression using more variables for affected "1" and not affected "0" second domiciles

ln_price	Affected "1" second domiciles		Not affected "0" second domiciles	
	Coefficient	t-Stat.	Coefficient	t-Stat.
ln_size	0,935	54,26 **	0,916	10,19 **
number_bathrooms	0,060	5,66 **	0,045	0,74
garage1	0,104	10,37 **	0,084	1,38
garage2	0,289	17,91 **	0,204	2,15 *
garage3	0,452	7,93 **	0,457	4,29 **
quality2	0,114	3,19 **	0,285	2,46 *
quality3	0,239	6,46 **	0,408	3,04 **
quality4	0,397	10,74 **	0,586	4,02 **
condition2	0,063	2,53 *	-0,058	-0,13
condition3	0,180	6,81 **	-0,016	-0,04
condition4	0,286	8,97 **	0,081	0,18
age1900	0,024	0,15	ommited	
age1920	-0,038	-0,54	-0,020	-0,16
age1940	-0,181	-1,87	-0,523	-3,22 **
age1960	0,012	0,14	ommited	
age1980	0,069	1,49	-0,350	-3,41 **
age2000	0,087	1,93	-0,271	-2,34 *
age2013	0,146	3,51 **	-0,308	-2,30 *
t_year2003	0,020	0,95	0,054	0,62
t_year2004	0,109	5,43 **	0,107	1,12
t_year2005	0,135	6,93 **	0,105	1,17
t_year2006	0,236	11,40 **	0,205	2,37 *
t_year2007	0,399	18,00 **	0,338	2,97 **
t_year2008	0,407	17,59 **	0,511	2,54 *
t_year2009	0,442	19,21 **	0,340	2,98 **
t_year2010	0,489	21,29 **	0,228	1,99 *
t_year2011	0,533	22,31 **	0,432	3,19 **
t_year2012	0,578	23,74 **	0,559	5,47 **
t_year2013	0,649	25,64 **	0,628	3,53 **
constant	8,027	88,94 **	8,387	14,11 **
R-squared	0,735		0,824	
Root MSE	0,366		0,300	
Number of obs.	7308		164	

2. Regression using quarterly time dummies for not affected second domiciles ("0"; "0" and "2")

ln_price	Not affected "0" second domiciles		Not affected "0" and "2" second domiciles	
	Coefficient	t-Stat.	Coefficient	t-Stat.
ln_size	0,976	9,74 **	0,726	18,17 **
number_bathrooms	0,031	0,44	0,143	5,38 **
garage1	0,057	0,77	0,036	1,43
garage2	0,221	2,03 *	0,210	4,94 **
garage3	0,461	3,89 **	0,627	4,46 **
quality2	0,437	1,88	0,234	1,68
quality3	0,577	2,35 *	0,416	3,02 **
quality4	0,775	3,07 **	0,640	4,54 **
quarter20022	0,195	0,65	0,060	0,39
quarter20023	0,117	0,87	0,052	0,45
quarter20024	0,215	1,49	0,265	1,96
quarter20031	0,095	0,61	0,116	1,03
quarter20032	0,089	0,61	0,058	0,54
quarter20033	0,440	2,73 **	0,273	2,70 **
quarter20034	0,129	1,01	0,195	1,79
quarter20041	0,048	0,44	0,312	2,90 **
quarter20042	0,225	1,07	0,186	1,56
quarter20043	0,209	1,35	0,227	1,87
quarter20044	0,153	1,24	0,271	2,47 *
quarter20051	0,253	1,94	0,251	2,06 *
quarter20052	0,247	1,05	0,361	3,49 **
quarter20053	0,171	0,84	0,238	2,03 *
quarter20054	0,178	1,39	0,231	2,17 *
quarter20061	0,415	2,70 **	0,344	3,22 **
quarter20062	0,264	2,10 *	0,292	2,72 **
quarter20063	0,371	1,62	0,351	3,05 **
quarter20064	0,536	2,99 **	0,424	3,62 **
quarter20071	0,436	2,04 *	0,565	3,92 **
quarter20072	0,405	1,63	0,419	3,14 **
quarter20073	0,514	3,22 **	0,540	5,13 **
quarter20074	0,298	0,78	0,351	2 *
quarter20081	omitted		0,328	2,37 *
quarter20082	0,194	1,29	0,433	3,19 **
quarter20083	0,653	1,46	0,649	4,30 **
quarter20084	0,908	3,41 **	0,712	5,69 **
quarter20091	0,311	1,23	0,483	3,44 **
quarter20092	0,502	2,01 *	0,496	4,16 **
quarter20093	omitted		0,486	4,24 **
quarter20094	0,328	2,29 *	0,227	2,15 *
quarter20101	-0,085	-0,63	0,584	4,55 **
quarter20102	0,523	3,91 **	0,506	3,74 **
quarter20103	0,305	2,09 *	0,601	5,00 **
quarter20104	0,408	3,14 **	0,595	5,11 **
quarter20111	0,558	4,11 **	0,729	5,46 **
quarter20112	0,522	2,62 **	0,567	4,95 **
quarter20113	0,624	3,01 **	0,571	5,43 **
quarter20114	0,466	0,87	0,498	3,23 **
quarter20121	0,810	5,08 **	0,654	5,86 **
quarter20122	0,416	2,29 *	0,476	3,95 **
quarter20123	0,513	4,43 **	0,552	4,65 **
quarter20124	0,749	4,64 **	0,822	7,07 **
quarter20131	0,214	1,63	0,647	5,07 **
quarter20132	0,642	3,24 **	0,668	4,93 **
quarter20133	1,163	8,50 **	0,692	5,91 **
quarter20134	0,765	5,73 **	0,714	6,56 **
_cons	7,601	17,56 **	8,807	37,70 **
R-squared	0,847		0,748	
Root MSE	0,311		0,306	
Number of obs.	164		760	

* = significant at the 5% level; ** = significant at the 1% level