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Restricting the construction of second homes in tourist destinations: an effective intervention towards sustainability?

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Abstract

This study evaluates the impact of the second home restriction (Lex Weber) on construction investments in Switzerland. Different specifications and variations are defined, and the changes in investment behaviour are analysed. A first basic model considers the variation in investments through a discrete event study analysis, while a second model includes a continuous treatment variable to account for the different strong impacts of the law in various municipalities. In the second step, these two basic models are developed in a way that allows to include controls for the different cantonal legislation. The results show that with a delay of three years (due to the expiration of permits), the law had the desired impact on new construction investments. Additionally, the importance of the changes on different outcomes in the local economy and tourism industry are discussed.

Keywords: Construction, Second homes, Housing investments, Tourism development, Switzerland

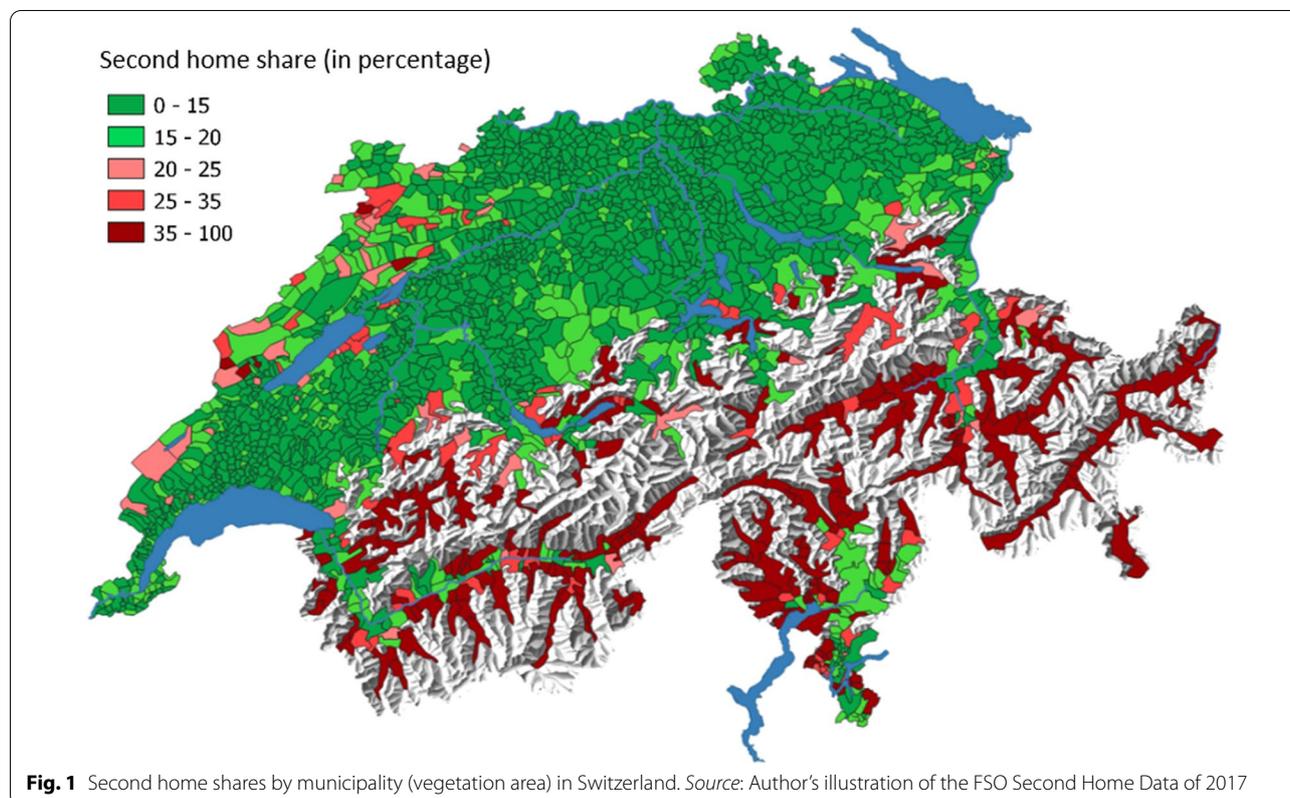**JEL Classification:** D72, E22, L74, O18, C23, Z38

1 Introduction

In Switzerland, the demand for second home ownership for leisure purposes grew very quickly in the late 1960s and early 1970s. The increasing construction activity resulted in the rapid consumption of construction grounds since hardly any restrictions and regulations for land use were applied. To address this increasingly important issue, several regional and local regulations were enacted, and spatial planning was undertaken. The last Federal Act on Spatial Planning (Spatial Planning Act, SPA) in 2011 requested cantons to identify possible ways to limit and guide the excessive construction of leisure homes in highly affected municipalities. Many of the measures enacted at the local level were financial disincentives, taxes and cross subsidies for primary homeowners and managed accommodations. Finally, on 11 March 2012, a federal popular initiative (Lex Weber) to limit second home construction in highly affected municipalities was approved by the majority of Swiss people and cantons. This was not expected to happen, since the most affected regions voted against the law, but people in the rather urban areas were favourable to this legal change. On this date, permits for new constructions were restricted to primary home purposes, and immediate transitory measures were applied. The federal council developed a regulation on new constructions, which was enacted by the end of 2012. Following its enactment, the parliament decreed the final second home law, which replaced the transitory measures starting in 2016, this as a formal change without any important change in the legal practice (Vinzens & Hefti, 2014).

A question that requires further analysis is what impact the number of second homes has on managed accommodations. One hypothesis is that among new second homeowners, overnight stays would be shifted away from hotels to their new flats and houses. The alternative to this hypothesis is that the second homeowners would be helpful in accessing additional markets for touristic areas; since these new homeowners would have high cohesion and identification

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Fig. 1 Second home shares by municipality (vegetation area) in Switzerland. *Source*: Author's illustration of the FSO Second Home Data of 2017

with the region, they would bring new guests with them. This connected to a lower supply of second homes would incentive the construction of new managed accommodations and in this sense have an effect on the number of available hotel beds in the regions. Considering the effects of the new law on the housing prices, theory suggest an ambiguous effect. On the one hand, the prices of second homes would rise, due to the artificially capped supply on the market. On the other hand, a lower demand for new first homes would imply lower prices for first homeowners in that part of the segmented market. If the inter- and intra-cantonal migration is studied, then in consequence to the new law, more persons would choose the touristic areas as their main residence, since prices become more affordable for a larger group of potential inhabitants. Consequently this would cause a population growth in the studied municipalities. The supporting parties for this law additionally discussed that an intact landscape is the most important asset for the sustainable development of touristic activities; on the other hand, the main political debate argued that a strong reduction in construction activity would directly and indirectly impact the economic value chain, economically damaging the peripheral, touristic regions of the country. Hilber (2018), for instance, discusses the political opposition for this law in the most affected regions, where the initiative was in

some cases perceived to be the result of the willingness to restrict second home construction among the residents of the Swiss Plateau being imposed on mountain dwellers. Figure 1 shows a map with the actual (2017 data) second home shares in the Swiss municipalities, with the red areas having restrictions on building new second homes. Furthermore, in their report, the Federal Office for Spatial Development ARE (2017) defines the spatial specialization and availability of construction grounds as well as land use in the various regions of Switzerland.

This research aims to contribute to this political debate, suggesting that the reduction in new building construction activity has been focused on the construction of new dwellings and has not been as strong as initially claimed by the opponents of the law. In this sense, the main research questions is on how large the effects of the second home restriction law was on the investments in new housing construction business. Furthermore, based on the descriptive results, touristic overnight stays in Swiss municipalities did not change dramatically—only a slight shift in overnight stays from touristic central municipalities to the surroundings was identified in some important touristic regions.

The paper is structured as follows. Section 2 introduces the theoretical background, and Sect. 3 explains the institutional setting of the analysed areas and provides details

about the legislation. Sections 4 and 5 explain the data and the empirical structure. In Sects. 6 and 7, the results on the impacts on new buildings are explained, and concluding remarks with a wider view of the law's impact, as well as the variations in the tourism industry, are presented.

2 Theoretical background

From a theoretical point of view, this research contributes to the previous literature in three main ways. First, it adds to the existing research on the geographic distribution of second homes and on the characteristics of second homeowners. For example, Gutierrez (1999) evaluates the impact of wealth effects on the demand for second homes. Di et al. (2001) define what second homes are and how they are distributed in the US. Additionally, they focus on the characteristics of second homeowners and the factors that drive the increasing demand for second homes. Planidea (2012) report some of the possible implications of the accepted second home restriction initiative in Switzerland, with a focus on the canton of Graubünden. BAK Basel (2013) analyses the topic in a more general way for all of Switzerland, hypothetically assuming different strong interpretations of the law. The author forecasts the effects of the second home act on tourism, construction activity, real estate and the other components of economy of the alpine areas. Four different scenarios of law implementation are outlined to conclude the study.

Second, the study contributes to the literature examining the implications of second home construction for housing demand and more general implications. For example, Mayo (1981) focuses on the income elasticity of demand and the difference between renter and owners. Goodman (1988) identifies housing price and income as the main decision variables of housing demand. Akintoye and Skitmore (1994) divide demand into commercial and industrial construction and private construction and find a larger price elasticity for the private sector. Belsky et al. (2006) study the case of second homeownership in the US. The innovative aspect of their model is that it accounts for the possibility of multiple home ownership, which other models of income elasticity and the demand for housing have not done. It is important to distinguish between the two different parts of demand, with second home ownership categorized as an investment. The concept that second homes do not produce a flow of housing services that they consume supports this idea. There is both a flow of consumption and investment in the case of housing demand, and which of the two prevails might be different for a person's first or second home. Additionally, in the Canadian context, Demers (2005) defines a model to forecast housing expenditures.

Last, from a methodological point of view, the present work contributes to the recent broad field of difference-in-difference (DiD) and event study design, such as for that

by Abadie (2005). An important application is the work of Card (1992), which was used as a referring in developing the empirical strategy for this research. Regarding in particular the event study design, Abraham and Sun (2020) discuss treatment with heterogeneous effects. Further, the work of Ly and Paty (2020) provides an example of how to address spatial heterogeneity and different local time trends in the application of DiD and event studies to nationwide legal change. Bertrand et al. (2004) describe important implications for dealing with standard errors in the DiD technique.

3 Institutional setting

Before the second home law implemented in 2012, no concrete restrictions and rules at the federal level had been applied for municipalities when construction permits were issued. The first wave of second home construction starting in the 1960s showed that the high level of construction activity was not only a positive development. The lack of any regulation led to the development of a spatial planning act that was applied in 1980. With the end of the oil crisis, construction activity entered a second wave, and guidelines and recommendations were formulated. More recent debate concerned property for foreign homeowners as well as construction restrictions. The popular vote on 11 March 2012 introduced the new article 75b to the federal constitution, which explicitly limits the share of second homes among the total homes to a maximum of 20% in every municipality. The new law took effect the same day through an immediate stop of emitting construction permissions without a restriction to use note. In this sense the law considers all from this date on newly requested construction permissions, not the ones placed before the date. The legal change needed to be mandatorily enacted in a similar way across all municipalities and cantons with a sharp immediate stop of new second home constructions. Additionally, the article stipulates that municipalities are in charge of annually publishing their first home plans and reporting their applied measures to enact the law (Vinzens & Hefti, 2014).

To guide the calculation of the share of second homes in a municipality, article 2 in the regulation defines second homes as habitations that are not permanently used by persons with legal residence in the municipality and that are not used by persons for working or education purposes. Criteria in civil law define where a person's place of legal residence is. A further important point is the rule on existing flats, houses and hotels. Existing first and second homes are not restricted to any particular use and can be freely converted for different purposes, requalified and restructured as long as their original sizes are maintained, with reasonably sized enlargements being permitted. Hotels can be transformed into second homes if they have been operative for at least 25 years and if it can be proven that their operation cannot be profitably maintained. In municipalities where second

homes are restricted, only managed touristic second homes (resorts and vacation villages) can be newly constructed. They need to be professionally managed for example as a part of a vacation resort or hotel village and not just be rented through private owners for a limited number of days in a year (Vinzens & Hefti, 2014).

The report of BAK Basel (2013) focuses on the possible impact of the second home restriction in the alpine regions. First, based on the economic trend in these areas, stagnating employment is predicted. The new law will have the greatest impact in peripheral areas that are specialized in tourism. According to the previous study, the main impact on employment will occur in the gastronomy and construction sectors. An earlier report by Credit Suisse (2005) analyses the importance and distribution of second homes and the associated construction activity on the construction industry and examines the impact of the abolishment of measures contained in an earlier restriction of house and land ownership for foreigners in Switzerland (Lex Koller).

Additionally, to this end, several institutions were asked by the Federal Office for Spatial Development (ARE) to determine possible consequences of the second home law for the local economy. An example is the analysis of the law with a focus on businesses presented by BHP (2019)[1] that proposed managerial adaptation processes for some example touristic, construction and real estate firms and touristic areas. Rütter Soceco (2019)[2] presents a more economic perspective, defining hotspot areas with high second home market margins and describing the potential for a 20% drop in construction investments in these hotspots. Further data analysis on the industry mix and labour productivity of the affected areas was performed. Such analysis is important from the perspective of new potentials and dynamic business changes in the affected industries, and the present work complements previous analyses. Last, the presentation by Infraconsult (2019)[3] proposes an evaluation of the implementation of the law at the municipal level, focusing in particular on different strongly affected typologies of the spatial dimension.

4 Empirical strategy

The formal model is used to analyse the effect of the second home restriction as a two-way fixed effect regression which compares the changing investments in construction in treated and control municipalities. The baseline event study model compares the investment in new home constructions in restricted municipalities with that ones in other municipalities. Additionally, the effects of the second home restriction on renovation investments, housing prices, migration, residential population, wealth of homeowners and the supply of hotel beds are analysed in separate models.

A first baseline model is formulated as an event study design, taking year-specific time dummies and a continuous treatment variable to identify the different treatment intensities in the period after the law's introduction. This procedure is discussed by Schmidheiny and Siegloch (2020) as well as Card (1992). Formally, this procedure defines the following model:

$$\ln I_{it} = \beta_s \times \text{SHShare}_i \times d_s \times \text{treat}_i + \theta_t \\ + \beta' X_{it} + \gamma_{ct} + \lambda_i + \varepsilon_{it}$$

where $(\ln I_{it})$ is the natural logarithm of new construction investments in municipality (i) in the years 2005, …, 2017. (SHShare_i) is used to represent the actual municipal second home share and (treat_i) the 2017 ARE second home statistics.[4] Furthermore, (X_{it}) describes a set of control variables and (θ_t) represents the time effects. Additionally, a variable (γ_{ct}) that controls for the different construction regulations at the regional (canton) level is included with the aim of capturing the time-varying changes in these regional laws. (λ_i) is the municipality fixed effect. (ε_{it}) is the robust standard errors, clustered by typology of municipality according to the categories defined by the Swiss Federal Statistical Office (FSO) for the years $t = 2012$ to $t = 2017$. Consequently, the year dummies (d_s) for the post-treatment years $s = 2012$ to $s = 2017$ are introduced.

Meanwhile, the second specification with a discrete treatment includes uniquely the dummy variable (treat_i), with a value of 1 for municipalities to which a second home restriction applies and 0 otherwise, to identify the effect of the legal change:

[1] Lüthi, S. (2019). Wirkungsanalyse Zweitwohnungsgesetz—Analyse der Auswirkungen mit betrieblichem Fokus. Presentation, Bern. Retrieved November 15, 2019, from https://www.seco.admin.ch/dam/seco/de/dokumente/Standortfoerderung/Tourismus/Tourismus%20Forum%20Schweiz/TFS2019/191113_Input_TFS_HSLU-BHP.pdf.download.pdf/191113_Input_TFS_HSLU-BHP.pdf

[2] Nathani, C., & Burri, B. (2019). Wirkungsanalyse Zweitwohnungsgesetz: Analyse der Auswirkungen mit volkswirtschaftlichem Fokus—Vorgehen und erste Ergebnisse. Presentation, Bern. Retrieved November 15, 2019, from https://www.seco.admin.ch/dam/seco/de/dokumente/Standortfoerderung/Tourismus/Tourismus%20Forum%20Schweiz/TFS2019/TFS_2019_Pr%C3%A4sentation_RSO.pdf.download.pdf/TFS_2019_Pr%C3%A4sentation_RSO.pdf

[3] Studer, D. (2019). Wirkungsanalyse Zweitwohnungsgesetz—Evaluation des Vollzugs. Presentation, Bern. Retrieved November 15, 2019, from https://www.seco.admin.ch/dam/seco/de/dokumente/Standortfoerderung/Tourismus/Tourismus%20Forum%20Schweiz/TFS2019/PPT_Infraconsult.pdf.download.pdf/PPT_Infraconsult.pdf

[4] Federal Office for Spatial Development ARE. (2017). Wohnungsinventare und Zweitwohnungsanteil 2017. Bern. Retrieved October 14, 2019, from https://www.are.admin.ch/are/de/home/raumentwicklung-und-raumplanung/raumplanungsrecht/zweitwohnungen.html

$$\ln I_{it} = \beta_s \times d_s \times \text{treat}_i + \theta_t + \beta' X_{it} + \gamma_{ct} + \lambda_i + \varepsilon_{it}$$

The results of the two models should be increasingly visible at least after three years, for the fact that existing construction permits from the period preceding the new law continued to be valid for another three years in the most affected areas, depending on the cantonal legislation. Therefore, the full effect of the new law would be noticed only with the complete expiration of the last "old" construction permits in the years after the actual treatment. A summary of the duration of the construction permits defined by the single cantonal laws is provided in "Appendix 1".

5 Data and summary statistics

To analyse the impact of the second home restriction law in Switzerland, an annual panel dataset for Swiss municipalities out of several statistics and data sources was constructed. First, the housing construction statistics data from the FSO[5] provide data on investments in new constructions and renovations for private real estate at the municipal level. The considered data include the years 2005–2017 (which has been the most recent available data when the analysis has been conducted) and take into account the numerous mergers of municipalities taking place during this period. The data are standardized with respect to the official register of municipalities of 2017. Furthermore, the 2017 ARE second home statistics, which include the share of secondary homes in each municipality for the first time since the law's introduction for each single entity, are included in the dataset. The data is revealed annually in this statistic, starting from 2017. More in details, only after 2017, it is possible that some municipalities close to a 20% share as a consequence of a varying number of second homes change from the treated to the control group or vice versa. This dataset identifies the treated and the control groups, with a threshold at the 20% share level of second homes. In order to improve the comparability of the control group, all municipalities below the 10% second homes share were dropped from the sample.

In addition to the previously mentioned data, a variation of the model includes several research variables of interest in alternative to the investments at the municipal level. First, it includes the filtered average square metre prices for housing at the district level. These data come from Comparis[6] and are based on the prices demanded on online announcements placed on the main platforms. This variable is included as an index to study the different appreciation patterns of housing in the districts. Second, data from the FSO Population and

Households Statistics[7] on the arrival of new residents from the internal and from the remainder of the cantons moving to the municipality are used as further dependent variables. This variable helps to understand the changing settlement behaviour of persons. In addition, the dataset includes the number of available beds in hotels and structured accommodations according to the FSO Tourist accommodation statistics[8] to understand the importance of tourism activity and how it changed after the application of the new law. Additionally, the number of empty, unused dwellings from the FSO Buildings and dwellings statistics[9] is included in this research paper to describe a potential excessive supply of apartments on the local market. Finally, to include the wealth of first and second homeowners, microdata from the FSO and ARE Mobility and Transport Microcensus (MTMC)[10] are included. A variable is constructed based on the average classes of the household incomes of first and second homeowners in each municipality and their relative importance based on the second home share compared to the primary home share as a control for income in the regressions. Since the MTMC is conducted only every five years, a five-year fixed income variable for the years 2005–2009, 2010–2014 and 2015–2017 is assumed. This variable is constructed as midpoints of the five defined intervals. There are slight variations within the grouped years because not all of the household income variables are available for each single municipality in ever year. For this reason, they might not be considered in the dataset in a determined year. The averages and standard deviations of the considered variables for the municipalities subject to the second home restriction and the control municipalities are reported in Table 1.

Figure 2 compares the average investments in new constructions (in natural logarithms of thousands of Swiss Francs) for the two groups of municipalities. This comparison of investments among the groups of municipalities to which a second home restriction applies as well as to the remainder, undermines, that the previous similar investment trends are diverging starting from 2012. Immediately after

[5] Swiss Federal Statistical Office FSO. (2019). Housing construction statistics—Investments in new buildings and renovations in municipalities 2005–2017. Retrieved June 5th, 2019, from https://www.bfs.admin.ch/bfs/en/home/statistics/construction-housing.assetdetail.9226208.html

[6] Comparis. (2019). Overview of purchase prices of apartments and houses from 2007 to 2018. Retrieved November 7th, 2019, from https://en.comparis.ch/immobilien/preisentwicklung

[7] Swiss Federal Statistical Office FSO. (2019). STATPOP—Demographic balance by institutional units 2005–2017. Retrieved June 3rd, 2019, from https://www.bfs.admin.ch/bfs/en/home/statistics/population/effectif-change/components-population-change.assetdetail.9566432.html

[8] Swiss Federal Statistical Office FSO. (2019). HESTA—Hotel accommodation: arrivals and overnight stays of open establishments for 100 communes by year, month, commune and visitors' country of residence 2005–2017. Retrieved November 3rd, 2019, from https://www.bfs.admin.ch/bfs/en/home/statistics/tourism/tourist-accommodation/hotel-accommodation/communes.assetdetail.13407433.html

[9] Swiss Federal Statistical Office FSO. (2019). Empty dwellings census—Number of empty dwellings in municipalities 2005–2017. Retrieved June 19th, 2019, from https://www.bfs.admin.ch/bfs/de/home/statistiken/bau-wohnungswesen/wohnungen/leerwohnungen.assetdetail.9366199.html

[10] Swiss Federal Statistical Office FSO. (2018). Mobility and transport microcensus (MTMC) microdata of the 2005, 2010 and 2015 MTMC. Data only available on special request at the FSO.

the 2008 crisis (which led to a temporary reduction in new second home construction investments) and later, especially in the post-treatment period, restricted municipalities registered stagnating investments for new constructions after the introduction of the second home law. A larger difference was registered after 2015, when even the latest pre-reform construction permits in the touristic cantons had expired.

Additionally to the new construction investments, an examination of the effects on renovation investments has been conducted (see Fig. 5 in "Appendix 2").

In order to validate the application of the event study design, the year-specific effects have been singularly analysed and later been included in the graphic results illustration. More detailed applications and variations of these techniques can be found in Fuest et al. (2018) as well as in Autor (2003).

6 Results

Following the empirical strategy introduced in Sect. 4, the results in Table 2 in this section report the estimates for the models. In detail it reports the results for two different specifications. The first baseline models (1) and (3) are extended to include canton by year effects in models (2) and (4) to control for the different cantonal legislations. All scenarios are further analysed through a continuous treatment (accounting for the share of second homes in the municipalities) and a discrete treatment (separating only affected from non-affected municipalities without considering the importance of the second home market for the town). The results suggest a negative impact on investments due to second home restriction. This negative effect is greater in the long run. As shown in the data section, this is mainly due to some investors bringing forward their investments, and therefore, they invest in finishing and starting the last constructions initiated before the law's application.

Considering the cumulative treatment effects of the second home law in each of the following years, the marginal effect increases during the entire observed post-treatment period. The results show that starting with the years following 2013 (one year after the treatment), the negative marginal effect of the second home restriction increases year by year, because of the cumulative effect for every year increasing faster in the post-treatment period. This means that the effect of the second home restriction continues to grow and that the new post-treatment equilibrium has not yet been reached.

The results in Table 2 suggest that the observed effect of the restriction to construct new second homes in the touristic areas of Switzerland had the desired effect in reducing the construction activity in the affected municipalities. Nevertheless, it took several years to notice the full magnitude of the obtained results. As much as emerges from the results of the discrete treatment effect model (3) the effect

is continuously growing over the observed period and coefficients are significant at a *p* value of 0.99 starting with the fourth year after the law was enacted. Figure 3 illustrates the obtained results from this model, including the coefficients of the years in the period precedent to the law's enactment.

Focusing on the results of the specifications (1) and (2) in the results in Table 2, then a growing negative trend in construction investments in new buildings in municipalities with a higher existing second home share is observed. Results show that the higher a second home share is, the more important this submarket of the construction industry is in the considered municipality. A more than proportional reduction for highly affected municipalities can be observed in the results of the continuous treatment effect specifications. Figure 4 evidences the cumulative effects of the specification (1) in the results in Table 2, including the coefficients for the pre-treatment period.

To check for a possible shift of construction activity away from new constructions towards investments in renovations, the models are rerun to analyse the effect of the law on renovation investments and on the remainder of the potential outcomes of the new second home law discussed in the introduction section (detailed results for all the specified models and a complete list for the above illustrated results can be found in "Appendix 3"—Tables 4, 5). These detailed results suggest no evidence for a possible shift (and consequently increase) of construction activity towards requalification yet. Considering the effect of the legal change on the housing prices, then two effects can be noticed: First, housing prices grew in the affected municipalities after the law's application; this might be an anticipation of the demand for the in future potentially scarce second homes. In a second moment, the housing prices were lowered, this probably as a result of the increasing number of first homes placed on the market at a lower price in the meantime, influencing the overall housing prices in second home restricted municipalities. Additionally, the interpretation of the changes in population before and after the law's application shows that the population in the peripheral touristic areas grew less than in the areas closer to the urban centres and this might even has an effect on the housing market. Moreover, the initiative was not able to cancel these trends for both the population growth and the inter-cantonal migration towards the centres. If migration within the canton is considered separately, then the increasing segmentation of the housing market makes residents more often move to these touristic hotspot municipalities. In this sense, an inversion of the previous trend that workers in touristic hotspots commute in from always more distant regions can be noticed. A further point of discussion were the effects of the new law on the available infrastructure in hotels and managed accommodations. In a first moment, the results show that the number of available hotel beds decreased in the affected municipalities

Table 1 Descriptive statistics for municipalities with and without the second home restriction

Descriptive statistics—averages and standard deviations of all variables in the dataset

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
No second home restriction													
New constructions investments*	20,122	19,811	19,563	20,411	21,271	21,162	21,532	21,768	22,677	23,152	23,234	23,246	24,588
	[1980]	[1875]	[1518]	[1544]	[1932]	[1865]	[1953]	[1855]	[1881]	[2058]	[1987]	[1961]	[2065]
Renovation investments*	7586	7812	8309	8341	8289	7699	8669	8858	9457	9857	10,391	10,341	10,778
	[1271]	[1323]	[1414]	[1154]	[1134]	[1214]	[1253]	[1340]	[1432]	[1501]	[1529]	[1497]	[1584]
Square meter price index (2005=100)	100.00	103.30	102.87	102.92	104.21	105.59	106.00	105.01	103.69	103.45	102.97	101.74	101.80
	[0.00]	[0.23]	[0.17]	[0.15]	[0.18]	[0.17]	[0.16]	[0.15]	[0.17]	[0.17]	[0.15]	[0.12]	[0.13]
Inter-cantonal migration	100.14	101.51	104.74	109.42	108.24	104.49	115.16	113.26	114.65	117.45	123.10	123.69	124.99
	[11.49]	[11.23]	[11.95]	[12.00]	[11.43]	[10.65]	[11.97]	[11.26]	[11.37]	[12.14]	[13.09]	[13.31]	[13.52]
Intra-cantonal migration	243.02	244.26	248.40	253.54	252.28	243.66	264.35	262.73	267.32	276.33	285.96	299.74	292.63
	[16.19]	[15.63]	[16.27]	[16.11]	[16.04]	[15.27]	[18.01]	[17.98]	[18.12]	[19.39]	[19.06]	[20.40]	[20.16]
Available beds in hotels	151.33	152.54	152.54	153.27	152.97	146.34	149.56	151.71	153.27	154.82	156.83	158.88	166.12
	[21.87]	[22.06]	[22.67]	[22.81]	[22.88]	[21.35]	[22.17]	[22.84]	[23.35]	[23.71]	[23.72]	[24.15]	[25.88]
% Empty apartments	1.11	1.18	1.17	1.11	1.11	1.18	1.20	1.21	1.25	1.37	1.44	1.61	1.79
	[0.04]	[0.04]	[0.04]	[0.04]	[0.04]	[0.04]	[0.04]	[0.04]	[0.05]	[0.05]	[0.05]	[0.05]	[0.06]
Household income class**	192.13	192.52	192.43	192.71	192.71	199.91	199.83	199.91	200.25	200.71	230.12	230.50	230.41
	[1.58]	[1.58]	[1.57]	[1.57]	[1.56]	[1.39]	[1.39]	[1.39]	[1.40]	[1.41]	[1.55]	[1.56]	[1.59]
Second home share (in 2017)													10.98
													[3.68]
Observations	1812	1812	1812	1812	1812	1812	1812	1812	1812	1812	1812	1812	1812
With second home restriction	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
New constructions investments*	8275	9291	9432	9859	9269	8687	9037	9406	9943	9428	9295	8316	8233
	[1125]	[1137]	[1010]	[1257]	[981]	[854]	[934]	[1077]	[1355]	[1187]	[989]	[810]	[846]
Renovation investments*	3144	3220	3710	4202	3633	3350	3852	3641	3643	3729	3854	4057	4082
	[390]	[401]	[548]	[654]	[507]	[341]	[387]	[327]	[354]	[375]	[453]	[410]	[406]
Square meter price index (2005=100)	100.00	101.92	102.69	104.00	106.84	104.87	104.84	104.36	103.71	101.08	101.26	100.74	98.97
	[0.00]	[0.70]	[0.49]	[0.45]	[0.70]	[0.57]	[0.49]	[0.37]	[0.39]	[0.40]	[0.37]	[0.30]	[0.25]
Inter-cantonal migration	29.35	29.25	28.16	29.94	31.10	27.14	28.77	28.43	28.83	30.30	30.80	31.45	31.46
	[2.86]	[3.02]	[2.69]	[2.83]	[3.00]	[2.56]	[2.65]	[2.70]	[2.81]	[2.85]	[2.83]	[2.96]	[2.69]
Intra-cantonal migration	61.45	60.93	59.87	61.83	63.43	58.13	63.81	64.33	65.55	67.57	68.72	73.31	72.97
	[5.95]	[6.12]	[5.75]	[6.09]	[5.96]	[5.11]	[6.32]	[5.88]	[6.61]	[6.64]	[6.04]	[6.69]	[6.48]
Available beds in hotels	437.07	433.69	426.85	424.54	422.17	361.51	354.47	359.57	360.18	363.52	358.75	358.90	371.33
	[60.89]	[58.37]	[57.26]	[57.04]	[57.22]	[46.79]	[46.52]	[47.05]	[47.77]	[48.97]	[46.47]	[46.75]	[50.02]
% Empty apartments	1.09	1.20	1.14	1.17	1.02	0.98	1.03	1.12	1.05	1.31	1.47	1.54	1.80
	[0.09]	[0.10]	[0.10]	[0.10]	[0.08]	[0.07]	[0.08]	[0.08]	[0.07]	[0.08]	[0.08]	[0.08]	[0.10]

Table 1 (continued)

Descriptive statistics—averages and standard deviations of all variables in the dataset

Household income class **	158.00	158.56	159.01	159.19	158.94	157.23	157.08	156.62	156.54	157.22	188.60	188.60	189.53
	[9.59]	[9.60]	[9.51]	[9.51]	[9.47]	[7.99]	[8.00]	[8.09]	[8.12]	[8.23]	[9.00]	[9.05]	[9.15]
Second home share (in 2017)													45.18
													[18.59]
Observations	365	365	365	365	365	365	365	365	365	365	365	365	365

Notes:

[] Standard deviations in parentheses

*Investments in 1000 CHF

**Household income classes: 0–100   = 0–4000 CHF
(monthly gross income − midpoint of   100–200   = 4001–8000 CHF
class intervals)   200–300   = 8001–12,000 CHF
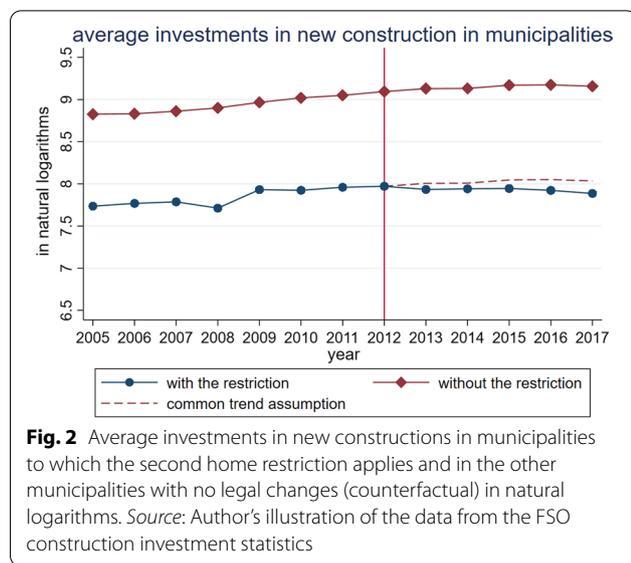   300–400   = 12,001—16,000 CHF
    >400   = >16,000 CHF

Table 2 Results of the event study of the effect of the second home restriction (with continuous and discrete treatment variable) on new construction investments (in natural logarithms)

New Home Construction Investments: regression results—discrete and continuous treatment estimates and year-specific cumulative estimates

	(1)	(2)	(3)	(4)
Effect of second home restriction	A. Continuous treatment		B. Discrete treatment	
Effect at reform	0.000	− 0.002	− 0.007	− 0.097
	[0.001]	[0.001]	[0.037]	[0.069]
Effect after 1 year	− 0.002*	− 0.003***	− 0.155**	− 0.205***
	[0.001]	[0.001]	[0.071]	[0.054]
Effect after 2 years	− 0.003*	− 0.004***	− 0.160*	− 0.223***
	[0.002]	[0.002]	[0.095]	[0.082]
Effect after 3 years	− 0.005***	− 0.006***	− 0.219**	− 0.201**
	[0.002]	[0.002]	[0.107]	[0.098]
Effect after 4 years	− 0.007***	− 0.007***	− 0.236***	− 0.202**
	[0.002]	[0.002]	[0.083]	[0.081]
Effect after 5 years	− 0.008***	− 0.009***	− 0.283***	− 0.245**
	[0.001]	[0.002]	[0.089]	[0.097]
Constant	10.510***	10.197***	10.513***	10.197***
	[0.018]	[0.408]	[0.017]	[0.408]
R-squared	0.785	0.793	0.784	0.793
Observations	10,353	10,353	10,353	10,353
Number of years	13	13	13	13
Municipality fixed effects	Yes	Yes	Yes	Yes
Canton by year effects	No	Yes	No	Yes

[*] $p < 0.1$, **$p < 0.05$, ***$p < 0.01$

[] Standard errors in parentheses

Source: Results from the event-study design application on the second home restriction law

Fig. 2 Average investments in new constructions in municipalities to which the second home restriction applies and in the other municipalities with no legal changes (counterfactual) in natural logarithms. *Source*: Author's illustration of the data from the FSO construction investment statistics
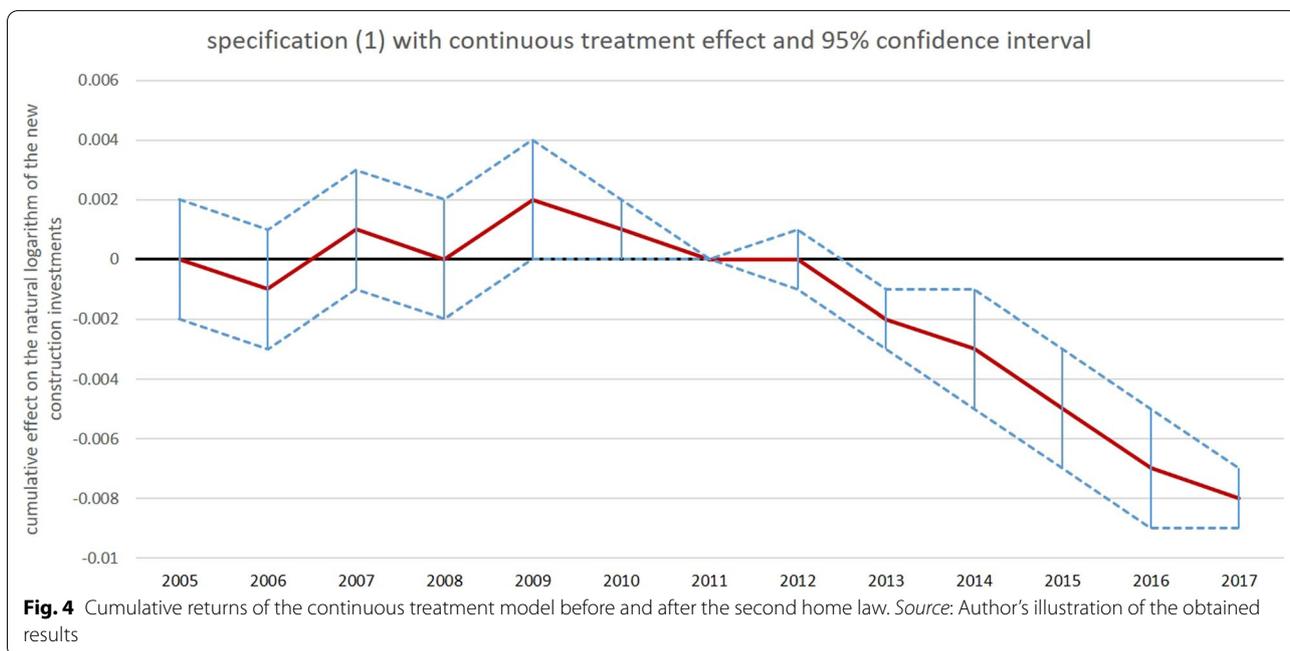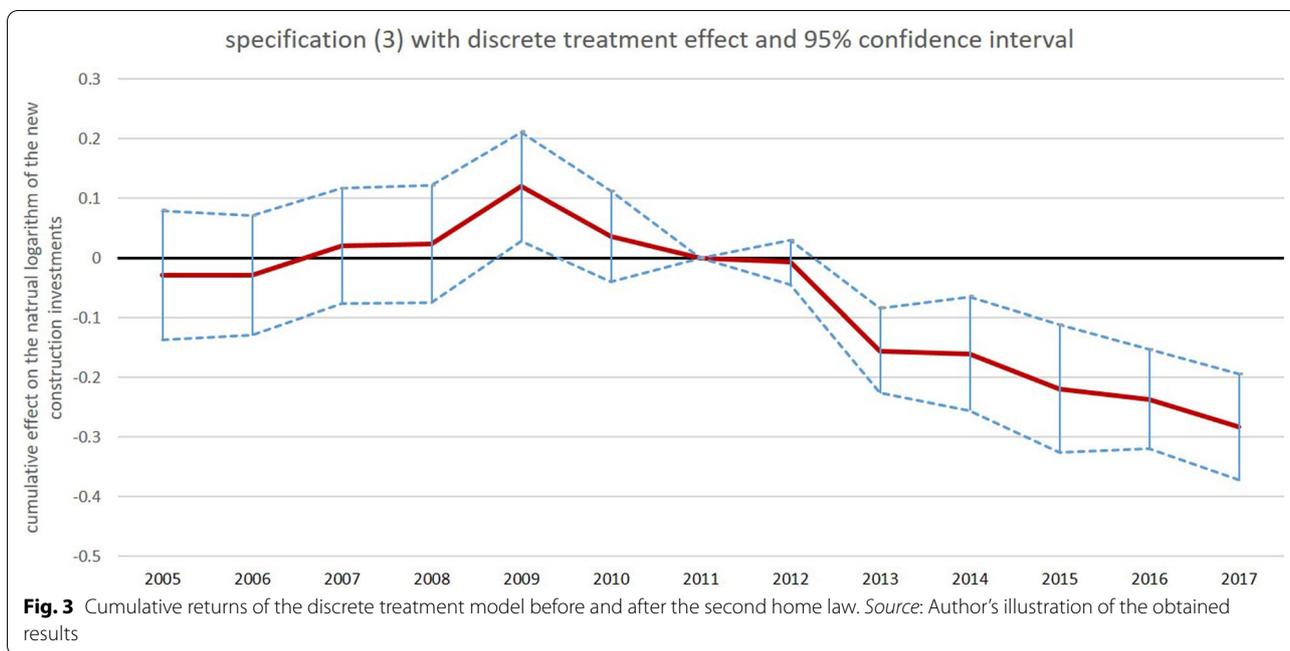
just after the second home restriction's application. This could be partially because non-profitable hotels could still be transformed into second homes as an exception of the enacted law. In a second moment, starting with 2017, the number of available hotel beds increased again. Such a delay in growing supply is plausible for the fact that new hotel projects require a longer time period to be developed than private housing. No significant effects on the homeowners' household income was noticed in the municipalities to which a second home restriction applies. In the end, it can be expected that in the case of a future lack of new second homes, it could become more attractive for interested persons to buy existing second homes and renovate the structures according to their needs.

7 Conclusions

The results of this research confirm the negative impact of the second home law on new construction investments. Proportionally, municipalities where there is a higher second home share and, consequently, where the business of second home construction used to be an important economic branch have been more affected by the law. The higher the proportion of already existing second homes, the larger the effect is. On the other hand, no significant effects of higher renovation investments were observed in the analysed period. Considering

Fig. 3 Cumulative returns of the discrete treatment model before and after the second home law. *Source*: Author's illustration of the obtained results

Fig. 4 Cumulative returns of the continuous treatment model before and after the second home law. *Source*: Author's illustration of the obtained results

the ageing of the investors in the second vacation home construction wave in the 1980s, it can be expected that many old second homes will soon be inherited or alternatively placed on the market and will be subject to larger renovation investments by new homeowners in the next years.

A great worry of touristic leaders and policymakers in the hotspot municipalities during the political debate was the expected negative impact of this law on several branches of the local economy in this mostly peripheral regions. This is because they expected a negative impact on tourism of the second home restriction in general. As such, in "Appendix 4", data from the FSO tourist accommodation statistics on overnight stays in touristic accommodations in the Swiss municipalities were studied. The observed effects are low-level variations, and hardly any of the considered municipalities reported large decreases or increases in the number of overnight stays, which would have caused a large negative or positive impact on the industry of managed accommodations.

In conclusion, the second home restriction has helped fight excessive construction and building in extensively occupied touristic towns in the mountains, significantly reducing investments in new constructions without leading to greater negative impacts on tourism in the short-run period. Such a segmentation of the market helps to lower the housing prices in touristic areas, making it affordable for the residents and local working population to settle in these towns. The questions of whether the second home act has had the desired impact on landscape protection in the Swiss mountain regions, and more generally, what have been the middle- and long-term effects on the local economy in the alpine regions can be investigated in future studies. Last, it could be interesting to study economic impacts on borderline municipalities that have alternated between being subject to and not subject to the second home restriction when a larger time series of annual second home registry data are available.

Appendix 1: Construction permit's validity according to cantonal laws
See Table 3.

Appendix 2: Renovation investments (average per group)
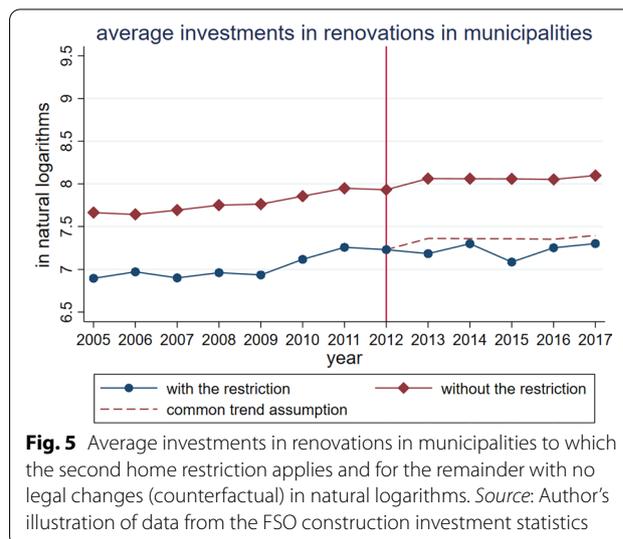See Fig. 5.

Fig. 5 Average investments in renovations in municipalities to which the second home restriction applies and for the remainder with no legal changes (counterfactual) in natural logarithms. *Source*: Author's illustration of data from the FSO construction investment statistics

Table 3 Construction permits validity according to cantonal legislation

Canton	Permit validity—work start latest *X* years after acceptance	Maximum years from acceptance to complete works (if defined)
Aargau	2	
Appenzell Ausserrhoden	2	
Appenzell Innerrhoden	1	3
Basel-Landschaft	2	
Basel-Stadt	3	
Bern*	3	
Freiburg	2	
Genf	2	
Glarus	1	
Graubünden*	2	3
Jura	2	
Luzern	2	
Neuenburg	2	
Nidwalden	1	
Obwalden	1,5	
Schaffhausen	2	
Schwyz	2	
Solothurn	1	
St. Gallen	3	
Tessin*	2	
Thurgau	2	
Uri	1	
Waadt	2	
Wallis*	3	
Zug	2	
Zürich	3	

* Cantons with a large number of touristic hotspot municipalities

Source: Cantonal construction laws

Table 4 Results of the discrete treatment estimates on other potential outcomes

Effects of the second home restriction on	(1) New construction	(2) Renovation	(3) New construction	(4) Renovation	(5) Housing prices	(6) Population	(7) Inter-cantonal migration	(8) Intra-cantonal migration	(9) Available beds in hotels	(10) Household income
Effect at reform	−0.007	0.042	−0.097	0.067	0.293	−241.531***	−7.536***	−21.416*	−10.217	−0.156
	[0.037]	[0.041]	[0.069]	[0.064]	[0.745]	[85.206]	[2.410]	[11.477]	[6.812]	[7.208]
Effect after 1 year	−0.155**	−0.087	−0.205***	−0.002	1.518**	−317.912***	−8.653***	−26.547**	−13.049	−0.283
	[0.071]	[0.064]	[0.054]	[0.061]	[0.710]	[114.601]	[2.193]	[13.151]	[8.309]	[7.323]
Effect after 2 years	−0.160*	−0.046	−0.223***	0.062	−1.509	−388.949***	−9.868***	−33.167*	−15.379	−0.936
	[0.095]	[0.063]	[0.082]	[0.067]	[1.092]	[141.481]	[3.258]	[17.012]	[9.636]	[7.312]
Effect after 3 years	−0.219**	−0.226***	−0.201**	−0.181***	−0.277	−457.633***	−15.786***	−37.769**	−20.002*	3.908
	[0.107]	[0.060]	[0.098]	[0.066]	[0.707]	[168.137]	[5.918]	[17.116]	[11.625]	[13.100]
Effect after 4 years	−0.236***	−0.089	−0.202**	−0.041	−0.330	−522.531***	−15.312***	−49.107**	−23.642*	3.242
	[0.083]	[0.056]	[0.081]	[0.089]	[0.544]	[191.699]	[5.847]	[21.646]	[13.524]	[12.941]
Effect after 5 years	−0.283***	−0.178*	−0.245**	−0.131	−1.632***	−579.402***	−15.714***	−44.176**	−20.927	2.799
	[0.089]	[0.097]	[0.097]	[0.114]	[0.597]	[210.651]	[5.433]	[19.262]	[18.059]	[13.114]
Constant	10.513***	8.064***	10.197***	7.936***	103.690***	10,894.525***	214.487***	496.861***	116.133***	188.639***
	[0.017]	[0.009]	[0.408]	[0.171]	[0.200]	[110.647]	[5.643]	[3.731]	[9.041]	[1.688]
Observations	10,353	10,378	10,353	10,378	10,800	10,800	10,800	10,800	10,800	9768
Number of years	13	13	13	13	13	13	13	13	13	13
R-squared	0.784	0.760	0.793	0.773	0.132	0.998	0.984	0.971	0.991	0.539
Number of municipalities	921	921	921	921	921	921	921	921	921	897
Municipality fixed effects	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Canton by year effects	NO	NO	YES	YES	NO	NO	NO	NO	NO	No

Robust standard errors in brackets: ***p<0.01, **p<0.05, *p<0.1

Source: Results from the event study application on the second home restriction law

Table 5 Results of the continuous treatment estimates on other potential outcomes

Effects of the second home restriction on	(1) New construction	(2) Renovation	(3) New construction	(4) Renovation	(5) Housing prices	(6) Population	(7) Inter-cantonal migration	(8) Intra-cantonal migration	(9) Available beds in hotels	(10) Household income
Effect at reform	0	0.000	−0.002	0.001	−0.008	−3.726***	−0.102***	−0.284***	−0.219	−0.092
	[0.001]	[0.001]	[0.001]	[0.001]	[0.015]	[1.300]	[0.035]	[0.086]	[0.189]	[0.237]
Effect after 1 year	−0.002*	−0.002	−0.003***	−0.000	0.019	−5.054***	−0.110**	−0.355***	−0.324	−0.091
	[0.001]	[0.001]	[0.001]	[0.001]	[0.013]	[1.742]	[0.045]	[0.103]	[0.218]	[0.237]
Effect after 2 years	−0.003*	−0.001	−0.004***	0.001	−0.026*	−6.121***	−0.103**	−0.437***	−0.301	−0.098
	[0.002]	[0.001]	[0.002]	[0.001]	[0.013]	[2.108]	[0.052]	[0.128]	[0.223]	[0.237]
Effect after 3 years	−0.005***	−0.004***	−0.006***	−0.003*	0.003	−6.835***	−0.184***	−0.446***	−0.265	0.196
	[0.002]	[0.001]	[0.002]	[0.002]	[0.006]	[2.302]	[0.057]	[0.126]	[0.242]	[0.436]
Effect after 4 years	−0.007***	−0.001	−0.007***	−0.000	−0.002	−7.809***	−0.170***	−0.621***	−0.349	0.197
	[0.002]	[0.001]	[0.002]	[0.002]	[0.011]	[2.602]	[0.063]	[0.192]	[0.255]	[0.435]
Effect after 5 years	−−0.008***	−0.004**	−0.009***	−0.003	−0.014	−8.384***	−0.173***	−0.443***	−0.236	0.164
	[0.001]	[0.002]	[0.002]	[0.002]	[0.010]	[2.683]	[0.061]	[0.150]	[0.207]	[0.443]
Constant	10.510***	8.064***	10.197***	7.936***	100.407***	8,978.364***	163.928***	424.274***	13.293	187.196***
	[0.018]	[0.009]	[0.408]	[0.171]	[0.194]	[1,849.699]	[57.073]	[63.700]	[114.730]	[5.683]
Observations	10,353	10,378	10,353	10,378	10,800	10,800	10,800	10,800	10,800	9768
Number of years	13	13	13	13	13	13	13	13	13	13
R-squared	0.785	0.760	0.793	0.773	0.362	0.998	0.986	0.973	0.994	0.550
Number of municipalities	921	921	921	921	921	921	921	921	921	897
Municipality fixed effects	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Canton by year effects	NO	NO	YES	YES	NO	NO	NO	NO	NO	NO

Robust standard errors in brackets: ***$p<0.01$, **$p<0.05$, *$p<0.1$

Source: Results from the event study method application on the second home restriction law
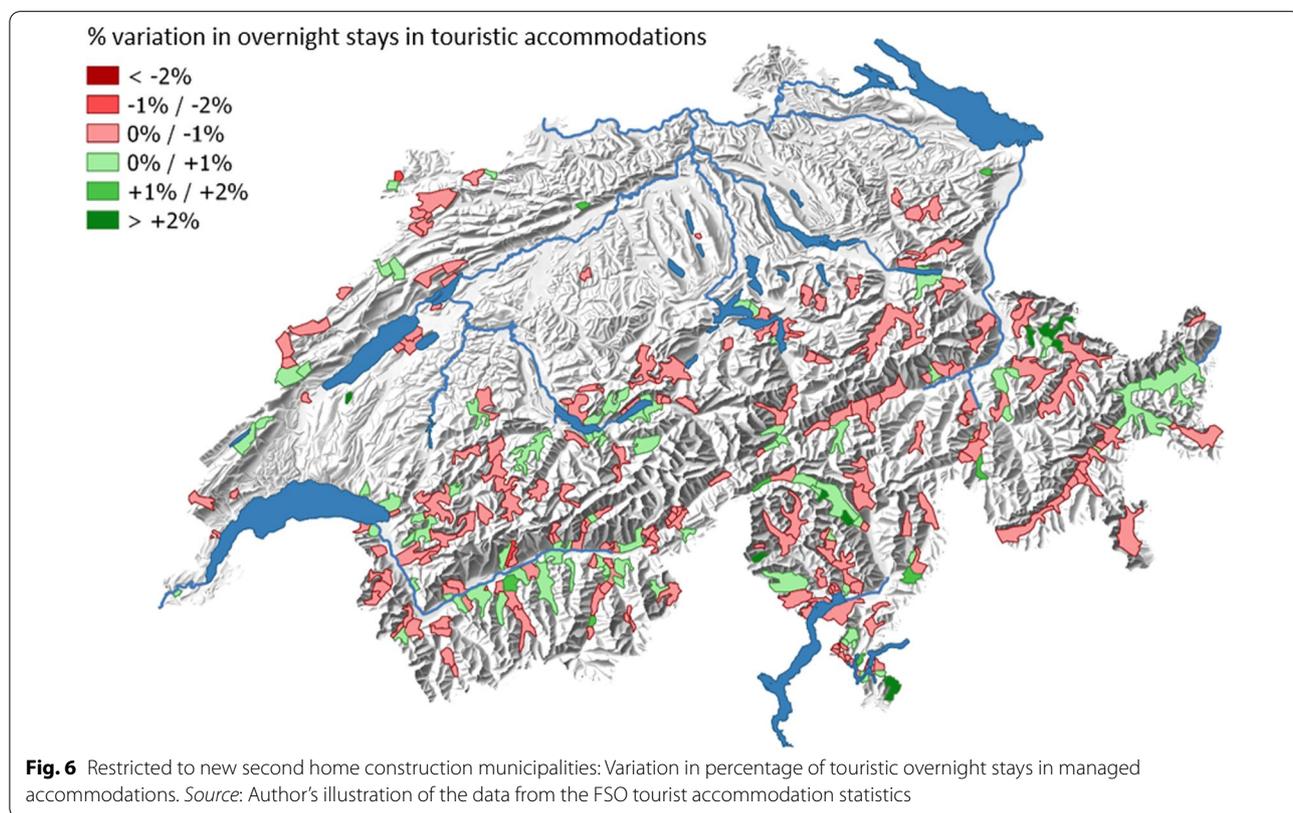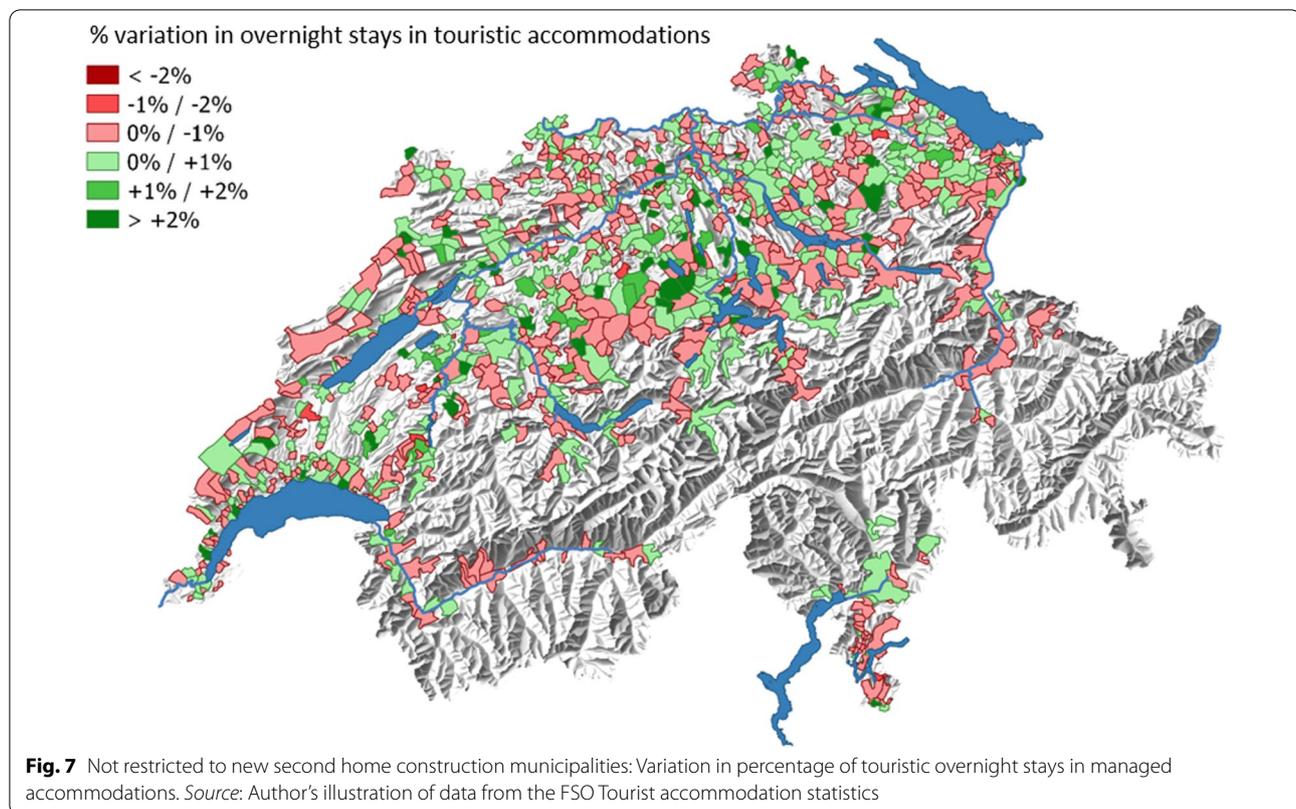
Appendix 3: Complete estimates output
See Tables 4 and 5.

Appendix 4: Variation of touristic overnight stays in managed accommodations in municipalities
The map (Fig. 6) compares the pre-treatment monthly average overnight stays in managed accommodations to those in the years after the law's adoption for the municipalities to which the second home restriction applies. For reasons of completeness, the variation in overnight stays of the remainder of the municipalities is shown in a second map in Fig. 7.

The main conclusion that can be drawn from this map is a notable shift of overnight stays in the most important touristic regions from the core municipality to the surrounding municipalities in the respective areas. Examples of this trend can be found in touristic areas such as the Zermatt, Davos-Klosters, Lenzerheide-Arosa, Adelboden-Lenk, Lago Maggiore and Lago di Lugano regions. A peculiarity is the Engadin region, where the upper part of the valley including towns such as St. Moritz, Celerina and Pontresina, reported decreases in overnight stays, while the internationally less known areas around Scuol-Tarasp in the lower part of the Inn Valley reported more overnight stays in the observed post-treatment period.

Fig. 6 Restricted to new second home construction municipalities: Variation in percentage of touristic overnight stays in managed accommodations. *Source*: Author's illustration of the data from the FSO tourist accommodation statistics

Fig. 7 Not restricted to new second home construction municipalities: Variation in percentage of touristic overnight stays in managed accommodations. *Source*: Author's illustration of data from the FSO Tourist accommodation statistics

Abbreviations
ARE: Federal Office for Spatial Development; DiD: Difference-in-difference; FSO: Federal Statistical Office; MTMC: Mobility and Transport Microcensus; SPA: Spatial Planning Act; SECO: Swiss State Secretariat for Economic Affairs.

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Availability of data and materials
The data that support the findings of this study are available from the Swiss Federal Office of Statistics (FSO) and Comparis but restrictions apply to the availability of these data, which were used under license for the current study, and so are not publicly available. Data are however available from the authors upon reasonable request and with the permission of Swiss Federal Office of Statistics (FSO) and/or Comparis.

Declarations

Competing interests
The author declares that he has no competing interests.

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