Policy Evaluation: Labour Market Liberalization, Unemployment and Second Home Construction. Evidence from Switzerland

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To my family

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Introduction

Introduction

This thesis is composed of three different chapters focusing on labour market policies and the construction industry. The first two parts analyse the employment effects of changing legislation, examining, first, labour market liberalization and, second, changing unemployment insurance law. The third chapter focuses on the effects of a second home restriction on construction activity.

In recent years, Switzerland has been characterized by a high rate of employment and a properly functioning social system ensuring high living standards for citizens. Several federal regulations provide space for cantonal authorities to design detailed, tailor-made applications of the common rules. This juridical hierarchy is important for all three chapters, where we address actual federal policies and laws that affect the Swiss economy in a heterogeneous way. Particular attention is therefore dedicated to the interconnectedness of the regions and cantonal peculiarities. In the first chapter, the attention to regional interaction is focused on the interdependence of labour markets, defined in a commuter stream matrix, while the second chapter compares the similarities of regions based on a predefined set of variables. In the last chapter, cantonal legislation is discussed an important factor that defines the non-homogeneous delay in the full effects of the new second home law in the cantons.

From a theoretical point of view, the three chapters contribute to the microeconomic composition of the production function. In effect, the last part of this dissertation focuses on the negative shock of a politically caused reduction in the production of construction firms, in other words, an external shock on the output side. Through further development of the input aspect of producer theory and a focus on labour as one of the production inputs, it is possible to explain firm-side employment decisions, which define the labour demand. The first chapter is an applied study of the effects of exogenously caused rising costs of production input "labour", as well as

the shift of the bargaining power of employees towards the employer side due to market liberalization; this shift was a result of growing competition within the workforce. Last, the middle part of the dissertation focuses on the labour supply side, studying the incentives of unemployed people to accelerate their job searches when the opportunity costs of long-term unemployment rise.

The following section summarizes the general production function and labour market decision, discussing the literature that provides a basis for the chapters composing this work. To start, we recall the formulation of the production function:

$$q = f(E, K)$$

The definition of production is given by the utilization and transformation of the two employed inputs, labour (E) and capital (K). Labour is defined based on employee hours, in other words, the product of hired workers and daily working hours (Borjas, 2005). This kind of production function is of a neoclassical character. Capital and labour are treated as imperfect substitutes in the production process, and they can be substituted with each other only up to a certain degree (Bosworth, Dawkins, & Stromback, 1996).

An associated concept of the production function is the formulation of the marginal product of input factors. Focusing on labour input would lead to the definition of the marginal product of labour (MPE). The MPE returns the gains in productivity that the firm obtains from the hiring of an additional employee. Based on the assumption that the MPE initially increases and then decreases with the number of employees, the second part of the decreasing marginal product is the consequence of the law of diminishing returns. This is the same law that, complementary to some other determinants, limits the number of employees that are hired by firms. With non-decreasing marginal productivity, any firm would hire an infinite number of workers. As a consequence of this marginal productivity behaviour, the average productivity also initially increases and eventually decreases with a delay with respect to marginal productivity (Borjas, 2005).

Another important concept that helps understand hiring decisions and the design of the optimal output in a firm is profit maximization. In a simplified way, the profit equation for a perfectly competitive firm is as follows (Borjas, 2005):

$$Profits = pq - wE - rK$$

where (p) is the unitary output price of the final product (q), labour hours (E) and capital (K) are the quantities of inputs used in the production, and (w) and (r) are their respective prices per unit. Perfect competition implies that the firm cannot act on the prices on the considered markets; therefore, the only way to react to changes is to alter the quantities (Borjas, 2005). For the topic of analysis, the focus of the first chapter is on the quantity of the employed workforce in the production process, or simply how many persons the firm hires, when the cost of labour rises. The policy researched in the third chapter instead would lead to an exogenous limitation of the output quantity (q) (in terms of construction investments).

To analyse the employment decisions of firms, economists define the short run as a period that is long enough to vary the labourers but not the quantity of capital employed in the production process. The long run instead allows adjustments in capital and labour as a consequence of changing exogenous factors. The very long run allows further changes, not only of inputs but also to technology. (Bosworth, Dawkins, & Stromback, 1996)

Furthermore, to understand the interaction of labour demand and supply (important for chapter 2), it is worth introducing the matching model. This model explains the factors influencing both sides, i.e., firms and workers, in the decision-making process. One of the advantages of this model is that it enables the coexistence of vacant jobs and unemployed workers.

Following a microeconomic path, we can set a variable (e_i) that measures the effort that an unemployed person takes during the job search, for example, the number of applications sent for vacant jobs. With a large number of vacant jobs (V) on the market, the number of hires can be expressed in the following way:

$$M = V\left\{1 - exp\left[-\left(\frac{\overline{e}\,D}{V}\right)\right]\right\}$$

where (D) is the number of job seekers, ($\bar{e}$) is the average level of job search effort of all individuals and (M) is the number of matches achieved on the market. According to this, one who invests greater personal effort in the job search has a higher personal chance of being hired (Cahuc, Carcillo, & Zylberberg, 2014).

Moving from the matching function to an aggregate level, two assumptions need to be taken into account. First, the matching function has constant returns to scale, and second, only unemployed workers search for a job ($U = D$). Furthermore, we need to introduce the term labour market tightness (θ), which is defined as the number of vacant jobs (V) divided by the number of unemployed persons (U). The exit rate of unemployment (hazard rate) is therefore an increasing function of (θ). Further, we need to add a job destruction rate (q) to the model, and it is possible to draw the variation in the stock of unemployed persons ($\dot{U}$) (Cahuc, Carcillo, & Zylberberg, 2014):

$$\dot{U} = \dot{N} + qL - \theta m(\theta)U$$

The variation in unemployment in this case depends on the growth of the labour force ($\dot{N}$), the number of persons who have lost their jobs (qL) and the number of persons who were unemployed and found a job in the meantime ($\theta m(\theta)U$). Writing this equation by applying the law of motion of the rate of unemployment and solving for the stationary value of the unemployment rate (u), we obtain the equation determining the Beveridge curve (BC) (Cahuc, Carcillo, & Zylberberg, 2014):

$$u = \frac{q + n}{q + n + \theta m(\theta)}$$

Considering that ($\theta = v/u$), the linkage provides us with the equilibrium of worker flows between employment and unemployment in the plane (v, u) (Cahuc, Carcillo, & Zylberberg, 2014).

For the firm side of this contracting, the goal is to maximize profits. Two assumptions are required to develop the problem: job destruction is an endogenous decision, and the real interest rate (r) is given exogenously. In this constellation, the firm can choose between two situations, i.e., employed or vacant, with each resulting in a different profit. The discounted future profits from employing somebody can be written in the following way (Cahuc, Carcillo, & Zylberberg, 2014):

$$r\Pi_e = y - w + q(\Pi_v - \Pi_e)$$

where $(y - w)$ is the instantaneous profit of the firm (w = wage; y = production output) and $(q(\Pi_v - \Pi_e))$ is the average gain of the job possibly changing state. (Cahuc, Carcillo, & Zylberberg, 2014)

On the other hand, we can write the returns a firm could achieve simply by keeping a position vacant. In this case, the discounted profit would be:

$$r\Pi_v = -h + m(\theta)(\Pi_e - \Pi_v)$$

In this formulation, $(-h)$ is the instantaneous cost of a vacant position. The remainder of the equation includes the average gain of a potential change in the state of the vacant position being occupied. Following this, assuming that the expected profit of a vacant job is strictly positive and adding the free entry condition ($\Pi_v = 0$), the two equations can be equalized to obtain the equation defining labour demand (Cahuc, Carcillo, & Zylberberg, 2014).

$$\frac{h}{m(\theta)} = \frac{y - w}{r + q}$$

The second component of the labour market considers the counterpart of the worker that wants to maximize his or her expected utility. For this, some assumptions are required: the expected utility of an employee is at least as high as that of an unemployed worker ($V_u \leq V_e$), and workers are risk neutral (linear utility function). In this way, the expected utilities for both situations of employment status can be obtained (Cahuc, Carcillo, & Zylberberg, 2014):

$$rV_e = w + q(V_u - V_e)$$

$$rV_u = z + \theta m(\theta)(V_e - V_u)$$

A particularity of the above equation is that (z) includes the benefits of being unemployed, which could be, for example, insurance contributions or social welfare transfers (a variable strongly influenced by the policy change discussed in chapter 2).

These two components, i.e., firm and worker decision making, lead to bargaining that determines the way the surplus of the production process is divided among the two counterparts. For this aim, we introduce a variable $\gamma \in [0,1]$ that reflects the bargaining power of the worker and is complementary to the firm's bargaining power. In this way, it is possible to combine the two components to obtain the wage curve (WC) that defines the relationship between wage (w) and tightness (θ) (Cahuc, Carcillo, & Zylberberg, 2014):

$$w = z + (y - z)\Gamma(\theta) \quad ,with: \quad \Gamma(\theta) = \frac{\gamma[r + q + \theta m(\theta)]}{r + q + \gamma\theta m(\theta)}$$

The exit rate from unemployment ($\theta m(\theta)$), and therefore ($\Gamma(\theta)$), increases with (θ). In the same way, ($\Gamma(\theta)$) decreases with the exit rate from employment (q). In this way, the WC explains an increasing relationship of wages and employment (Cahuc, Carcillo, & Zylberberg, 2014).

The above introduced dynamics of the matching model can be presented graphically (see Figure 1) to discuss the possible effects of changing wage policies and their impact on different variables in the system affecting employment status. The first graph shows the equilibrium wage (w^*) and market tightness (θ) in a system in which the WC equals the labour demand (LD). The WC shifts upwards with higher unemployment benefits (z), higher worker bargaining power (γ) increasing productivity (y) and matching of unemployed individuals (m). The same curve instead shifts downwards if the employment exit rate (q) and real interests (r) increase. LD is affected positively by higher productivity (y) and increasing matching function (m). LD shifts downwards in response to a higher exit rate (q), higher real

interest rates (r) and higher expenses for vacant positions (h) (Cahuc, Carcillo, & Zylberberg, 2014).

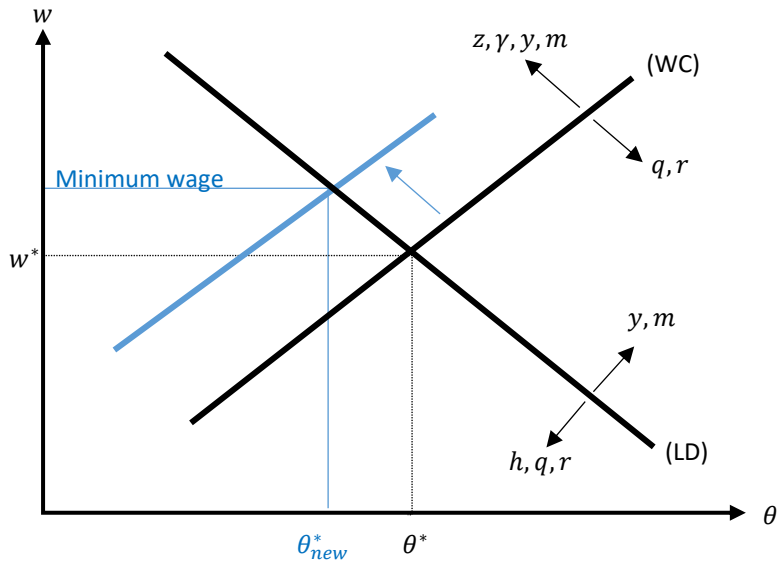

Figure 1. Negotiated wage and labour market tightness.

Source: Cahuc et al. (2014): p. 596, with author's amendments.

Focusing on the effects of higher minimum wage in the framework of the labour market liberalization, in addition to the increasing minimum wages, we need to address the shift of bargaining power away from the workforce towards the firm. As shown in the graph (Figure 1), a higher minimum wage alone would cause an upwards shift of the WC, up to the new higher wage level, and a decrease in the tightness (θ) value. This would be the effect when all other possible factors are excluded and it is assumed that there will be no productivity growth for higher efficiency or perhaps longer working hours (which itself would lead to an upwards shift in labour demand and establish the equilibrium at a point that reduces (θ) less). In the case studied in chapter 1, the effects of higher minimum wage are limited since labour market liberalization reduces the bargaining power of employees and acts in the opposite way to the minimum wage effects (a downwards shift of the WC). On the

other hand, in the case of a reduction of unemployment benefits (z) (as studied in the second chapter), the WC also moves down, which would lead to higher tightness (θ).

To understand the effects of the studied policies on unemployment, we will now focus on a second graph (Figure 2). This graph explains the effects in more detail, with the line starting at the origin, which reports the dynamics from Figure 1. The angle of the x-axis of the graph increases with the tightness (θ). In other words, the line is steeper when productivity (y) and matching (m) increase. On the other hand, it is flatter when unemployment benefits (z), worker bargaining power (γ), costs of vacant positions (h), real interest rates (r), or employment exit rates increase. The curve in the graph, representing the BC, shows the relationship of unemployment and vacant jobs in the plane. The BC shifts downwards in response to an improved matching process (m). In contrast, it shifts upwards if the exit rate of employment (q) increases and if the workforce grows at a higher rate (n) (Cahuc, Carcillo, & Zylberberg, 2014).

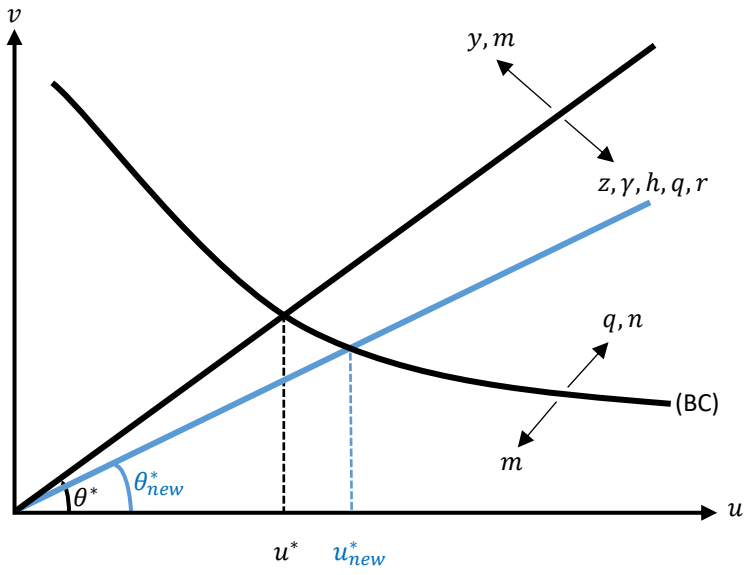

Figure 2. Vacant jobs and unemployment.

Source: Cahuc et al. (2014): p. 597, with authors' amendments.

In our case, considering the new situation in Figure 1, an increasing minimum wage level would lead to a higher general wage level and a lower value of labour

market tightness (θ^*). Thus, the line in Figure 2 will adapt in response to the rising minimum wages and be flatter than the original line. The BC would not be affected by this policy change, and therefore, the unemployment rate would increase. The loss of bargaining power of employees due to the liberalization of the labour market would cancel out this minimum wage effect to a certain point.

The second effect is that the vacancy rate (v) and, consequently, the number of vacant jobs will decrease. This effect is derived from the first point, where increasing wages lower a firm's profits, which also lowers the expected profits from a filled job. This profit is equal to the average cost of an unoccupied job and therefore causes the firm to lower the number of jobs offered on the market (Cahuc, Carcillo, & Zylberberg, 2014).

In the "real world", where it is not possible to exclusively examine a changing variable, the impact of increasing minimum wages could have different effects than an increase in unemployment. In an economy with growing productivity, for example, the LD could shift upwards in addition to the WC shifting upward, and the result would be a higher wage level and only marginal variation in the labour market tightness. This would result in a situation with an identical unemployment rate and vacant job ratio. Alternatively, an even more extreme situation would occur if the higher productivity (or other factors that impact positively on employment) would more than compensate for the effect of the higher wage, as the employment effect would ultimately be positive (the higher minimum wage leads to higher employment). A second point to mention is the initial ratio of labour market tightness, which affects the strength of the impact of a new wage policy on vacant jobs and unemployment. Imagining an initial situation with a high labour market tightness (many vacant jobs and low unemployment), through the convex BC, the impact of a higher minimum wage would lead to a high reduction in the number of vacant jobs by firms, but the impact on the unemployment rate would be relatively small. The opposite scenario would occur if the initial situation were characterized by a low tightness value, as the

effect would be a small reduction in vacant jobs but a stronger impact on the unemployment rate.

Imagining a reduction in unemployment benefits (z), the consequently higher tightness (θ) would result in a lower unemployment rate (u^*) and a slightly higher vacancy rate (v), which naturally depends on the shape of the BC.

The following chapters present three different empirical studies using different research methods to apply these theoretical models from producer theory. First, we investigate the interaction of higher minimum wages and employment in the context of labour market liberalization. Second, we study the consequences of a reduction in unemployment insurance benefits on the unemployment rate. Finally, the effects of an exogenous reduction in production output are quantified and discussed.

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Chapter 1

Impact of Labour Market Liberalization on Minimum Wage Effects: the Case of the Construction Sector in a Small Open Economy

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Abstract

The objective of this article is to estimate the impact of the application of the bilateral agreement of Free Movement of Persons between Switzerland and the EU-15 countries on the labour market outcomes in the Swiss main construction sector. The analysis happens in the context of increasing minimum wage levels in the industry. The included treatment variable, the minimum wage bite, is compared to the growth of sectoral employment. We conduct two specifications of a Difference-in-Difference (DiD) model, controlling for different characteristics and spatial spillover effects. The results show that the introduction of the Free Movement of Persons reduced the growth rate of employment in the construction sector compared to the growing minimum wage bites, considering the cantons as a box. The results for the specification, including spillover effects, suggest that the employment variation in construction is guided in large part by the local and interregional economic trends. While in open market construction firms do not dispose of instruments to cover higher wages, a country sealing off its markets from an interconnected economic space could pay minimum wages above the marginal productivity of its workers. Making use of an exogenous institutional change, we contribute to the evolving international literature that examines minimum wage effects on labour market outcomes.

JEL codes: C33, J31, J38, J61

Keywords: minimum wage; construction sector; spatial heterogeneity; labour market outcomes; Switzerland

1. Introduction

The Swiss main construction sector is highly regulated compared to the remainder of the economy. A collective labour agreement (CLA) - Landesmantelvertrag (LMV) - ensures minimum wages and employment conditions for all construction employees. In addition, the construction sector recruits a significant part of its low-skilled workforce abroad.

The objective of the article is to estimate the effects of the opening of the Swiss labour markets towards the European Union (EU) and the relative impact on the growth of the labour market outcomes (employment) compared to the variation of the minimum wage bite in a context of rising minimum wages over time. The bilateral application of the Free Movement of Persons Agreement (FZA) by the EU and the Swiss Confederation and the consequently higher worker mobility changed the way in which minimum wage floors affect the functioning of the Swiss construction labour market.

The treatment in this research will be measured regarding the effect that the minimum wage bite, which is the quota of workers in this period earning below the minimum wage of the upcoming year, has on employment. The source of the changes in the treatment variable derives from the rise of the minimum wage level for unskilled employees in the main construction sector. The external shock we want to analyse is the application of the FZA agreement which impacts on the relationship of the minimum wage bite and employment effects. The spatial unit of the study is the cantonal level (NUTS – 3). Furthermore, cantons are used to control for spatial heterogeneity.

Our findings show that because of the application of the FZA in June 2002, the growth rate of employment was lower than the minimum wage bite growth. Considering employment effects, the impact of changed minimum wage bites were different, depending on the chosen specification. The analysis is conducted using a base model and six variations of the model, including different controls as well as

spillover effects of the economically interconnected cantons (defined as economic neighbours). The first four models control for different variables (economic structure, firm size and wage dispersion), and all these variables are included in the last model. The last two models control for potential spillover effects of neighbouring cantons, including more or fewer control variables.

This paper makes two contributions to the literature. First, using both a panel data approach and an approach including neighbouring effects, we contribute to the evolving international literature that examines minimum wage effects on labour market outcomes. Second, we focus on the Swiss context, enriching the ongoing research on European cohesion policy. The studied labour market liberalisation focuses specifically on the construction industry, employing both low-wage and high-wage earners and a significant share of the foreign workforce.

We use nationally representative data from the Swiss Labour Force Survey (SLFS)[1], which is conducted every year by the Swiss Federal Office of Statistics (FSO). This survey provides data on workers' characteristics, such as working hours, earned wages, working places and sector of activity. In addition to this database, information on annually valid minimum wage levels for unskilled employees in the construction sector was extracted from the LMV databases. These are published every year on a cantonal basis by the Swiss constructors' association (Baumeisterverband SBV).

Our analysis of the impacts of the FZA in the Swiss main construction sector is structured as follows. Section 2 reviews the literature concerning minimum wages and economic liberalisation. Section 3 introduces the institutional setting, describes the data and our measures of minimum wages in Switzerland. Finally, it formalises the model and the variations. The results are discussed in Section 4, and Section 5 presents concluding remarks.

[1] Swiss Labour Force Survey (SLSF) 1999-2016, source: BFS: Schweizerische Arbeitskräfteerhebung (SAKE).

2. Literature Review and Theory Development

This paper contributes to the recent literature, combining two different streams of research in a joint Difference-in-Difference (DiD) model. From the methodological point of view we try to contribute to the broad DiD literature. We follow the approaches widely discussed by Abadie (2005) and Author (2003), as well as the important application of Card (1992), which helps to refine the research strategy of the present work. Last we refer to the contribution of Bertrand *et al.* (2004) with important implications on the detailed empirical strategy. As novelty we analyse the impact of the labour market liberalization in a classic minimum wage and employment effects model. For this aim the following part tries to reappraise the existing literature in the two fields and to highlight the relevant parts for the analysis.

2.1. Minimum Wage Bite and Wage Effects

A broader literature refers to the impacts of minimum wages on the labour market, this subject has been extensively researched during the last decades. A review of the literature on this topic is in detail explained in the book of Cahuc *et al.* (2014).

From a theoretical point of view, minimum wages can have an effect in two ways: on the one hand, the introduction of minimum wages can lead to transitional labour market flows (Mortensen and Pissarides, 1994) and job matches under a certain productivity level are destroyed. Moreover, the introduction of minimum wages may change the optimal combination of firm and worker characteristics.

On the other hand, the introduction of minimum wages may have an effect on equilibrium outcomes. If a minimum wage is above the reservation wage before its introduction, it simply deletes jobs. Moreover, if the minimum wage implies a lower level of salaries, it conducts to a lower level of direct job-to-job transitions (van den

Berg and Ridder, 1998). Finally, the effect depends on the elasticities of job search and of vacancy creation. The final effect is therefore not clear ex ante, and for this reason there are several empirical approaches.

Vom Berge and Frings (2019) model the effects of a minimum wage introduction in the several districts of the German economy. Their benefits are to include spatial spillover effects and to use the minimum wage bite as treatment variable, both factors that our model considers in a similar way.

Recent literature, for example for Canada (Brochu & Green, 2013), Portugal (Portugal & Cardoso, 2006), United States (Dube *et al.*, 2010) and on Germany (Bachman *et al.*, 2012), in summary state that the employment effects of minimum wages are probably small or inexistent for total employment. Only the weaker part of the workers could be affected, justifying the focus on the bite for the research. (Kampelmann, Garnero, & Rycx, 2013). Consequently, the minimum wage bite (the bite calculated on the next year's minimum wage) is an adequate measure because it best captures the marginal employees that are at highest risk of unemployment.

Dolton *et al.* (2012), in their analysis of the impact of minimum wages on employment and inequality, relied on the minimum wage bite as a variable of analysis: they illustrate their reasoning and justification for the adoption of the minimum wage bite in the analysis. Their explanations, using a structural econometric model, consist of two equations, which were already suggested in the previous literature by Card (1992) and Stewart (2002). The first of the two equations takes up the concept of labour demand. It describes the move of the employment rate (ΔE_j) along the labour curve with the set wage level. In other words, employment is defined as a function of the wage. In the second equation, a form of identity, the wage variation, is a function of the proportion of the low-paid workers (P_j). Substituting the second equation in the labour demand equation, the equation changes as follows (Dolton, Bondibene, & Wadsworth, 2012):

$$\Delta E_j = \gamma_0 + \eta\alpha_1 + \beta P_j + \varepsilon_j$$

where ($\beta = \eta\lambda$), and (λ) is assumed to be positive, implying that (β) has the same sign as (η), and according to economic theory, both are negative. In other words, a higher proportion of low-paid workers, in our case, contributing to a higher bite, would result in a negative variation of employment (Dolton, Bondibene, & Wadsworth, 2012).

Steward (2002) sets the precondition for identification of this model as the proportion of the low-paid workers (P_j) being a predetermined instrument for the endogenous wage change. We discuss this precondition, which implies that an endogenous variation of the bite through variation of the workforce composition can be neglected, in the next Section. In our research, the bite is consequently defined to be affected by changing minimum wage policy and economic conditions, but not through more than proportional growth of the low-wage workforce.

2.2. Effects of Labour Market Liberalisation

Favre (2011) follows the approach of analysing the competition among workers along the entire wage distribution as proposed by Dustmann *et al.* (2013) and shows that the competition between natives and immigrants are at the two tails of the wage distribution. This approach is in contrast to the earlier literature in the field that presents the correlation of the mean wage variation in response to the market liberalisation across spatial units. Data from the years preceding 2011 provide evidence about the changes in the education level of immigrants in Switzerland. Due to the labour market liberalisation between Switzerland and the European Union, highly skilled workers also started to be attracted. This trend is also emerging in the wage distribution, where immigrants have been recently overrepresented in the low and high wage classes (Favre, 2011).

Our analysis, focusing on the correlation between average wages and employment with the minimum wage bite growth, follows the standard literature.

Nevertheless, the insights gained from the work of Favre (2011) are useful for the understanding and interpretation of the results. A further distortion is that not each region is similarly attractive to immigrants, but they tend to allocate in areas with an already high presence of other immigrants of their nationality. This might attract more immigrants from countries with languages different from the Swiss national languages. In addition, a second issue is the inter-regional mobility of workers, which can cause employees to move from one place to another with less competition in earnings.

A work published by Gilpin *et al.* (2006) focuses on the effects of the European free movement of workers agreement on the UK labour market. The policy was implemented in a time of rising unemployment in 2005, and therefore, this was dealt with as one of the contributors to unemployment. The research finds no statistical evidence that the agreement was a contributor to the higher unemployment.

Focusing on the wage effects, the research takes into consideration the growth rate of the Average Earnings Index. For this comparison, there is low evidence of a fall in nominal wage growth in reaction to market liberalisation. No discontinuity in the wage growth rate was observed, and even for the missing counterfactual, it was not possible to find a significant effect of immigration on wages (Gilpin, Henty, Lemos, Portes, & Bullen, 2006).

Our hypothesis is that as a consequence of the liberalization of the Swiss labour market the median wage of the common space falls with respect to the minimum wages of construction. According to previous studies discussed by Neumark and Wascher (2008), this would lead to stronger minimum wage effects and put pressure on employment of this industry.

3. Material and Methods

3.1. The Swiss Construction Sector

According to the most recent data from 2016, the construction sector achieved a net product of 33.71 billion (bn) CHF overall. Compared to the nominal Swiss gross domestic product (GDP) of 650.11 bn CHF, this corresponds to 5.15% of the GDP. Regarding achieved revenues in 2016, civil engineering with 10.17 bn CHF slightly exceeded structural engineering, which reached revenues of 9.80 bn CHF. The entire construction sector employed 80,700 workers in September 2016, of which 65,400 were workers on the construction side, 10,800 technical and service employees and 4,600 trainees. The labour force was composed of 56% of foreigners (45,300 employees), compared to 35,400 native workers. The average wage achieved across the entire construction sector amounted to 5,765 CHF per month across all wage classes. (Baumeisterverband, 2016)

Concerning the percentage of GDP, the expenses for construction decreased over the years, reaching a minimum in 2008 as a consequence of the financial crisis, and registered a smooth increase since then. In contrast, the net nominal product of the sector increased overall, except for an expected slight reduction for the last year considered year 2016 in the data (Baumeisterverband, 2016).

It is essential to understand how the share of expenses on construction change in Switzerland. One point to focus on is undoubtedly the productivity of the workforce. Increasing productivity means that the output costs can be reduced, workers' wages can be increased, or the firm's profits can be higher. In a competitive sector such as main construction, the first two alternatives are the most plausible. According to the historical data (Figure 3), (real) labour productivity in the construction sector was increasing in the eighties, and then, starting in the nineties, no significant increments were registered.

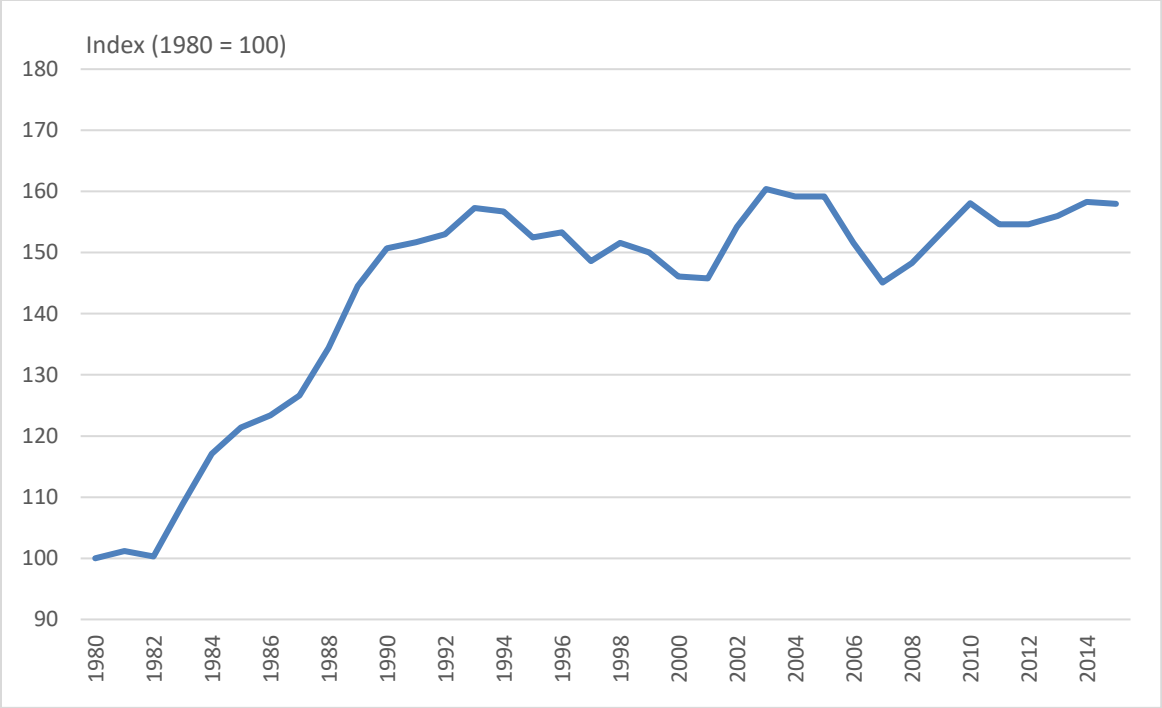

Figure 3. Labour productivity (real in full-time equivalents) in the Swiss construction sector.

Source: Data from BAK Basel - labour productivity in construction.

Remembering the three alternative effects of increasing productivity, it is worth focusing on the growing productivity of the workforce as a primary driver for wage growth. The trend over the past couple of years shows that the wages of employees in the construction industries were continuously growing over time. In real terms, compared to the inflation index, they grew (as shown in Figure 4 below). Since 2008, the wages of construction site employees (covered by the national collective wage agreement "Landesmantelvertrag" (LMV)), which will be the focus of this work, grew by 8.5%, on average, in real terms. Only supervisors' real wages grew even more (Baumeisterverband, 2016).

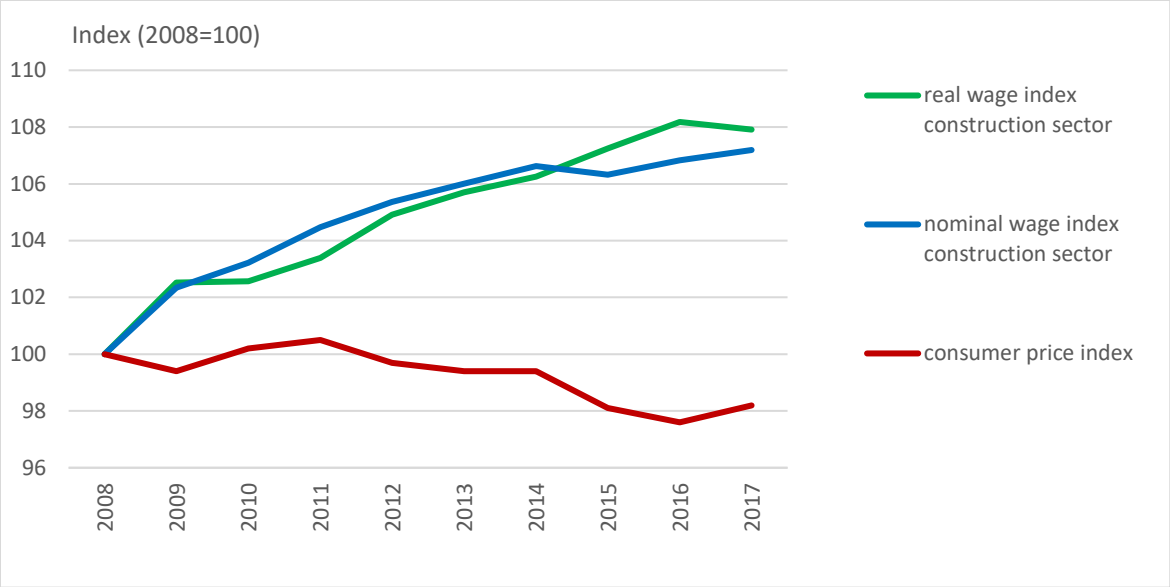

Figure 4. Wages in the main construction sector and inflation.

Source: Swiss Federal Office of Statistics (SFO) – real and nominal wages in construction and consumer price index.

A further possibility for a firm facing higher labour costs is to forward the additional expenses directly to the consumer market. Giupponi and Machin (2018) therefore checked for this possibility in their study on minimum wages in the care home industry. Figure 5 compares the indexed growth of the prices of the construction industry and the indexed growth of the minimum wages in the sector. We can divide the period into two parts. The first covers the years preceding 2008 and presents a significant relative growth of minimum wages, which is linked to growing construction prices. In the second period of the most recent years, construction prices stagnated on a stable level and therefore entailed a limited capacity to absorb higher wage costs, which were passed on to the consumer. The evidence from this data comparison suggests a partial absorption of the wage effect on employment and a lower employment effect than there would have been in the absence of this absorption.

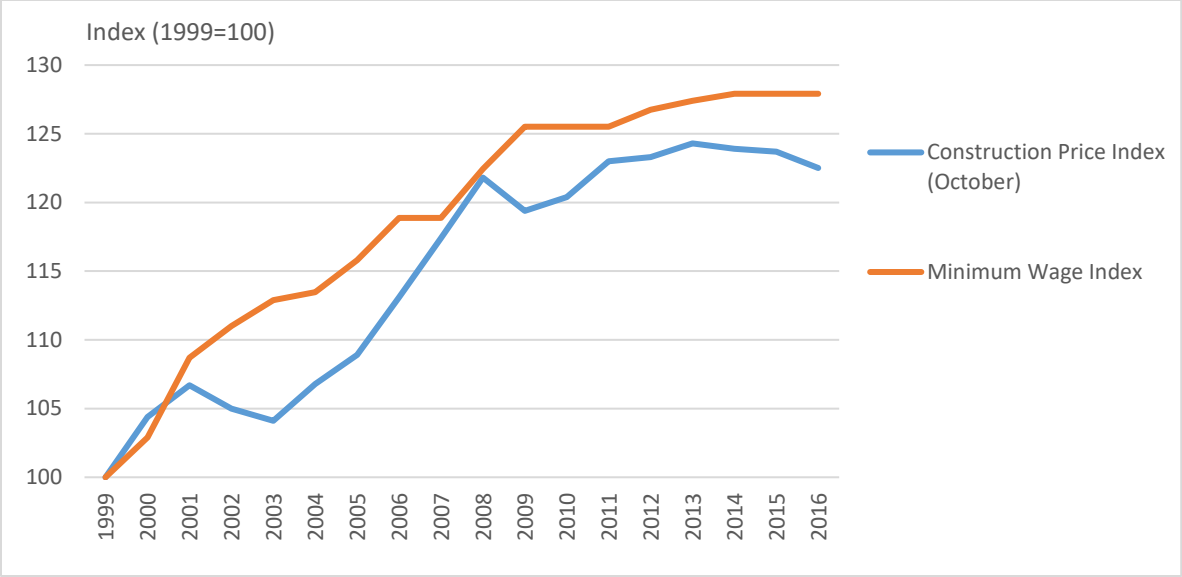

Figure 5. Minimum wage index in the construction sector and construction price index (month of October).

Source: Data from the Swiss Federal Office of Statistics (SFO) – construction price index and minimum wage data from the collective labour agreements of the Swiss constructors' association (Baumeisterverband).

Again considering the labour market outcomes, the hypothetically higher productivity of the workforce could be translated into a reduced requirement for the workforce to produce the same amount of output. For this reason, the next focus is on the number of employees in construction over time. Figure 6 below highlights the variability of the workforce in the Swiss main construction sector. The sector registered a drop in employment as a consequence of the real-estate bubble in the nineties and grew afterwards until 2014. In the last few years, employment fell again. Most of the growth was registered in the finishing construction segment, a part of the sector that does not apply minimum wages as proposed in the LMV. The main construction sector grew by less (Baumeisterverband, 2016).

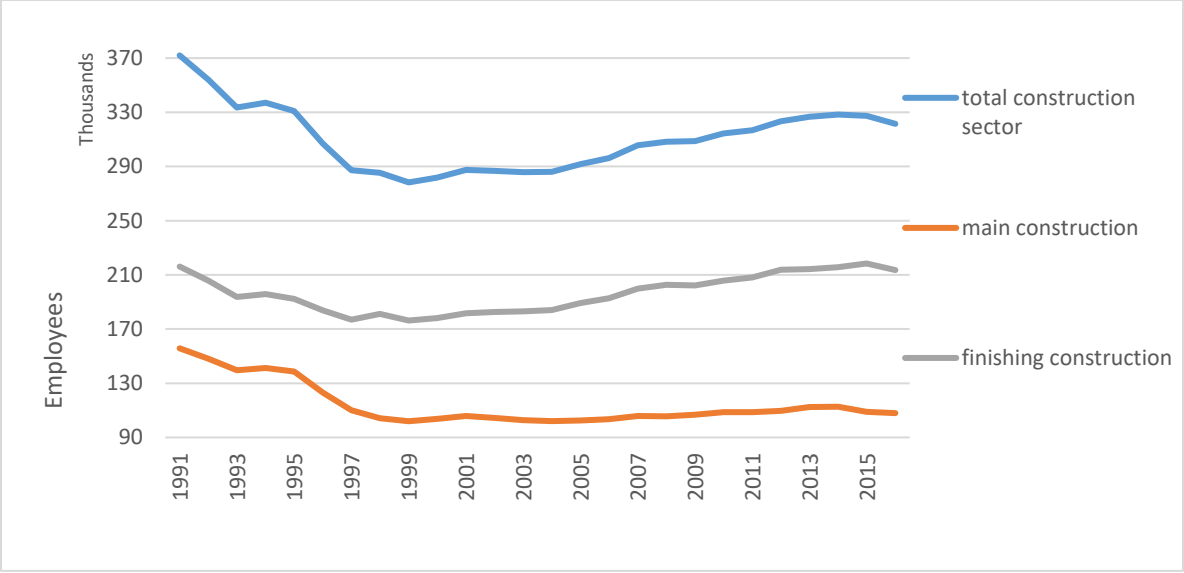

Figure 6. Employment (full-time equivalents) in the construction sector (in the third quarter of the year).

Source: Data from Swiss Federal Office of Statistics (SFO) – Job Statistics.

The main focus of this study is on the minimum wage variation as a result of higher pressure on the labour market. We need to limit the effect of a heterogeneous growth of the workforce in the sector that could endogenously affect the variation of the minimum wage bite. For this reason, we choose to analyse the growth of the low-wage and high-wage workforce compared to the total growth of the workforce in the construction sector in each of the Swiss greater regions (NUTS-2). Figure 7 shows these trends for Switzerland at the national level. Over the observed years, total employment in the construction sector grew. In addition, the data highlight that this growth was mainly due to the evolution in the high-earning share of the workforce, while the number of low-wage employees remained stable in the same period. This trend is valid for each of the greater regions of Switzerland. We can exclude from this point of view a rising minimum wage bite as a consequence of a more than proportional growth of the employment in the lower part of the wage distribution. Variations in the minimum wage bite, in this case, must be the result of the exogenous variation of the minimum wage level and the changing economic environment and conditions.

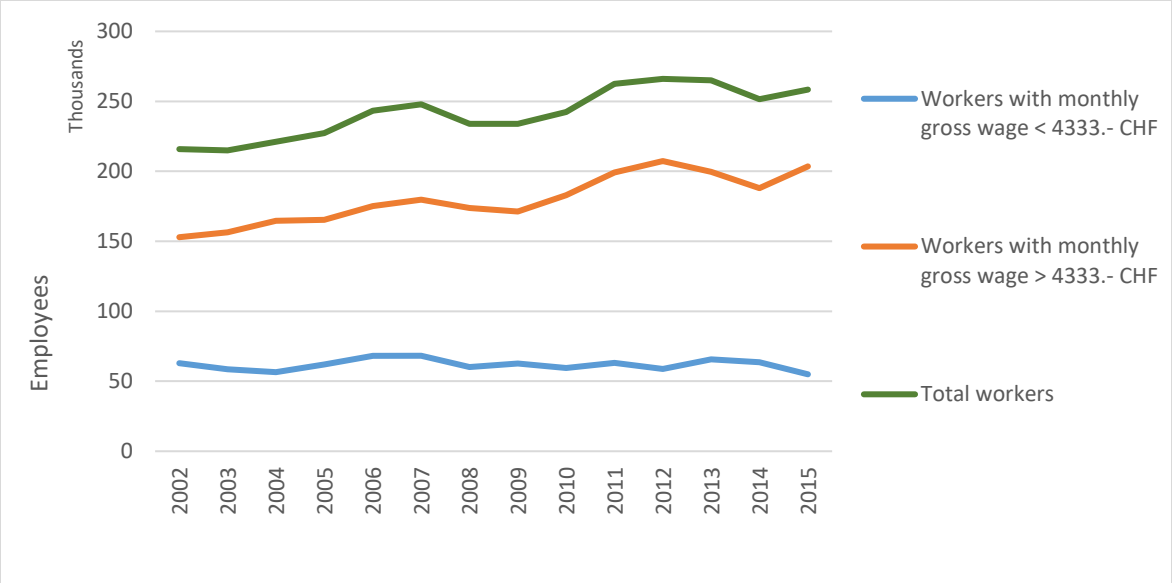

Figure 7. Employment in the construction sector in Switzerland, by wage classes.

Source: Data from Swiss Federal Office of Statistics (SFO) – Swiss Labour Force Survey (SLFS).

A crucial last factor is the educational level of the employees in the main construction sector because the lowest possible minimum wage applied to unskilled workers is the point of reference for this study. Therefore, unskilled workers are potentially most affected by varying minimum wages, particularly if the focus is on the lowest wage group. The increasing number of skilled workers in the labour force is due to the increasing complexity of construction sites. Many tasks require specialised skills to keep up with technological progress.

Moreover, in general, the quota of unskilled workers on the Swiss labour market is decreasing. Only the share of supervisors is nearly unchanged over the years. The exclusion of supervisors in the general trend towards higher-skilled workers is mainly because they execute jobs that are different from those of the two other groups of workers (office work rather than jobs on the construction site) (Baumeisterverband, 2016).

3.2. Free Movement of Persons Agreement (FZA) Switzerland – EU

In 1999, Switzerland signed bilateral agreements with the European authorities and countries, and the population approved them in May 2000. According to the bilateral agreement on Free Movement of Persons (FZA), all citizens of European countries have the right to freely choose their location of residence within the zone of all contractual partners. Additional components of the agreement were the coordination of the national social security systems and the mutual recognition of foreign professional diplomas.

The agreement was adopted gradually during a transition phase, and instruments such as priority to natives and contingency systems could still be applied unilaterally. These measures were also known as "valve clauses" to ensure a gradual and controlled merger of labour markets. For the original 15 EU nations, Malta and Cyprus, the agreement was to start on June 1st, 2002, and entered in full application in 2007, after which it was no longer possible to apply "valve clauses" (EDA, 2017).

In 2007, the border zones of Switzerland were abolished, and through this, a further limitation to labour mobility was removed (Verein-Grenzgänger, 2013). After this, even citizens from non-neighbouring countries could work in Switzerland with a cross-border commuter permit. This further policy change caused a second wave (after 2001/2002) of strong relative growth in the number of cross-border commuters in Switzerland.

To reduce violations against Swiss wage and labour conditions, supporting measures were applied in 2004. These measures made it possible to ensure that employers meet the conditions that are foreseen in CLAs and that foreign service providers maintain guidelines contained in the employee secondment law. Tripartite commissions are in charge of controlling and checking the application of these measures. The commissions are composed of representatives from public authorities, employers and labour unions. Their main task is to check for compliance with regular and CLA norms. The employment secondment law has been adapted continuously to

meet the requirements of a changing environment and growing zone of application of the Free Movement of Persons Agreement. In this way, the most recent refinements were taken in the inclusion phase when Romania and Bulgaria into the agreement (EDA, 2017).

4. Dataset

This study is based on data from the Swiss Labour Force Survey (SLFS) and supplementary and specific data about minimum wage levels for main construction workers in Switzerland; in addition, data from the Swiss Federal Office of Statistics (SFO) were used to define spatial parameters and regional peculiarities.

The first of the two primary data sources, the SLFS, is annually conducted by the SFO and has interviewed up to 105,000 subjects since 1991. The questionnaires include several features around the topics of employment, unemployment and the educational and professional background of the interviewees. Further questions cover geographic and sociodemographic issues. Social security, education and migration topics complete the survey. For this research, the variables that identify the sector and industry of activity of an employee, as well as the identification of the geographical unit (Switzerland's 26 cantons), are of particular interest. The core element for the aim of this research is the wages associated with the share of workers employed in the main construction sector. Those wages, however, are not revealed uniquely and therefore need to be standardised to guarantee comparability. All wages are counted as annual net wages to compare employees with salaries on an hourly basis and part-time employees with full-time wage earners.

The process of wage standardisation follows three principles, concerning the working hours per worker, the contributions of unemployment insurance (ALV) and the pension fund contributions. This SLFS microdata in the end was then aggregated into a cantonal panel data set, including both wage and employment indicators divided by year and cantons.

Moreover, taking into consideration the minimum wage for the main construction sector in accordance with the collective wage agreement (LMV), it is possible to draw a local minimum wage that formulates the reference independently of qualifications. The first national agreement was accorded during 1998 and officially enacted in January 1st 1999, for this reason construction minimum wages exist since then. These wages are divided into three different categories that take into account spatial heterogeneity. For cantons that are split up in two different wage categories (Bern, Schwyz, St. Gallen, Solothurn), following a precautionary principle, the lower of the two included levels was considered as a reference. The provided minimum wages are standardised according to the personal characteristics on an annual net level, following the same principles described above and according to individual characteristics, determined in this case by the spatial association with the canton of activity.

Finally, the merging of the two databases, including observations from years 1999-2016, allows for the construction of the final panel dataset including the determinants of all 26 Swiss cantons over a period of 17 years. The main variables for this panel define the economic structure, the importance of the construction sector in a particular region, and the workplace distribution among different economic sectors. The primary independent variable includes a reflection of the wage structure prevailing in the main construction sector. We focus on the effects of changing wage policies in the labour market, which are changing levels of employment in the sector. This issue is discussed with a particular focus on the theoretical part of this work. The variables consider the main construction sector's changing wage structure and the employment effect, which is formalised concerning a relative change in employment on a logarithmic scale. The second of these two variables, including all others except the main construction sector, is constructed similarly and then included as a further independent variable in the model.

When choosing the measure to analyse the effects of a given wage floor, researchers frequently have to deal with the minimum wage bite. This section is

devoted to the explanations that favour the choice of this measure to evaluate the impacts of defined wage policies.

As explained in detail by Kampelmann, Garnero and Rycx (2013), the Kaitz index (the relation of minimum wages to the overall wage distribution) is not the right measure for all issues, especially not for studying the impact of minimum wage policies. The minimum wage bite is the better choice for this aim. It focuses on a particular part of the wage distribution, namely, the employees earning wages at and below the minimum wage threshold. An interesting application of the bite consists of focusing on the effects of an increased minimum wage in a defined sector. Following the neoclassical models for the labour market, this would imply that workers in the minimum wage bite would lose their job if they were not able to increase their marginal productivity above the new wage. The variation of the bite is, according to this framework, a measure that helps understand the reaction of the firms. They still have the possibility to pass the higher production costs to the customer or to reduce their actual profits. Alternatively, as previously mentioned, the productivity of employees can improve, for example, by taking additional courses or reviewing the organisational structure of firms (Kampelmann, Garnero, & Rycx, 2013).

On average, across all observed years, 10% of employees are employed on a marginal wage basis – this means that they earn salaries that would be below the minimum wage the upcoming year (the minimum wage bite). This distribution is not homogeneous across the 26 cantons and is not persistent over time.

Each of the 26 cantons is grouped in one of the three "regions" that define the level of wages that apply to all employees of the sector (Figure 8). The highest levels are applied in the two cantons of Geneva and Vaud in the western part as well as the two cantons of Basel-Stadt and Basel-Landschaft. The lowest levels are applied among the cantons situated in the south-eastern part of Switzerland, Schaffhausen and Bern.

The evolution of the minimum wage levels in absolute terms for the three above-mentioned regions is presented in the following figure (Figure 9) for the entire period of analysis. The colours of the lines in the figure (Figure 9) correspond to the three regions in the map (Figure 8), with the darkest line applying the highest minimum wage level and the lightest one applying the lowest possible level in the region.

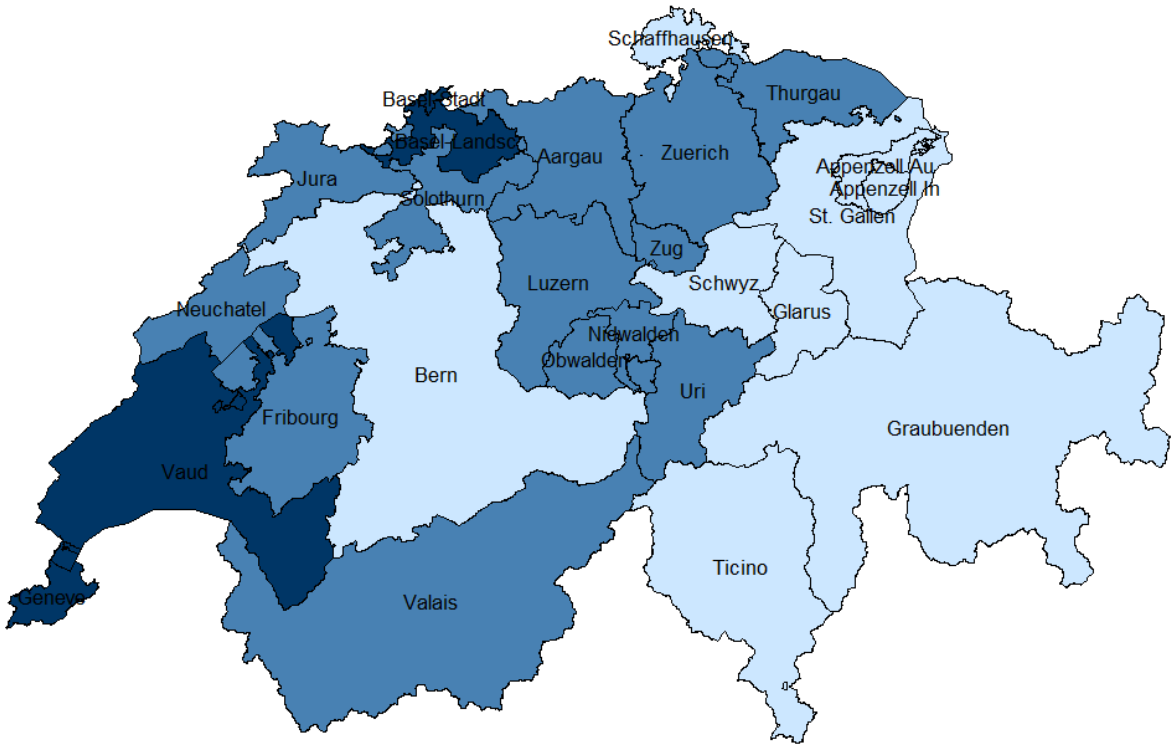

Figure 8. Regions with different minimum wage levels according to the collective labour agreement.

Source: Authors' illustration based on minimum wage data from the collective labour agreements of the Swiss constructors' association (Baumeisterverband).

Figure 9. Monthly gross minimum wages for unskilled workers in the construction sector 1999-2016, for each of the three regional minimum wage levels.

Source: Authors' calculations based on minimum wage data from the collective labour agreements of the Swiss constructors' association (Baumeisterverband).

The average annual net wage of employees in the main construction sector in Switzerland is 72,086 CHF, and it is 95,560 CHF for the other sectors in 2010. The share of employees in the main construction sector represents, on average, 3.5% of total employment. These values also change across cantons.

A factor that might influence the wage differentials across cantons is the different relative importance of the construction sector in the regions. A higher concentration of the construction sector can be explained in the less densely populated regions, as there is a relatively high requirement for civil engineering to maintain traffic and public infrastructure. Furthermore, regions with a low presence of workplaces in other industries and regions without any large centre offering services show a higher share of the construction sector in the regional economy.

5. Method and Empirical Strategy

The basis for the construction of the model is the approach proposed by vom Berge and Frings (2019), who focused on the introduction of a minimum wage in Germany and the effects on the labour markets, distinctly for Western and Eastern Germany. They combine the panel approach of Neumark and Wascher (1992) with the approach of applying minimum wage bites, as in Card (1992). According to vom Berge and Frings (2019), the post-treatment effects are different from the effects in the period preceding the exogenous shock. In their paper, they use the introduction of the minimum wage in 1997 in Germany. The cut-off for the present study is the application of the Free Movement of Persons Agreement in Switzerland in 2002 with the original 15 EU countries. Differential trends of the minimum wage effects are captured analogously in the pre-treatment period following Dolton, Bondibene and Wadsworth's (2010) study in the UK.

For the first estimation, we followed vom Berge and Frings (2019) but varied and adapted the specifications to explain the various effects of the policy adaptation on the labour market outcome. We further included a continuous time trend instead of the time fixed effects according to the research focus and because the impact of the policy application takes place across a more extended period after the policy introduction and concerns a smooth application of the labour market liberalisation, rather than a particular impact in time. This choice is based on the assumption that the effect we estimate is smoothly being adopted and not as a shock in a specific year.

The difference between the two models applied is that the first one considers the local economy in a box, while the second analysis includes spatial spillover effects from interconnected cantons. Both models have been tested for consistency, leaving out some of the included control variables.

The first part considers the control variables, which are specific to each canton without taking into account the interconnectedness of the regional labour markets within the same country. The model (in the results table 1 specification 5) includes

(y_{it+1}) describing the employment growth in region (i) (in our case cantons) in the time from (t) to ($t+1$), (d) is the indicator for the post-treatment effect (in this case, the introduction of the minimum wage). Similar to vom Berge and Frings (2019) we chose to use the growth of employment as dependent variable instead of levels since we are interested on the sign of the employment variation and not in describing what actually defines the stock of employees. (β^D) captures the treatment effect on the minimum wage. (x_{it}) instead would be the mean employment or wage growth in the other industries, except for all construction sectors. (μ_i) represents canton fixed effects and (λt) a continuous time trend. Furthermore, the variable (q_{it}) represents the ratio of secondary sector workplaces compared to third sector workplaces, and the variable (s_{it}) is constructed as the number of firms with 50 or more employees divided by the number of firms with less than 50 employees for every canton in every year. Last, a control variable (r_{it}) is constructed as the coefficient of the 25% quantile divided by the 75% quantile of the wage distribution in year (t) and canton (i). It is worth to remember that this control variable is calculated for the analysed year (t), differently from the computation of the minimum wage bite, which we calculate based on the wage distribution of the upcoming year ($t+1$) and therefore are not describing the same data. This last control measures the wage dispersion in the construction industry. We choose to include those variables in order to capture the peculiarities and to describe the structure of the local economies in the single cantons.

$$\Delta \ln y_{it+1} = b_{it}\alpha^D + (d \times b_{it})\beta^D + \Delta \ln x_{it}\gamma^D + q_{it}\delta + s_{it}\psi + r_{it}\phi + \mu_i + \lambda t + \epsilon_{it}$$

In our study, the focus is on the employment effects of labour market liberalization and not on wage redistribution, as in vom Berge and Frings (2019). The formulation focuses on the employment effects and the reduction of workplaces in response to higher minimum wages, again using the pre-FZA period for calibration and the post-treatment period to focus on this problem.

In addition to this model, four variations (specifications (1)-(4)), each considering only some of the variables and controls, are applied to check for the consistency of the results in specification (5) considering the cantons as single, closed entities.

The second model design, unlike the first, includes the possibility that variations in interconnected local labour markets affect neighbouring cantons. Borders among cantons are open and depend on the geographic position; mobility is rather high among some of them. It could therefore be a problem to analyse the effects keeping the cantons as separate units without taking into account the trends of their neighbours. This specification includes, in addition to the already included variables, average values of the independent variables from the surrounding cantons. We distinguish the direct effects (D), or the variable characterising the trend and situation in the analysed canton, and the indirect effects (I) that capture the impact of the average of the variables of all cantons being economically interconnected with the analysed one. The two variables (b_{it}) and (x_{it}) are averaged for all the neighbouring cantons (N) as a weighted average and included in the regression. Weights (f_{ji}) are constructed as the share of all inbound commuters towards canton (i) having residence in canton (j); these data come from the MZMV 2015[2] and are maintained fixed across the analysed period. We chose to include this kind of spillover effects for the present case rather than spatial econometrics since Switzerland has a particular topography and the constructed matrix of the commuter streams is more suitable to account for the relative interdependence of the local labour markets among the cantons. In this definition every canton is a neighbour of all the remainder and the larger the commuter stream is the "closer" this regions are by definition, independent of their geographical position. Adapting this as the baseline model, the following regression (specification 7 in the results table 1) can be written:

$$\Delta \ln y_{it+1} = b_{it}\alpha^D + (d \times b_{it})\beta^D + \Delta \ln x_{it}\gamma^D + \overline{b_{it}}^N\alpha^I + \left(d \times \overline{b_{it}}^N\right)\beta^I + \Delta \ln \overline{x_{it}}^N\gamma^I + q_{it}\delta + s_{it}\psi + r_{it}\phi + \mu_i + \lambda t + \epsilon_{it}$$

$$where: \qquad \overline{b_{it}}^N = \sum_{j=1}^{26} f_{ji} * b_{jt} \qquad and \qquad \Delta \ln \overline{x_{it}}^N = \sum_{j=1}^{26} f_{ji} * \Delta \ln x_{jt}$$

[2] Mobility and Transport Microcensus (MZMV) 2015, source: BFS/ARE: Mikrozensus Mobilität und Verkehr.

Similar to the baseline model, a variation of this model (in the results table 1 specification 6) is set up, again excluding the additional control variables, to test the results of the specification (7).

6. Results and Discussion

In Table 1, we report the results for the seven conducted scenarios formally introduced in the preceding section. We further include a continuous time variable (λt) to control for time-specific trends. A continuous time variable is the best choice for our problem set, because we are not interested in a significant event with a specific shock in one year but aim to control for the trend of the time component itself.

The results suggest a positive relationship across specifications (1) to (5) for the minimum wage bite (α^D) and the next year's growth of employment. No significant coefficients were obtained for models (6) and (7). If we therefore observe a growing minimum wage bite, in other words, a larger share of the employees being paid a wage lower than the next year's minimum wage, we will still observe growing employment. With the introduction of the FZA agreement, we include a second time the minimum wage variable as a post-treatment variable (β^D). What we observe across specifications (1) to (5) is a negative sign of the treatment effect. This means that with a growing minimum wage bite in the period following the introduction of the FZA agreement, employment does not grow further. Considering the following variables, we notice that the construction industry follows this trend in employment growth but less intensely than the remainder of the economy (γ^D). For all specifications, this is true, and the results are significant at the 1% level. For specifications (2), (5) and (7), we include a variable controlling for the economic structure (δ). The coefficients imply a negative impact on employment growth in construction. The more extensive share of secondary sector workplaces concerns the ones in the service sector. In specifications (3), (5) and (7), we include a variable (ψ) indicating the quotient of large firms (50 or more employees) and small firms (less

than 50 employees) in the construction industry. The results suggest a positive effect on employment growth if the share of large firms increases. These results are significant at the 1% level for specification (7) and at the 10% level for (5) and are not statistically significant for specification (3).

The last of the included variables, wage dispersion (ϕ), does not provide results at a significance level of 10% or lower. The sign of the coefficient suggests that a lower dispersion of wages would be connected to higher growth of employment. Less inequality of wages in construction, therefore, would promote employment growth. The remainder of the variables are the weighted averages of previously mentioned controls for neighbouring cantons. Considering coefficients (α^I) and (β^I) (neither result is significant at a level lower than 10%) for the trends in the neighbouring cantons, the sign is identical to the direct effect. Growing minimum wage bites in the pre-treatment period in the neighbouring cantons are connected to higher growth in employment in the considered cantons; similarly, the direct effect is reduced when applying the post-treatment variable for the neighbouring cantons as well (results not significant). In the end, (γ^I) establish a positive relationship between the growth of employment in the neighbours' economy (excluding the construction industry) and the employment growth in the construction industry of the considered canton.

Summarising these results, some important points can be observed. For the first five specifications (1) to (5), the minimum wage bite variation contributes significantly to the variation of employment in the construction sector. This is not true for specifications (6) and (7), where we do not look at the single cantons as a box but include spillover effects. Apparently, in those specifications, the variation of employment in construction is guided by the variation of non-construction employment in the canton of analysis and the neighbouring cantons, and in specification (7), the variation is additionally guided by the coefficients (δ) and (ψ). We can therefore say that the trends of employment variation in the remainder of the domestic economy and in the interconnected cantons absorb the employment effect of the minimum wage bite variation. To conclude, it is therefore important to keep in

mind that the mechanisms change in the two different analyses. First, we identify a significant effect of the minimum wage bite variation on the construction employment and a significant treatment effect of the policy change looking at the single cantons. Outside the box, both before and after the labour market liberalization, the employment effects are closely related to the economic trends and structural indicators of the local economy and the corresponding spillovers from all interconnected cantons.

In part with the obtained results we can accept for the Swiss case the original hypothesis that was formulated by Gilpin *et al.* (2006), who failed to prove the negative effect of the labour market liberalization in UK on employment. Furthermore, we can confirm the evidence from the collection of several works in the minimum wage literature, resumed by Neumark and Wascher (2008). Our results checks the main results from the main empirical works in their collection, that state that high minimum wages, which are close to the median wage have a negative impact on employment.

Table 1. Effects of the FZA on employment in the main construction sector.

Minimum Wage Effects in Main Construction - Effect on Employment

Specification number		(1)	(2)	(3)	(4)	**(5)**	(6)	**(7)**
VARIABLES		Baseline Model	Baseline Model with Econ. Structure var.	Baseline Model with Firm Size Index	Baseline Model with Wage Dispersion	**Baseline Model with all Controls**	Neighbour Cantons only	**Neighbour Cantons and all Controls**
Minimum wage bite	α^D	1.38**	1.38***	1.41**	1.38**	**1.47*** **	0.69	**0.82**
		[0.53]	[0.49]	[0.54]	[0.53]	**[0.48]**	[0.57]	**[0.51]**
TE Minimum wage bite	β^D	-1.43**	-1.37***	-1.49**	-1.43***	**-1.50*** **	-0.57	**-0.73**
		[0.51]	[0.47]	[0.54]	[0.51]	**[0.48]**	[0.55]	**[0.51]**
Non-construction employment differential	γ^D	0.46***	0.41***	0.46***	0.46***	**0.41*** **	0.37***	**0.34*** **
		[0.08]	[0.08]	[0.08]	[0.07]	**[0.08]**	[0.07]	**[0.07]**
Share of secondary sector workplaces	δ		-0.82***			**-1.04*** **		**-1.01*** **
			[0.27]			**[0.27]**		**[0.27]**
Firm size index	ψ			0.18		**0.46***		**0.64*** **
				[0.25]		**[0.23]**		**[0.20]**
Wage dispersion index	ϕ				-0.82	**-0.25**		**0.42**
					[0.89]	**[0.84]**		**[0.77]**
Neighbour's min. wage bite	α^I						0.85	**0.78**
							[0.83]	**[0.83]**
Neighbour's TE min. wage bite	β^I						-0.46	**-0.34**
							[0.76]	**[0.77]**
Neighbour's non-constr. employment diff.	γ^I						0.74***	**0.76*** **
							[0.18]	**[0.18]**
YEAR	λt	-0.01***	-0.02***	-0.01***	-0.01***	**-0.02*** **	-0.00	**-0.01*** **
		[0.00]	[0.00]	[0.00]	[0.00]	**[0.00]**	[0.00]	**[0.00]**
Constant		25.68***	33.38***	27.22***	28.79***	**40.32*** **	5.70	**19.18*** **
		[7.34]	[6.79]	[6.74]	[7.97]	**[6.69]**	[6.81]	**[6.37]**
Observations		409	409	409	409	**409**	409	**409**
R-squared		0.178	0.196	0.180	0.181	**0.205**	0.295	**0.323**
Number of Cantons		26	26	26	26	**26**	26	**26**
Canton FE		YES	YES	YES	YES	**YES**	YES	**YES**
Neighbour Cantons		NO	NO	NO	NO	**NO**	YES	**YES**

Robust standard errors in brackets

*** p<0.01, ** p<0.05, * p<0.1

Source: Authors' calculations based on wage and employment data from the Swiss Labour Force Survey (SLFS) and minimum wage data from the collective labour agreements of the Swiss constructors' association (Baumeisterverband).

7. Conclusions

The liberalization of the Swiss labour market with the adoption of the FZA agreement changed the employment effects of rising minimum wages in the construction industry. In the time preceding the introduction of the bilateral agreement in situations of rising minimum wage bites, employment continued to grow. As the labour productivity remained constant, the data suggest that the higher labour costs were forwarded to the consumers, implying higher construction prices, as long as the markets remained closed. The construction market allowed for larger margins and the possibility for the enterprises to absorb the higher wage costs. After the application of the bilateral agreements between Switzerland and the European Union, the dynamics in the industry changed. A higher minimum wage bite reduced the growth of employment in construction. Additionally, in the descriptive statistics, we observe stagnating construction prices. This means that in a liberalized labour market and additionally in a more open market, construction firms do not dispose of the instruments to cover higher wages for workers actually employed below the next year's minimum wage. Assuming that the actual wage of a worker would respect his marginal productivity, then a new minimum wage at a higher level would no longer justify the work relationship, and the firm would replace the employee. The observed results confirm that the liberalized labour market and, in general, open markets affect the employment decisions of the involved firms through higher competition. Therefore, in years with growing minimum wage bites, employment growth slows down.

In the opposite case, following the obtained results, a country sealing off its markets and labour markets from an interconnected economic space could pay minimum wages above the marginal productivity of its workers, imposing higher margins. In this case, the considered firms would forward the costs to the output, making the final consumer pay, and would therefore be able to maintain a larger workforce through the gained market power. A future application of the method could in this way study the specific context of the Brexit case and try to study whether the

conclusions from this work could apply to the opposite case and if the corresponding results would confirm a reversibility of the effects when disintegrating labour markets.

A further extension of this research could be the application of the methodology to an industry with a relatively low minimum wage. According to Neumark and Wascher (2008) the effect of the minimum wage on labour market outcome depends on the distance of the minimum and the median wage. Since the construction industry has a high minimum wage compared to the median, it could be interesting to extend this study into an industry with relatively low minimum wages. Moreover, many Central and Eastern European countries have national statutory minimum wage systems, which could be similarly analysed.

A limitation of this research is certainly that it takes several assumptions on the economic conditions during the analysed period. The effect was analysed in a box, not taking into account other shocks taking place in the meantime and might affecting each of the cantons in a heterogeneous way. And secondly the construction industry, offering standardized rules and data for all over Switzerland, constitutes only a small part of the entire economy, making it difficult to generalize conclusions for the remainder of the economic sectors.

Therefore, a deep analysis of the different effects of minimum wages constitutes scope for future research, as soon as larger and more complete data sets on this topic become available.

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Chapter 2

The Effect of Reduced Unemployment Duration on the Unemployment Rate: a Synthetic Control Approach

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Abstract

This paper examines the impact of the fourth partial revision of the law of unemployment insurance (AVIG) on unemployment dynamics in Switzerland at a cantonal level. The authors apply the Synthetic Control Method (SCM), a matching method for comparative case studies. A counterfactual analysis of the cases studied is performed by combining a control group of several untreated units, which provides a better comparison to the treatment group than a single unit. The control unit is designed as a weighted average of the available cantons in the donor pool, taking into account the similarities between the chosen controls and the treated unit. Once policy changes are controlled, the results suggest a significant effect on the unemployment rate at a cantonal level: the reform had a discernible impact on lowering the unemployment rate in the Italian- and French-speaking cantons in Switzerland.

JEL codes: C52; E24; J65

Keywords: labour market reforms; unemployment; treatment effects; Synthetic Control Method

1. Introduction

The present research attempts to contribute to the extensive literature on labour economics and social welfare, studying the effect of a revision of the unemployment law (AVIG) on the return on job of unemployed workers. The focus of the paper is on the fourth partial revision of the law of unemployment insurance in Switzerland in 2011. This law eliminated a previous measure to lengthen the maximum unemployment duration in disadvantaged cantons affected by the economic downturn. What we want to analyse is whether this shorter unemployment duration had an effect on the unemployment rate in Ticino, the most affected of the five cantons subject to the law's revision. The dataset consists of observations on the 26 Swiss cantons, and we analyse the unemployment rate, defined according to the standards of the Swiss State Secretariat for Economic Affairs (SECO)[3]. This standard is valid for the definition of the number of unemployed persons and the computation of the corresponding unemployment rate. Our treated unit is the canton of Ticino, which applied this measure during the pre-treatment period.

Other cantons that partially or entirely applied this optional extension were Geneva, Neuchâtel, Jura and Vaud. Since they experienced the same cut of the measure as the treated canton of Ticino, these four cantons were excluded from the control donor pool; thus, only 21 cantons remained eligible in this pool. Following the considerations of Abadie, Diamond and Hainmueller (2015), the Synthetic Control Method (SCM) was chosen because it works best with a dataset that contains few registrations on an aggregate level that are potential controls and in cases where the impact on the variable takes place on a regional level. Moreover, in a recent paper, Ferman and Pinto (2019) have proven that a modified Synthetic Control (SC) estimator is generally lower biased than the Difference-in-Difference (DiD) estimator.

[3] Registered unemployed are defined as persons who are enrolled at the regional placement service (RAV) and are immediately placeable, whether or not they benefit from unemployment compensations. The unemployment rate is calculated as the share of the unemployed divided by the total labour force, collected form the Swiss Federal Statistical Office (FSO) in the annual structural survey (https://www.arbeit.swiss/secoalv/de/home/menue/institutionen---medien/statistiken/definitionen.html).

For the study design, we considered seven different scenarios. We included and excluded various predictors and tested the composition of SC, as well as inferences for the post-treatment effects, in a graphic way for each specification. We applied an additional placebo test, following the approach proposed by Abadie, Diamond and Hainmueller (2015) and McClelland and Gault (2017). Our results show that the impact of the law revision led to a reduction in the unemployment rate in Ticino, while the unemployment rate for the SC displayed a similar trend in the years following the pre-treatment period. We can clearly see that the adoption of the law, which reduced the maximum unemployment insurance duration, had a substantial impact on reducing the unemployment rate in Ticino, reaching the lowest value since 1996.

The article is organised as follows. Section 2 reviews the previous works in the literature. Section 3 provides background information on the introduction of the fourth partial revision of the AVIG law and the economic conditions in Switzerland. Section 4 describes the SCM approach in detail from a theoretical point of view. It also describes the model and dataset as well as the seven different specifications applied in this research. Section 5 presents the results of the specifications and the placebo test for Ticino and the remainder of the treated cantons. In Section 6, robustness tests check for the results' validity. Section 7 comments on the results obtained in the canton of Ticino, and finally, Section 8 concludes.

2. Literature Review

In evaluating policy interventions, scientists refer to estimations in comparative case studies with aggregate databases. This implies an examination of a control group with the group of interest. One of the most famous studies with this setup is Card and Krueger (1994), who analysed the impact of minimum wages on employment in the fast-food industry, comparing the treated state of New Jersey to the control state of Pennsylvania. For the part concerning the rule of the maximum length of the

beneficiary period of the unemployment insurance on the exit rate from unemployment, Cahuc, Carcillo and Zylberberg, (2014) refer to a number of previous studies that confirm the outcome of their job search model. In particular, Meyer (1990) focuses on the behaviour of the unemployed in the period just before they reach the maximum duration of unemployment and notes an increase in the unemployment exit rate towards its end. Dormont Fougère, and Prieto (2001) distinguish by qualification of workers and point out the opportunistic behaviour of higher qualified French workers when leaving unemployment. In the Austrian context, Card, Chetty and Weber (2007) identify a difference between the exit rate from unemployment and the entry rate of employment, which diverges when reaching the maximum unemployment duration, this is a result of unemployed transiting into other labour market states, as training programs or leaving the active labour force completely. Last, Pellizzari (2006) attributes the scarce impact of policies reducing the unemployment benefit programs generosity on unemployment to the coexistence of other social assistance programmes, which makes recipients react in a less sensitive way on policy changes.

For the analysis of such problem sets, comparative case studies have significant potential, as many introduced policies take place on an aggregate level. Nevertheless, two weaknesses can be identified. First, there is ambiguity surrounding how the comparison groups are chosen. Second, in employing data on an aggregate level, estimating the effect without error is not always possible, as the counterfactual fit of the control group in reproducing the outcome variable might be biased by uncertainty. The idea behind applying a SC is that combining a control group of several untreated units provides a better comparison to the treatment group than a single unit (Abadie, Diamond, & Hainmueller, 2010). The clear advantage of constructing a SC to address this kind of problem is that the dataset is composed of few aggregate units, and therefore, a weighted average of all potential comparison units reproduces the characteristics of interest in the best way (Abadie, Diamond, & Hainmueller, 2010).

The essential features of the SCM are that the control unit is designed as a weighted average of the available non-treated units and that it takes into account the similarities between the chosen controls and the treated unit. The weighting technique also ensures that the control does not need to be checked for extrapolation problems. A second advantage of the method is that researchers do not have to know the impact on the variable of the treatment ex-ante, but any variable can be chosen to analyse a possible effect of an introduced policy on it (Abadie, Diamond, & Hainmueller, 2010).

Comparative case studies have been broadly applied in various fields, such as political science (Tarrow, 2010); labour market effects of migration, as described in Card (1990); and even economic costs of terrorist conflicts in Spain (Abadie & Gardeazabal, 2003). The potential of comparative case studies has grown with the availability of aggregated data. As described in Abadie, Diamond and Hainmueller (2015), the SCM applies best in studies with a limited number of untreated, eligible units for the control and in studies on impacts on the aggregate level, such as regions. Furthermore, a well-functioning model requires a sizable number of pre-intervention periods to reach a proper fitting and to ensure that the outcome of interest tracks the same trend as the SCM over a more extensive period.

In the introduction to their paper, Kaul, Klößner, Pfeifer and Schieler (2017) state that the "SCM involves the comparison of outcome variables between a unit representing the case of interest, i.e. a unit affected by the intervention, and otherwise similar but unaffected units reproducing an accurate counterfactual version of the unit of interest in the absence of the intervention. An algorithm-derived combination of precisely weighted comparison units is supposed to better depict the characteristics of the unit of interest than either any single comparison unit alone or an equally weighted combination of all or several available control units" (p. 2).

The SCM has thus been applied to diverse research topics, rapidly becoming an intuitive alternative for constructing counterfactual units. Athey and Imbens (2017) state that the SCM "is arguably the most important innovation in the policy

evaluation literature in the last 15 years" (p. 9). Applications of the SCM in an economic and political contexts include Nannicini and Billmeier (2011) as well as Billmeier and Nannicini (2013) (economic growth), Hosny (2012) (free trade), Jinjarak, Noy and Zheng (2013) (capital inflows), Acemoglou, Johnson, Kermani, Kwak and Mitton (2016) (political connections), Eren and Ozbeklik (2016) (right-to-work laws). Possebom (2017) as well as Gobillon and Magnac (2016), in particular, performed impact evaluations on enterprise zones.

Concerning theoretical contributions to the SC literature, Gardeazabal and Vega-Bayo (2017) find that the SCM estimator performs well in comparison to alternative panel approaches. Klößner and Pfeifer (2017) extend the SCM to the forecasting context, and Klößner, Kaul, Pfeifer and Schieler (2017) provide a critical note on the applied cross-validation technique applied in Abadie, Diamond and Hainmueller (2015). Developments of the SCM include Cavallo et al. (2013) as well as Dube and Zipperer (2015) (pooling multiple synthetic case studies), Li (2017) (modified SCM to estimate ATE), Galiani and Quistorff (2016) (a development of the synth_runner package to conduct placebo and inference) and Quistorff (2016) (corresponding instruction on the possible placebo tests). Finally, Firpo and Possebom (2018) analysed sensitivity and confidence intervals for the SCM, while Ferman and Pinto (2019) and Arkhangelsky et al. (2019) considered a demeaned SCM and synthetic DiDs.

3. The Institutional Context

In Switzerland, starting in 2003, the debt of the unemployment insurance system reached a level that demanded control in order for the system to prosper in the future. To address the debt problem, policymakers developed a recovery plan. In 2011, the accumulated debt reached 7.8 billion Swiss Francs. Consequently, the Federal Council raised insurance contributions. Additionally, a solidarity percentage was introduced for medium to high earning workers. These measures were enacted

starting in April 2011 and were a part of the fourth partial revision of the AVIG law. The primary purpose was the achievement of the balance of the revenues and expenditures of the insurance and the clearance of the structural debt and was achieved within one year. Later, in the period following the application of the new policy, the accumulated debt was reduced significantly. The austerity measures of the law's revision foresee a stronger connection of the contribution period to the possible beneficiary period. Additionally, several latencies have been augmented, and numerous individual cases for free treatment of beneficiaries have been reduced. The consequence is that the new measures have had impacts on various worker segments. Specifically, the expiration of the beneficiary period has been shortened for some profiles of unemployed persons. The policy change raised the expiration rate in the year of application, while in the longer run, the rate converged to a slightly higher level compared to the period before 2011.

The main issue of the revision was to design the revenues and expenditures of the unemployment insurance to achieve a balance, which should be independent of conjuncture. Cost cuts are achieved mainly through the adaptation of the beneficiary system of coverage that reduces beneficiary periods as well as the long wait time for compensation. At its core, the insurance principle is reinforced, and the labour market reintegration measures are designed more efficiently (SECO Staatssekretariat für Wirtschaft, 2013).

One of the main concerns of the debate was the effects on the unemployment rate. The revision could lead to a lower unemployment rate, as a higher share of unemployed persons would leave the workforce and no longer be statistically registered. This reduction in the unemployment rate would be artificial and distorted and not due to an actual improvement in economic conditions in the labour market. However, data show that the exit rate of unemployment did not change between the periods preceding and following the introduction of the new law. The effect of a temporarily higher exit rate from unemployment was inconsistent and observed only in the first months. Even the duration of unemployment did not fall below the level

of the preceding years. The duration increased only temporarily, as a momentarily higher concentration of long-term unemployed persons exiting from the labour force was registered (SECO Staatssekretariat für Wirtschaft, 2013). No significant differences among workers with different demographic profiles were identified. The only observation to mention is that younger workers were slightly more affected than elderly workers.

From a geographic point of view, the Italian- and French-speaking parts of Switzerland were more strongly affected by the law's revision than the German-speaking part; this was due to the omission of the measure to optionally lengthen the beneficiary period in cases of locally high unemployment rates, which affected those regions in particular. The SECO foresaw that the effects of the law's revision in the short run would reduce the unemployment duration and the unemployment rate marginally. At that time, no significant, long-term impact on these two variables was expected (SECO Staatssekretariat für Wirtschaft, 2013).

4. Methods and Empirical Framework

4.1. Data and Sample

Table 2 describes the included variables for Ticino and the cantons that, in the following computation, compose the SC for Ticino. (The complete table 8 for all cantons and variable definitions is reported in Appendix 1).

Table 2. Descriptive statistics for Ticino and cantons composing the SC for Ticino.

		Unemployment rates				Employment		Social indexes			Education
		SECO	ILO	swiss	foreign-ers	annual growth rate	tertiary sector share	assist-ance	poverty	median taxable income	maturity quota
	unit	*rate*	*rate*	*rate*	*rate*	*rate*	*quota*	*quota*	*quota*	*CHF*	*quota*
Canton											
Basel-Stadt	mean	3.738	4.038	2.814	5.672	0.007	0.718	6.144	11.067	52175	31.571
	sd	0.904	0.585	0.639	1.811	0.013	0.019	0.445	1.316	3022	8.651
Schaff-hausen	mean	2.978	3.444	1.993	6.172	0.009	0.680	2.367	5.144	49293	29.512
	sd	0.916	0.498	0.559	2.350	0.012	0.015	0.194	0.340	2819	7.377
Thurgau	mean	2.467	3.444	1.724	4.942	0.009	0.680	1.656	3.144	48495	23.141
	sd	0.740	0.498	0.488	1.769	0.012	0.015	0.124	0.159	3280	7.629
Ticino	**mean**	**4.283**	**5.869**	**3.325**	**6.517**	**0.014**	**0.752**	**2.078**	**8.833**	**44508**	**41.269**
	sd	**1.328**	**1.045**	**0.960**	**2.141**	**0.018**	**0.012**	**0.273**	**0.296**	**4279**	**7.898**
Valais	mean	3.811	6.356	2.800	7.532	0.016	0.809	1.456	3.156	41840	29.296
	sd	1.595	0.979	1.308	2.946	0.014	0.012	0.159	1.063	4166	6.627
Zürich	mean	3.417	4.025	2.514	6.146	0.011	0.830	3.344	5.333	55540	29.130
	sd	0.921	0.512	0.679	1.908	0.019	0.018	0.235	0.458	3766	6.031

Source: Official data on employment, unemployment, social structure and education from the Federal Statistical Office.

To develop the model, a number of data series from different sources were taken into account. In order to control for the seasonality of the data, we chose to take the second quarter of every year as a reference and to compare these quarterly data in the constructed cantonal panel data set. The reason for this choice is that each of the Swiss cantons has a different seasonality (most of them reaching the annual maximum during winter or summer months) in unemployment, and in fact, it is the second quarter, which fits best in comparing the realities for most of the cantons. The dependent variable is the unemployment rate, which is computed as an average of the three monthly datasets for the second quarter of each year (simple average of April, May and June), in order to be consistent with the remainder of the data. The unemployment rate is determined from data published monthly by the SECO. Furthermore, we included annual tax data from the Federal Tax Administration Office for each of the 26 Swiss cantons as covariates. We also list the quarterly unemployment rate, measured according to the definition of the International Labour

Organization (ILO) from the Federal Statistical Office (FSO). Other data refer to employment levels from the Swiss Labour Force Survey (SLFS), education indicators (high school degree quota), social assistance statistics (poverty index, social assistance), job statistics (labour force composition and unemployment structure) and the national account (gross domestic product per canton). All data come from various FSO statistics, on either an annual or quarterly basis.

4.2. Computational Issues: Constructing a Synthetic Control for Ticino

There are several challenges in constructing a SC for this case. In observing the time trends of the unemployment rate of each of the donor cantons and the treated canton of Ticino, the first issue is that the unemployment rates in Ticino were higher than those in the donor pool for most of the years in the pre-treatment period. This is clearly visible in Figure 10.

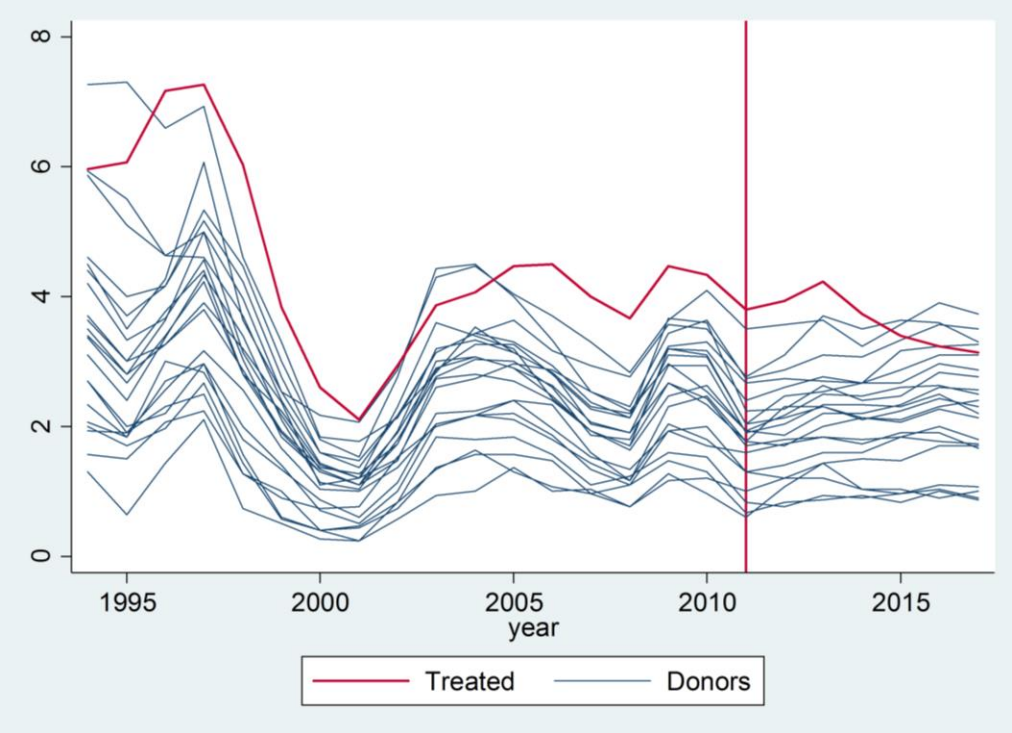

Figure 10. Unemployment rates (SECO) of Ticino (treated) and cantons in the donor pool.

Source: Authors' calculations based on unemployment data from the Swiss Secretariat for Economic Affairs SECO from 1995-2016.

Figure 10 helps us understand that the synthetic version of Ticino, combining different cantons from the donor pool, will not achieve the same high unemployment rate and therefore formulates a constraint to the SCM. In order to achieve a parallel trend for the outcome variable in the pre-treatment period of the synthetic Ticino we need to extend the standard SCM procedure described by Abadie, Diamond and Hainmueller (2015), who state that the outcome variable should produce similar trajectories over an extended period. We therefore demeaned the data on unemployment for all units. This SCM extension was proposed by Ferman and Pinto (2019) and helps to reduce the bias and variance of the SCM. Furthermore, as introduced by Doudchenko and Imbens (2016), through the demeaning of the unemployment data we can fulfil the no-intercept rule of SCM, making the treated and control cantons producing a feasible trajectory.

For the further SC computation, we excluded data from the cantons of Geneva, Neuchâtel, Jura and Vaud from the sample, since in the years preceding the AVIG law revision, thy applied the option of increasing the unemployment duration by 120 days in situations of high unemployment as well. This step is required for a clear distinction between treated and untreated cantons.

4.3. Specification of the Synthetic Control Estimator

We define seven different specifications and linear combinations of the pre-treatment outcome variables to be included in the estimation of the SC. We mainly follow the five specifications proposed by Ferman, Pinto and Possebom (2017), adapting them to the context of our research. We add the following variables to the predictors of the original specification:

(1) Original specification: no pre-treatment outcome values, only predictors

(2) Pre-treatment outcome mean: $X_j = [\sum_{t=1}^{T_0} Y_{j,t}/T_0]$;

(3) All pre-treatment outcome values: $X_j = [Y_{j,1} \dots Y_{j,T_0}]$';

(4) The first half of the pre-treatment outcome values: $X_j = [Y_{j,1} \dots Y_{j,T_0/2}]$';

(5) The first three-fourths of the pre-treatment outcome values: $X_j = [Y_{j,1} \dots Y_{j,3T_0/4}]$';

(6) Pre-treatment outcome values of even-numbered years: $X_j = [Y_{j,1}\ Y_{j,3} \dots Y_{j,T_0-1}]$';

(7) Pre-treatment outcome values of odd-numbered years: $X_j = [Y_{j,2}\ Y_{j,4} \dots Y_{j,T_0-2}]$'

where $\boldsymbol{T_0}$ = 2011 and $\boldsymbol{Y_{j,1}}$ the outcome of the year 1994.

5. Results and Discussion

Ferman, Pinto and Possebom (2017) recommend testing the composition of SC by considering different scenarios of predictors. In the results summary in Table 3 and the following sections, the results for each of the seven scenarios are listed and compared. Depending on the chosen scenarios, the synthetic version of Ticino is constructed as a mix of the cantons of Valais, Basel-Stadt, Zürich, Schaffhausen and Thurgau. The highest relative importance for the trend is the canton of Valais, whose labour market is similar to the one of Ticino, based on the chosen predictors. In section 6, placebo tests will determine the validity of this composition. For all scenarios, we obtain a rather high post/pre RMSPE ratio (comparing the post- and pre-treatment ratios of the mean squared prediction errors (RMSPE[4])). This indicates that for each specification, as the treatment was not assigned randomly, at least the same value could have been achieved with a probability of 60% (for the entire post-treatment period). This is unsurprising, as, in this period, the unemployment rate of Ticino continues to rise in the first two years and decreases only later. Only in this

[4] Ferman, Pinto, & Possebom (2017) follow a proposal of Abadie, Diamond, & Hainmueller (2015) who adopt a straightforward placebo test, as a possible inference procedure. Furthermore, they compute the test statistic, computing the RMSPE (ratio of the mean squared prediction errors): $RMSPE_j := \frac{\sum_{t=T_0+1}^{T}(Y_{j,t}-\widehat{Y_{j,t}^N})^2/(T-T_0)}{\sum_{t=1}^{T_0}(Y_{j,t}-\widehat{Y_{j,t}^N})^2/T_0}$

second step, its values are closer to the rates of the remainder of the cantons in the donor pool. More importantly for the overall post-treatment period are the p-values[5] of the probability of obtaining the unemployment rate by chance in every single year of the post-treatment period.

Table 3. Summary of the SC and placebo effects (p-values).

Summary Synthetic Control - Unemployment Insurance Reform							
	Scenario 1	**Scenario 2**	**Scenario 3**	**Scenario 4**	**Scenario 5**	**Scenario 6**	**Scenario 7**
RMSPE	0.4260	0.4661	0.4846	0.4494	0.5019	0.4692	0.523
W-weights controls							
- Control Zürich			0.430	0.072		0.232	
- Control Valais	0.524	0.534	0.570	0.565	0.568	0.591	0.552
- Control Thurgau	0.298						
- Control Schaffhausen	0.103	0.349		0.363	0.224	0.166	0.157
- Control Basel-Stadt	0.075	0.117			0.208	0.011	0.291
post/pre RMSPE ratio Ticino	1.61	1.53	1.53	1.79	1.53	1.39	1.54
p-values years after treatment							
1	0.857	0.667	0.650	0.571	0.600	0.700	0.650
2	1	0.952	1	0.857	0.950	1	1
3	0.095	0.095	0.150	0.095	0.150	0.150	0.150
4	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0

Source: Authors' calculations based SCM variables.

Summarizing, we can state that the probability of a randomly obtained value is high in the first two years after the AVIG revision, which is the period it took to have full impact on the unemployment rate. Therefore, in the first two years after the law's revision (time required to be fully adopted in Ticino) the probability of obtaining the

[5] Ferman, Pinto, & Possebom (2017, p. 10) propose to calculate a p-value to reject the null hypothesis of no effect. The test is conducted at a pre-specified significance level. In the specification, $\mathbb{1}$ is the indicator function of the event: $p := \frac{\sum_{j=0}^{J+1} \mathbb{1}[RMSPE_j \geq RMSPE_1]}{J+1}$

value of the synthetic Ticino by chance was almost 1. Starting with the third year, when the law's revision had a full impact, the p-values are lower and undermine that the unemployment rate was not decreasing by chance.

The second important point is to consider how the cantons that comprise the SC of Ticino are chosen from the cantons in the donor pool. In each of the scenarios, a different set of predictor variables defines how and how strongly the predictors influence the relative importance of a canton in composing the SC. In the composition of the SC version of Ticino, the characteristics that define the quality of the matching of every single variable predicting the SC out of the cantons in the donor pool are given by the V-weights matrix. This predictor weights of the SCM are calculated as a vector over the combination of the included predictor variables (weights are listed by scenarios in Table 4).

Table 4. Predictor V-weights in defining the SC from the cantons in the donor pool.

Variables Matrix V-weights – Quality of the prediction							
Predictors	**Scenario 1**	**Scenario 2**	**Scenario 3**	**Scenario 4**	**Scenario 5**	**Scenario 6**	**Scenario 7**
Unempl. % (ILO)	0.0029216	0.0126819	0.0251016	0.0003355	0.0178546	0.0608614	0.1030930
Unempl. % Swiss	0.0079965	0.0058136	0.0305801	0.0040307	0.0000000	0.0000061	0.0000427
Unempl. % Foreigners	0.0017593	0.1575096	0.1602247	0.2563659	0.0522683	0.4462761	0.0174129
Empl. growth	0.0524550	0.0104868	0.0050203	0.0910613	0.0101024	0.0882374	0.1116625
% of 3rd sector firms	0.5339663	0.1133374	0.0001609	0.0835999	0.0585871	0.0114713	0.0542441
% of social aid	0.2806241	0.5113206	0.0054987	0.0505141	0.1710640	0.1558218	0.2433129
Poverty index	0.0000026	0.0861157	0.0012954	0.0080217	0.0758434	0.0001324	0.1494127
Median taxable income	0.1195161	0.0272772	0.0063893	0.0397639	0.1014102	0.0549717	0.0596940
% of high school graduates	0.0007581	0.0201676	0.0541417	0. 0166663	0.0036179	0.0000641	0.0155404
SECO unemployment % (average 1994-2011)		0.0552891					
SECO unempl. % (1994)			0.1174882	0.0810530	0.0820655	0.0428916	
SECO unempl. % (1995)			0.0000000	0.0005544	0.1738635		0.1474132
SECO unempl. % (1996)			0.0000000	0.0000004	0.0071515	0.0036269	
SECO unempl. % (1997)			0.0806469	0.0095650	0.0006242		0.0054000
SECO unempl. % (1998)			0.1625513	0.3171984	0.0928863	0.0373949	
SECO unempl. % (1999)			0.0811219	0.0090562	0.1093570		0.0293314
SECO unempl. % (2000)			0.0002206	0.0084711	0.0241066	0.0013137	
SECO unempl. % (2001)			0.0035450	0.0035092	0.0048304		0.0016268
SECO unempl. % (2002)			0.0663867	0.0202324	0.0012570	0.0627973	
SECO unempl. % (2003)			0.0363450		0.0017574		0.0108765
SECO unempl. % (2004)			0.0518272		0.0071014	0.0287362	
SECO unempl. % (2005)			0.0000000		0.0008485		0.0497369
SECO unempl. % (2006)			0.0406707		0.0034017	0.0035184	
SECO unempl. % (2007)			0.0000000				0.0000000
SECO unempl. % (2008)			0.0059918			0.0003590	
SECO unempl. % (2009)			0.0430760				0.0011992
SECO unempl. % (2010)			0.0217150			0.0015189	

Source: Authors' calculations based on the SCM computation.

In Table 5, we further compare the predicted SCM predictor averages for each of the seven scenarios to the sample average of the predictors in Ticino. This simple

matching helps to understand the quality of the matching and prediction of the unemployment rate.

Table 5. Predictor weights in defining the SC from the cantons in the donor pool.

Synthetic control predictor averages compared to Ticino (predictor balance)								
		SCM	SCM	SCM	SCM	SCM	SCM	SCM
	Ticino	**Scenario 1**	**Scenario 2**	**Scenario 3**	**Scenario 4**	**Scenario 5**	**Scenario 6**	**Scenario 7**
Unempl. % (ILO)	5.25	4.78	4.82	5.14	4.89	4.96	5.07	4.97
Unempl. % Swiss	3.19	2.16	2.22	2.41	2.17	2.32	2.30	2.40
Unempl. % Foreigners	5.98	5.59	5.78	6.05	5.84	5.82	5.96	5.80
Empl. growth	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
% of 3rd sector firms	0.75	0.75	0.76	0.82	0.77	0.76	0.79	0.77
% of social aid	1.92	1.92	2.28	2.25	1.88	2.60	2.06	2.94
Poverty index	8.70	3.64	4.45	3.77	3.77	4.83	3.77	5.30
Median taxable income	46925	47342	47624	49827	47587	47634	48463	47946
% of high school grad.	43.87	29.74	30.98	30.96	30.86	31.09	30.92	31.19
SECO unempl. % (average 1994-2011)	4.01		3.59					
SECO unempl. % (1994)	5.97			6.12	6.03	6.33	6.16	
SECO unempl. % (1995)	6.07			5.88	5.76	6.04		6.09
SECO unempl. % (1996)	7.17			5.55	5.54	5.65	5.61	
SECO unempl. % (1997)	7.27			6.25	6.18	6.14		6.09
SECO unempl. % (1998)	6.03			4.54	4.46	4.39	4.50	
SECO unempl. % (1999)	3.83			3.17	3.08	3.02		2.99
SECO unempl. % (2000)	2.60			1.82	1.75	1.85	1.79	
SECO unempl. % (2001)	2.10			1.67	1.64	1.76		1.81
SECO unempl. % (2002)	2.93			2.41	2.19	2.29	2.29	
SECO unempl. % (2003)	3.87			3.69		3.31		3.43
SECO unempl. % (2004)	4.07			3.89		3.67	3.71	
SECO unempl. % (2005)	4.47			3.79		3.60		3.67
SECO unempl. % (2006)	4.50			3.23		3.20	3.16	
SECO unempl. % (2007)	1.00			2.76				2.90
SECO unempl. % (2008)	3.67			2.57			2.52	
SECO unempl. % (2009)	4.47			3.51				3.51
SECO unempl. % (2010)	4.33			3.56			3.47	

Source: Authors' calculations based on the SCM computation.

The following section graphically shows and discusses the results for the third of the listed scenarios (the remainder are in Appendix 3). The only variation between the scenarios consists of the included predictors, which define the relative similarity of the cantons in the donor pool and the treated Ticino. We chose Scenario 3 as a benchmark specification since the SCM goal is to fit the levels of the outcome variable and this works best if the entire pre-treatment period is completely included.

5.1. Specification Including All Pre-Treatment Outcome Values Singularly (Scenario 3)

The third specification includes, in addition to the basic scenario, a vector with all the pre-treatment outcome values from every single year. This helps to create an additional weight that searches for similarities in the single unemployment rates of the pre-treatment period among all the included cantons. The SC in this scenario is composed of only two cantons, Valais and Basel-Stadt, with a stronger weight of Valais (W-weights in Table 3). In this specification, no great difference in the slope of the SC unit can be noticed in Figure 11.

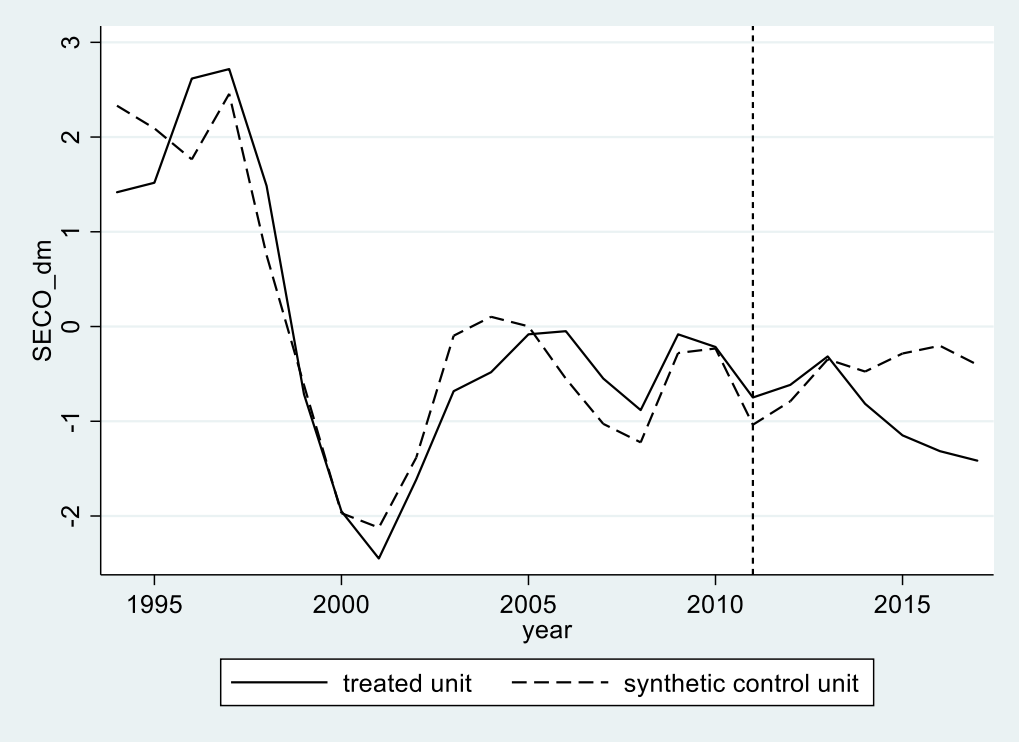

Figure 11. Demeaned SC and Ticino unemployment rate, including all pre-treatment variables as predictors.

Source: Authors' results of the SCM computation.

With regard to the effect of the introduction of the law's revision in the post-treatment period, we note two observations. First, the previous parallel trend of unemployment rates changes. Initially, this translates into a smoother growth in the unemployment rate for Ticino compared to its SC. Most workers work more than two years before losing their jobs and therefore have a maximum of 400 workdays covered by insurance (five workdays per week). The main effect of the omission of the possibility of lengthening the beneficiary period by 120 days in Ticino has the greatest effect with a delay of 400 workdays after the revision of the law. This means, as our reference period is the second quarter of the year, that the main effect of the omission of this additional measure would be visible within two years of the law's revision (April 1st, 2011). Thus, the 2013 data should make the effect visible for the first time. The second observation is that starting in 2013, Ticino's unemployment rate drops significantly and falls below the rate of its SC for the first time since 2005. This provides evidence that a part of the chronically higher unemployment rate in Ticino

is due to the potentially longer beneficiary period compared with the control cantons in the donor pool.

The graphical illustrations of the results for the remainder of the scenarios contained in the results table 3 can be found in Appendix 3. In addition to the specifications, further robustness tests are described in the following Section 6. First, a DiD model with a linear fit for the controls and the treated canton was computed. Second, the SCM was used to analyse the remainder of the cantons that applied for the additional measure of extending the maximum unemployment duration. The results are discussed in comparison with Ticino.

6. Robustness Tests

To test the validity of the results, two placebo tests following the literature were performed. First, the data were analysed in a DiD context, allowing for a differentiated view of the problem set. Second, SC were constructed for the remainder of the cantons affected by the law's revision to identify common tendencies and differences among those treated. As shown, in Appendix 3, all different scenarios introduced in Section 4.3 were calculated for Ticino, checking for the robustness of the results by varying the relative importance of the pre-treatment outcome variables as predictors of the SC of Ticino. This different scenarios do not show any variation of the results from the previously discussed scenario 3 and therefore undermine the obtained results for Ticino.

6.1. Difference-in-Difference Computation of Ticino and the Donor Pool Average

To verify the diverging trend of the unemployment rates in Ticino and the weighted average of the donor pool cantons, a DiD analysis was conducted. The data illustrated in Figure 12 compares the time trend of Ticino, represented by the blue

line, with a weighted average of all donor pool cantons. The weights correspond to the respective size of the labour market in the remaining cantons.

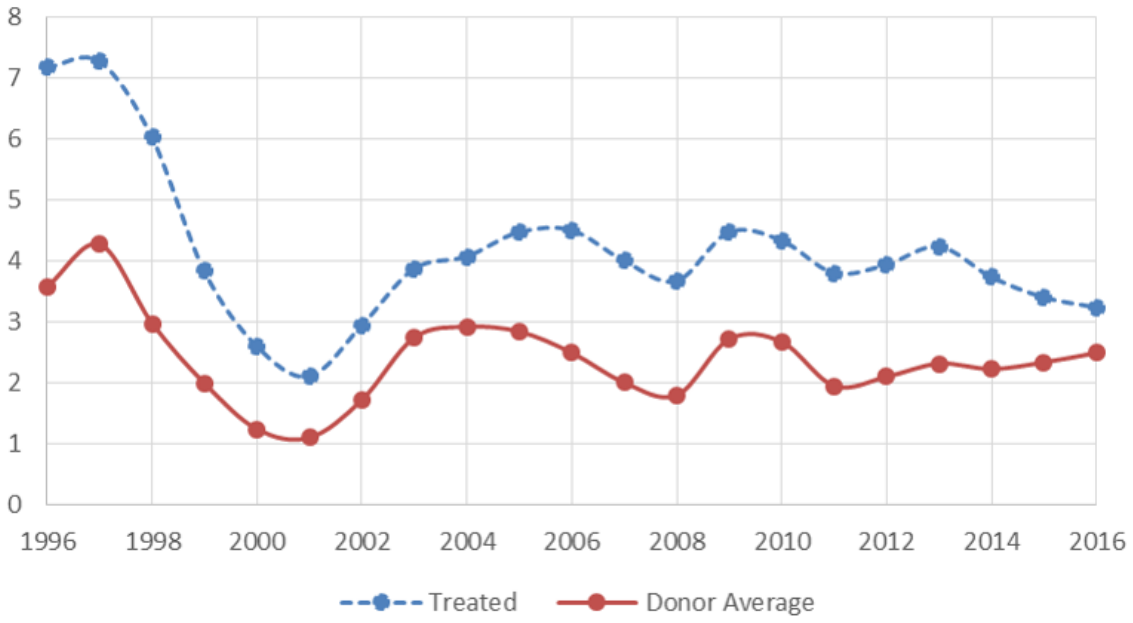

Figure 12. Unemployment rates (SECO) of Ticino (treated) and weighted average (by employees) of the donor pool. Second quarter of the year.

Source: Authors' elaboration of unemployment data from the State Secretariat for Economic Affairs SECO.

The data displayed in Figure 13 suggests a linear fit across the years in the pre-treatment period from 2003 to the revision of the unemployment law in 2011, identifying a common trend in the time before the revision. We defined two scenarios: the first one was a cut-off in the fitted values in 2011, when the actual law revision took place, and the second one was a time lag of two years when the last unemployed person benefitting from the additional beneficiary periods left unemployment. This is graphically illustrated in Figure 13.

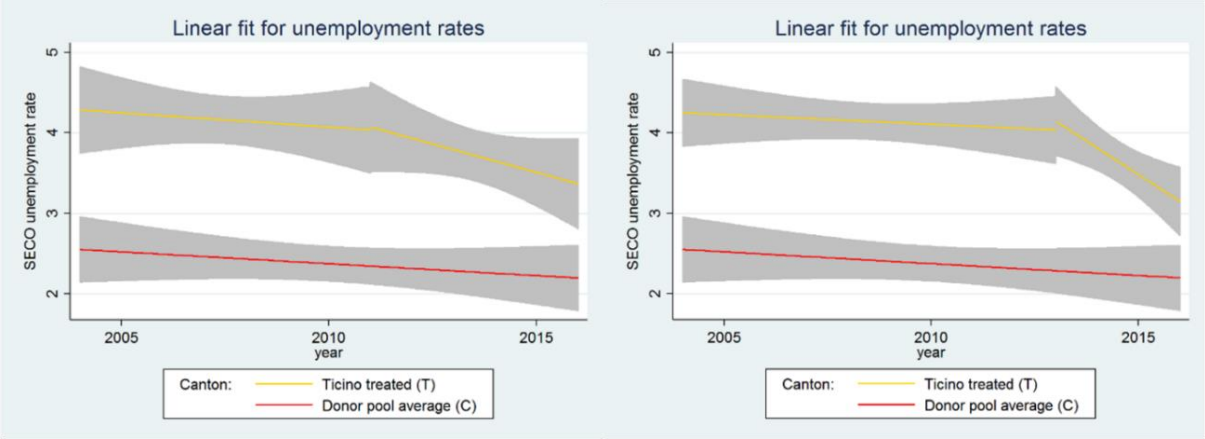

Figure 13. Linear fits for Ticino and donor pool with cut-offs in 2011 (left) and 2013 (right).

Source: Authors' computation of linear fits for the SECO unemployment rates.

The numerical results for the DiD analysis are illustrated in Table 6. In the pre-treatment period, Ticino systematically displays a higher unemployment rate compared to the donor pool average (1.74% for 2011 cut-off and 1.77% for 2013). The DiD result, assuming the continuity of the common trend of decreasing unemployment rates over time from the pre-treatment period, suggests a reduction in unemployment in Ticino with the revision of the unemployment insurance law. This reduction on average was as large as -0.33% in the first scenario and as large as -0.66% in the second scenario.

Table 6. Difference-in-difference outcomes for Ticino and donor pool canton average unemployment rates.

VARIABLES	(1) Cut-off 2011	(2) Cut-off 2013
Time	-0.130	-0.029
	[0.171]	[0.148]
Treated	1.738***	1.765***
	[0.197]	[0.164]
DiD	-0.326	-0.663***
	[0.271]	[0.220]
Constant	2.425***	2.381***
	[0.159]	[0.132]
Observations	26	26
R-squared	0.861	0.881
Robust standard errors in brackets		
*** p<0.01, ** p<0.05, * p<0.1		

Source: Authors' calculation of DiD method for the SECO unemployment data.

6.2. Results for Other Cantons Affected by the Additional Measure

A second placebo test aimed to compare and test the validity of the results by researching the effect the reform had in the remainder of the cantons that applied the measure to lengthen the maximum number of days of unemployment in the period preceding the revision of the unemployment law. For each of these, a SC unit was constructed and compared graphically to their unemployment rate trends. Table 7 summarizes the main results of these computations.

Table 7. Summary of the SC computation of other cantons affected by the new policy.

Summary Synthetic Control - Unemployment Insurance Reform				
	Canton Geneva	**Canton Vaud**	**Canton Jura**	**Canton Neuchâtel**
RMSPE	0.512	0.282	0.495	0.641
W-weights controls				
- Control Valais		0.580	0.143	0.242
- Control Basel-Stadt	0.641	0.420	0.377	0.758
- Control Zürich	0.359			
- Control Solothurn			0.480	
p-value (post/pre RMSPE ratio)	No convergence achieved in synth_runner (derivatives cannot be calculated)	0.547	0.823	1.577
p-values years after treatment				
1		0.75	0.15	0.15
2		0.70	0.55	0
3		0.85	0.90	0
4		0.75	0.45	0
5		0.30	0.10	0
6		0.50	0	0

Source: Authors' calculations based SCM computation.

For three of the four remaining cantons that had applied the optional lengthening of the maximum unemployment duration, it was possible to construct a complete SC analysis and to compare the trend of their unemployment rate with their respective

SC. With the available data for the canton of Geneva, it was not possible to reproduce a complete SC analysis that followed a similar trend in the pre-treatment period, so only partial results are available for this case.

The first canton analysed is Geneva. Unlike Ticino, Geneva did not implement the optional lengthening of the maximum unemployment duration in the six months preceding the revision of the unemployment insurance law. Consequently, the full effect is observed earlier in Geneva than in Ticino. Figure 14 shows that the difference between Geneva's demeaned unemployment rate and that of its SC is larger after the law's revision. This is visible in Figure 14, where the difference between Geneva and its SC is larger after the law's revision, but different from Ticino the effect of a shorter unemployment duration is noticed earlier.

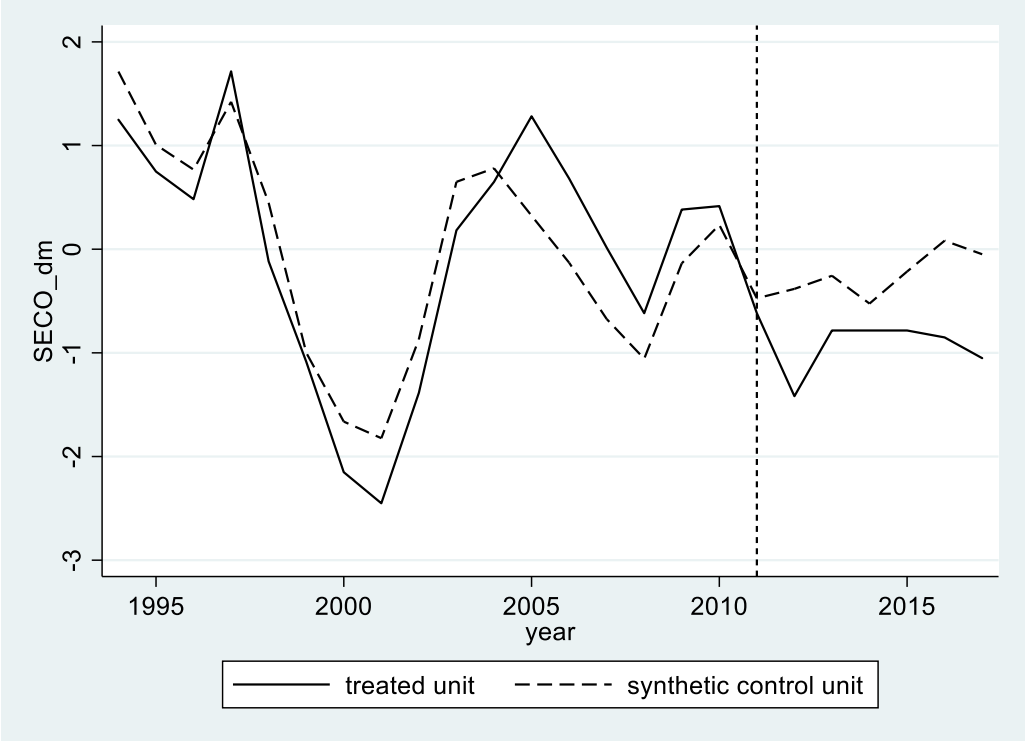

Figure 14. Outcome for Geneva: Demeaned SC and unemployment rate, including all pre-treatment variables as predictors.

Source: Authors' illustration based on the obtained SCM results.

The second analysed canton is Vaud. The results for this canton (see Figure 15) suggest that starting with 2015 the demeaned unemployment rate started to be lower than its SC. The effect is less visible, a possible explanation being that Vaud already had a lower unemployment rate than Geneva in the pre-treatment period, so the impact of the measure was less evident. Furthermore, analogously to the case of Ticino, Vaud adopted the measure up to the last possible date in 2011, which delays the effect slightly compared to the Geneva case.

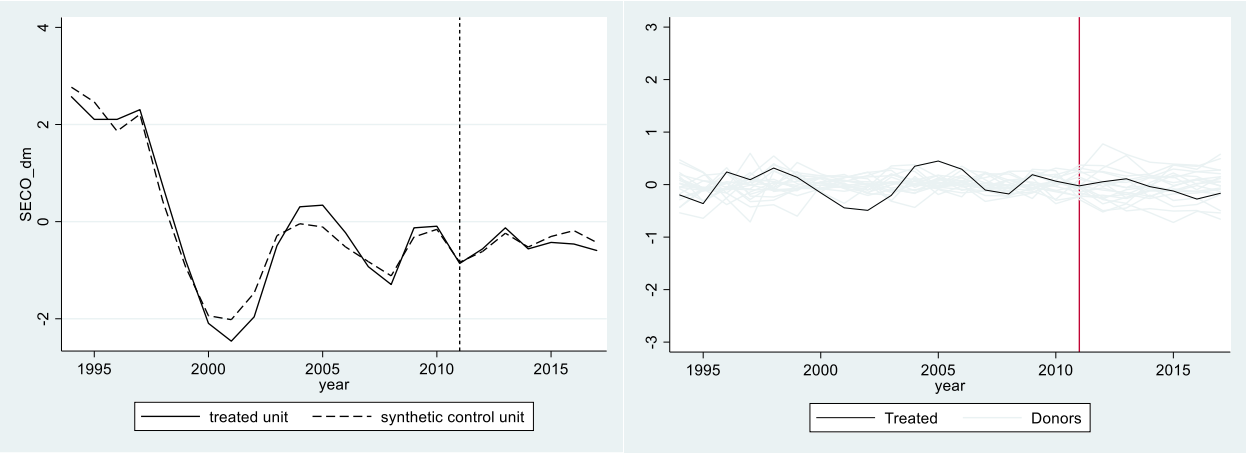

Figure 15. Outcome for Vaud: Demeaned SC and unemployment rate, including all pre-treatment variables as predictors.

Source: Authors' illustration based on the obtained SCM results.

The unemployment rate in the canton of Jura fluctuates more than that of the previously analysed cantons. Jura is a small canton that is more strongly affected by cyclical unemployment than many other cantons. The analysis, in this case, does not indicate any clear results (Figure 16), especially as the high unemployment rate in 2009-2010 could not be reproduced in its demeaned SC. Nevertheless, starting in 2011, the unemployment rate of Jura falls below its SC for the first time since 2001.

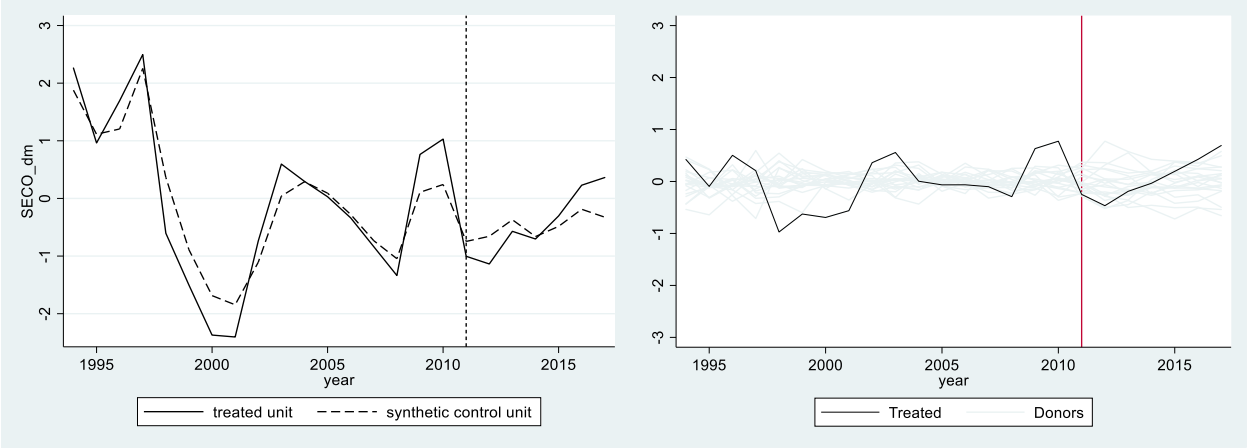

Figure 16. Outcome for Jura: Demeaned SC and unemployment rate, including all pre-treatment variables as predictors.

Source: Authors' illustration based on the obtained SCM results.

The last of the treated cantons is Neuchâtel. It was one of the last adaptors of the measure as well. Similar to Jura it is has a small and volatile labour market. For this, it is hard to obtain a meaningful SC in this canton since it is impossible to reproduce the volatility of the demeaned unemployment rate of this canton with the ones of the donor pool (results in Figure 17).

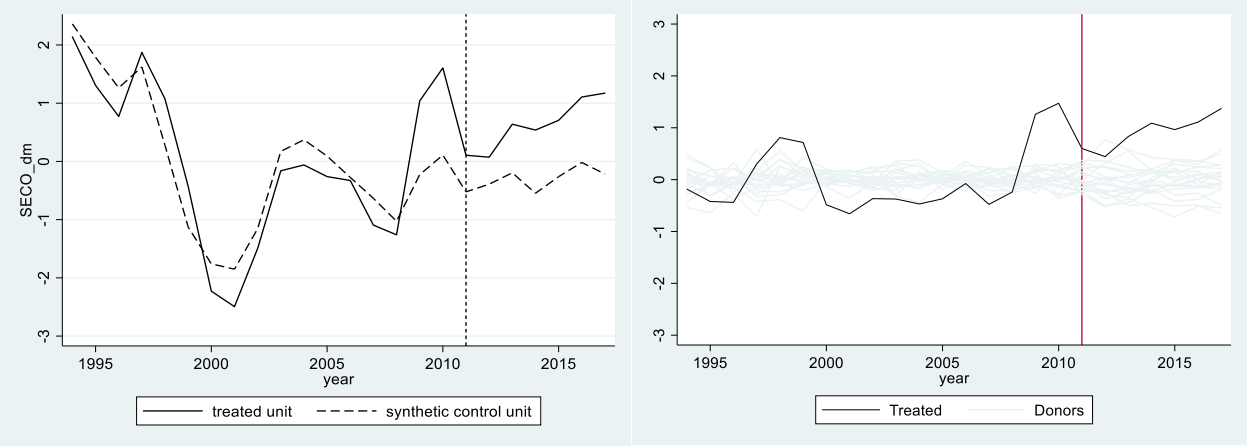

Figure 17. Outcome for Neuchâtel: Demeaned SC and unemployment rate, including all pre-treatment variables as predictors.

Source: Authors' illustration based on the obtained SCM results.

7. Comment on Results

The results for different specifications of the SC, as previously proposed by Ferman, Pinto and Possebom (2017), help us gain insight into the sensitivity of the computation. The seven scenarios include different predictor variables of the SECO unemployment rate of the pre-treatment period in addition to the independent predictors composing the basic scenario. With this procedure, we want to test the sensitivity of the construction of the SC of Ticino. As we noticed, the two or more (depending on the scenario) cantons from the donor pool constructing the SC for Ticino remain the same across some of the specifications. Even if their relative weight changes across the scenarios.

For the fact that the control cantons are the five individuated in all scenarios, we can exclude the possibility that one canton is part of the SC only because of a defined predictor or a unique event. The specifications confirm that the weighted composition of the synthetic Ticino, composed up of Valais, and depending on the scenario on one or more additional cantons, is the most similar to the real Ticino.

The results show that in the years preceding the revision of the unemployment law, a parallel trend, with the demeaned unemployment rate for Ticino, is registered. With the revision of the AVIG law, the previous parallel trend approaches its SC. The greatest effect, when the unemployment rate in Ticino falls below that of its SC, is registered two years after the revision of the law. This can be explained by the effect of the annulment of the additional measure to lengthen the beneficiary period for unemployment in Ticino beyond 400 days. In summary, the reform of the unemployment law and the standardisation of the unemployment duration caused the chronically higher unemployment rate of Ticino to fall to a lower level than it would otherwise have been. In the short period, as described in the (SECO Staatssekretariat für Wirtschaft, 2013) report, the movement from unemployment to social assistance increased, but the effect did not persist over time. The lower unemployment rate in the longer term, therefore, is also the result of the changing

duration of the maximum beneficiary period and the faster reintegration of the unemployed workforce into the labour market.

Moreover, the achieved results are clearly supported in two of the four analysed cantons in addition to Ticino. Geneva and Vaud, which propose similar to but less accentuated results than Ticino. Nevertheless, both show a reduction in their demeaned unemployment rate in comparison with their SC.

8. Conclusions

This research attempts to identify the effect of the introduction of the partial revision of the unemployment insurance law (AVIG) on the actual unemployment rates in the Ticino region in southern Switzerland. This area was particularly affected by the revision of this law, which eliminated the possibility of increasing the maximum unemployment duration in cases of high regional cyclic unemployment. The data indicate that for the entire period observed, the unemployment rate of the canton of Ticino lies above the average of the cantons included in the donor pool. In the years preceding the reform, the unemployment rate of Ticino was, on average, approximately 1.8% higher than the weighted average of the cantons in the donor pool. Descriptive statistics show that this difference was reduced starting with the introduction of the revised law in 2011, reaching a difference of 0.74% in 2016. Nevertheless, the unemployment rate in Ticino remained higher than the average rate in the donor pool cantons.

The main goal is to compare the trend of the unemployment rate in Ticino with the best-fitting control cantons in order to identify the effect of the measure, which eliminated the possibility for Ticino to lengthen the unemployment duration. The SC identifies a weighted average of the unemployment rate of the most similar cantons regarding a chosen number of predictors in seven different scenarios. Each of the seven scenarios includes two or more cantons that construct their respective SC. In the years preceding the revision of the unemployment insurance law, Ticino and its

SC followed a similar trend, and Ticino's unemployment rate was approximately 1% higher than that of its control. This difference decreased with the introduction of the law's revision, and starting in 2014, the common trend ended. In 2015, for the first time, the unemployment rate in Ticino lay below that of its SC and remained so until the end of the observed period.

We can conclude that the application of the revised unemployment insurance law had a strong effect on reducing the unemployment rate in Ticino, while in the SC, constructed of similar cantons, no such similarity can be identified. Most workers entering unemployment in Ticino contributed two or more years to the insurance and therefore can benefit from insurance coverage for a maximum of 1.5 years. Once this period expires, an additional 120-day benefit prolongation could have been applied in Ticino before the law's application. With the new legislation in Ticino, the unemployment rate decreased. As the SECO Staatssekretariat für Wirtschaft (2013) report shows, in terms of unemployed persons, the French and Italian areas of Switzerland (in large part applying the additional measure) were disproportionally affected by the law's revision, experiencing a greater effect than the German-speaking part of the country. This, in combination with a reduction in the general duration of unemployment, led to a more than proportional and persistent reduction in Ticino's unemployment rate compared with its SC, constructed with cantons from the remainder of Switzerland. These results are in contrast to the forecast of the SECO Staatssekretariat für Wirtschaft (2013) in a report studying all of Switzerland, where, in the long run, no persistent reduction in unemployment rates resulted from the partial revision of the unemployment law.

In conclusion, this means that in the period before the revision of the unemployment law, the return on job of unemployed workers lasted longer than afterwards. A shorter insurance period makes pressure on the job seekers and accelerates their search for a new position. The previous policy adapted especially in the Italian and French-speaking part of Switzerland reduced the intensity of the job search of unemployed as their insurance covered a longer period. In this sense, the

law's revision helped especially in those regions to fight the high unemployment rate, by limiting the maximum length of the insured beneficiary period.

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10. Appendix 1 – Descriptive Statistics

Table 8. Summary of descriptive statistics for all cantons.

		Unemployment rates				Employment		Social indexes			Education
		SECO	**ILO**	**Swiss**	**foreign-ers**	**annual growth rate**	**tertiary sector share**	**assist-ence**	**poverty**	**median taxable income**	**maturity quota**
Canton	*unit*	*rate*	*rate*	*rate*	*rate*	*rate*	*quota*	*quota*	*quota*	*CHF*	*quota*
Appenzell Outer-Rhodes	**mean**	1.681	3.444	1.297	3.394	0.009	0.680	1.778	3.456	48005	28.870
	sd	0.508	0.498	0.389	1.096	0.012	0.015	0.199	0.313	3051	7.727
Appenzell Inner-Rhodes	**mean**	1.015	3.444	0.749	2.702	0.009	0.680	1.111	2.078	46375	23.000
	sd	0.427	0.498	0.332	1.159	0.012	0.015	0.169	0.120	3660	7.511
Aargau	**mean**	2.807	4.038	1.944	5.960	0.007	0.718	1.967	3.422	52830	25.071
	sd	0.782	0.585	0.542	1.816	0.013	0.019	0.071	0.192	3702	6.218
Basel District	**mean**	2.722	4.038	2.058	5.406	0.007	0.718	2.467	4.100	56765	31.944
	sd	0.657	0.585	0.497	1.662	0.013	0.019	0.206	0.235	4134	7.592
Basel Stadt	**mean**	3.738	4.038	2.814	5.672	0.007	0.718	6.144	11.067	52175	31.571
	sd	0.904	0.585	0.639	1.811	0.013	0.019	0.445	1.316	3021	8.651
Bern	**mean**	2.479	3.825	1.858	6.229	0.010	0.722	4.144	6.478	47480	27.494
	sd	0.850	0.478	0.655	2.256	0.012	0.014	0.133	0.130	4362	8.179
Fribourg	**mean**	2.881	3.825	2.100	6.615	0.010	0.722	2.422	4.556	48180	33.678
	sd	1.193	0.478	1.012	2.523	0.012	0.014	0.130	0.274	4917	8.415
Geneva	**mean**	5.989	6.356	5.404	6.800	0.016	0.809	4.389	11.167	56275	36.940
	sd	1.078	0.979	1.034	1.199	0.014	0.012	0.807	1.112	4962	4.777
Jura	**mean**	3.974	3.825	3.307	7.607	0.010	0.722	2.111	5.800	44140	33.743
	sd	1.275	0.478	1.198	2.159	0.012	0.014	0.333	0.361	3726	7.640
Glarus	**mean**	1.964	3.444	1.357	3.863	0.009	0.680	2.022	3.922	46070	22.785
	sd	0.592	0.498	0.381	1.381	0.012	0.015	0.120	0.222	2800	5.206
Grisons	**mean**	1.860	3.444	1.288	4.281	0.009	0.680	1.233	2.800	44980	28.756
	sd	0.485	0.498	0.465	1.057	0.012	0.015	0.132	0.100	3253	8.818
Lucerne	**mean**	2.378	2.875	1.631	6.031	0.016	0.729	2.189	4.322	47935	24.582
	sd	0.818	0.617	0.546	2.476	0.020	0.020	0.162	0.179	4038	7.879
Neuchâtel	**mean**	4.575	3.825	3.565	7.236	0.010	0.722	6.544	8.911	48035	37.332
	sd	1.230	0.478	1.004	1.893	0.012	0.014	0.550	0.662	4370	7.733

		Unemployment rates				Employment		Social indexes			Education
		SECO	**ILO**	**Swiss**	**foreign-ers**	**annual growth rate**	**tertiary sector share**	**assist-ence**	**poverty**	**median taxable income**	**maturity quota**
Canton	*unit*	*rate*	*rate*	*rate*	*rate*	*rate*	*quota*	*quota*	*quota*	*CHF*	*quota*
Nidwalden	**mean**	1.367	2.875	1.103	3.493	0.016	0.729	0.900	1.967	51860	26.096
	sd	0.669	0.617	0.582	1.581	0.020	0.020	0.050	0.141	4272	8.330
Obwalden	**mean**	1.196	2.875	0.822	3.738	0.016	0.729	1.122	2.578	45795	22.498
	sd	0.549	0.617	0.405	1.816	0.020	0.020	0.097	0.156	3994	8.038
St Gallen	**mean**	2.500	3.444	1.660	5.406	0.009	0.680	2.133	4.200	47570	23.927
	sd	0.696	0.498	0.466	1.656	0.012	0.015	0.100	0.240	2959	6.335
Schaff-hausen	**mean**	2.978	3.444	1.993	6.172	0.009	0.680	2.367	5.144	49292	29.512
	sd	0.916	0.498	0.559	2.350	0.012	0.015	0.194	0.340	2819	7.377
Solothurn	**mean**	2.992	3.825	2.083	6.942	0.010	0.722	3.111	5.289	49755	23.410
	sd	1.015	0.478	0.715	2.630	0.012	0.014	0.355	0.948	3423	5.666
Schwyz	**mean**	1.682	2.875	1.160	4.174	0.016	0.729	1.500	2.733	51385	22.689
	sd	0.588	0.617	0.375	1.880	0.020	0.020	0.100	0.141	5023	6.931
Ticino	**mean**	4.283	5.869	3.325	6.517	0.014	0.752	2.078	8.833	44507	41.269
	sd	1.328	1.045	0.960	2.141	0.018	0.012	0.273	0.296	4278	7.898
Thurgau	**mean**	2.467	3.444	1.724	4.942	0.009	0.680	1.656	3.144	48495	23.141
	sd	0.740	0.498	0.488	1.769	0.012	0.015	0.124	0.159	3279	7.629
Uri	**mean**	1.111	2.875	0.740	4.030	0.016	0.729	1.144	2.467	46370	23.696
	sd	0.442	0.617	0.334	1.693	0.020	0.020	0.053	0.112	3229	7.354
Valais	**mean**	3.811	6.356	2.800	7.532	0.016	0.809	1.456	3.156	41840	29.296
	sd	1.595	0.979	1.308	2.946	0.014	0.012	0.159	1.063	4165	6.627
Vaud	**mean**	4.844	6.356	3.764	7.174	0.016	0.809	4.878	7.922	50515	30.335
	sd	1.334	0.979	1.114	1.909	0.014	0.012	0.130	0.672	6148	5.281
Zug	**mean**	2.471	2.875	1.765	4.957	0.016	0.729	1.722	3.689	60025	30.932
	sd	0.755	0.617	0.531	1.841	0.020	0.020	0.083	0.298	5591	9.337
Zurich	**mean**	3.417	4.025	2.514	6.146	0.011	0.830	3.344	5.333	55540	29.130
	sd	0.921	0.512	0.679	1.908	0.019	0.018	0.235	0.458	3766	6.031
Total	**mean**	2.815	3.906	2.109	5.528	0.012	0.727	2.536	4.944	49315	28.527
	sd	1.515	1.236	1.282	2.343	0.015	0.046	1.511	2.632	5802	8.811

Source: Official data on employment, unemployment, social structure and education from the Federal Statistical Office.

11. Appendix 2 – Variables List

Table 9. Variables included in the SC computation.

Variable	Definition
SECO unemployment rate	Number of registered unemployed workers (last day of the month - enrolled at the regional labour agency) divided by the number of active labour force members. Labour force is revealed by the structural census and kept fixed over the years.
SECO_dm	SECO unemployment rate demeaned by the canton pre-intervention average SECO unemployment rate.
ILO unemployment rate	Unemployed workers in this sense are all persons form 15-74 years, who were unemployed in the reference week and were actively searching for a job in the previous four weeks and who are available to start a new job.
unemployment rate of Swiss	Calculated as the SECO unemployment rate, but considering Swiss workforce only.
unemployment rate of foreigners	Calculated as the SECO unemployment rate, but considering foreign workforce only.
annual growth rate of employed persons	This includes all persons aged 15 and over, who in the reference week worked at least one hour for payment and although temporarily absent from the workplace had a job as an employee or were self-employed or who worked in a family business without payment.
share of tertiary sector employees	Number or employees defined according to the above specification who worked in a firm of the tertiary sector, divided by the number of employees in the secondary sector in the same period.
social assistance quota	All persons enrolled in social assistance (as part of the permanent residential population) divided by the permanent residential population in December of the previous year.
poverty quota	Share of persons with an equivalent income below the relative poverty threshold
median of taxable income	Median of the taxable income in the canton of natural persons that are contributing to the direct federal tax. Taxable income is defined as the perceived income minus the admitted deductions (on average 30% reduction).
maturity quota	Percentage of youth with a highschool equivalency compare to the total of youth that have finished any degree of mandatory schooling.

Source: Authors' explanation of included variables in the SCM model.

12. Appendix 3 – Scenarios 1, 2, 4-7 for Ticino

12.1. Basic Specification with no Pre-Treatment Outcomes (Scenario 1)

This first computation is the basic model that does not include any value of the dependent variable (SECO unemployment rate) from the pre-treatment period as an additional predictor. As previously explained, Ticino by construction, already has a higher unemployment rate than the remainder of the cantons in the donor pool. A similar trend at the respective level of unemployment is clearly achieved applying the demeaned variable for the SCM through which we can obtain a parallel trend for this case and draw valid results. In this specification, the SC of Ticino is composed of the cantons of Valais, Thurgau, Schaffhausen and Basel-Stadt. The effect is graphically illustrated in Figure 18.

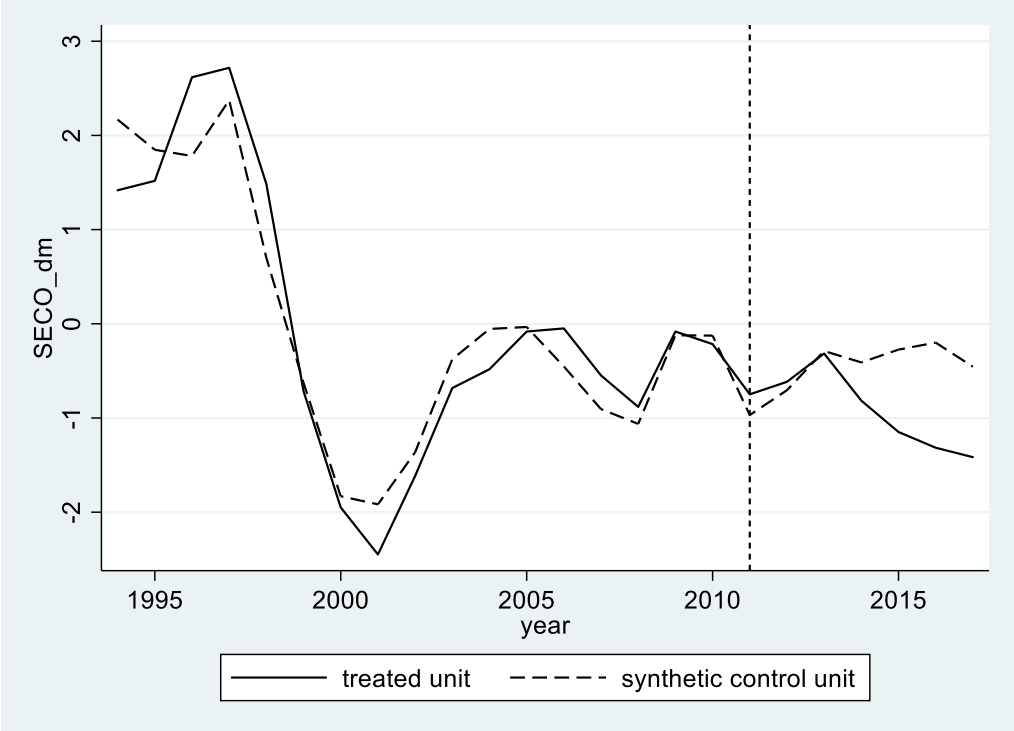

Figure 18. Outcome specification 1 for Ticino.

Source: Authors' illustration based on the obtained SCM results.

12.2. Specification with Pre-Treatment Outcome Mean (Scenario 2)

The second specification, in addition to the predictors of the basic scenario, includes a predictor variable that is made up of the average unemployment rate of all the pre-treatment years for the specific canton. The advantage of this additional variable is that it provides a more stable predictor, which is not strongly affected by extraordinary shocks in an examined canton. Only three of the cantons composing the SC of Ticino are the same as in the basic scenario, the relative importance being slightly changed to more weight for Basel-Stadt, Schaffhausen and Valais and compared to scenario 1 it excludes Thurgau from the donor pool. Graphical results are illustrated in Figure 19.

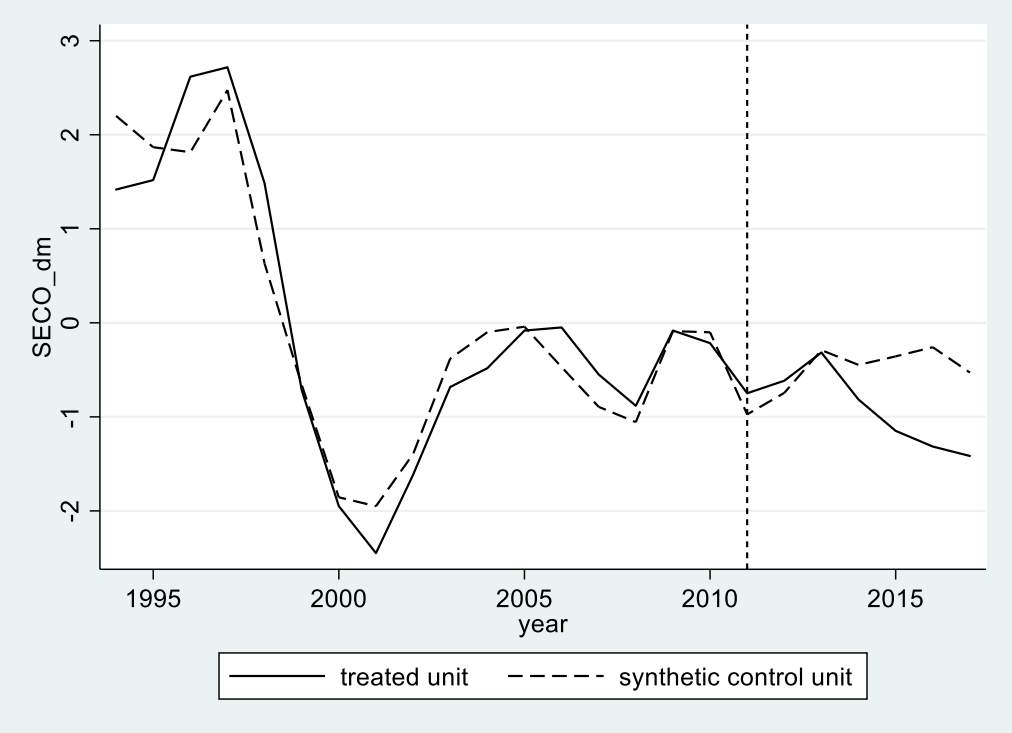

Figure 19. Outcome specification 2 for Ticino.

Source: Authors' illustration based on the obtained SCM results.

12.3. Specification with the First Half of the Pre-Treatment Outcome Values Singularly (Scenario 4)

The fourth specification includes a vector of single pre-treatment unemployment rates for the first half of the observed years starting with 1994. This scenario adds additional weight to the early years of the observed period, which are further from the current treatment. Compared to the results of the previous scenario, including the values from all pre-treatment years, the weights do not change, and the SC is again made up of Valais and Schaffhausen with similar weights, but substitutes Basel-Stadt with Zürich in the composition of the SC. Zürich even contributes to the SC in our benchmark scenario 3. Figure 20 shows the comparison of the SC and Ticino demeaned unemployment rate.

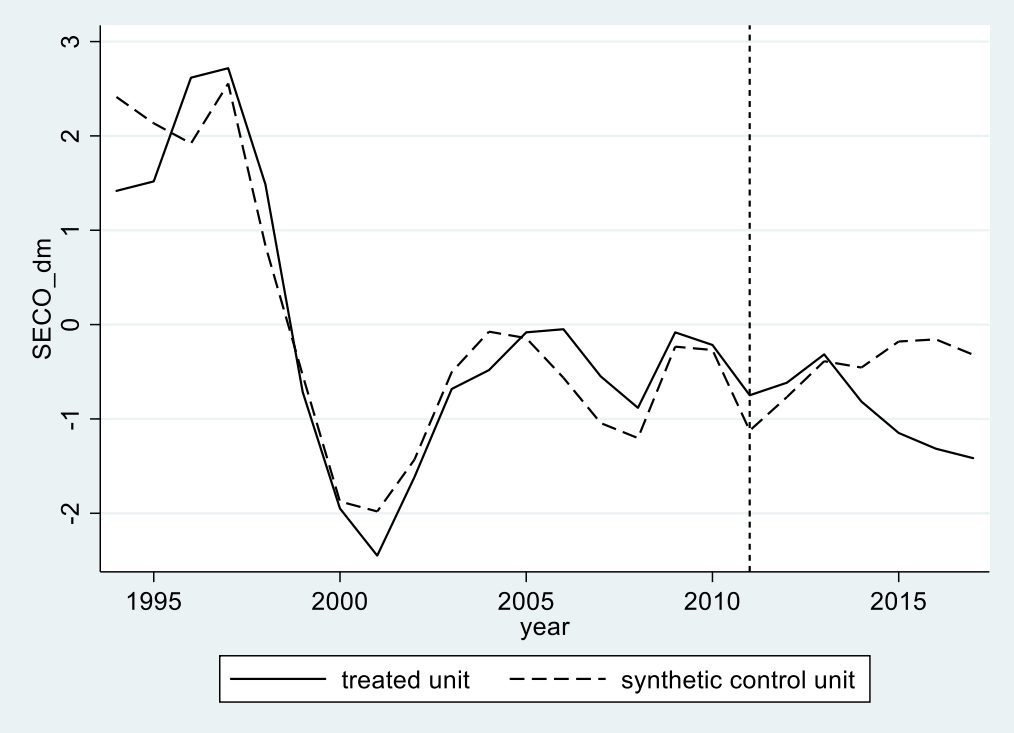

Figure 20. Outcome specification 4 for Ticino.

Source: Authors' illustration based on the obtained SCM results.

12.4. Specification with the First Three Quarters of the Pre-Treatment Outcomes (Scenario 5)

The fifth specification (Figure 21) follows the same idea as the previous specification. It includes the first three quarters of the unemployment rate in the pre-treatment period as predictor variables. The weights for the cantons composing the SC shift back and again exclude Zürich from the controls, adding Basel-Stadt in comparison with the previous scenario 4. The weights for the cantons are similar to scenario 2, with slightly more weight to Basel-Stadt.

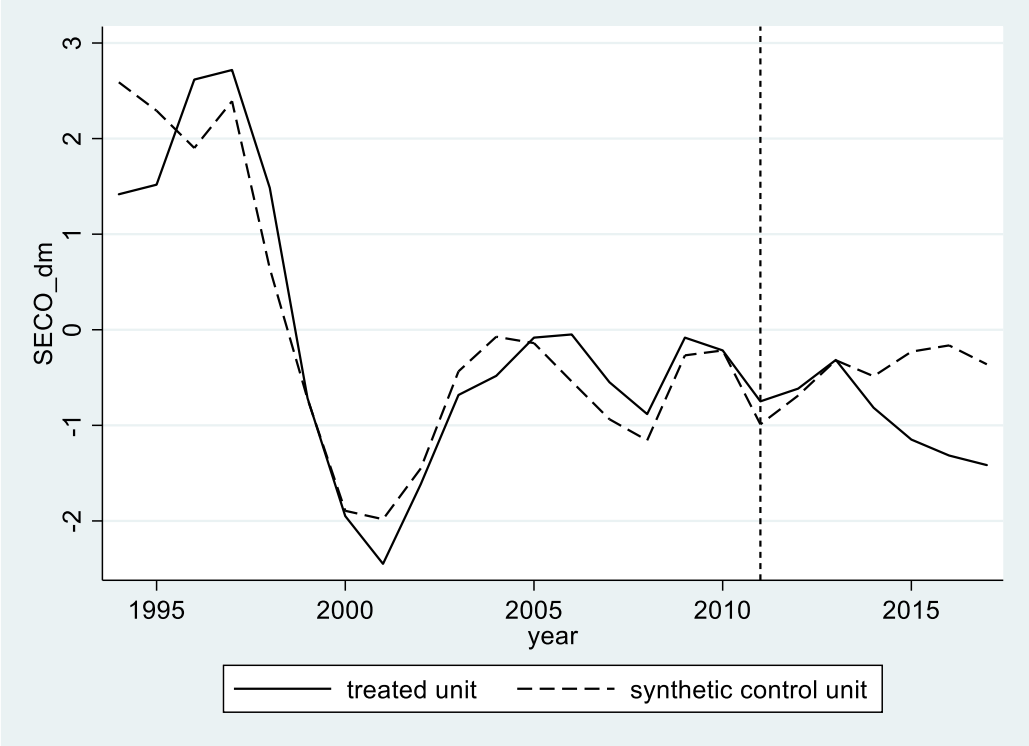

Figure 21. Outcome specification 5 for Ticino.

Source: Authors' illustration based on the obtained SCM results.

12.5. Specification with Even-Numbered Years of the Singular Pre-Treatment Outcome Values (Scenario 6)

Scenario 6 includes even-numbered years as predictors, starting in 1994; see Figure 22. This helps to remove the weight of extraordinary shocks happening in a single year and strong cyclic down- and upturns. For example, the importance of fitting situations with very low unemployment as in 2001 or very high unemployment in 1997. The combination of the SC is made of the cantons of Valais, Zürich, Schaffhausen and Basel-Stadt.

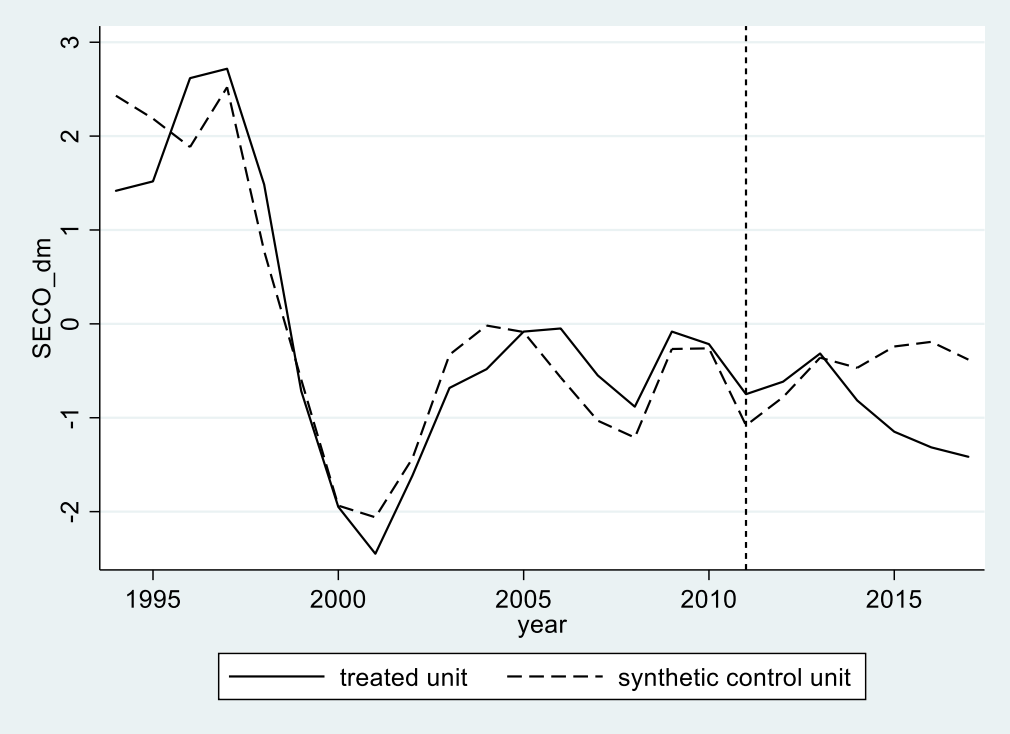

Figure 22. Outcome specification 6 for Ticino.

Source: Authors' illustration based on the obtained SCM results.

12.6. Specification with Odd-Numbered Years of the Singular Pre-Treatment Outcome Values (Scenario 7)

The last specification is based on the definition of scenario 6, but shifts to include the values of the unemployment rate of the odd-numbered years in the pre-treatment period as predictor variables in addition to the basic setup. The cantons composing the SC are Valais, Basel-Stadt and Schaffhausen. Results are illustrated in Figure 23.

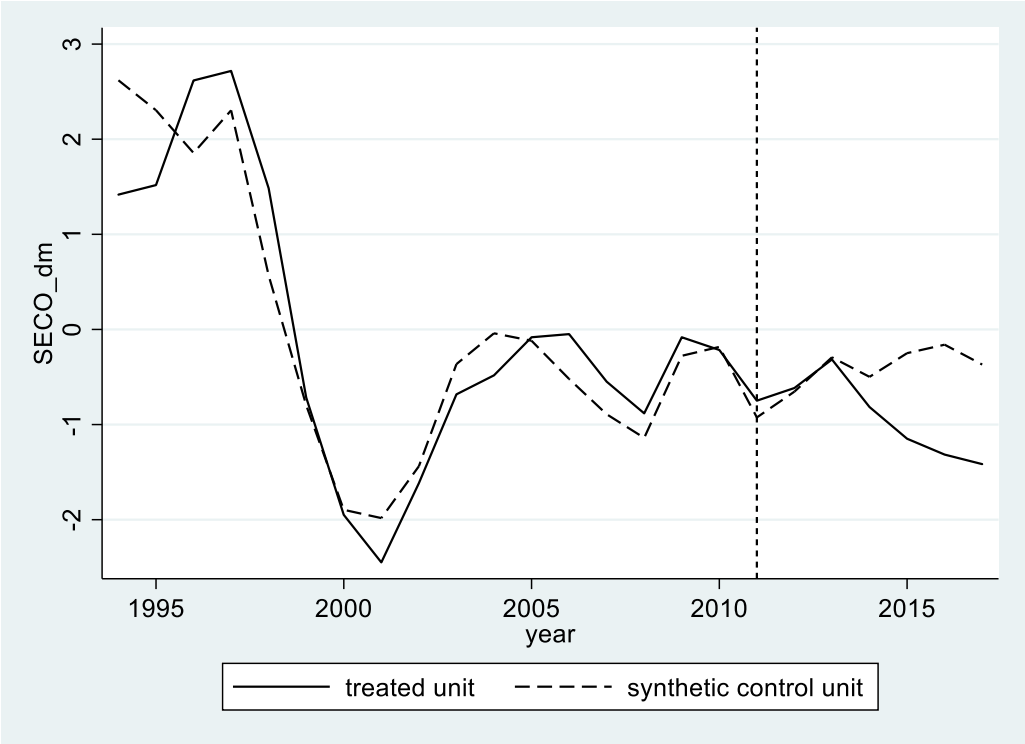

Figure 23. Outcome specification 7 for Ticino.

Source: Authors' illustration based on the obtained SCM results.

Chapter 3

Restricting the Construction of Second Homes in Tourist Destinations: an Effective Intervention towards Sustainability?

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Abstract

This study uses a quasi-experiment to evaluate the impact of the second home restriction (Lex Weber) on construction investments in Switzerland. It estimates the effect in different strongly affected areas. Four different specifications are defined, and the changes in investment behaviour are analysed. A first basic model considers the variation in investments through a discrete difference-in-difference analysis, and an extension of the model instead 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 into an event study design that allows us to evaluate the effects of the initiative by considering the yearly cumulative impacts separately. 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 in the local economy and tourism industry are discussed.

JEL codes: D72, E22, L74, O18, C23, Z38

Keywords: Construction, Second Homes, Housing Investments, Tourism Development, Switzerland

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 March 11, 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. 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 (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 with the region, they would bring new guests with them. The supporting parties for this law instead stated 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 24 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.

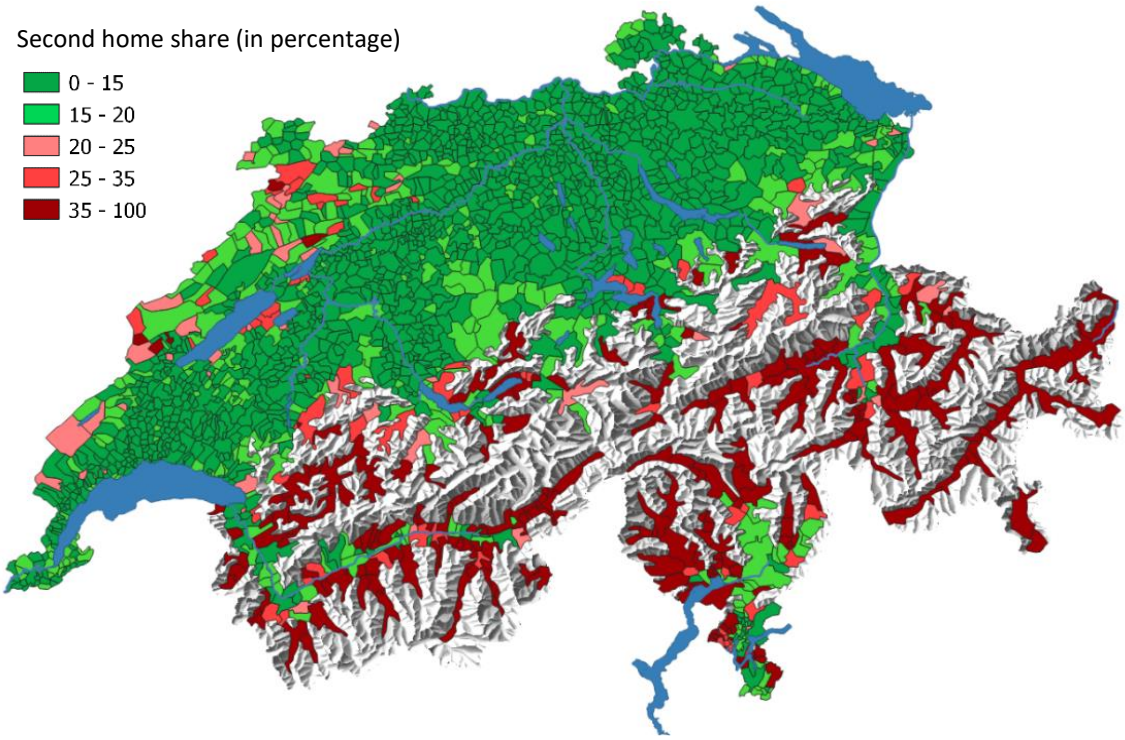

Figure 24. Second home shares by municipality (vegetation area) in Switzerland.

Source: Author's illustration of the FSO Second Home Data of 2017.

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. Furthermore, based on our 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 section 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 sections 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 entire 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 & 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) studies, 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 event study design, Abraham and Sun (2020) discuss treatment with heterogeneous effects. Further, the work of Ly and Paty (2019) 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 March 11, 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. 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. (Vinzens & Hefti 2014)

The report of BAK Basel (2012) 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)[6] that proposed managerial adaptation processes for some example touristic, construction and real estate firms and touristic areas. Rütter Soceco (2019)[7] 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)[8] 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 and conduct a quasi-natural experiment that compares the changing investments in

[6] 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

[7] 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

[8] 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

construction in affected and control municipalities. The baseline DiD model compares the investment in new home constructions in restricted municipalities with that in the other municipalities.

To test the validity of the obtained results, variations of these models including the actual second home share as a continuous treatment variable for the restricted municipalities to replace the previous discrete treatment variable were designed. This procedure was previously described by Card (1992) with the main aim of dealing with different treatment intensities.

In detail, the DiD model is designed as follows:

$$I_{it} = \beta_S SHShare_i + \beta_P Post_t + \beta_{SP} SHShare_i \times Post_t + \beta' X_{it} + \gamma_{ct} + \lambda_i + \mu_t + \varepsilon_{it}$$

where (I_{it}) is new construction investments in municipality (i) in the years 2005, … , 2017. $(SHShare_i)$ is a dummy variable with a value of 1 for municipalities with a second home share >20% (where the law applies) and 0 otherwise, defined by the 2017 ARE second home statistics[9]. In the specification with continuous treatment, $(SHShare_i)$ is used to represent the actual municipal second home share for the treated group, and 0 is used to represent that for the other municipalities. $(Post_t)$ is a dummy variable dividing the pre- and post-treatment periods. Further, (X_{it}) includes a set of control variables that account for the economic and demographic characteristics of the municipalities. 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, and (μ_t) controls for the time fixed effects, which is required since the law change occurs heterogeneously and it is necessary to deal with diverging trends at the local level. (ε_{it}) is the robust standard errors, clustered

[9] 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

by typology of municipality according to the categories defined by the Swiss Federal Statistical Office (FSO).[10]

The baseline model is further expanded into an event study design, taking year-specific time dummies to identify the different treatment intensities in the period after the law's introduction. This procedure is discussed by Schmidheiny and Siegloch (2020). Formally, this procedure involves replacing the treatment variable with year-specific dummies:

$$I_{it} = \beta_S SHShare_i + \beta'_P P_t + \beta'_{SP} SHShare_i P_t + \beta' X_{it} + \gamma_{ct} + \lambda_i + \mu_t + \varepsilon_{it}$$

where $\beta'_P = (\beta_P^{12} \dots \beta_P^{17})$ and $\beta'_{SP} = (\beta_{SP}^{12} \dots \beta_{SP}^{17})$ for the years t=2012 to t=2017. Consequently, the year dummies $P'_t = (P_t^{12} \dots P_t^{17})$ for the post-treatment years are introduced. Again, two specifications with a discrete and a continuous treatment of the new construction investments are implemented.

The two models are varied to delay the actual treatment effect by three years after the application of the new law. This variation is chosen to address 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 three 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.

[10] Swiss Federal Statistical Office FSO. (2017). Raumgliederungen der Schweiz - Gemeindetypologie und Stadt/Land-Typologie 2012. Neuchâtel. Retrieved September 23, 2019, from https://www.bfs.admin.ch/bfsstatic/dam/assets/2543323/master

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[11], provide data on investments in new constructions and renovations for private real estate at the municipal level. The considered data include the years 2005 to 2017 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. These data identify the treated and the control group, with municipalities subdivided by those with a second home share above and below the 20% share, which indicates whether the law has been applied.

In addition to the previously mentioned controls, the model includes several controls for 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[12] and are based on the prices demanded on online announcements placed on the main platforms. This variable is included as an index to control for the different appreciation patterns of housing in the districts. Second, data from the FSO Population and Households Statistics[13] on the arrival of new residents from the internal and from the remainder of the cantons moving to the municipality are included. This variable helps to control for the fact that a part of the investment

[11] 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

[12] 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

[13] 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

growth is guided by the settlement of persons. In addition, the dataset includes the number of available beds in hotels and structured accommodations according to the FSO Tourist accommodation statistics[14] to account for the importance of tourism activity for each municipality. Additionally, the number of empty, unused dwellings from the FSO Buildings and dwellings statistics[15], is included 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)[16] 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. There are slight variations within the grouped years because not all of the socioeconomic control variables are available for each single municipality in each year and therefore 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 10.

[14] 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

[15] 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

[16] 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.

Table 10. Descriptive statistics for municipalities with and without the second home restriction.

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

no second home restriction	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
new constructions investments *	20122	19811	19563	20411	21271	21162	21532	21768	22677	23152	23234	23246	24588
.stdv	[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	10391	10341	10778
.stdv	[1271]	[1323]	[1414]	[1154]	[1134]	[1214]	[1253]	[1340]	[1432]	[1501]	[1529]	[1497]	[1584]
sq. 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
.stdv	[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
.stdv	[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
.stdv	[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
.stdv	[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 appartments	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
.stdv	[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
.stdv	[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]
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
.stdv	[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
.stdv	[390]	[401]	[548]	[654]	[507]	[341]	[387]	[327]	[354]	[375]	[453]	[410]	[406]
sq. 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
.stdv	[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
.stdv	[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
.stdv	[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
.stdv	[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 appartments	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
.stdv	[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]
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
.stdv	[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]

notes:

* investments in 1000 CHF

** household income classes: (monthly gross income)

0-100	= 0-4000 CHF
100-200	= 4001-8000 CHF
200-300	= 8001-12000 CHF
300-400	= 12001 - 16000 CHF
>400	= >16000 CHF

Source: Author's calculations of the data from the official FSO statistics and Comparis.

Figure 25 below compares the average investments in new constructions for the two groups of municipalities. Restricted municipalities registered stagnating investments for new constructions after the introduction of the second home law. The greatest drop was registered after 2015, when even the latest pre-reform construction permits in the touristic cantons had expired.

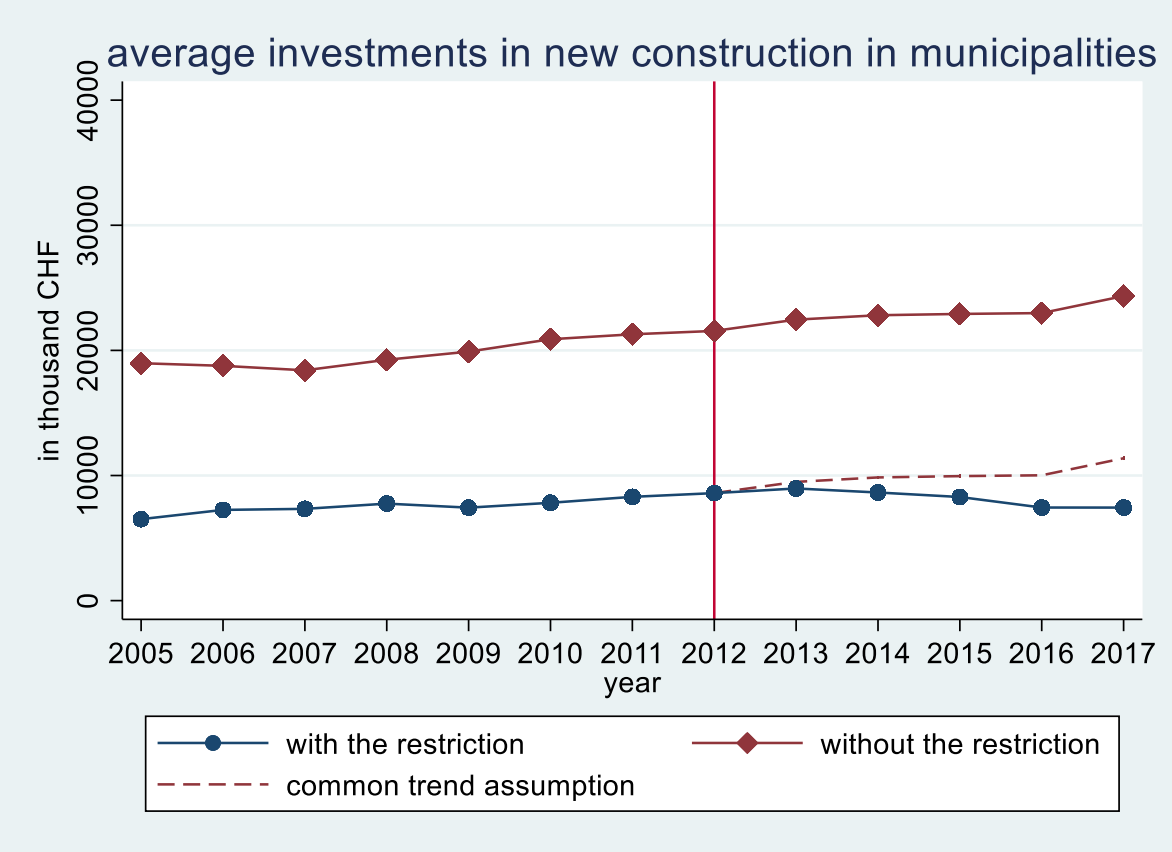

Figure 25. Average investments in new constructions in municipalities to which the second home restriction applies and in the other municipalities with no legal changes (counterfactual).

Source: Author's illustration of the data from the FSO construction investment statistics.

Additionally, in Appendix 2, Table 14 provides the annual variations for each year in the pre-treatment period to validate the application of the DiD methodology. An application of this procedure can be found in Author (2003) for an example. An examination of the effects on both new constructions and renovations (graphs in Appendix 3) immediately after the 2008 crisis and later, especially in the post-treatment period, shows a growing annual difference in construction investments.

In order to validate the application of the event study design we further report the year specific effects in the following Figure 26. Defining 2011 (the year before the policy application) to be the year of reference, the coefficients exclude at the 95% confidence interval that an event in the pre-treatment period would have significantly affected the obtained results. A more detailed application of this technique can be found in Fuest *et al.* (2018).

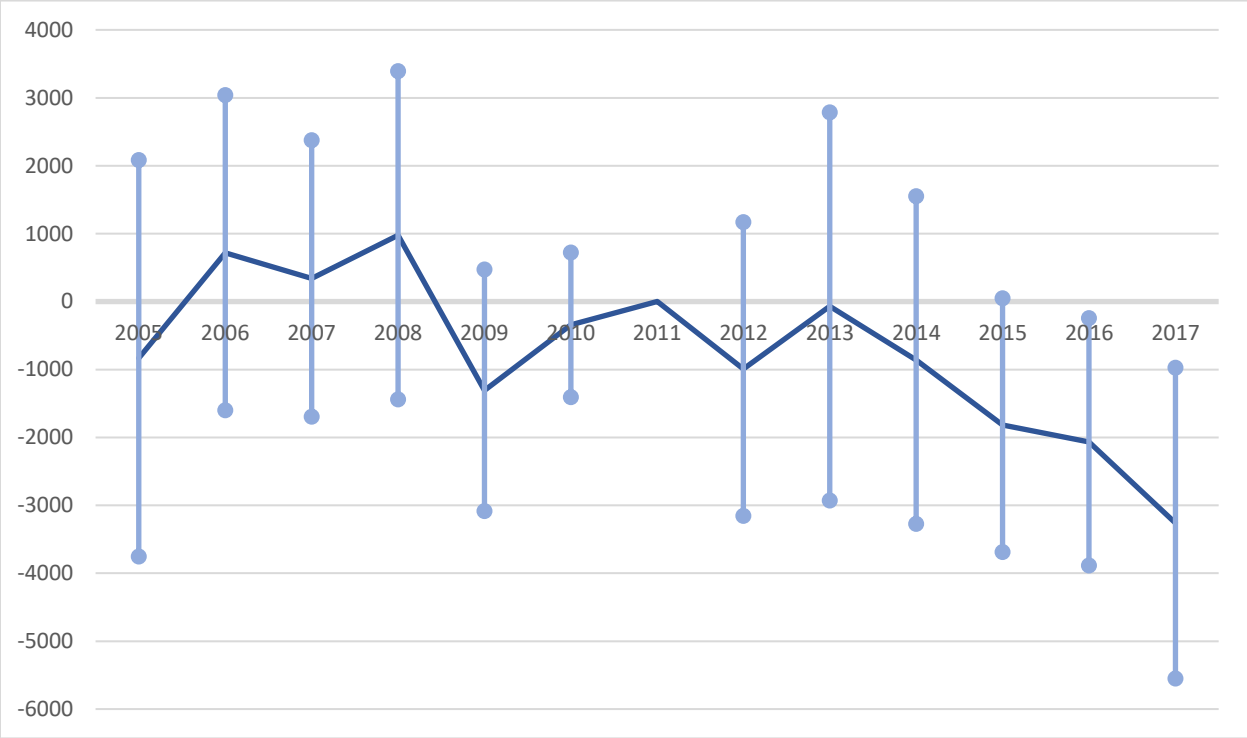

Figure 26. Year specific effects of the investments in new construction and 95% confidence interval with reference year 2011 (t-1).

Source: Author's illustration of calculated year specific effect of the data from the FSO construction investment statistics.

6. Results

Following the empirical strategy introduced in section 4, the results in Tables 11 and 12 in this section report the estimates for two different models, the first assuming an immediate effect of the second home law and the second assuming that the real effect takes place with a delay of three years, accounting for the maximum validity of construction permits in the most affected cantons. Table 11 reports the results for the two scenarios separated by three different specifications. The first baseline model (1) is extended to include socioeconomic controls (2) and canton by-year effects (3) 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 effect for the scenarios with immediate treatment (treatment in 2012) suggests a negative impact on investments due to second home restriction, considering the baseline model (1). This negative effect is greater when the treatment is delayed by three years. 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 started before the law's application. For example, considering the delayed continuous treatment model (3), a 1% higher second home share results in a 56,000 CHF lower investment on average in new constructions due to the law.

Table 11. Results of the DiD analysis of the effect of the second home restriction (with continuous and discrete treatment variables) on new construction investments.

New Home Construction Investments: regression results - discrete and continuous treatment estimates						
	Immediate treatment (cut-off t_{2012})			Delayed treatment (cut-off t_{2015})		
	(1)	(2)	(3)	(1)	(2)	(3)
	A. Continuous treatment					
Second home share x Post	-48***	-15	-31	-61***	-35**	-56***
.stdv	[13]	[12]	[23]	[12]	[14]	[16]
R-squared	0.913	0.919	0.922	0.011	0.814	0.735
Observations	15,612	14,437	14,437	15,612	14,437	14,437
	B. Discrete treatment					
Sec home restriction x Post	-2,393***	-631	-1,402	-2,803***	-1,325*	-2,110**
.stdv	[696]	[518]	[957]	[631]	[690]	[793]
R-squared	0.913	0.919	0.922	0.011	0.086	0.735
Observations	15,612	14,437	14,437	15,612	14,437	14,437
Socioeconomic controls	No	Yes	Yes	No	Yes	Yes
Canton by year effects	No	No	Yes	No	No	Yes
**p < .1, **p < .05, ***p < .01*						

Source: Results from the difference-in-difference method application to the second home restriction law.

In addition to the standard DiD model, the analysis is extended to an event study design using year-specific variables to identify the impact of the popular initiative (results in Table 12). Considering the cumulative treatment effects of the second home law in each of the following years, the marginal effect increases the entire observed post-treatment period. The results show that starting with the years following 2015, the negative marginal effect of the second home restriction increases year by year. This is because the cumulative effect for every year increases faster each year in the post-treatment period. In particular, the results for 2017 show the highest marginal annual reduction in investments in new constructions. 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.

Table 12. Results of the event study of the effect of the second home restriction (with continuous and discrete treatment variable) on new construction investments.

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

	Immediate treatment (cut-off t_{2012})			Delayed treatment (cut-off t_{2015})		
	(1)	(2)	(3)	(1)	(2)	(3)
	A. Continuous treatment					
Second home share x D^{12}	-18	9	-17			
.stdv	[14]	[14]	[28]			
Second home share x D^{13}	-22	9	10			
.stdv	[20]	[24]	[35]			
Second home share x D^{14}	-41**	-9	-13			
.stdv	[17]	[17]	[28]			
Second home share x D^{15}	-49***	-11	-44*	-40***	-12	-42**
.stdv	[14]	[14]	[25]	[10]	[11]	[17]
Second home share x D^{16}	-69***	-32	-52**	-60***	-33*	-50***
.stdv	[16]	[20]	[21]	[15]	[19]	[15]
Second home share x D^{17}	-91***	-61***	-79***	-82***	-62***	-76***
.stdv	[19]	[17]	[24]	[18]	[18]	[20]
R-squared	0.913	0.919	0.922	0.00258	0.814	0.741
Observations	15,612	14,437	14,437	15,612	14,437	14,437
	B. Discrete treatment					
Sec home restriction x D^{12}	-975	374	-917			
.stdv	[746]	[708]	[1,256]			
Sec home restriction x D^{13}	-1,392	168	8			
.stdv	[1,001]	[1,058]	[1,382]			
Sec home restriction x D^{14}	-2,125**	-529	-786			
.stdv	[928]	[751]	[1,226]			
Sec home restriction x D^{15}	-2,299***	-278	-1,746	-1,801***	-280	-1,557*
.stdv	[713]	[591]	[1,105]	[513]	[524]	[803]
Sec home restriction x D^{16}	-3,188***	-1,137	-1,992**	-2,690***	-1,138	-1,804**
.stdv	[845]	[944]	[984]	[754]	[928]	[809]
Sec home restriction x D^{17}	-4,433***	-2,591***	-3,188***	-3,936***	-2,592**	-3,001***
.stdv	[1,077]	[911]	[1,181]	[965]	[948]	[1,033]
R-squared	0.913	0.919	0.922	0.011	0.087	0.735
Observations	15,612	14,437	14,437	15,612	14,437	14,437
Socioeconomic controls	No	Yes	Yes	No	Yes	Yes
Canton by year effects	No	No	Yes	No	No	Yes
**p < .1, **p < .05, ***p < .01*						

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

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. The results suggest no evidence for a possible shift (and consequently increase) of construction activity towards requalification yet

(detailed results in Appendix 3). 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 saw. 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 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 the whole local economy of this mostly peripheral region. 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. 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.

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9. Appendix 1 – Construction Permit's Validity According to Cantonal Laws

Table 13. 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.

10. Appendix 2 – Year Specific Effects

Table 14. Year specific annual variations of new construction and renovation investments.

VARIABLES	(1) New Construction w.o controls	(2) Renovation w.o. controls	(3) New Construction with controls	(4) Renovation with controls
1.treatX1.post06	859	-204	1,554	-39
	[866]	[274]	[1,050]	[373]
1.treatX1.post07	1,193	-383	1,176	3
	[1,104]	[376]	[1,277]	[515]
1.treatX1.post08	848	-151	1,811	843
	[1,126]	[456]	[1,344]	[568]
1.treatX1.post09	-271	-541	-472	-701
	[1,078]	[436]	[1,374]	[763]
1.treatX1.post10	-1,079	-277	493	294
	[1,073]	[445]	[1,281]	[520]
1.treatX1.post11	-1,002	-783**	835	530
	[1,144]	[373]	[1,387]	[527]
1.treatX1.post12	-932	-1,079***	-158	100
	[1,164]	[402]	[1,511]	[585]
1.treatX1.post13	-1,349	-1,658***	765	180
	[1,323]	[449]	[1,788]	[589]
1.treatX1.post14	-2,083	-1,955***	-26	20
	[1,328]	[498]	[1,784]	[568]
1.treatX1.post15	-2,255*	-2,436***	-984	-227
	[1,194]	[597]	[1,660]	[829]
1.treatX1.post16	-3,143***	-2,209***	-1,231	333
	[1,094]	[599]	[1,559]	[748]
1.treatX1.post17	-4,388***	-2,501***	-2,426	-401
	[1,105]	[612]	[1,655]	[701]
Observations	15,612	15,612	14,437	14,437
Num. of municipalities	1,333	1,333	1,307	1,307
**** p<0.01, ** p<0.05, * p<0.1*				

Source: Author's calculations based on the FSO Construction statistics.

11. Appendix 3 - Renovation Investments

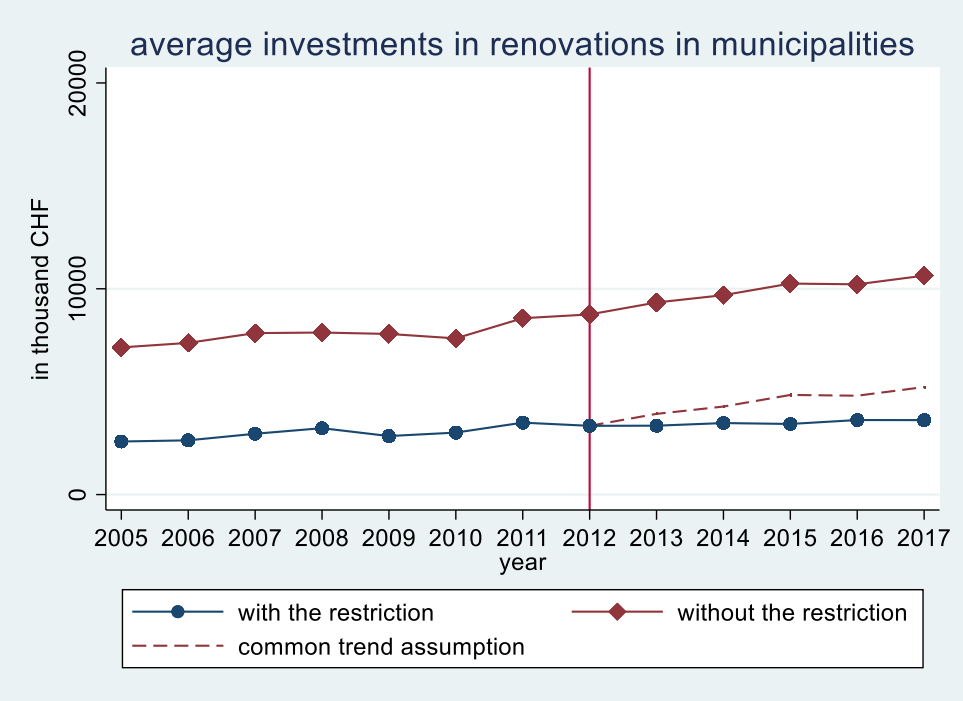

Figure 27. Average investments in renovations in municipalities to which the second home restriction applies and for the remainder with no legal changes (counterfactual).

Source: Author's illustration of data from the FSO construction investment statistics.

Table 15. Results of the DiD for the second home restriction (with continuous and discrete treatment variable) on renovation investments.

Renovation Investments: regression results - discrete and continuous treatment estimates

	Immediate treatment (cut-off t_{2012})			Delayed treatment (cut-off t_{2015})		
	(1)	(2)	(3)	(1)	(2)	(3)
	A. Continuous treatment					
Second home share x Post	-30**	-6	-0	-31**	-8	-4
.stdv	[14]	[8]	[11]	[14]	[7]	[9]
R-squared	0.956	0.965	0.967	0.017	0.200	0.260
Observations	15,612	14,437	14,437	15,612	14,437	14,437
	B. Discrete treatment					
Sec home restriction x Post	-1,619**	-354	-151	-1,634**	-369	-229
.stdv	[751]	[365]	[461]	[773]	[326]	[423]
R-squared	0.956	0.965	0.967	0.00145	0.826	0.831
Observations	15,612	14,437	14,437	15,612	14,437	14,437
Socioeconomic controls	No	Yes	Yes	No	Yes	Yes
Canton by year effects	No	No	Yes	No	No	Yes

**p < .1, **p < .05, ***p < .01*

Source: Results from the Difference-in-Difference method application on the second home restriction law.

Table 16. Results of the event study for the second home restriction (with continuous and discrete treatment variable) on renovation investments.

Renovation Investments: regression results - discrete and continuous treatment estimates and year-specific cumulative estimates

	Immediate treatment (cut-off t_{2012})			Delayed treatment (cut-off t_{2015})		
	(1)	(2)	(3)	(1)	(2)	(3)
	A. Continuous treatment					
Second home share x D^{12}	-14*	2	-0			
.stdv	[8]	[9]	[14]			
Second home share x D^{13}	-23**	-4	5			
.stdv	[10]	[8]	[11]			
Second home share x D^{14}	-30**	-7	1			
.stdv	[14]	[10]	[12]			
Second home share x D^{15}	-39**	-10	-7	-31**	-9	-8
.stdv	[18]	[8]	[13]	[14]	[7]	[10]
Second home share x D^{16}	-34**	-1	8	-27*	-0	8
.stdv	[17]	[9]	[10]	[14]	[7]	[7]
Second home share x D^{17}	-41**	-15	-11	-34**	-14	-11
.stdv	[19]	[14]	[15]	[15]	[11]	[13]
R-squared	0.956	0.965	0.967	0.00133	0.826	0.260
Observations	15,612	14,437	14,437	15,612	14,437	14,437
	B. Discrete treatment					
Sec home restriction x D^{12}	-734*	99	-60			
.stdv	[424]	[403]	[656]			
Sec home restriction x D^{13}	-1,314**	-382	21			
.stdv	[533]	[374]	[523]			
Sec home restriction x D^{14}	-1,610**	-504	-140			
.stdv	[772]	[452]	[531]			
Sec home restriction x D^{15}	-2,091**	-565	-379	-1,686**	-478	-359
.stdv	[991]	[391]	[488]	[787]	[341]	[378]
Sec home restriction x D^{16}	-1,865*	-132	181	-1,459*	-43	201
.stdv	[955]	[433]	[502]	[751]	[341]	[436]
Sec home restriction x D^{17}	-2,157**	-669	-553	-1,752**	-587	-533
.stdv	[1,031]	[609]	[717]	[823]	[513]	[637]
R-squared	0.956	0.965	0.967	0.00145	0.200	0.260
Observations	15,612	14,437	14,437	15,612	14,437	14,437
Socioeconomic controls	No	Yes	Yes	No	Yes	Yes
Canton by year effects	No	No	Yes	No	No	Yes
**p < .1, **p < .05, ***p < .01*						

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

12. Appendix 4 – Variation of Touristic Overnight Stays in Managed Accommodations in Municipalities

The map (Figure 28) 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 Figure 29.

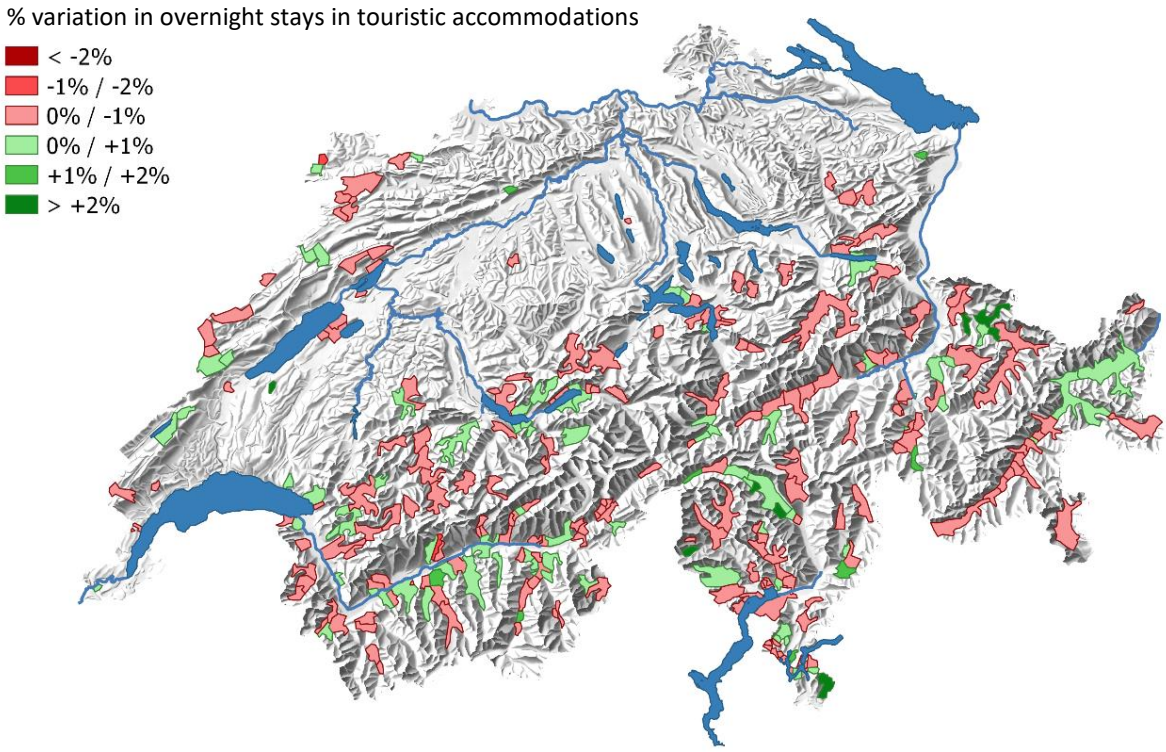

Figure 28. Variation in the percentage of overnight stays in touristic managed accommodations in municipalities to which the second home restriction applies.

Source: Author's illustration of the data from the FSO tourist accommodation statistics.

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.

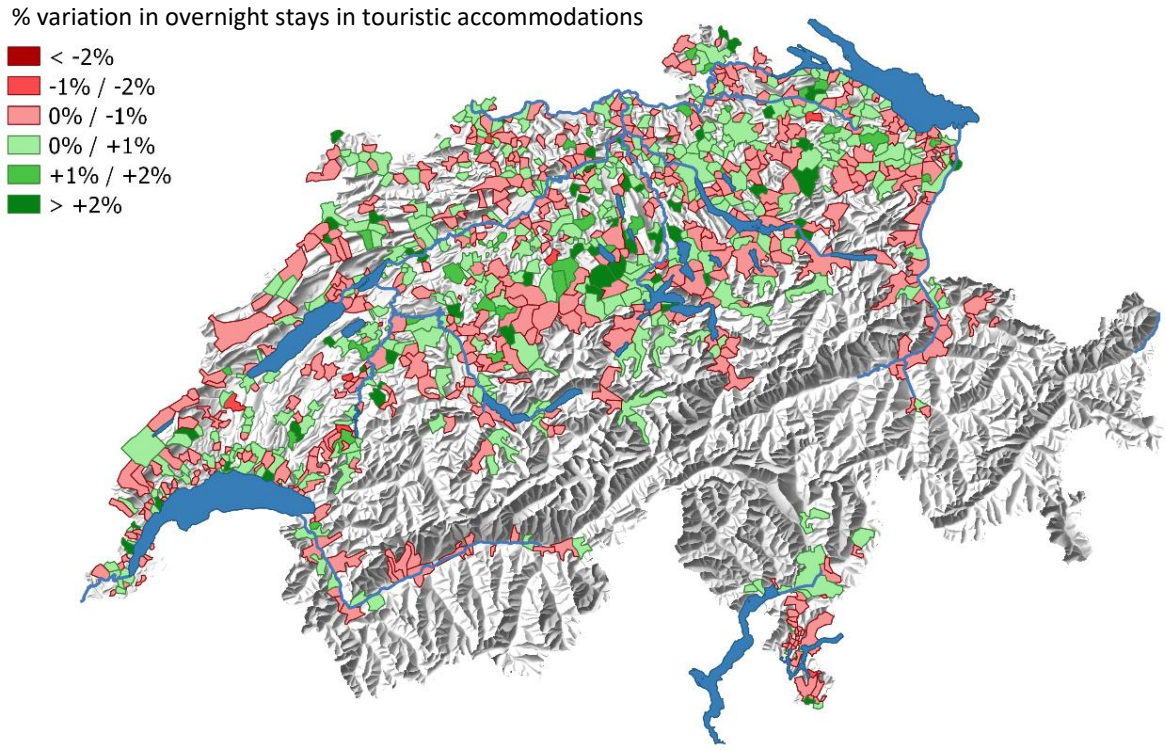

Figure 29. Variation in percentage of touristic overnight stays in managed accommodations in municipalities to which the second home restriction does not apply.

Source: Author's illustration of data from the FSO Tourist accommodation statistics.

Conclusions

Conclusions

To summarize the main findings of the three chapters composing this thesis, some main points can be noted. First, we refer to the findings and conclusions of the first chapter, which identify the increasing pressure from raising minimum wages on employment as a consequence of the application of the bilateral agreement on the Free Movement of Persons between Switzerland and the European Union. Referring to labour market theory, in general, increasing minimum wages should lead to lower labour market tightness, which, depending on the shape of the Beveridge curve, would result in higher unemployment. Nevertheless, labour market liberalization shifted bargaining power away from employees towards firms, a factor that acted in the opposite way to minimum wages, more explicitly shifting the wage curve downwards. Moving to the level of the production function, the bilateral agreement guarantees access of foreign firms to the Swiss market up to a certain level and vice versa, which led to higher competition among construction firms, resulting in a potential reduction of the firms' profits.

In this first part, the results show that in the period after the application of the bilateral agreements, employment grew at a lower level, indicating that due to the higher competition, construction firms partially lost their possibility to forward the higher wage costs to the consumer. The natural reaction is that in the absence of the possibility of earning higher prices, the input costs need to be reduced, with given wage costs for the labour input, which would again result in lower employment. In terms of growth, the effect would be an initial reduced growth rate of employment. These first models were extended to include additional variables defining economic and spatial spillover effects. More specifically, when the employment and minimum wage growth of all interconnected cantons (defined as economic neighbours based on an analysis of the inbound commuter streams) were taken into account, the original results slightly changed. In effect, the variation in the labour supply in the neighbour

cantons significantly impacted the growth rate in the other analysed cantons. This result is supported by the fact that most regions in Switzerland have a high geographical proximity, which allows for a high mobility of working commuters.

Moving to the second part of the thesis, we focus on the fourth partial revision of the law of unemployment insurance, which eliminated the possibility for economically disadvantaged cantons to temporarily extend their maximum beneficiary period for unemployed. In essence, this policy change involved a reduction in the unemployment benefits on a cantonal level where the additional extension period previously applied. Ticino was chosen as an ideal canton for the synthetic control analysis since it applied the lengthening measure almost uninterruptedly during last years of the pre-treatment period. The results of the matching technique of the synthetic control method suggest that unemployment in Ticino could have been persistently reduced. Based on labour market theory, this local reduction in unemployment benefits (towards the unique national level) would necessarily result in a higher labour market tightness. A higher tightness (assuming an intersection point in the rather flat part of the Beveridge curve) would lead to a lower unemployment rate. In fact, in accordance with the theory, our results show a lasting effect of the law's revision on the unemployment rate. The reduced maximum duration accelerated the job searches and efforts of unemployed people in Ticino. The results are in line with previous analyses conducted in other countries for similar policy changes, especially the literature indicating an increasing search effort towards the end of the maximum unemployment duration.

Moving to the third chapter, where we analyse the impact of the second home restriction in the Swiss municipalities, we address an external shock on the production output side. In the economic context of the production function, construction firms in the most affected touristic areas face an artificial reduction in their produced quantity. In effect, the obtained results quantify the reduction in new construction investments, which were growing over time, starting with the date of the law's application. Moreover, the higher the historical share of second homes in

the single municipality was, the stronger the effect. In general, this reduction in the production output of the construction industry in the affected areas did not result in lower utilization of production inputs, especially in a spatial dislocation of their range of activity. Indeed, on an aggregate, national level, the construction investments in new buildings and renovations continued to grow even in the period after the second home law's application. An additional hypothesis considered whether the construction activity in the touristic regions would have been shifted to favour the requalification of existing buildings. In the short term, no such effect could have been identified. Under the premise that in the next decade, a larger part of existing second homes will be on the market for demographic reasons, renovation activity could possibly gain importance.

In conclusion, considering the results of the three chapters composing this thesis, we assert that policy interventions that change the existing equilibrium can have ambiguous effects on both the local economy and the workforce, as well as the final consumer, citizens and firms. In fact, the liberalization of the labour market and easier access to markets has led to stagnating construction prices in Switzerland to the favour of investors. Firms consequently must increase their efficiency. Higher competition in the labour market results in a higher pressure of minimum wages on employment growth, interrupting the previous artificial growth path of wages in the construction industry. These ambiguous effects are in contrast to the second policy intervention of the unemployment insurance law, which successfully reduced the opportunistic behaviour of persons who were eligible for a longer unemployment duration and thus delayed their job search efforts, thereby contributing to increased social costs for the working population. Last, in an economic sense, the limitation of second home construction creates an excess of demand, favouring actual second homeowners at the cost of future purchasers – shifting the housing prices away from equilibrium prices. The increasing speculation on second homes makes them increasingly become an investment asset instead of homes that would produce a consumption good of "living" at a reasonable price, as is the case for primary homes.

In this sense, such a policy can succeed in reducing living costs for residents, and ultimately, it can help fight the waste of construction grounds for value-stable financial investments in real estate, which has been a main contributor to the destruction of the intact mountain landscape – one of the main touristic assets of the Alpine regions.