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Transaction Taxes, Capital Gains Taxes and House Prices

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Abstract: Motivated by the search for instruments to contain future housing bubbles, we examine the impact of transaction taxes and capital gains taxes on residential house price growth. We exploit the variation in taxation across Swiss cantons, as well as within-canton changes in taxation over time. We relate these taxes to house price growth observed for 92 regions of the country during the period 1985 – 2009. Our results suggest that higher taxes on capital gains exacerbate house price dynamics while transaction taxes have no impact on house price growth. These findings support the existence of a lock-in effect of capital gains taxes on housing supply. They further suggest that taxes on real estate capital gains and transaction values are not suitable measures to prevent excessive house price growth.

Keywords: House prices, Transaction tax, Capital gains tax, Macroprudential policy

JEL Codes: E32, H24, R21

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1 Introduction

The recent financial crisis has highlighted the need for macroprudential policy which strengthens the financial system's resilience to economic downturns and limits the build-up of risks to financial stability.¹ In most economies, macroprudential policy frameworks are at an early stage of development, and the evidence for their effectiveness is tentative. There is also considerable debate about the appropriate instruments to be used in macroprudential policy. However, policymakers agree that instruments to curb excess house price growth should be among the toolkit. The recent turbulences in the financial sector in the United States and Europe were at least partly caused by the build-up and subsequent collapse of property prices.²

One specific macroprudential instrument authorities may use to limit or pre-empt real estate price booms is a (variable) cap on loan-to-value ratios of mortgages.³ Alternatively, countercyclical capital buffers enable the authorities to adjust capital requirements in the banking system, depending on potential excesses in the mortgage market.⁴ Beyond macroprudential policy, the recent literature suggests that fiscal instruments may also help contain real estate bubbles (Posen 2009). Jeanne (2008) proposes a counter-cyclical Pigouvian tax on debt, including mortgage debt, to internalize the negative externality which individual borrowers produce on systemic risk. Jeanne and Korinek (2010) discuss a dynamic model in which a Pigouvian tax manages credit booms and busts.

¹ Milne (2009), CGFS (2010), Jordan (2010). Bank of England (2009) discusses possible ways to make a macroprudential policy regime operational.

² See, e.g., Borio and Disyatat (2009), IMF (2003), Ahearne et al. (2005), Leamer (2007), Claessens et al. (2008), Claessens et al. (2010), IMF (2009), Jannsen (2010), Crowe et al. (2011). Reinhart and Rogoff (2008) set out some parallels between America's subprime crisis and 18 previous post-war banking crises in the rich world.

³ Goodhart (2009).

⁴ Switzerland introduced an anticyclical capital buffer as a macroprudential instrument in 2012 (Danthine, 2012).

In this study we examine the effectiveness of taxes on real estate transaction values and capital gains as instruments to smooth price growth in the residential housing market. We exploit the variation in taxation across 21 Swiss cantons as well as within-canton changes in taxation over time during the period 1985 – 2009. The level and variation in tax rates within Switzerland, for example for real estate transaction taxes, is similar to what can be observed across OECD countries (Crowe et al. 2011). We relate house price growth in 92 regions to the taxation of transaction values and capital gains in the canton the region is located in.

Switzerland is a particularly interesting country in which to study the effects of real estate taxes for two reasons. First, given the substantial variation in taxation of real-estate transaction values and capital gains across its cantons, Switzerland provides a unique opportunity to study how taxes impact on residential house price growth in a *homogeneous macroeconomic environment* with an *integrated banking sector* and a *common legal system*. By comparison, cross-country studies of regulation, taxation and house prices are marred by (unobservable) macroeconomic and structural characteristics across countries.⁵ Second, Switzerland has in the past experienced a banking crisis due to a real estate boom. The sharp rise in real estate prices in the 1980s, followed by a slump in prices in the early 1990s, led to substantial loan losses as well as a restructuring of the Swiss banking sector. The large Swiss banks alone wrote off CHF 30 billion or nearly 13% of their loan volume. Nearly half of the 200 regional banks, a group consisting of small locally-based institutions, did not survive the crisis and lost their independence.

We find no evidence that transaction taxes or capital gains taxes dampen house price growth. On the contrary, we find that taxes on capital gains, and in particular penalty taxes on short-term gains seem to fuel price growth. Sample splits show that this result is driven by

⁵ See Crowe et al. (2011) for a similar reasoning.

house price dynamics in tourism regions where housing is most likely to be an investment object as opposed to a durable consumption good. Instrumental variable estimates suggest further that this result is not driven by reverse causality.

Our results suggest to policy makers that transaction taxes and capital gains taxes on housing are not suitable as instruments of macroprudential policy. In particular, due to lock-in effects for existing home-owners, taxes on (short-term) capital gains seem even to be counterproductive to the objective of systemic stability.

The rest of the paper is organized as follows. Section 2 offers a review of related literature. Section 3 presents the data and empirical methodology. Section 4 presents the results and section 5 concludes.

2 Related Literature

There is an extensive theoretical and empirical literature examining the impact of housing tax policy on housing decisions (see, for instance, Smith et al. 1988 and Nakagami and Pereira 1995). By contrast, only little research has been devoted specifically to the effects of taxation on price developments in real estate markets. In this section we focus on those contributions which study the impact of transaction taxes and capital gains taxes on house price dynamics. This literature provides ambiguous predictions and inconclusive empirical findings on the relationship between transaction taxes, capital gains taxes and house price developments.

2.1 Theoretical studies

The idea to tax financial transactions in order to reduce asset price volatility was introduced by Keynes (1936) for stock exchanges and Tobin (1978) for currency markets. Stiglitz (1989) argues that a transaction tax can reduce speculative trading and price volatility in asset markets. However, the subsequent theoretical literature suggests that transaction taxes may amplify rather than smooth price fluctuations, for instance by reducing the liquidity of asset markets (see, e.g., Hau 2006). The effect of a capital gains tax on asset price volatility is also theoretically ambiguous (see Fuest et al. 2004 for an overview). The model of Stiglitz (1983), for example, shows that such a tax may increase volatility. In his model, a capital gains tax leads households to postpone the realization of capital gains (lock-in effect⁶) and bring forward capital losses, lifting asset prices when there is upward price pressure and reducing them when the prices of assets are low.

With respect to the housing market, Englund (1986) suggests that *capital gains taxes* on real estate can exacerbate price dynamics by giving rise to lock-in effects which inhibit trade.⁷ He considers in a two-period overlapping-generations (OLG) model whether capital gains taxation increases or decreases market demand for owner-occupied housing. In a growing economy an increase in the capital gains tax lowers housing demand for low tax rates, reducing price dynamics. However, as soon as the tax rate reaches a critical value, the household chooses to stick to the same house for both periods and demand picks up. The general conclusion is that a high capital gains tax may not dampen, but actually accelerate the development of house prices.

⁶ A homeowner postponing the realization of a capital gain is hit by a lower tax rate in present value terms.

⁷ Englund (1985) compares taxation of capital gains on realization with taxation on accrual in the context of owner-occupied housing in an infinite-horizon model. Taxing capital gains upon realization rather than as the gains accrue boils down to giving the taxpayer an interest-free loan, effectively taxing capital gains at a lower rate than other income, thereby violating the principles of comprehensive income taxation. See Diamond (1975) and King (1977).

Fuest et al. (2004) also use a two-period OLG model to examine whether capital gains taxes increase or decrease fluctuations in house prices. They argue that households who buy their real estate in a boom are likely to suffer a capital loss. By contrast households buying their real estate in a recession are likely to make a capital gain when selling it. A capital gains tax reduces the expected losses of those buying in the boom and reduces the gains of those buying during recession. As a consequence the former will pay more while the latter will pay less so that real estate prices increase even further in booms and fall even more in recessions.

There is to our knowledge no theoretical paper which explicitly models the implications of a transaction tax on house price dynamics. Lundborg and Skedinger (1999) show in a search model with endogenous house prices that a transaction tax unambiguously leads to lock-in effects. Their model does not consider the implications of this effect for house prices in a dynamic setting. However, according to the model of Englund (1986) mentioned above, lock-in effects in the real estate market would amplify house-price volatility.

2.2 Empirical studies

Hoyt and Rosenthal (1992) simulate the effects on housing demand from a simultaneous increase in the capital gains tax rate and a lowering of federal marginal income tax rates, consistent with the US Tax Reform Act in 1986 (TRA86). Rollover provisions in the US tax code enable homeowners to avoid paying tax on the capital gains from the sale of their home if they purchase another home of equal or greater value within a certain period of when they moved. Because of these tax provisions households face a different price of housing depending on whether they purchased a more (buy up) or less expensive house (buy down). Against this legal background, the TRA86 increased the difference in the price of housing services between buying up versus buying down. On the one hand an increase in the

capital gains tax rate raised the penalty for buying down, on the other lower marginal tax rates raised the user cost of owner-occupied housing. As a result housing demand would fall with a decrease in the capital gains tax rate as additional previous homeowners buy down.

Lundborg and Skedinger (1998) provide evidence on the size of the lock-in effect due to capital gains taxation based on survey data of 6,000 Swedish home owners during the 1980s. Their results suggest that capital gains taxation reduces the probability of buying down for households with too high a housing consumption. However, capital gains taxes do not appear to have lock-in effects for households which want to buy up, i.e. those whose income has risen or family size increased and thus for whom consumption is regarded as too small.

Rosen et al. (1984) examine how capital gains taxes affect the risk associated with home ownership. They estimate the impact of capital gains taxation on the tenure choice during the second half of the 1970s, taking into account the uncertainty about the user cost of housing and assuming perfect supply elasticity. Based on US time series and cross sectional data they show that capital gains taxes may, on balance, increase the proportion of owner-occupiers. Two opposing effects are working. On the one hand, the expected cost of owning increases. On the other hand, the forecast error variance of the user cost is sufficiently reduced to dominate.

Similar to this paper, Sheffrin and Turner (2001) examine the impact of capital gains taxes across different metropolitan regions with varying patterns of house price dynamics.⁸ Using household data from 1985 to 1995 they find that households would, on the one hand, benefit from a capital gains tax by reducing the volatility of housing prices. On the other hand capital gains taxes increase the user cost. On balance, and contrary to Rosen et al. (1984), the

⁸ From a methodological point of view the panel analysis based on US interstate variation in capital gains taxation during 1979-90 provided by Bogart and Gentry (1995) is the most similar to our approach. In contrast to our paper which looks at the impact on house price dynamics, Bogart and Gentry look at the relation between capital gains tax rates and capital gains realizations. They find that capital gains realizations are negatively related to capital gains tax rates, suggesting lock-in effects from capital taxation.

latter effect dominates, leaving households on average worse off. However, the results vary strongly by metropolitan areas and over time. Households in high-volatility areas would benefit from capital taxes whereas homeowners in high-appreciation cities would be hurt. By contrast, in the euro area, van den Noord (2005) finds that more favorable tax treatment of housing may increase house price volatility.

Closest to our approach, Crowe et al. (2011) address the question of how property taxes in the US affect price dynamics in a sample covering 243 metropolitan areas. They report that a one standard deviation increase in property tax rates reduces the average annual price growth by 0.9 percentage points. This compares with an annual price growth of 5.6 percent. The impact on price volatility around the trend is similar. One interpretation of these results is that by indirectly taxing imputed rent, property taxes may mitigate the effect of other tax treatments favoring homeownership and reduce speculative activity.

To our knowledge there is no empirical study which examines the impact of a transaction tax on house price dynamics.⁹ As far as financial transaction taxes are concerned, the empirical evidence on the relation between transaction costs and asset price volatility is inconclusive.¹⁰

Our study complements the literature presented above by examining the impact of cross-sectional and time-variation in transaction and capital gains taxes on house price growth. Compared to the above studies on US and Swedish data, our analysis benefits from the fact that we observe varying levels of taxation across regions within a country and over a long period of time. Compared to potential cross-country studies on taxation our analysis has the

⁹ Crowe et al. (2011) report that higher stamp duties to dampen real estate prices and discourage speculation in China and Hong Kong SAR seem to have led to a stronger reaction of transaction volume than of housing prices suggesting only a transient impact of the higher tax.

¹⁰ For a survey of the literature see, e.g., Pomeranets (2012).

advantage of studying a sample of regions which have a harmonized macroeconomic policy, an integrated banking system and a common legal environment.

3 Data and methodology

3.1 House prices

Our analysis is based on house prices observed for 92 MS-regions (MS = spatial mobility) in Switzerland over the period 1985 – 2009. Each MS-region is made up of several municipalities which together form a local labor market. A graphical representation as well as a list of all MS-regions and their attribution to the Swiss cantons are provided in Appendix A1. The MS-regions covered in this study account for 87% of the Swiss population and an estimated 87% of Swiss GDP in 2008.¹¹ For each MS-region we observe an annual index of nominal prices for single-family houses and condominiums separately. Both indices are measured on a hedonic basis to account for quality changes. We calculate average annual nominal price growth for single-family houses (*Price growth SFH*) and condominiums (*Price growth CON*) for each of the following five periods: 1985-1989, 1990-1994, 1995-1999, 2000-2004, 2005-2009. Table 1 provides definitions and sources of all variables employed in our analysis. Table 2 provides summary statistics for all variables.

[Table 1 here]

[Table 2 here]

¹¹ We include in our analysis the four MS-regions (Laufental (25), La Broye (93), La Chaux-de Fonds (103) and Murten (42)) for which a share of 21 to 40 percent of the population in these MS-regions is living in municipalities belonging to one or more other cantons than the canton listed in Table A1. All our results are confirmed in robustness tests dropping these four MS-regions.

Figures 1 and 2 display the variation of house price growth across time and MS-regions in our sample. Four important observations can be made from these figures. First, the five periods for which we calculate house-price growth correspond to five distinct phases of house-price movements. Figure 1 shows that between 1985 and 1989 prices for single-family houses rose by 3.5% per year in nominal terms (median). In real terms this corresponds to a cumulative increase of 7% for this period. At the beginning of the 1990s price growth came to a halt. Nominal prices for single-family homes remained stable between 1990 and 1994, implying a cumulative real decline of more than 15%. Between 1995 and 1999 both nominal and real prices for single-family houses remained stable. Between 2000 and 2004 nominal prices for single-family houses rose by 0.8% per year, implying a modest cumulative real growth of 3% for this period. From 2005 onwards price growth accelerated, reaching 3.5% per year in nominal terms and a cumulated real price growth of 13% between 2005 and 2009.

[Figure 1 here]

[Figure 2 here]

The second observation is that the price growth of condominiums displays stronger variation across time than that of single-family homes. Figure 1 shows that in the periods of strongest price increases median price growth for condominiums exceeds that of single-family houses by 1.7% per year (1985-1989) and 0.6% per year (2005-2009), respectively. By contrast in the two periods of real price decline (1990-1994, 1995-1999) the prices of condominiums displayed lower median growth than those of single-family houses.

The third observation from Figure 1 is that in each of the five periods there is substantial regional variation in price growth. Between 1985-1989, for example, nominal

price growth for single-family homes grew by less than 0.4% per year in the four slowest growing MS-regions, while price growth exceeded 7% per year in the four fastest growing MS-regions. The most recent period 2005-2009 has seen a similar dispersion in regional house price developments. Nominal prices for single-family houses rose by less than 1% per year in the two slowest growing MS-regions, while price growth exceeded 8% per year in the three fastest growing MS-regions. The figure shows that the two periods of real price depreciation (1990-1994, 1995-1999) also display substantial regional variation in price developments.

The fourth observation is that the geographical distribution of regions with strong price growth varies substantially between the two boom periods 1985-1989 and 2005-2009. Figure 2 plots house price growth by MS-region for these two periods and shows that the strong price growth at the end of the 1980s (above 5% p.a.) was widespread in urban and semi-urban areas, but not in the main tourist, i.e. mountain areas. By contrast, in the most recent period strong price growth is focused on the financial centers (Zurich and Geneva) and the main tourist areas.

3.2 Taxation of real estate capital gains and transaction values

The taxation of real-estate capital gains and transaction values differs strongly across Swiss cantons.¹² We collected information on the tax regimes and tax rates from the authorities of the 26 cantons over the period 1980-2005. Appendix A2 provides an overview

¹² Our analysis focuses on the taxation of capital gains and transaction values as we expect these taxes to influence *house price growth*. We do not examine the taxation of property values or (imputed) income, as we expect these taxes to affect the *level of house prices* rather than their growth. In Switzerland the *holding* of real-estate, i.e. the property value and the income derived from it, are taxed. Switzerland is one of the very few countries that bring imputed rents into the income tax (Keen et al. 2010). The imputed rent of owner-occupied housing is considered to be part of household income and is therefore subject to the ordinary income tax, while housing value is subject to wealth tax. Housing expenses such as mortgage interest can be deducted from income taxes while the mortgage itself from the wealth tax. In most cantons also maintenance costs or insurance premiums can be deducted from the income tax (SFTA 2010a, 2010b).

of the current tax regimes of the capital gains tax and transaction tax by canton. Due to missing data only 21 cantons are included in our sample.¹³

We employ three indicators of taxation in our empirical analysis. The first two tax indicators measure the taxation of real estate capital gains by canton.¹⁴ For private households, each canton levies a real-estate capital gains tax, which is independent of the income or wealth status of the tax payer.¹⁵ The capital gains tax is levied each time a gain on real estate has been realized and is due by the seller. The gain is computed as the selling price (transaction value) minus the original purchasing price minus the value increasing expenditures by the owner. In most of the cantons the tax rate is progressively related to the level of the capital gain, while in each canton there is an inverse relationship between the tax rate and the duration the real estate was held.¹⁶ This tax pattern aims to penalize short-run price speculation.¹⁷ Our two indicators capture the level and inverse time progression of the capital gains tax. The variable *Capital gains tax* measures the top marginal tax rate applicable to real estate capital gains if the property is sold after holding it 5 years. The variable *Speculation tax* measures by how much the top marginal rate on real-estate capital gains is increased (in percentage points) if the residential property is sold less than one year after it has been purchased. Our third tax indicator measures the transaction tax which is levied every

¹³ There is no tax data available from the canton Zug and St. Gallen, and data for Jura and Solothurn is only available for a limited period. Data on mortgage interest rates for Appenzell A.Rh. are missing.

¹⁴ In Switzerland taxes are levied at the federal, at the cantonal and communal level. Income taxes are levied at all three state levels. Wealth taxes and property taxes are cantonal and communal, but the latter do not exist in all cantons. Capital gains taxes are cantonal and/or communal. The capital gains tax on movable private wealth was abolished in all cantons. The canton Graubünden was the last canton which abolished this tax in 1997 (SFTA 2010d).

¹⁵ For companies, gains on real estate are taxed either according to the corporate income tax rate or the above mentioned gains tax. As 89% of all residential buildings in Switzerland are owned by private persons we focus our analysis on cross-canton differences in the taxation of gains by private persons. Concerning private persons one has to distinguish between private wealth and business assets. On private wealth the capital gains tax is levied and on real estate that belongs to the business assets, the income tax is levied.

¹⁶ Unlike other countries the tax code makes no explicit distinction between buying up and buying down transactions. However, like in other countries, cantonal tax rules provide for postponement of the tax liability if the sales revenue of owner-occupied housing is used to purchase another property within some period of time (roll-over provision). This amounts to an implicit tax-exemption on “buying up”.

¹⁷ SFTA (2010c).

time real estate changes hand.¹⁸ It is applied to the transaction value, i.e. the selling price. In most cantons the tax is proportional to the real-estate value and due by the buyer.¹⁹ The variable *Transaction tax* captures the top marginal rate of the tax on transaction values by canton.²⁰

[Table 3 here]

We collected our three tax indicators at five points in time: 1985, 1990, 1995, 2000 and 2005. Table 3 shows that there is substantial variation across the cantons and over time for each indicator. In 1985, for example, the *Capital gains tax* varied from less than 20% in the cantons of Obwalden and Vaud to 40% and more in Thurgau, Schaffhausen and Valais. Between 1985 and 2005 eight cantons raised this tax (e.g. Basel-Stadt from 32% to 48%), while four cantons reduced it (e.g. Valais from 40% to 26%). The *Speculation tax* on short-term real estate gains varied in 1985 from 0% in Basel-Stadt, Vaud and Valais, to 25% or a doubling of the capital gains tax in Basel-Landschaft. Between 1985 and 2005 this tax was increased in 10 cantons, while it was reduced in four cantons. Finally, the *Transaction tax* rate varied in 1985 from less than 0.5% in Aargau and Uri to 4% in Fribourg and Neuchâtel. Between 1985 and 2005 this tax shows the fewest changes within cantons; it was raised in two cantons and reduced in five others, for example in Zurich, where it was abolished altogether.

¹⁸ Transaction taxes are, similar to capital gains taxes, levied at the canton and/or municipal level.

¹⁹ SFTA (2010e). Some cantons apply progressive tax rates, in some cantons the transaction tax has the form of a fee and some cantons do not have such a tax anymore. Also, some cantons split the tax between the buyer and seller. See Appendix A2 for details. The majority of cantons levy a lower rate for transactions within families (descendants, spouses, etc.). However, as such intra-family sales are quite rare in Switzerland, we focus on the regular transaction tax rate.

²⁰ In robustness checks we calculated our three tax indicators based on five standard real estate transactions. The qualitative findings are the same.

3.3 Estimating house price growth

In our empirical analysis we relate price growth, $P_{r,t}$, by MS-region r in the period t to the taxation of real estate transactions in that period in the canton c where an MS-region is located, $T_{c,t}$. As illustrated in model [1] we employ MS-region fixed effects α_r to account for time-invariant, structural differences across MS-regions, which may affect housing demand and supply. For example, regions differ in their attractiveness for tourism, their urban/rural structure,²¹ their availability of vacant premises, land for building purposes²² and home-ownership rates.²³ We further employ period fixed effects α_t to control for the average impact of the business cycle and monetary policy (e.g. nominal interest rates) on housing demand and supply across the country.

$$[1] \quad P_{r,t} = \alpha_r + \alpha_t + \beta_1 \cdot T_{c,t} + \beta_2 \cdot X_{r,t} + \beta_3 \cdot Z_{c,t} + \varepsilon_{r,t} ,$$

whereby $P_{r,t} \in \{ \text{Price growth SFH}; \text{Price growth CON} \}$

To control for differences in fundamental drivers of housing demand and supply across MS-regions and periods of observation we employ three time-varying indicators per MS-region, $X_{r,t}$, and two time-varying indicators per canton, $Z_{c,t}$.²⁴ The variable *Income*

²¹ The Swiss Federal statistical office classifies each municipality into one of four types: 1=Central city of an agglomeration, 2=Agglomeration, 3=Isolated city, 4=rural.

²² Zürich has the lowest housing vacancy rate with 0.03%, while the MS-region “Glarner Hinterland” has the highest rate with 3.82% (in 2008).

²³ The home ownership rate in Switzerland, defined as the ratio of owner-occupied dwellings to total occupied dwellings, is 35%. Owner-occupied dwellings consist of condominium owned dwellings (22.8%), sole owned houses (66.5%) or joint owned houses (10.7%) (SFSO 2004). Bourassa and Hoesli (2006) analyse the reasons for the country’s low ownership rate by international standards.

²⁴ Steiner (2010) considers these indicators to be key determinants of Swiss housing dynamics at the country level.

growth measures nominal annual growth of per capita income and *Population growth* measures average annual population growth per MS-region and period.²⁵ The variable *Housing stock growth* is our indicator of growth in housing supply and refers to the net growth of the housing stock and again measures average annual growth per period and MS-region. As housing supply has been found to have a lagged impact on house price dynamics (Steiner 2010), we employ the lagged value of this variable in our analysis.²⁶

We take account of differences in lending conditions across time and regions. Previous research (Bolliger and Cecchin 2009) shows that there are significant regional differences in mortgage loan pricing within Switzerland. We control for this variation by including the variable *Mortgage rate*, which measures the average interest rate offered on new mortgages at the canton level.²⁷ Finally, we control for the *Income tax* rate which varies strongly across Swiss cantons, and which has been argued to exert a strong influence on house prices (Bourassa and Hoesli, 2006). Our indicator measures the average tax rate on annual income of CHF100,000.

4 Results

4.1 Univariate results

Table 4 presents a univariate analysis of the relation between the change in housing taxes and the change in house price growth over time at the MS-region level. Our analysis is

²⁵ Population growth includes immigration which has been shown to affect house prices in Switzerland and other developed countries (see, e.g., Degen and Fischer 2009 and Saiz 2007).

²⁶ For the period 2005-2009 we use average annual growth in housing for the period 2000-2004, for the period 2000-2004 we use net growth housing stock for the period 1995-1999, etc. For the period 1985-1989 we use net growth in housing stock in 1984 as we have data on the housing stock only from 1984 onwards.

²⁷ Due to missing data for 2009, our indicators of *Population growth*, *Income growth*, and *Mortgage rate* for the period 2005-2009 are based on 2005-2008 averages.

focused on the two boom periods identified in Figure 1: 1985-1989 and 2005-2009. For each MS-region we calculate the difference in Price growth SFH ($\Delta Price\ growth\ SFH$) and Price growth CON ($\Delta Price\ growth\ CON$) between these two periods. We then compare our three canton-level tax indicators *Capital gains tax*, *Speculation tax* and *Transaction tax* in 1985 and 2005 and identify those cantons in which each tax increased, decreased or stayed the same. Table 4 compares the change in price growth for MS-regions located in cantons where taxes were increased to changes in price growth for MS-regions located in cantons where taxes were decreased or stayed the same.

The difference-in-difference tests reported in Table 4 provide inconclusive evidence for an impact of the *Capital gains tax* or *Transaction tax* on house price growth. MS-regions located in cantons that increased the *Capital gains tax* did not experience significantly lower price growth than MS-regions located in cantons that decreased or did not change that tax. MS-regions located in cantons that increased the *Transaction tax* did experience lower price growth than MS-regions located in cantons that decreased or did not change that tax. However, the difference-in-difference test is only economically and statistically significant for the comparison between those cantons that increased the tax versus those that did not change the tax.

The results shown in Table 4 do suggest a strong positive relation between changes in the *Speculation tax* and changes in house price growth. MS-regions located in cantons that increased the *Speculation tax* did experience a *higher* price growth than MS-regions located in cantons that decreased or did not change that tax. The tests reported in the table suggest that these differences are not only statistically significant, but also large in terms of economic magnitude. For example, in cantons which increased their *Speculation tax* the price growth of single-family houses increased by 2.7% p.a. more than in cantons which did not change this

tax. Compared with cantons that lowered the *Speculation tax* the prices of single-family houses grew by 1.9% more per annum.

[Table 4 here]

The Table 4 results provide first evidence that taxes on capital gains and transaction values have not dampened house price growth in our sample. By contrast, and in line with a lock-in effect, the results suggest that, penalty taxes on short-term capital gains (speculation tax), may actually spur house price growth. However, it would be premature to draw conclusions on the *causal* impact of taxes on house price growth from the univariate tests above. First, differential changes in housing-taxes across cantons may have coincided with changes in economic conditions (e.g. income growth, immigration or income taxation) which may have affected house price growth. Second, increases in housing taxes, e.g. the *Speculation tax*, may have been driven by expected house-price growth. In our subsequent multivariate analysis we examine whether our univariate findings are robust to accounting for omitted variables and reverse causality.

4.2 Multivariate results

Table 5 presents the results of our estimation of model [1]. Columns (1-3) report results for *Price growth SFH* while columns (4-6) report results for *Price growth CON*. For both dependent variables we present estimates based on all five periods (columns 1,4), the two boom periods only (columns 2,5) as well as the three non-boom periods. As indicated by model [1] all models include (non-reported) MS-region and period fixed effects. Standard errors reported in brackets are clustered by canton.

[Table 5 here]

The results presented in Table 5 confirm a significant positive correlation between the *Speculation tax* and house price growth. This correlation is driven entirely by price-growth in the two boom periods 1985-1989 and 2005-2009. The column (2) and column (5) estimates suggest that cantons which increased their speculation tax by 1% experienced an increase in house-price growth between these two periods by 0.3% (single family houses) and 0.24% (condominiums) per annum. Thus the increase in the average *Speculation tax* (across all cantons) between period 1985-1989 and 2005-2009 (3.41%, see Table 2) would imply an annual increase in price growth between 0.8% (condominiums) and 1% (single family houses). This is a sizeable effect, given that average annual price growth was 4% - 5% in these periods. Finally, the estimates reported in column (3,6) show that the level of the *Speculation tax* has no impact on house price growth during periods where prices are falling or growing slowly.

According to the estimates reported in Table 5, ordinary *Capital gains taxes* also vary positively with house price growth. However, the economic magnitude of the coefficients for the *Capital gains tax* are much smaller than those of the *Speculation tax*. Moreover, from a statistical viewpoint these estimates are only significant at the 10% level and only for prices of condominiums (see column 5). These results suggest that penalty taxes on short-term gains have a stronger lock-in effect than ordinary capital gains taxes.

The estimates of Table 5 also confirm that the *Transaction tax* is negatively correlated with house price growth. The estimated coefficients suggest that this correlation is sizeable from an economic viewpoint. For example, the estimate provided in column (1) implies that a 1% increase in the *Transaction tax* (which corresponds to the standard deviation of this tax

across regions) would reduce house price growth by 0.8% per annum. However, the estimates for *Transaction tax* are only weakly significant for single family houses and only in the full sample, suggesting that this result is hardly robust.

The estimated coefficients for our control variables suggest that house price growth is lower in cantons with higher *Income tax*. By contrast, our other time-varying indicators of housing demand (Income growth, Population growth, Mortgage rate) and housing supply (Housing stock growth) are not correlated with house price growth. The latter results suggest that differences in the development of housing demand and supply *across MS-regions* do not contribute to explaining differential changes in house-price growth across these regions. That said, aggregate changes in housing demand and supply over the business cycle do impact strongly on house price growth. In robustness checks (not reported) we replicate the specifications (1) and (4) from Table 5, excluding period fixed effects. In these robustness tests we find significant positive coefficients of *Income growth*, *Population growth* and a significant negative coefficient of *Mortgage rate* and *Housing stock growth*.

The results presented in Table 5 suggest that the lock-in effect of capital gains taxes on the supply of housing is stronger than the effect of such taxes in reducing speculative demand for housing. The finding that capital gains taxes exacerbates price dynamics due to a reduction in market liquidity is in line with previous empirical findings for financial asset markets (e.g. Hau 2006; Pomeranets and Weaver 2011). However, it is surprising that we find such an effect in a real asset market, i.e. the Swiss housing market, which, due to a low home-ownership rate and long tenure is arguably dominated by households with a durable consumption motive rather than an investment motive.

In order to check the reliability of our results and to rule out that these are driven by spurious correlation, we resort to subsample analyses. If capital gains taxes exacerbate price dynamics in the Swiss housing market, this effect should be concentrated in those segments of the

market which are most populated by transactors with an investment motive rather than a durable consumption motive. Recent market developments and policy initiatives suggest that investment activity in the Swiss real estate market is concentrated in tourist resorts.²⁸

We therefore split our sample of MS-regions into three categories according to their importance as a tourism destination. The variable *Tourism* measures the number of overnight stays per annum divided by the resident population. We distinguish regions with high, medium and low tourism intensity according to whether their average *Tourism* value over our whole observation period is in the first, second or third tercile. We expect that the impact of housing taxes on price growth is strongest in the subsample of MS-regions with high tourism.

[Table 6 here]

Table 6 presents our sub-sample analysis by tourism intensity. We limit our analysis to the two boom periods 1985-1989 and 2005-2009. Results for single-family houses are presented in columns (1-4) while results for condominiums are presented in columns (5-8). The results displayed in Table 6 are in line with our predictions: The *Speculation tax* has a significant positive impact on house price growth only in the high-tourism areas. In these areas we also find that the ordinary *Capital gains tax* has a positive impact on house price growth, while neither tax has an effect in MS-regions with medium or low tourism. The results shown in Table 6 confirm that there is no robust effect of the *Transaction tax* on house-price growth in our sample.

²⁸ In the classic tourist destinations strong building activity in the past has led to an average proportion of second homes in excess of 50%. As a result a referendum initiative entitled "Stop the Endless Construction of Second Homes" was launched. On March 11 2012 Swiss voters accepted the initiative which imposes severe restrictions on the construction of second homes in Switzerland, calling for the proportion of second homes in a municipality to be kept at 20% or lower.

Confirming our results in Table 5, we find that in high tourism areas the impact of the *Speculation tax* on house price growth is more than three times as much as that of the *Capital gains tax*. The coefficients estimated for single family houses in column (1) and condominiums in column (5) suggests that a 1% increase in the *Capital gains tax* in an MS-region with high tourism is associated with an increase in annual price growth of 0.12% and 0.11% respectively. By comparison a 1% increase in the *Speculation tax* in a region with high tourism is associated with an increase in annual price growth of 0.43% and 0.36% respectively.

Thus the increase in the *Capital gains tax* in the canton of Graubünden (home to the tourist resorts of St. Moritz or Davos) from 30% in 1985 to 50% in 2005 would be associated with an annual increase in price growth of 2.4 percentage points for single-family houses and 2.2 percentage points for condominiums.²⁹ By comparison the more moderate increase in the *Speculation tax* in the canton of Valais, (home to the tourist resorts of Verbier or Zermatt) from 0% in 1985 to 12% in 2005 would be associated with an annual increase in price growth of 5.2 percentage points for single-family houses and 4.3 percentage points for condominiums. These effects compare well to the increase in price growth in these major tourist cantons. In Graubünden prices of single family houses (condominiums) increased annually by 2.3 (1.1) percentage points between 1985-1989 and 2005-2009. In Valais the annual price growth of single family houses (condominiums) increased by 4.6 (2.9) percentage points between 1985-1989 and 2005-2009.

²⁹ The Speculation tax rose from 8% to 13%. See Table 3.

4.3 Accounting for the endogeneity of taxes

Do higher taxes on (short-term) capital gains lead to an increase in price growth or does higher expected price growth lead to higher taxation of capital gains? Tax rates set by the cantonal authorities could well be endogenous to expected price growth. Cantons which expect a strong growth in real-estate prices may hike their rates in advance in order to increase their tax revenue or to smooth future house price growth.

In order to mitigate as much as possible potential biases arising from forward-looking tax authorities, we have throughout our analysis measured the tax conditions at the *start of each period* (1985, 1990, 1995, 2000, 2005). Employing the tax rates at the beginning of a period may not be enough to overcome the potential endogeneity of tax policy. In this section we therefore employ an instrumental variables (IV) approach. Potential instrumental variables are democratic constraints on cantonal spending and the relative strength of political parties. Empirical analysis shows that cantons with stronger direct democratic institutions are fiscally more conservative than cantons with weaker institutions. Funk and Gathmann (2011) show that the existence of a mandatory budget referendum and also left-wing governance in the cantons' parliaments have a significant impact on cantonal fiscal policy in Switzerland. It is unlikely, however, that either of these variables has a direct impact on house price growth within a canton.

We conduct a two-stage least-squares (2SLS) estimation in which our tax indicators *Capital gains tax*, *Speculation tax* and *Transaction tax* are instrumented with indicators of the political and fiscal conditions in each canton. The instrumental variables capture the share of left wing parties in the canton's executive (*Left-wing executive*) and parliament (*Left-wing parliament*), as well as the existence of a mandatory referendum on key budget positions at the cantonal level (*Budget referendum*).

Results of our IV estimations are presented in Table 7. Our analysis is focused on the two boom periods 1985-1989 and 2005-2009. In the first-stage estimates we relate our indicators of real estate taxation in 1985 and 2005 to measures of our instruments in the previous period (1980-1984 and 2000-2004).³⁰ The first-stage estimates (columns 3-5) suggest that the strength of the instruments for the *Speculation tax* (F-Test value = 5.55) is acceptable, while the instruments for the *Capital gains tax* (F-Test value = 1.21) and for the *Transaction tax* (F-Test value = 2.92) are rather weak.

[Table 7 here]

In the second stage (columns (1-2) we regress house price growth on our instrumented tax variables. The results for *Price growth SFH* (column 1) and *Price growth CON* (column 2) suggest that our previous results for the speculation tax are not driven by reverse causality. On the contrary, our IV estimates yield a significant and positive impact of the (instrumented) speculation tax on the price growth of single family houses and condominiums. Moreover, the economic magnitude of the IV estimates for this tax are similar to our OLS estimates in Table 5 (columns 2, 5). In line with our previous results capital gains taxes are not uniformly significant while transaction taxes have no significant impact on house price growth. Our findings suggest that potential reverse-causality in the relationship between taxes and house prices in Switzerland may be mitigated by tax competition. Tax competition among the Swiss cantons is strong (Brülhart and Jametti 2008) and may induce those cantons which expect

³⁰ For the variable *Tourism* we employ values for 1985-1989 instead of 1980-1984 due to lack of data for the latter period.

higher future real estate gains and transaction values to actually *reduce* rather than increase their tax rates, corroborating our findings.³¹

5 Conclusions

Excessive growth of house prices is seen as one of the major determinants of the recent financial and economic crisis, in the US and in the euro area (e.g. Ireland). Motivated by the search for macroprudential instruments it has been argued that a transaction tax and a capital gains tax on real-estate sales may dampen the swings in prices in the housing market by “throwing sand in the wheels” of short-term speculation.³² We investigate the effect of capital gains taxes and transaction taxes on house price dynamics, exploiting the variation in tax rates across Swiss cantons, as well as changes in these tax rates with cantons over the last three decades.

Similar to previous evidence for Tobin taxes in financial asset markets we find no robust evidence that transaction taxes curb house price growth. Our findings also support theoretical models (Englund, 1986) which suggest a lock-in effect of capital gains taxes. In particular penalty taxes on short-term gains seem to fuel price growth by making house owners more reluctant to sell their property. The lock-in effect is strongest in tourist destinations where we expect to find more real estate transactions motivated by pure investment considerations.

Overall, our findings suggest that taxes on transaction values and capital gains in the real-estate market may not be suitable as instruments of macroprudential policy. Indeed, due

³¹ A similar point is made by Crowe et al. (2011), who point out that municipalities in the US often face pressure to reduce tax rates when markets are booming and tax revenues are high.

³² The OECD has, for instance, expressed a view along these lines. See Fuest et al. (2004).

to lock-in effects for existing home-owners, taxes on (short-term) capital gains may be counterproductive to the objective of more stable housing prices.

References

- Ahearne, A.G., J. Ammer, B.M. Doyle, L.S. Kole, R.F. Martin. 2005. House Prices and Monetary Policy: A Cross-Country Study. International Finance Discussion Papers 841. Board of Governors of the Federal Reserve System, Washington, D.C.
- Bank of England. 2009. The role of macroprudential policy. A Discussion Paper, November.
- Bogart, W.T. and W.M. Gentry. 1995. Capital Gains Taxes and Realizations: Evidence from Interstate Comparisons. *Review of Economics and Statistics* 77(2), May: 267-282.
- Bolliger, M. and I. Cecchin. 2009. How do Banks set Loan Rates? An Empirical Investigation for Switzerland, memo, Swiss National Bank.
- Borio, C. and P. Disyatat. 2009. Unconventional monetary policies: an appraisal. BIS Working Papers No 292, November.
- Bourassa, S.C. and M. Hoesli. 2006. Why Do the Swiss Rent? Swiss Finance Institute Research Paper Series N°07-04, December 27.
- Brühlhart, M. and M. Jametti. 2008. Does Tax Competition Tame the Leviathan? University of Lausanne Working paper.
- CGFS Papers No 38. 2010. Macroprudential instruments and frameworks: a stocktaking of issues and experiences, May. Committee on the Global Financial System. Bank for International Settlements.
- Claessens, S., M.A. Kose, M.E. Terrones. 2008. What Happens During Recessions, Crunches and Busts? IMF Working Paper 08/274, December.
- Claessens, G., G. Dell’Ariccia, D. Igan, and L. Laeven. 2010. Cross-Country Experiences and Policy Implications from the Global Financial Crisis. *Economic Policy* 25: 267-293.
- Crowe, C., G. Dell’Ariccia, D. Igan, P. Rabanal. 2011. How to Deal with Real Estate Booms: Lessons from Country Experiences. IMF Working Paper WP/11/91.

- Danthine, J.-P. 2012. Taming the financial cycle. 30th SUERF Colloquium. Zurich, 5 September 2012.
- Degen, K. and A.M. Fischer. 2009. Immigration and Swiss House Prices. CEPR Discussion Paper 7583.
- Diamond, P.A. 1975. Inflation and the comprehensive tax base. *Journal of Public Economics* 4: 227-244.
- Englund, P. 1985. Taxation of Capital Gains on Owner-Occupied Homes. *European Economic Review* 27: 311-334.
- Englund, P. 1986. Transaction Costs, Capital Gains Taxes and Housing Demand. *Journal of Urban Economics* 20: 274-290.
- Fuest, C., B. Huber, and S.B. Nielsen. 2004. Capital Gains Taxation and House Price Fluctuations. Department of Economics Copenhagen Business School Working paper 16-2004.
- Funk, P. and C. Gathmann. 2011. Does Direct Democracy Reduce the Size of Government? New Evidence from Historical Data, 1890-2000. *Economic Journal* 121: 1252-1280.
- Goodhart, C.A.E. 2009. *The Regulatory Response to the Financial Crisis*. Edward Elgar Publishing Limited, Cheltenham UK.
- Hau, H. 2006. The Role of Transaction Costs for Financial Volatility: Evidence from the Paris Bourse. *Journal of the European Economic Association* 4(4): 862-890.
- Hoyt, W.H. and S.S. Rosenthal. 1992. Owner-Occupied Housing, Capital Gains, and the Tax Reform Act of 1986. *Journal of Urban Economics* 32: 119-139.
- International Monetary Fund (IMF). 2003. When Bubbles Burst. *World Economic Outlook*, Washington, D.C.: 61-94.
- International Monetary Fund (IMF). 2009. Lessons for Monetary Policy from Asset Price Fluctuations. *World Economic Outlook*, Washington, D.C.: 93-120.

- Jannsen, N. 2010. National and International Business Cycle Effects of Housing Crises. *Applied Economics Quarterly* 56(2): 175-206.
- Jeanne, O. 2008. Dealing with Credit Booms and Busts: the Case for Prudential Taxation, November.
- Jeanne, O. and A. Korinek. 2010. Managing Credit Booms and Busts: A Pigouvian Taxation Approach. NBER Working Paper 16377, September.
- Jordan, Th.J. 2010. A changing role for central banks? Welcome Event Master of Banking and Finance. St. Gallen, 22 September 2010.
- Keen, M., A. Klemm and V. Perry. 2010. Tax and the Crisis. *Fiscal Studies* 31(1): 43-79.
- Keynes, J.M. 1936. *The General Theory of Employment, Interest, and Money*. London: Macmillan.
- King, M.A. 1977. *Public policy and the corporation*. Chapman and Hall, London.
- Leamer, E. 2007. Housing is the Business Cycle. NBER Working Paper 13428.
- Lundborg, P. and P. Skedinger. 1998. Capital gains taxation and residential mobility in Sweden. *Journal of Public Economics* 67: 399-419.
- Lundborg, P. and P. Skedinger. 1999. Transactions Taxes in a Search Model of the Housing Market. *Journal of Urban Economics* 45: 385-399.
- Milne, A. 2009. Macroprudential policy: what can it achieve? *Oxford Review of Economic Policy* 25(4): 608-629.
- Nakagami, Y. and A.M. Pereira. 1995. Inflation, housing taxation, and homeowner uptrading. *Public Finance* 50(3): 442-469.
- Pomeranets, A. 2012. Financial Transaction Taxes: International Experiences, Issues and Feasibility. *Bank of Canada Review*, Autumn 2012: 3-13.
- Pomeranets, A. and D.G. Weaver. 2011. Security Transaction Taxes and Market Quality. Bank of Canada Working Paper No. 2011-26.

- Posen, A.S. 2009. Finding the Right Tool for Dealing with Asset Price Booms. Speech to the MPR Monetary Policy and the Markets Conference, London, 1 December 2009.
- Reinhart, C.M. and K.S. Rogoff. 2008. Is the 2007 U.S. Sub-Prime Financial Crisis So Different? An International Historical Comparison. NBER Working Paper 13761, January.
- Rosen, H.S., K.T. Rosen, and D. Holtz-Eakin. 1984. Housing Tenure, Uncertainty and Taxation. *Review of Economics and Statistics* 66: 405-416.
- Saiz, A. 2007. Immigration and Housing Rents in American Cities. *Journal of Urban Economics* 61(2): 345-371.
- Sheffrin, S.M. and T.M. Turner. 2001. Taxation and House-Price Uncertainty: Some Empirical Estimates. *International Tax and Public Finance* 8: 621-636.
- Smith, L., K. Rosen, and G. Fallis. 1988. Recent Developments in Economic Models of Housing Markets. *Journal of Economic Literature* 24: 29-64.
- Steiner, E. 2010. Estimating a stock-flow model for the Swiss housing market. Swiss National Bank Working Paper 2010-8.
- Stiglitz, J.E. 1983. Some Aspects of the Taxation of Capital Gains. *Journal of Public Economics* 21: 257-294.
- Stiglitz, J.E. 1989. Using Tax Policy to Curb Speculative Short-term Trading. *Journal of Financial Service Research* 3(2-3): 101-115.
- Swiss Federal Statistical Office (SFSO). 2004. Eidgenössische Volkszählung 2000 – Gebäude, Wohnungen und Wohnverhältnisse. Neuenburg: SFSO.
- Swiss Federal Tax Administration (SFTA)
- (2010a). *Die Einkommenssteuer natürlicher Personen.*
- (2010b). *Die Vermögenssteuer natürlicher Personen.*
- (2010c). *Die Besteuerung der Grundstückgewinne.*

(2010d). *Die Besteuerung der Kapitalgewinne auf beweglichem Privatvermögen.*

(2010e). *Die Handänderungssteuer.*

Retrieved February 10, from

<http://www.estv.admin.ch/dokumentation/00079/00080/00736/index.html?lang=de>

Tobin, J. 1978. A Proposal for International Monetary Reform. *Eastern Economic Journal* 4: 153-159.

van den Noord, P. 2005. Tax Incentives and House Price Volatility in the Euro Area: Theory and Evidence. *Économie internationale* 101: 29-45.

Table 1. Variable definitions and sources

Sources: BAK (Basel Economics): www.bakbasel.ch. W&P (Wuest & Partner): <http://www.wuestundpartner.com>. SFSO (Swiss Federal Statistical Office): www.bfs.admin.ch. SFTA (Swiss Federal Tax Administration): www.estv.admin.ch. SNB (Swiss National Bank): www.snb.ch

Variable name	Definition	Source	Level of observation	Periodicity
House prices				
Price growth SFH	Average annual growth rate of the hedonic transaction price index of single-family houses.	W&P	MS-region	1985-1989 / 1990-1994 / 1995-1999 / 2000-2004 / 2005-2009
Price growth CON	Average annual growth rate of the hedonic transaction price index of condominiums.	W&P	MS-region	1985-1989 / 1990-1994 / 1995-1999 / 2000-2004 / 2005-2009
Taxation of real estate transactions				
Capital gains tax	Top marginal gains tax rate (%) if real estate has been held for five years.	Cantonal tax authorities, SFTA	Canton	1985 / 1990 / 1995 / 2000 / 2005
Speculation tax	Additional tax (in %) on capital gains if real estate is sold after less than one year instead of after 5 years.	Cantonal tax authorities, SFTA	Canton	1985 / 1990 / 1995 / 2000 / 2005
Transaction tax	Top marginal transaction tax rate (%).	Cantonal tax authorities, SFTA	Canton	1985 / 1990 / 1995 / 2000 / 2005
Control variables				
Income tax	Average tax rate on annual income of 100'000 CHF	SFTA	Canton	1985-2008
Income growth	Average annual growth rate of per capita income (nominal).	BAK	MS-region	1985-1989 / 1990-1994 / 1995-1999 / 2000-2004 / 2005-2008
Population growth	Average annual growth rate of population.	SFSO	MS-region	1985-1989 / 1990-1994 / 1995-1999 / 2000-2004 / 2005-2008
Housing stock growth	Average annual net growth rate of the stock of dwellings (lagged by one observation period).	SFSO	MS-region	1985-1989 / 1990-1994 / 1995-1999 / 2000-2004 / 2005-2008
Mortgage rate	Mortgage interest rate offered by cantonal banks on new mortgages.	SNB	Canton	1985-1989 / 1990-1994 / 1995-1999 / 2000-2004 / 2005-2008
Tourism	Number of overnight stays per annum divided by the resident population	SFSO	MS-region	1985-1989 / 1990-1994 / 1995-1999 / 2000-2004
Instrumental variables				
Left-wing executive	Share of left-wing members of canton-level executive.	SFSO	Canton	1980-1984 / 2000-2004
Left-wing parliament	Share of left-wing members of canton-level parliament	SFSO	Canton	1980-1984 / 2000-2004
Budget referendum	Canton has a mandatory referendum on key budget positions (1=yes)	Funk & Gathmann	Canton	1980 / 2000

Table 2. Summary statistics

This panel reports the mean and standard deviation (in brackets) across the 92 MS-regions in our sample for the periods 1985-1989, 1990-1994, 1995-1999, 2000-2004, 2005-2009 separately and all 5 periods together. Definitions and sources of the variables are provided in Table 1.

Period	1985-1989	1990-1994	1995-1999	2000-2004	2005-2009	all 5 periods
<i>House prices</i>						
Price growth SFH	3.69 (1.99)	-0.11 (1.44)	-0.22 (1.03)	0.93 (1.79)	3.94 (2.01)	1.65 (2.48)
Price growth CON	4.97 (1.22)	0.08 (1.33)	-1.99 (1.24)	1.98 (1.58)	4.54 (2.44)	1.91 (3.10)
<i>Taxation of real estate transactions</i>						
Capital gains tax	31.17 (7.52)	33.21 (9.36)	33.87 (8.95)	33.97 (9.02)	32.45 (9.13)	32.94 (8.84)
Speculation tax	12.91 (8.42)	12.65 (7.77)	14.60 (9.68)	14.60 (9.67)	16.32 (7.44)	14.21 (8.71)
Transaction tax	1.86 (1.05)	1.84 (1.03)	1.84 (0.97)	1.76 (0.87)	1.60 (1.03)	1.78 (0.99)
<i>Control variables</i>						
Income tax	11.80 (1.68)	10.24 (1.62)	10.95 (1.65)	10.55 (1.67)	10.22 (1.78)	10.75 (1.77)
Income growth	5.29 (0.89)	3.00 (1.08)	1.09 (1.09)	-0.19 (1.45)	3.07 (1.48)	2.45 (2.24)
Population growth	0.88 (0.71)	1.10 (0.69)	0.26 (0.72)	0.76 (0.61)	0.78 (0.73)	0.76 (0.74)
Housing stock growth	1.67 (0.79)	1.70 (0.62)	2.05 (1.15)	1.23 (0.53)	0.70 (1.04)	1.47 (0.97)
Mortgage rate	5.50 (0.06)	6.91 (0.14)	4.57 (0.07)	3.82 (0.07)	3.17 (0.04)	4.79 (1.31)
Tourism	3.19 (6.21)	3.19 (6.21)	2.79 (5.42)	2.78 (5.43)	2.79 (5.37)	2.95 (5.72)
<i>Instrumental variables (canton-level)</i>						
Left-wing executive	0.18 (0.14)				0.19 (0.12)	
Left-wing parliament	0.19 (0.13)				0.25 (0.13)	
Budget referendum	0.57 (0.51)				0.38 (0.50)	

Table 3. Taxes on real estate gains and transaction values by canton

The table displays the value of the variables *Capital gains tax* (in %), *Speculation tax* (in %) and *Transaction tax* (in %) in 1985 and 2005 for the 21 cantons in the sample. Definitions and sources of the variables are provided in Table 1.

Canton	Abbr.	Capital gains tax		Speculation tax		Transaction tax	
		1985	2005	1985	2005	1985	2005
Aargau	AG	30	32	19	8	0.4	0.5
Appenzell I.Rh.	AI	38	38	12	12	1.0	1.0
Bern	BE	39	34	22	30	1.5	1.8
Basel-Landschaft	BL	25	25	25	20	3.0	2.5
Basel-Stadt	BS	32	48	0	12	3.0	3.0
Fribourg	FR	29	29	20	20	4.0	3.0
Genève	GE	20	30	12	20	3.0	3.0
Glarus	GL	29	29	9	11	0.5	0.5
Graubünden	GR	30	50	8	13	1.5	1.5
Luzern	LU	27	27	14	14	1.5	1.5
Neuchâtel	NE	24	40	16	24	4.0	3.3
Nidwalden	NW	25	29	11	11	1.0	1.0
Obwalden	OW	16	17	7	8	1.5	1.5
Schaffhausen	SH	48	44	21	20	0.7	0.7
Schwyz	SZ	27	27	15	15	1.0	1.0
Thurgau	TG	40	40	10	10	1.0	1.0
Ticino	TI	26	26	10	4	1.1	1.1
Uri	UR	33	44	10	11	0.3	0.2
Vaud	VD	18	18	0	12	3.3	3.3
Valais	VS	40	26	0	12	1.4	1.4
Zürich	ZH	38	38	22	22	2.0	0.0

Table 4. Full-sample difference-in-difference tests

This table relates the difference in price growth 2005-2009 minus 1985-1989 for single family houses (Δ Price growth SFH) and condominiums (Δ Price growth CON) to changes (2005 minus 1985) in *Capital gains tax*, *Speculation tax* and *Transaction tax*. The table reports the outcome of t-tests comparing those MS-regions which are located in cantons that increased taxes to those MS-regions located in cantons which did not change taxes and to those which reduced taxes.

	Observations	Δ Price growth SFH		Δ Price growth CON	
		Mean	Std. Err.	Mean	Std. Err.
<i>Full sample</i>	92	0.257	0.307	-0.428	0.282
Δ Capital gains tax					
increase	24	0.324	0.653	-0.173	0.541
same	41	-0.325	0.409	-0.969	0.378
decrease	27	1.186	0.582	0.169	0.592
$\Delta\Delta$ increase - same	65	0.717	0.731	0.796	0.644
$\Delta\Delta$ increase - decrease	68	-0.861	0.872	-0.343	0.809
Δ Speculation tax					
increase	50	1.369	0.457	0.299	0.420
same	25	-1.395	0.337	-1.650	0.383
decrease	17	-0.582	0.493	-0.765	0.541
$\Delta\Delta$ increase - same	75	2.764***	0.691	1.95***	0.654
$\Delta\Delta$ increase - decrease	67	1.951**	0.837	1.065	0.787
Δ Transaction tax					
increase	19	-1.335	0.419	-2.107	0.439
same	51	1.291	0.458	0.481	0.410
decrease	22	-0.764	0.384	-1.085	0.378
$\Delta\Delta$ increase - same	70	-2.626***	0.795	-2.588***	0.724
$\Delta\Delta$ increase - decrease	41	-0.570	0.567	-1.021	0.576

Table 3. Full-sample multivariate results

The dependent variables are *Price growth SFH* and *Price growth CON*. The time dimension of the panel covers the five periods 1985-1989, 1990-1994, 1995-1999, 2000-2004, 2005-2009. Standard errors, clustered by canton, are reported in brackets. ***, **, * denote significance at the 0.01, 0.05 and 0.10-level. Definitions and sources of all variables are provided in Table 1.

	Dependent variable:					
	<i>Price growth SFH</i>			<i>Price growth CON</i>		
	All	1985-1989, 2005-2009	1990-1994, 1995-1999, 2000-2004	All	1985-1989, 2005-2009	1990-1994, 1995-1999, 2000-2004
MS-regions						
Periods						
Model	(1)	(2)	(3)	(4)	(5)	(6)
Capital gains tax	0.067 [0.057]	0.09 [0.068]	0.035 [0.122]	0.042 [0.041]	0.097 [0.049]*	0.001 [0.101]
Speculation tax	0.18 [0.058]***	0.303 [0.088]***	-0.047 [0.088]	0.163 [0.058]**	0.242 [0.079]***	0.014 [0.086]
Transaction tax	-0.827 [0.356]**	-0.73 [0.885]	-1.867 [2.113]	-0.583 [0.421]	-0.854 [0.889]	-1.602 [1.214]
Income tax	-0.709 [0.477]	-1.558 [0.642]**	-0.399 [0.692]	-0.715 [0.320]**	-1.477 [0.625]**	-0.729 [0.470]
Income growth	-0.091 [0.089]	0.027 [0.264]	-0.028 [0.156]	0.039 [0.051]	0.228 [0.241]	0.001 [0.087]
Population growth	0.111 [0.293]	-0.327 [0.601]	0.437 [0.424]	0.477 [0.312]	0.581 [0.704]	0.414 [0.414]
Housing stock growth	0.16 [0.183]	0.161 [0.537]	0.185 [0.378]	0.091 [0.160]	-0.301 [0.520]	0.194 [0.278]
Mortgage rate	0.25 [2.354]	-2.271 [5.875]	-1.06 [2.997]	-1.509 [1.676]	-1.214 [6.632]	-2.026 [2.493]
MS-region FE	yes	yes	yes	yes	yes	yes
Period FE	yes	yes	yes	yes	yes	yes
Observations	460	184	276	460	184	276
R-squared	0.68	0.69	0.40	0.83	0.698	0.746
Number of MS-regions	92	92	92	92	92	92
Number of Cantons	21	21	21	21	21	21
Number of periods	5	2	3	5	2	3

Table 6. Multivariate Analysis by Tourism Intensity

The dependent variables are *Price growth SFH* and *Price growth CON*. The time dimension of the panel covers the 2 periods 1985-1989 and 2005-2009. High tourism, Medium tourism and Low tourism regions are defined based on terciles of the ratio of tourist overnight stays in comparison to local population measured over the entire observation period. Heteroskedasticity-robust standard errors, clustered by canton are reported in brackets. ***, **, * denote significance at the 0.01, 0.05 and 0.10-level. Definitions and sources of all variables are provided in Table 1.

Dependent variable:	<i>Price growth SFH</i>				<i>Price growth CON</i>			
	<i>1985-1989, 2005-2009</i>				<i>1985-1989, 2005-2009</i>			
	<i>Tourism = high</i>	<i>Tourism = medium</i>	<i>Tourism = low</i>	<i>All</i>	<i>Tourism = high</i>	<i>Tourism = medium</i>	<i>Tourism = low</i>	<i>All</i>
Model	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Capital gains tax	0.124 [0.040]***	-0.011 [0.068]	0.17 [0.107]	0.032 [0.087]	0.114 [0.039]**	0.052 [0.066]	0.144 [0.117]	0.066 [0.095]
Speculation tax	0.433 [0.141]***	0.137 [0.090]	0.122 [0.087]	0.197 [0.110]*	0.36 [0.132]**	0.135 [0.070]*	0.046 [0.089]	0.148 [0.100]
Transaction tax	-0.14 [0.928]	0.179 [1.202]	0.049 [1.285]	-0.624 [0.666]	0.116 [0.695]	-0.915 [1.286]	0.507 [1.392]	-0.708 [0.721]
<i>Tourism = high *</i>								
<i>Capital gains tax</i>				0.073 [0.091]				0.033 [0.107]
<i>Speculation tax</i>				0.33 [0.172]*				0.288 [0.158]*
<i>Transaction tax</i>				-1.031 [0.825]				-1.022 [0.899]
MS-region FE	yes	yes	yes	yes	yes	yes	yes	yes
MS-region controls	yes	yes	yes	yes	yes	yes	yes	yes
Period FE	yes	yes	yes	yes	yes	yes	yes	yes
Observations	60	62	62	184	60	62	62	184
R-squared	0.85	0.82	0.85	0.75	0.849	0.811	0.845	0.747
Number of MS-regions	30	31	31	92	30	31	31	92
Number of Cantons	13	14	10	21	13	14	10	21
Number of periods	2	2	2	2	2	2	2	2

Table 7. Controlling for endogeneity of tax changes

The dependent variables are *Price growth SFH* and *Price growth CON*. The time dimension of the panel covers the two high price-growth periods 1985-1989 and 2005-2009. In columns (1-2) we instrument the variables *Capital gains tax*, *Speculation tax* and *Transaction tax* with the variables *Left-wing executive*, *Left-wing Parliament* and *Budget referendum*. First stage regressions for this IV analysis are presented in columns (3-5). Heteroskedasticity-robust standard errors, clustered at the canton-level are reported in brackets. ***, **, * denote significance at the 0.01, 0.05 and 0.10-level. Definitions and sources of all variables are provided in Table 1.

MS-regions Periods	All regions 1985-1989, 2005-2009					
	Model	Price growth SFH (1)	Price growth CON (2)	Capital gains tax (3)	Speculation tax (4)	Transaction tax (5)
Capital gains tax		0.178 [0.113]	0.165 [0.107]			
Speculation tax		0.332 [0.070]***	0.255 [0.067]***			
Transaction tax		-0.435 [1.184]	-0.159 [1.094]			
Left-wing executive				16.761 [18.653]	23.888 [8.538]**	-0.309 [0.711]
Left-wing parliament				-67.626 [38.070]*	20.691 [25.170]	-0.494 [2.887]
Budget referendum				2.33 [3.242]	3.392 [2.916]	0.623 [0.225]**
MS-region controls		yes	yes	yes	yes	yes
Canton FE		yes	yes	yes	yes	yes
Period FE		yes	yes	yes	yes	yes
IV		2nd stage	2nd stage	1st stage	1st stage	1st stage
Observations		184	184	184	184	184
R-squared		0.524	0.463	0.838	0.902	0.954
F-Test of instruments				1.21	5.55	2.92
Number of MS-regions		92	92	92	92	92
Number of Cantons		21	21	21	21	21
Number of periods		2	2	2	2	2

Figure 1. Housing prices 1985 - 2009

This figure displays the level of house prices for single family houses and condominiums in Switzerland between 1985 and 2009. The index for both types of housing are set at 100 in the year 2000. The vertical lines illustrate the five-year periods in which we split our data.

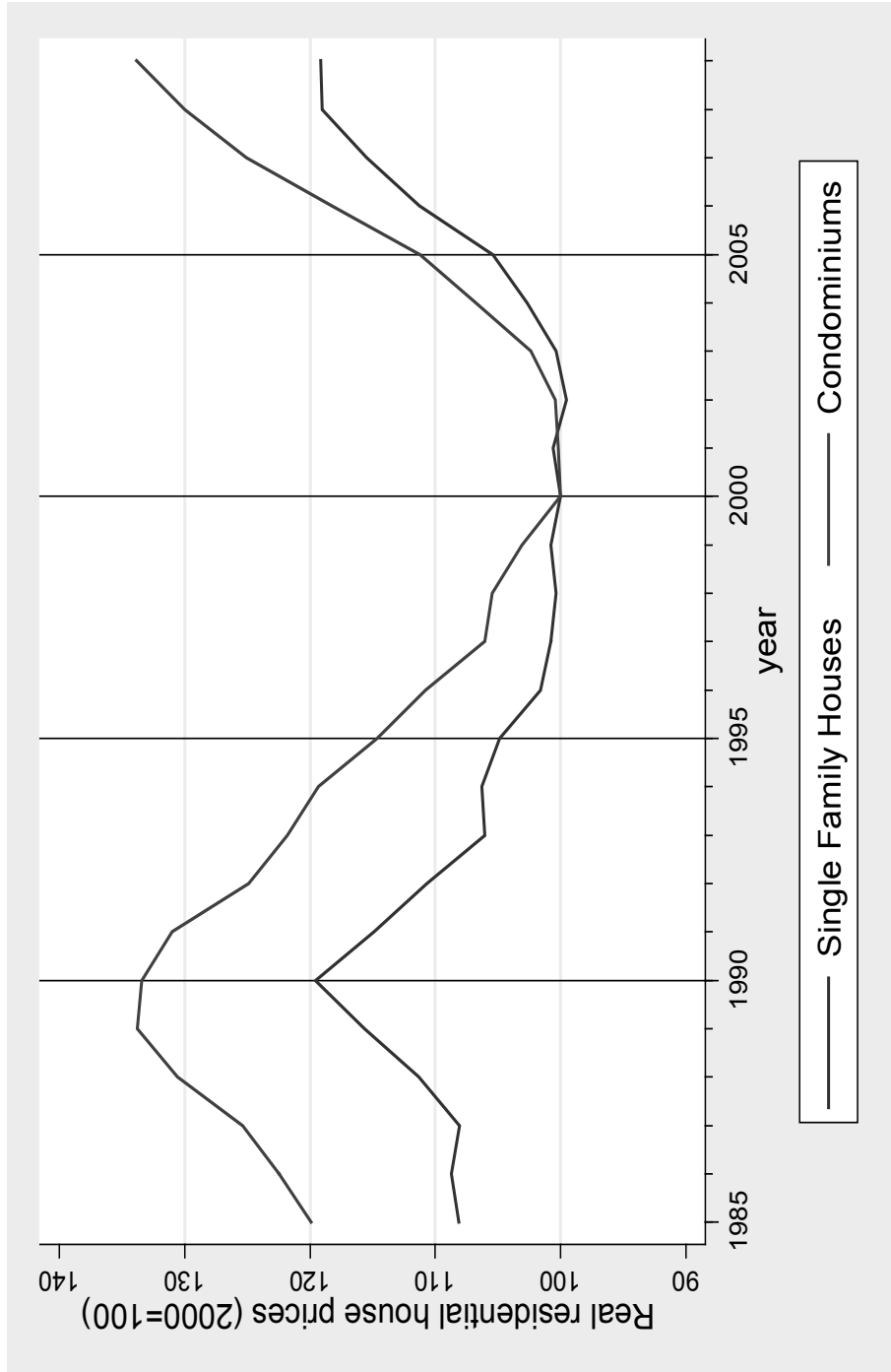


Figure 2. House price growth by period and MS-region

This figure displays box plots for the variables *Price growth SFH* and *Price growth CON* for the five periods 1985-1989, 1990-1994, 1995-1999, 2000-2004 and 2005-2009. For each period the figure shows the distribution across MS-regions. Each box starts at the lower quartil (25th percentile) and ends at the upper quartil (75th percentile). The line inside the box indicates the median. The upper and lower adjacent values are defined as the 75th (25th) percentiles plus (minus) 1.5 times the size of the box (75th percentile - 25th percentiles). Outside values are represented by dots.

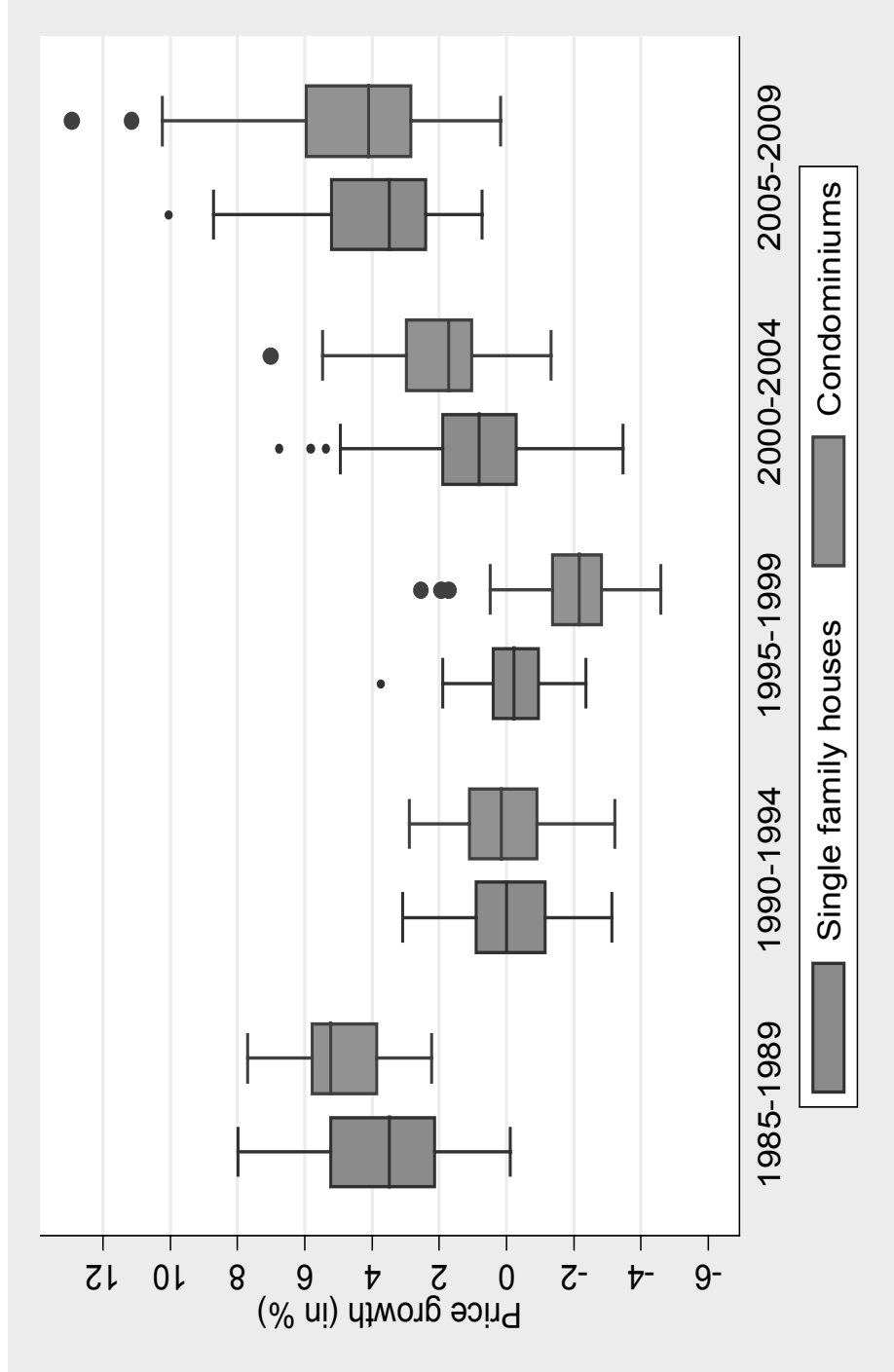


Figure 3. House price growth by MS-region: 1985-1989 & 2005-2009

This figure displays the realization of the variables *Price growth SFH* and *Price growth CON* for each MS-region for the two periods 1985-1989 and 2005-2009. MS-regions with annual price growth below 2.5% are shaded green. MS-regions with annual price growth between 2.5% and 5% are shaded yellow. MS-regions with annual price growth above 5% are shaded red.

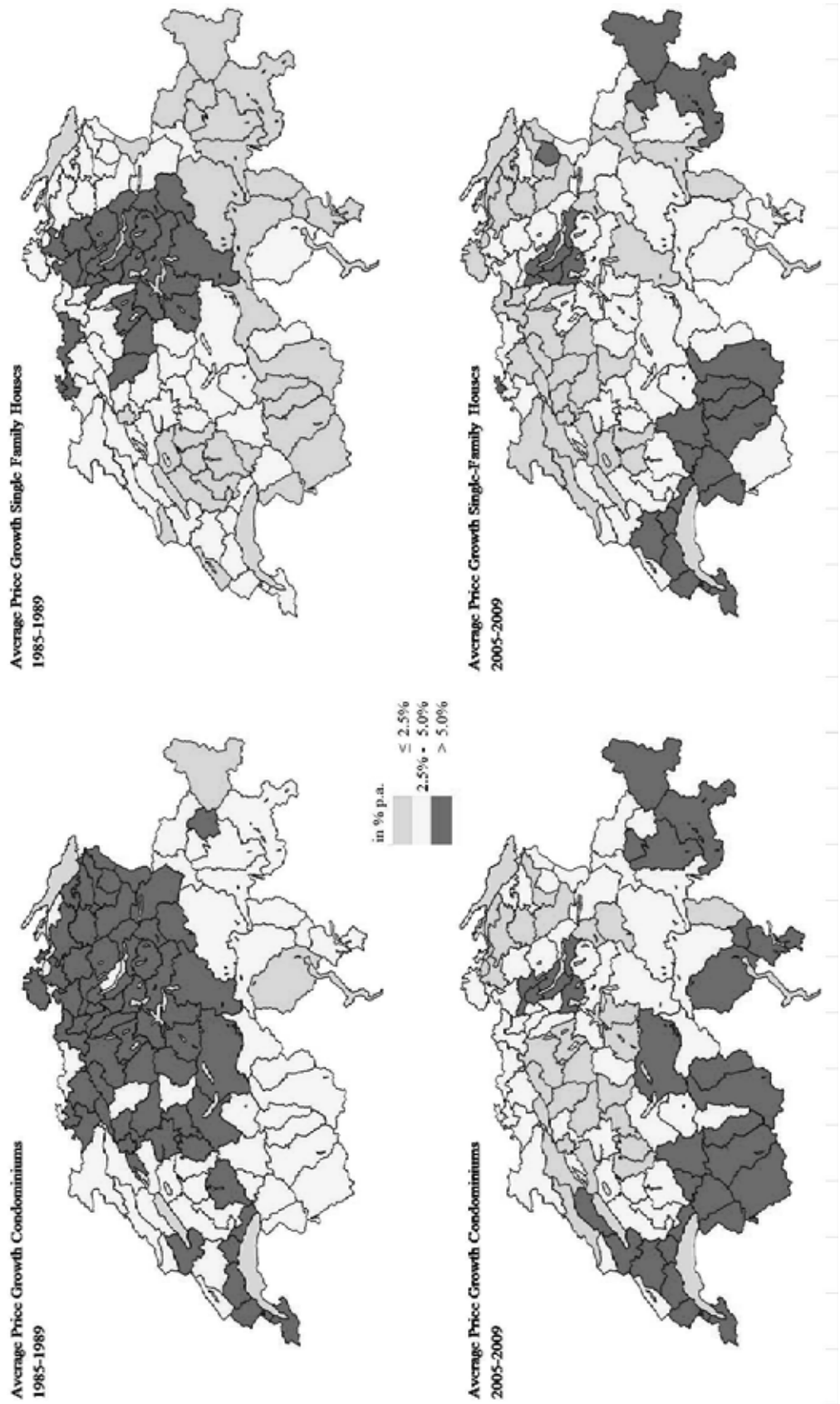


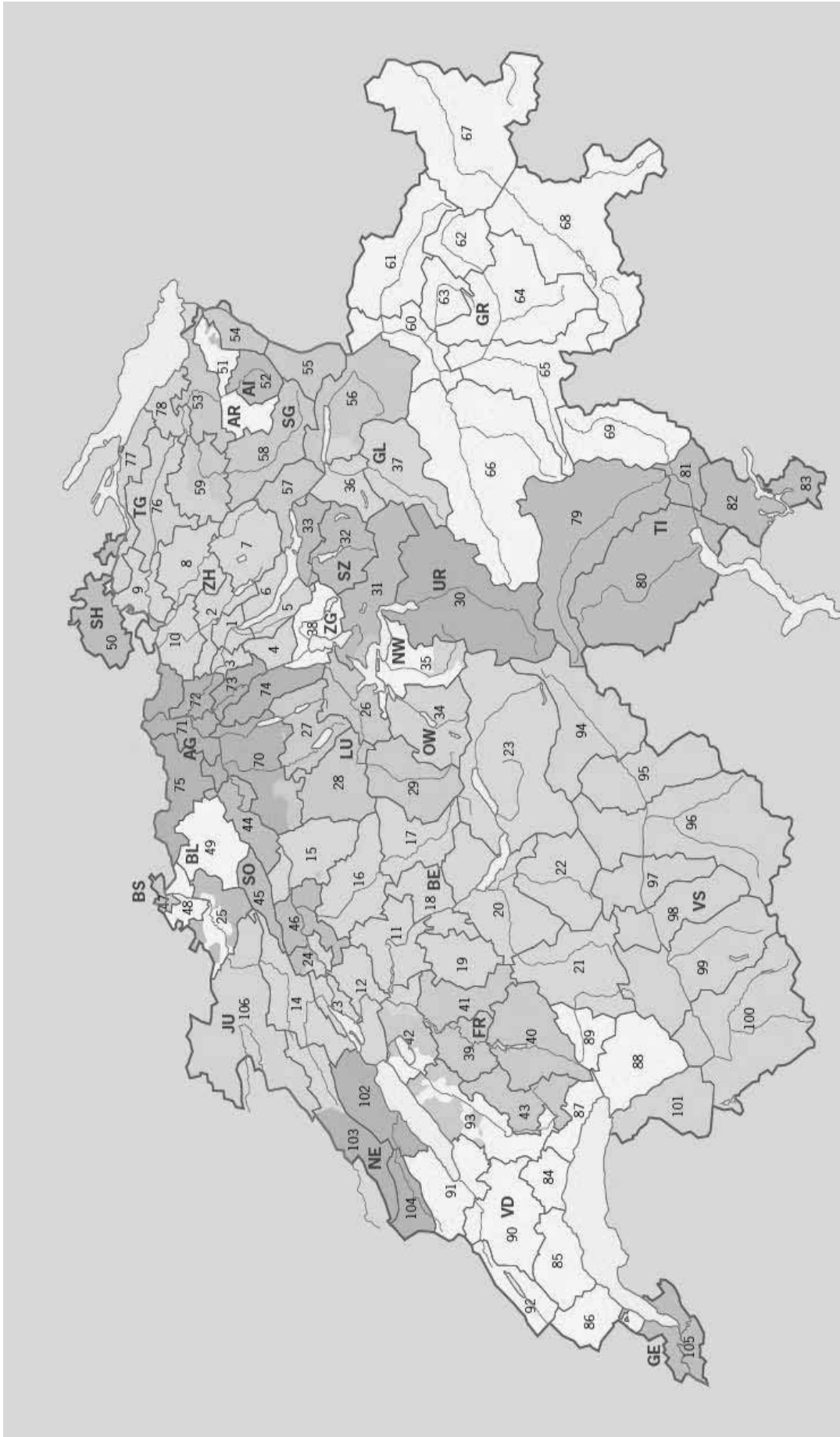
Figure 4. Change in Taxes: 1985 vs. 2005

This figure displays the change of the *Capital gains tax*, *Speculation tax* and *Transaction tax* by MS-region between 1985 and 2005. Regions for which the tax was increased are shaded red. Regions for which the tax stayed the same are shaded yellow. Regions for which a tax decreased are shaded green.



Appendix A1. Cantons and MS-regions

This figure displays the 26 cantons and the 106 MS-regions in Switzerland. Source: SFSO.



Appendix A1. Cantons and MS-regions

The table lists the 106 MS-regions and their attribution to a canton. Note that information on the attribution of municipalities to MS-regions and cantons is available. In 14 MS-regions the municipalities belong to two or more cantons. These MS-regions have been assigned to the canton that covers the majority of municipalities. *Source:* SFSO.

Canton	Abbr.	MS-region	MS-region nb.	Canton	Abbr.	MS-region	MS-region nb.		
Zürich	ZH	Zürich	1	St.Gallen	SG	St.Gallen	53		
		Glattal-Furttal	2			Rheintal	54		
		Limmattal	3			Werdenberg	55		
		Knonaueramt	4			Sarganserland	56		
		Zimmerberg	5			Linthgebiet	57		
		Pfannenstiel	6			Toggenburg	58		
		Zürcher Oberland	7			Wil	59		
		Winterthur	8			Graubünden	GR	Chur	60
		Weinland	9					Prättigau	61
		Zürcher Unterland	10					Davos	62
		Schanfigg	63						
Bern	BE	Bern	11			Mittelbünden	64		
		Erlach-Seeland	12			Viamala	65		
		Biel/Bienne	13			Surselva	66		
		Jura bernois	14			Engiadina Bassa	67		
		Oberaargau	15			Oberengadin	68		
		Burgdorf	16			Mesolcina	69		
		Oberes Emmental	17	Aargau	AG	Aarau	70		
		Aaretal	18			Brugg-Zurzach	71		
		Schwarzwasser	19			Baden	72		
		Thun	20			Mutschellen	73		
Saanen-Obersimmental	21	Freiamt	74						
		Kandertal	22			Fricktal	75		
		Oberland-Ost	23	Thurgau	TG	Thurtal	76		
Luzern	LU	Luzern	26			Untersee	77		
		Sursee-Seetal	27			Oberthurgau	78		
		Willisau	28	Ticino	TI	Tre Valli	79		
		Entlebuch	29			Locarno	80		
Uri	UR	Uri	30	Bellinzona	81				
		Schwyz	SZ	Innerschwyz	31	Lugano	82		
Einsiedeln	32			Mendrisio	83				
March	33			Vaud	VD	Lausanne	84		
Obwalden	OW	Sarneraatal	34			Morges	85		
		Nidwalden	35			Nyon	86		
Glarus	GL	Glarner Unterland	36			Vevey	87		
		Glarner Hinterland	37			Aigle	88		
Zug	ZG	Zug	38			Pays d'Enhaut	89		
Fribourg	FR	La Sarine	39			Gros-de-Vaud	90		
		La Gruyère	40			Yverdon	91		
		Sense	41			La Vallée	92		
		Murten/Morat	42			La Broye	93		
		Glâne-Veveyse	43	Valais	VS	Goms	94		
Solothurn	SO	Grenchen	24			Brig	95		
		Olten	44			Visp	96		
		Thal	45			Leuk	97		
		Solothurn	46			Sierre	98		
Basel-Stadt	BS	Basel-Stadt	47			Sion	99		
Basel-Landschaft	BL	Laufental	25	Martigny	100				
		Unteres Baselbiet	48	Monthey	101				
		Oberes Baselbiet	49	Neuchâtel	NE	Neuchâtel	102		
Schaffhausen	SH	Schaffhausen	50			La Chaux-de-Fonds	103		
		Appenzell	AR			Appenzell A.Rh.	51	Val-de-Travers	104
Appenzell	AI	Appenzell I.Rh.	52	Genève	GE	Genève	105		
Innerrhoden						Jura	JU	Jura	106

Appendix A2. Tax regimes by canton

This table provides an overview of the current (2010) tax regimes of the real-estate capital gains tax and transaction tax by canton. For the capital gains tax *Taxing authority* indicates by who the tax is levied. *Taxation of accumulated gains* indicates whether all realized gains within a year are accumulated or taxed separately. If real estate was owner-occupied and the proceeds of selling it are reinvested within a certain time period in owner-occupied housing then taxation is postponed (*Postponement upon reinvestment*). In GE the tax is reimbursed instead of postponed. The tax is also postponed in the case of inheritance (except in NE and GE) and donation. In some cantons the capital gains tax rate increases with the size of the gain (*Progression gain*) and in all cantons the rate depends on the holding duration (*Degression holding duration*). Some cantons have a base tax rate which is multiplied every year by a cantonal only or a cantonal, municipal and a parish-factor (*Annual multiplier*). The tax rate may vary across municipalities (*Variation across municipalities*). The transaction tax rate is *Proportional in transaction value*, *Progressive in transaction value* or is a *Fixed fee*. The transaction tax rate does not vary with the holding duration. The last column indicates whether there is a reduced transaction tax rate or no tax for certain types of transactions (for example transfers within family) (*Exemptions*). In cantons where taxes vary across municipalities the tax rate of the major city has been used. The sources are the cantonal tax authorities and the SFTA. * In Zurich the transfer tax has been abolished per January 2005 and in Schwyz per January 2009. ** For gains from owner-occupied housing the tax is 30%, independent of the holding duration.

Canton	Abbr.	Capital gains tax					Transaction tax									
		Taxing authority			Taxation of accumulated gains	Postponement upon reinvestment	Rate			Taxing authority			Rate		Exemptions	
Canton	Municipality	Canton and municipality	Progression in gain	Degression in holding duration			Annual multiplier	Variation across municipalities	Canton	Municipality	Canton and municipality	Proportional in transaction value	Progression in transaction value	Fixed fee		Variation across municipalities
Aargau	AG	x	o	o	o	x	o	x	o	o	x	o	o	o	o	x
Appenzell I.Rh.	AI	x	o	o	o	x	x	x	o	o	x	o	o	o	o	x
Appenzell A.Rh.	AR	x	o	o	o	x	o	x	o	o	o	x	o	o	x	x
Bern	BE	o	o	x	x	x	x	x	x	x	x	o	o	o	o	x
Basel-Landschaft	BL	x	o	o	x	x	x	x	o	o	x	o	o	o	o	x
Basel-Stadt	BS	o	o	x	o	x	o	x**	o	x	x	o	o	o	o	x
Fribourg	FR	o	o	x	o	x	o	x	o	o	o	o	x	o	x	x
Genève	GE	x	o	o	o	o	o	x	o	o	x	o	o	o	o	x
Glarus	GL	x	o	o	o	x	x	x	o	o	x	o	o	o	o	x
Graubünden	GR	o	o	x	x	x	x	x	o	x	o	x	o	o	x	x
Jura	JU	o	o	x	x	x	x	x	x	x	x	o	o	o	o	x
Luzern	LU	x	o	o	o	x	x	x	x	o	x	o	o	o	o	x
Neuchâtel	NE	x	o	o	o	x	x	x	o	o	x	o	o	o	o	x
Nidwalden	NW	x	o	o	o	x	o	x	o	o	x	o	o	o	o	x
Obwalden	OW	x	o	o	x	x	o	x	x	x	x	o	o	o	o	x
St.Gallen	SG	x	o	o	o	x	x	x	x	o	o	x	o	o	o	x
Schaffhausen	SH	o	o	x	o	x	x	x	x	x	x	o	o	o	o	x
Solothurn	SO	x	o	o	o	x	x	x	x	x	x	o	o	o	o	x
Schwyz*	SZ	x	o	o	x	x	x	x	o	o	-	-	-	-	-	-
Thurgau	TG	x	o	o	o	x	o	x	o	o	x	o	o	o	o	x
Ticino	TI	x	o	o	o	x	o	x	o	o	x	o	o	o	o	x
Uri	UR	x	o	o	o	x	x	x	o	o	x	o	o	o	o	o
Vaud	VD	x	o	o	o	x	o	x	o	o	o	o	x	o	x	x
Valais	VS	x	o	o	o	x	x	x	o	o	x	o	o	o	o	o
Zug	ZG	o	x	o	o	x	x	x	o	o	x	o	x	o	o	o
Zürich*	ZH	o	x	o	o	x	x	x	o	o	-	-	-	-	-	-

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