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The Evolution of Top Incomes in Switzerland over the 20th century

Working Paper No. 2011 - 06

The Evolution of Top Incomes in Switzerland over the 20th century¹

by

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Abstract

We study the income concentration in the Swiss federation over the course of the 20th century using federal income tax statistics. The results suggest that top incomes in Switzerland evolved over time rather remaining constant across different income shares. Income concentration peaked during the 1940s, with a slight downward trend until the 1990s. Over the last 15 years, top incomes have recovered. In contrast, the evolution of income concentration is much more heterogeneous on the sub-federal level for the 26 cantons because of the federalist constitution, which has a decentralized taxing power. Consequently, top incomes in some cantons have a downward trend; others show a fall and rise of top incomes over the century, as exemplified by the Kuznets' hypothesis; some develop rather constantly; and some cantons even produce a striking upward trend.

JEL-Classification: D31; H2; N3

Keywords: Income inequality; Top incomes, Taxation

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1. Introduction

The evolution of income concentration across countries has received much attention in recent years both in research and in politics. One motivation driving this research is to provide evidence on the aspects of inequality and income distribution. Another focus addresses possible trade-offs between equality and incentive effects (see the overview provided by Atkinson, Piketty and Saez, 2011). Starting with Piketty's (2003) seminal contribution on income concentration in France, many authors have utilised income tax return statistics to assess the evolution of top incomes over the course of the 20th century. To date, Atkinson and Piketty (2007 and 2010) have documented 22 country studies in their works.²

If we compare these 22 country studies, we can divide the evolution of top income shares roughly into three groups. There is a distinct U-shaped pattern, with a sharp increase in top income shares. This trend can be seen in recent years for Western, English-speaking countries such as the UK, USA, Canada, Australia and New Zealand. Southern European countries as well as Nordic countries also show a striking but less pronounced increase of income concentration. Lastly, Continental European countries such as France, Germany, the Netherlands, and Switzerland can be characterized as countries with a general flat evolution of top income shares (Dell 2005, Dell, Piketty and Saez, 2007 and Atkinson and Piketty, 2010).³

The evolution of top income shares in the Swiss federation is worth studying for two reasons: First, Swiss cantons are considerably autonomous in defining their income tax burden and other fiscal policy decisions, economic policy choices and their institutional framework on the cantonal level due to the constitutionally granted fiscal federalism. Hence, this institutional variety has favoured lively system competitions between the cantons that could shape the income concentration for each canton. Second, an important challenge for cross-country comparison lies in analysing different country-specific definitions of personal income and variant tax systems. One way to cope with these problems is to utilize the data from a federalist country that has a federal income tax but has rather autonomous sub-federal governments with its own taxing power. Switzerland has such a dataset with homogenously defined time-series data of the top incomes according to federal income tax reports for 26 cantons over the 20th century.

This paper provides new evidence about the evolution of top incomes in the Swiss federation over the course of the 20th century – i.e., for Switzerland as a whole as well as for the 26

² See also the “Top Incomes Database” by Alvaredo, F., Atkinson, A. B., Piketty, T. and Saez, E. on <http://gmond.parisschoolofeconomics.eu/topincomes/>

³ A recent study sheds some light to the question of why some countries show a downward trend in income concentration while others do not and discusses possible determinants of the evolution of top incomes (Roine, Vlachos and Waldenström, 2007).

cantons at the sub-federal level. We confirm the results by Dell, Piketty and Saez (2007) that, at the federal level, Switzerland's top incomes were negligibly hit by the shocks of World War II but stayed relatively stable over time. In addition, our analysis shows how the proportion of income earned by the top 10, 5, 1, 0.5, 0.1 and 0.01 percent of the population has changed for these 26 cantons over time. We find a U-shaped pattern of the income share over the period from 1917 to 2007 for five cantons (19 percent of all cantons) and a relatively flat development of income concentration in 23 percent of all the other cantons. In most cantons (50 percent), there is a downward trend in income concentration. However, in two economically important cantons, top incomes have gained as a share of total income on the cantonal level.

The paper proceeds as follows. Section two describes the data and the methodology used in this study. Then, section three reports empirical evidence for the development of top income shares in the 26 Swiss cantons between 1917 and 2007. Finally, section four provides concluding remarks.

2. Data and methodology

Our analysis focuses on income concentration for the Swiss case at both the federal and the sub-federal (cantonal) level. The time-series estimations are based on income tax return data from the Swiss Federal Tax Administration (ESTV).⁴ These raw data are provided in tabulations with different tax brackets in which the number of taxpayers in the brackets corresponds with their total tax payments.

The different sources of our data are indicated in Appendix A. Data continuing from 1916 are available, but only on an irregular basis. The first two federal income taxes were levied during World War I on an exceptional basis due to the temporarily rising defence expenses. First, federal tax returns are documented in the *I. eidgenössische Kriegssteuer*, based on incomes earned from 1916 to 1917. However, these data only document the tax amounts and the tax units on labour income. Therefore, our series begins with the second federal income tax statistic: *Statistik der Neuen Ausserordentlichen Eidgenössischen Kriegssteuer* (Period I, II, III), measuring labour income for the years 1917-1920 (Period I: 1921-1924), 1921-1924 (Period II: 1925-1928) and 1925-1928 (Period III: 1929-1932). Problematically, many types of capital income were not covered by these taxes in the 1920s. The third wave of federal income taxes over the 26 cantons is based on the *Eidgenössische Krisenabgabe* (Period I, II,

⁴ For a detailed documentation of the historical development of the tax system in Switzerland, see "Daten aus der Geschichte der Bundessteuern": <http://www.estv.admin.ch/dokumentation/00079/00080/00736/index.html?lang=de> .

III). In this case, labour and capital incomes were assessed for the years 1933 (Period I: 1934-1935), 1934-1935 (Period II: 1936-1937) and 1936-1937 (Period III: 1938-1939).

Lastly, the fourth federal income tax was levied in 1940 (*Eidgenössische Wehrsteuer I. Periode*, 1941-1942), using the total household income as the tax units. Unfortunately, the second period with income for the years 1941-1942 (*Eidgenössische Wehrsteuer II. Periode*, 1943/1944) has never been published. The more homogenous series starts in 1943, with Period III of the *Eidgenössische Wehrsteuer* (1945) including total income for the years 1943-1944. This is followed by Period IV through Period XXI of the *Eidgenössische Wehrsteuer* for the years 1981-1982. The tax return statistics between the years 1947-1982 deal with the averages of the bi-annual total household income as tax units. From the year 1983-1984, the federal income tax changed its name from *Eidgenössische Wehrsteuer* to *Direkte Bundessteuer*; however, it was still levied on a bi-annual basis. The latest data on tax units and total income are available up to 2007.

With the introduction of the federal Tax Harmonisation Act in 1990⁵, cantons were required to levy income taxes on a yearly basis. Basel-Stadt moved as the first canton to use the annual tax basis. Three years later, the cantons Zürich and Thurgau followed. In 2001, the majority of cantons introduced an annual tax system (Bern, Luzern, Uri, Schwyz, Obwalden, Nidwalden, Zug, Solothurn, Basel-Landschaft, Schaffhausen, Appenzell i. Rh., Appenzell a. Rh., St. Gallen, Glarus, Aargau, Neuchâtel, Geneva and Jura). Finally by 2003, with the inclusion of Ticino, Vaud and Wallis, all cantons had left the bi-annual tax system (see Appendix D for details on the data for the shift of the assessment period from biannual to yearly between the years 1995 and 2003 and for our method of interpolation between the missing values).

Thus, our data spans over more than 90 years, covering the Great Depression, World War II, the post war and cold war periods, the two oil shocks and the information technology boom. Our estimates are based on net income, or the personal income of households before deductions.⁶ The income definition for all cantons is identical, includes labour income, business income, and capital income and is relatively stable over the time from 1933 to 2007. For the years 1917 to 1928, the income definition only considers labour income and not capital income. Realized capital gains are always excluded from the tax base. Between 1945 and

⁵ Bundesgesetz über die Harmonisierung der direkten Steuern der Kantone und Gemeinden (StHG), enacted on December 14, 1990: http://www.admin.ch/ch/d/sr/c642_14.html

⁶ Note that this is only a statistical nomenclature and corresponds to gross income. The net income does not reflect the actual gross income for two reasons. First, not all deductions are eliminated. Second, tax-free income is not covered: especially private capital gains and income parts that have been taxed already abroad and are not subject to taxation due to double taxation agreements in Switzerland.

1970, the income data reflect income after personal deductions (for example, deductions for married persons, children or insurance premiums). Nevertheless, information on those deductions is provided in the tax statistics; thus, we could add the personal deductions to the income data to obtain a consistent series over time.

Lastly, there are two general problems with using tax data addressed by the literature: first, tax avoidance and tax evasion (Piketty and Saez, 2006). Second, the income tax data cover only the taxpaying population. To account for these two aspects, we use Kuznets' (1953) and Piketty's (2001) method and combine tax data with estimates of the total population and the total income. This procedure is based on the population census and on national income estimates.

a. Tax units and population

Our top income shares are defined as fractions of the total number of adults (above the age of 20 and above the tax allowance) minus half the number of married men and women on the household level. The total number of adults and the number of married men and women for every year, beginning from the year 1900 in Switzerland, are obtained from the Federal Statistical Office (www.bfs.admin.ch). Siegenthaler (1996) uses the respective data for the different cantons over the years 1900-1980 for the historical statistics of Switzerland, and these statistics are interpolated with the estimator between two consecutive censuses to create annual series for the total number of households. Continuing from 1981, the yearly data for the cantons are based in the Federal Statistical Office.

The Federal Tax Administration (ESTV) divides the tax units into the normal units (Normalfälle) and the normal units including the special tax units (Sonderfälle). For the time 1971-2007 and 1949-1958, the normal tax units are available. For the years 1959-1970 and 1917-1948, we have only data for normal units including the special tax units.

b. Total income denominator

To relate our tax data to a comparable total amount of incomes earned, we have to define an income denominator. One approach to this definition adds the income of non-filers to the income tax data. The other approach compares data from national accounts with the income tax data (Atkinson, 2007). In our case, the total income denominator for Switzerland is defined as follows: over the period 1971-2007, we assume that non-filers earn, on average, 20 percent of average income.⁷ For the time before 1971, we take the national accounts to esti-

⁷ Feld and Frey (2002) estimate values of slightly above 20 percent income tax evasion for Switzerland.

mate our total income denominator. The denominator accounts for 75 percent of the national income. The national income is defined as the sum of personal income, government transfer, and corporate savings. Hence, there is no discontinuity in our estimated denominator. Unfortunately, the components of the national income are not available for all years; therefore, we decided to adopt the simple 75 percent of national income rule.⁸ This implies that for the cantons, the national income rule varies between 55 percent and 80 percent of cantonal income. Before 1964, data on the national income on a cantonal basis do not exist. However, we have tax returns and the national income for Switzerland, which allows for the estimation of the national income for every canton.

In order to deflate our nominal income series, we use the consumer price index (CPI) for Switzerland (Landesindex der Konsumentenpreise (LIK): www.LIK.bfs.admin.ch). The Swiss CPI starts in 1914 with the value of 100 and is provided by the Federal Statistical Office.

c. Pareto interpolation

The basic statistical data are provided in the form of grouped tabulations. These group tabulations have intervals that do not correspond with the percentiles of our interest, i.e., the percentage groups of population (e.g., 10 percent or 1 percent). Therefore, our raw data have to be interpolated by an adequate technique. Piketty (2001) describes, in detail, the Pareto interpolation technique used in this paper. This technique is commonly used when working with historical tax data.⁹ V. Pareto (1896, 1896-1897) was the first in the 1890s to use tax data tabulations from some Swiss cantons and determined an extraordinarily good approximation in the top tails of the income and wealth distribution. The Pareto formula for top incomes is given by the following cumulative distribution function, $F(y)$, for income y (see also Atkinson, Piketty and Saez, 2011):

$$1-F(y) = (k/y)^\alpha \text{ with } k > 0, \alpha > 1.$$

The α is called the Pareto coefficient. The corresponding density function is given by $f(y) = \alpha k^\alpha / y^{(1+\alpha)}$. In order to estimate a given fractal threshold, we choose the income bracket threshold, s , such that the fraction, p , of tax units with incomes above s is as close as possible to the given fractal. To estimate the parameters α and k , we denote β as the ratio between the average incomes of all tax returns above s . Therefore, we can compute $\alpha = \beta/(\beta-1)$ and $k =$

⁸ This method follows Dell, Piketty and Saez (2007).

⁹ See, e.g., Table 1.

$sp^{(1/a)}$. The top fractal average incomes (10 percent, 5 percent, 1 percent, 0.5 percent, 0.1 percent and 0.01 percent) are obtained by multiplying the corresponding fractal threshold by β , which is often called the inverted Pareto coefficient.¹⁰ An additional advantage of using the β coefficient is a larger β coefficient can directly be interpreted as a larger top income share; therefore, as higher income inequality.

Table 1 presents the income thresholds and average incomes of the top income groups for Switzerland, calculated by the above described interpolation method by Pareto. The top 1 percent-income share consisted of 41'393 tax units with an average income of 586'366 CHF. The top 10 percent-income group started with an income of roughly 100'000 CHF, which comprises more than 400'000 tax units with an average income of nearly 190'000 CHF.

Table 1: Thresholds and average incomes for the top income shares in Switzerland, 2007

Percentile threshold	Number of tax units (adults age 20 and above, 2007)	Income threshold (2007, CHF)	Average income in each income group (2007, CHF)
Top 10 percent	413'927	103'258	188'136
Top 5 percent	206'963	138'380	259'451
Top 1 percent	41'393	284'857	586'336
Top 0.5 percent	20'696	406'826	837'391
Top 0.1 percent	4'139	930'681	1'915'669
Top 0.01 percent	414	3'040'713	6'258'856

Figure 1a shows the cantonal distribution of the different top-income shares in Switzerland for the year 2007. As can be seen by the different boxplots, the variation of income concentration within Switzerland is considerable. For example, in 2007, the top 10 percent income shares in Swiss cantons varied between having 23 percent and 42 percent of all income with a mean of 29 percent (median 27 percent). The top 1 percent income shares have the respective values of 6 percent and 21 percent with a mean of 9 percent (median 8 percent). At the very top income level, with 414 tax units for Switzerland only and incomes above some 3'000'000 CHF, we have a cantonal variation between 0.4 percent and 5 percent of all income.

¹⁰ Note that there exists a one-to-one, monotonically decreasing relationship between α and β coefficients. That means $\beta = \alpha/(\alpha-1)$. For Example for the top 0.01 percent in 2007 and the years of 1977/78 in Switzerland the values correspond to $\alpha_{2007} = 1.94$ with $\beta_{2007} = 2.06$ and $\alpha_{1977-78} = 2.01$ with $\beta_{1977-78} = 1.99$.

Figure 1a: Boxplots for the cantonal distribution of top-income shares in Switzerland for 2007

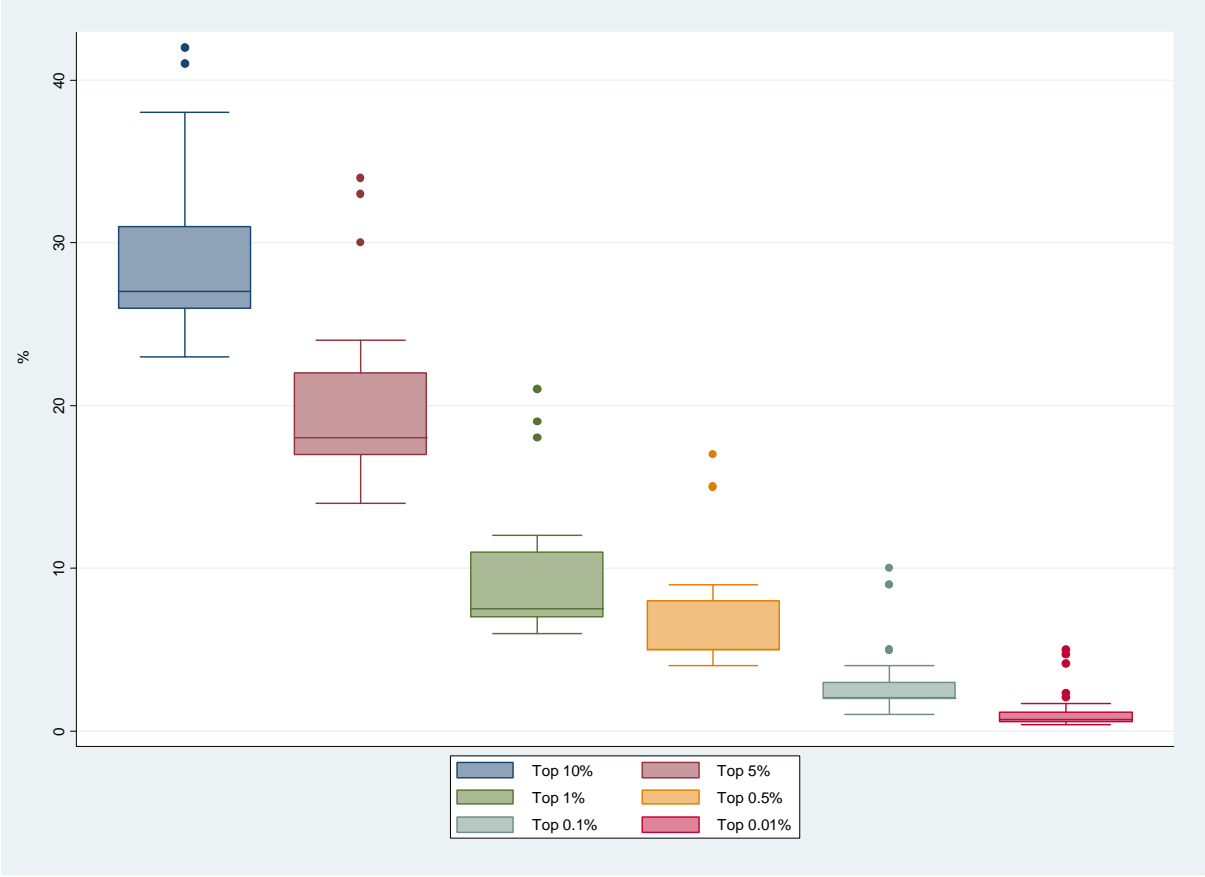
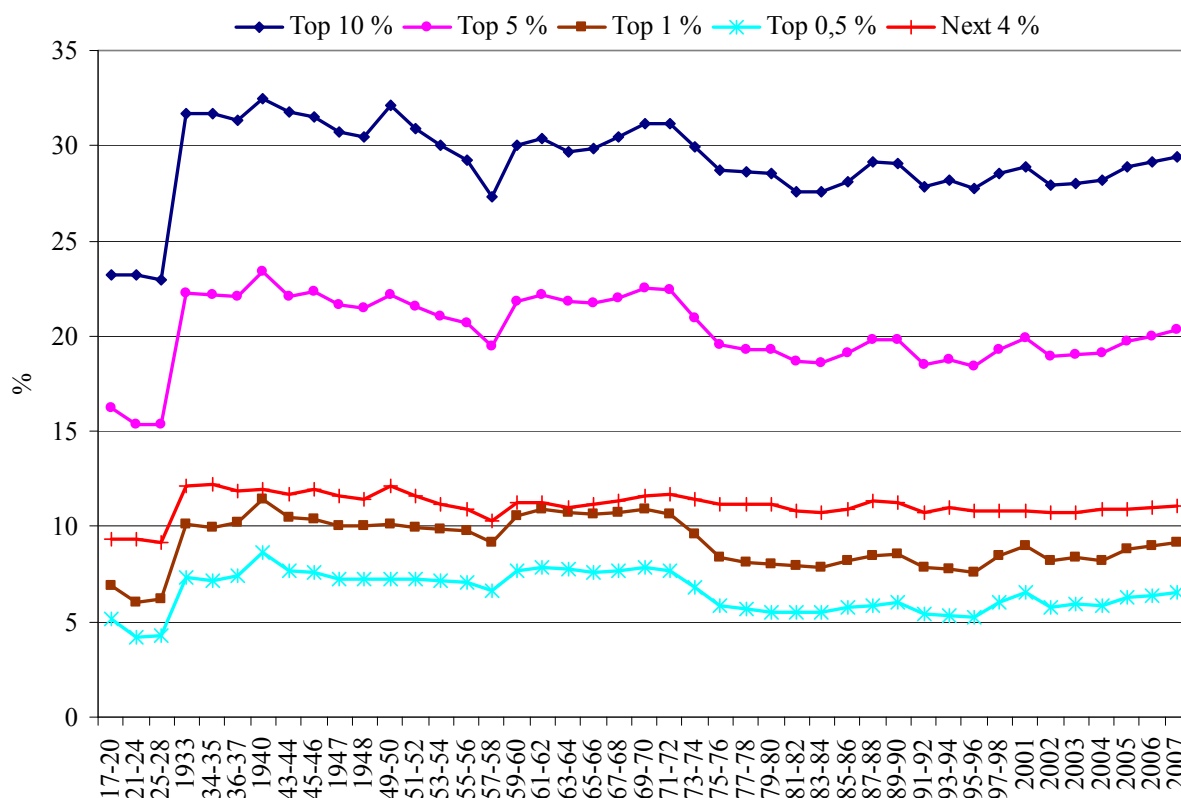


Figure 1b shows the results for the development of different top-income shares in Switzerland over the 20th century. The picture suggests that top incomes in Switzerland changed rather constantly across different income shares. Moreover, there is a break in series before and after 1928 due to a different tax base (only labour income before 1933; see Section 2). Income concentration peaked during the 1940s, where the top 1 percent income shares had more than 10 percent of all income. There was a slight downward trend in these shares until the 1990s, which decreased this value to 8 percent of all income. During the last 15 years, the top-incomes have increased to 9 percent. Indeed, the same can be concluded for the other top-income shares. Comparatively, the upper middle class (the next 4 percent) is very stable with incomes varying around 11 percent of all income.

Figure 1b: Development of top-income shares in Switzerland, 1917-2007



3. Top income shares in Switzerland and the 26 cantons over the century

Figure 2 displays the top 10 percent income shares for Switzerland and for the 26 cantons from 1917 to 2007. For Switzerland, the top 10 percent income shares are relatively stable over time (see Appendix C). Until the 1930s, income concentration of the top 10 percent varied around 23 percent of total income. Between 1933 and 1973-1974, the corresponding values increased to 31 percent of total income. However, they decreased again during the years 1971-1972 to 2007 with values between 27 percent and 28 percent. Thus, over the century, the top 10 percent income shares in Switzerland are remarkably stable around 30 percent.¹¹

However, the 26 cantons reveal a considerable variation from 1917 to 1945-1946 and again from 1995-1996 on. Before World War II, income concentration increased considerably in almost all the cantons, peaking finally in 1940. The highest income concentration for the top 10 percent was found in Glarus (GL) with 47 percent in 1933; the lowest was in Geneva (GE) with 17 percent during 1921-1924. This trend ends during World War II, when the top 10 percent income shares changed to a slight downward trend until the end of the 1950s. During this phase, the cantonal variation is high with a maximum value of above 60 percent from Appenzell i. Rh. (AI) in 1948 and a minimum value of just below 20 percent of total cantonal

¹¹ Dell et al. (2007) calculate a similar trend for the top 10 percent income shares between 1933 and 1995-1996.

income in 1959/1960 in the canton Neuchâtel (NE). The 1960s are characterized by a slight increase of the income concentration and a much smaller cantonal variation. Beginning in the 1970s, the top 10 percent income shares decreased again until the early 1980s. From the mid-1990s until the year 2007, the top 10 percent income shares in Switzerland showed an upward trend, with a widening of the cantonal variation. This increase was especially rapid in the cantons of Schwyz (SZ), Zug (ZG), Nidwalden (NW), Basel-Stadt (BS) and Geneva (GE).

Figure 3 shows the top 5 percent income shares of Switzerland and the 26 cantons (see Appendix C). The development for Switzerland and for the cantons is very much the same for the top 10 percent income shares: a stable income concentration for Switzerland of about 21 percent of all incomes between 1933 and 2007. During the early 1920s, the top 5 percent income shares varied around 17 percent. During the period of 1933-1969/1970, the top 5 percent income shares fluctuated between 19 and 23 percent, which was followed by a modest decrease and diminishing cantonal variance between 18 and 22 percent after 1971/1972. From the mid-1990s until 2007, income concentration as well as the cantonal variation increased again. Low-tax cantons, such as Zug (ZG) and Schwyz (SZ), experienced a remarkable increase in income concentration of the top 5 percent of income shares after the mid-1990s, with values reaching almost 35 percent. Compared to Switzerland, the top 5 percent income shares in the United States of America showed a U-shaped pattern during the period of 1933-2009 with the minimum in 1972 of about 20 percent, followed by an increase from 1973 to 2008 to a value of some 31 percent (Atkinson, Piketty, Saez, 2011). Additionally, the United Kingdom shows a U-shaped pattern of the top 5 percent income shares. In 1978, the top 5 percent fell from 30 percent of total income to about 17 percent; however, there was an increase to approximately 30 percent in 2005 (Atkinson, Piketty, Saez, 2011). Thus, compared to other countries, the top 5 percent income shares in Switzerland evolved very stably over the course of the 20th century.

The top 1 percent income shares are indicated in Figure 4. The top 1 percent income shares for Switzerland concentrate around 9 percent of all income (see also Appendix C). From 1933 to 1969/1970, the top 1 percent income shares stayed stable around 10 percent. However, for the last quarter of the 20th century, the Swiss average decreased to approximately 8 percent. The top 1 percent income shares reached a peak in 1940 at 12 percent. Again, there is a relatively large variation at the beginning and end of the 20th century for these cantons, with an end result close to the Swiss average during the 1970s. Figure 4 shows that the canton Nidwalden (NW) had the highest income concentration of the top 1 percent income shares during the first half of the 20th century, with a maximum value of 27 percent in

the year 1933. This is approximately 16 percentage points higher than the Swiss average and around 19 percentage points above the canton Neuchâtel (NE), which had the lowest income concentration. Afterwards, the concentration decreased in Nidwalden (NW) during the years 1943/1944 to 14 percent, followed by an increase to around 17 percent in the period 1945/1946 and 1961/1962. It peaked again in 2005 with a value above 20 percent. After the 1980s, and more pronounced after the mid-1990s, cantons as Schwyz (SZ), Zug (ZG) and Nidwalden (NW) revealed a striking increase in income concentration for the top 1 percent incomes. The other cantons stay relatively stable over the 20th century. Indeed, the same stable pattern of income concentration can be seen for the 0.5 percent income shares in Figure 5 (see also Appendix C). Again, for the top 1 percent income shares, Switzerland reached a peak in the 1940s with a value of some 9 percent, and low-tax cantons revealed a sharp increase after the mid-1990s.

Figure 6 shows the development of the top 0.1 percent income shares and Figure 7 the very top 0.01 percent income shares for Switzerland and the 26 cantons (see Appendix C). Again, it is remarkable that the Swiss average in both figures is relatively stable over time. In the period from 1933 to the early 1970s, the top 0.1 percent income shares decreased from 4 percent of all income to some 3 percent. Since the 1970s, the shares have stayed relatively stable. The Swiss average for top 0.01 percent of income shares always varies between 0.6 percent and 1.5 percent. Particularly striking is the canton Nidwalden (NW): in 1933, the top 0.1 percent income shares peaked by 17 percent and decreased until 1945/1946 to 6 percent. This decrease was followed by another decrease to 4 percent in the years 1981/1982. But from 1979/1980 to the year 2005, the top 0.1 percent income shares increased to 11 percent again. Notably, the top 0.1 and 0.01 percent income shares of the low-tax cantons Zug (ZG) and Schwyz (SZ) have again increased considerably during the recent decade.

A remarkable pattern is also obvious for the canton Uri (UR). The top 0.1 percent income shares increased from 2.51 percent in 1969/1970 to some 15 percent in 1989/1990. Once again, this was followed by a large decrease in 1993/1994 to around 1.8 percent. Note that for small cantons such as Uri, these large changes in the top-income shares are reflecting the small number of the taxpaying population (see Appendix B). Thereafter, the income concentration at this very top end stayed relatively stable. Also the canton Schwyz (SZ) shows a large variation over the century. The maximum level of the top 0.01 percent income shares was at 9 percent in 1997/1998 and decreased to 3 percent in 2002. This was followed by a recovery until 2007 to some 9 percent. The top 0.01 percent income shares have never been as high as they are in the current decade.

Table 2: Averages of top income shares for 26 cantons during the 1950s, the late 1970s early 1980s and the mid 2010

	Top 10 percent			Top 1 percent			Top 0.01 percent		
	Average	Average	Average	Average	Average	Average	Average	Average	Average
	49-58	77-86	03-07	49-58	77-86	03-07	49-58	77-86	03-07
Aargau	26.92	24.91	25.16	8.63	6.18	6.22	0.93	0.43	0.43
Appenzell a. Rh.	28.20	28.16	27.10	9.38	8.61	7.88	1.09	0.63	0.81
Appenzell i. Rh.	44.57	26.22	30.33	12.20	6.97	11.40	1.40	0.39	1.79
Basel-Landschaft	24.71	27.12	27.57	8.81	7.21	7.82	0.98	0.70	0.69
Basel-Stadt	35.05	29.52	32.26	12.25	8.85	11.13	1.34	0.76	1.58
Bern	27.79	27.15	25.60	8.57	7.20	6.47	0.91	0.48	0.52
Fribourg	34.28	26.23	25.18	8.78	6.96	6.42	0.84	0.54	0.53
Geneva	26.92	31.32	33.81	9.08	9.17	11.18	0.99	1.11	1.34
Glarus	32.34	25.07	23.95	11.10	6.80	6.04	1.28	0.33	0.44
Graubünden	35.12	27.33	26.63	9.41	7.49	7.37	0.79	0.45	0.65
Jura		25.06	23.11		6.57	5.23		0.93	0.35
Luzern	31.79	27.26	26.74	9.08	7.82	7.82	0.92	0.65	0.86
Neuchâtel	22.55	25.83	25.80	7.67	6.98	6.60	0.86	0.80	0.52
Nidwalden	40.69	30.62	35.60	17.18	12.01	16.17	2.37	1.37	3.80
Obwalden	35.97	28.66	28.00	8.18	10.10	10.14	0.36	2.69	1.93
Schaffhausen	26.71	25.53	25.22	8.43	6.14	6.25	0.88	0.26	0.45
Schwyz	35.77	27.68	40.45	9.82	8.88	19.34	0.96	1.22	4.62
Solothurn	28.98	25.76	24.97	9.09	7.11	6.65	0.94	0.65	0.60
St. Gallen	31.51	26.68	25.83	10.25	7.85	6.94	1.12	0.77	0.59
Ticino	28.04	28.99	29.81	7.81	8.07	9.10	0.80	0.46	0.95
Thurgau	30.27	25.48	25.31	8.86	7.04	6.61	0.92	0.69	0.53
Uri	29.37	27.74	22.10	7.98	11.19	5.12	0.80	4.74	0.38
Vaud	23.26	28.47	30.68	6.90	8.05	8.34	0.69	0.75	0.64
Wallis	32.04	24.55	25.49	7.97	6.40	7.33	0.50	0.40	0.85
Zug	37.21	30.95	37.92	12.25	10.34	15.84	1.35	1.17	2.94
Zürich	29.56	29.73	30.64	10.56	8.98	9.50	1.17	0.84	0.97
Switzerland	29.92	28.09	28.74	9.78	8.03	8.70	1.07	0.75	0.91

What about the income concentration at the middle top-class? Figure 8 displays the next 4 percent, i.e., those in the top 5 percent income shares that do not belong to the top 1 percent income share (see Appendix C). Interestingly, and in contrast to the widening of cantonal differences in income concentration during the last years for the different top income shares, the cantonal variation for the next 4 percent tends to converge considerably over the century. From 1933-2007, the income concentration of the middle top-class of Switzerland remains stable between 12 percent and 9 percent of total income. The low-tax cantons Zug (ZG) and Schwyz (SZ) and the high-tax cantons Geneva (GE) and Vaud (VD) are those with the highest income concentration for the middle top-class during the last 30 to 40 years.

Table 2 illustrates the cantonal results for the top 10, 1 and 0.01 percent income shares for all 26 cantons since World War II. It categorizes the development of the income concentration according to three “five tax-period averages” of 1949-1958, 1977-1986 and 2003-2007. As can be seen in Table 2, most cantons produced a decrease in their income concentration between the three period averages. Only Geneva (GE) and Vaud (VD) have a clear upward trend toward a higher income concentration across the top 10, 1 and 0.01 percent income shares.

If we look at the patterns of cantonal income concentration for the top 5 percent income shares over the century, we can categorize the 26 cantons into four groups (see Figures 9 to 12). The cantons Appenzell i. Rh. (AI), Nidwalden (NW), Zug (ZG), Basel-Stadt (BS) and Schwyz (SZ) follow a U-shaped pattern (see Figure 9).

Table 3: Pattern of income concentration over 20th century for the 5 percent income share

<i>Canton</i>	<i>U-shaped</i>	<i>downward</i>	<i>upward</i>	<i>constant</i>
Aargau		X		
Appenzell a. Rh.				X
Appenzell i. Rh.	X			
Basel-Landschaft				X
Basel-Stadt	X			
Bern		X		
Fribourg		X		
Geneva			X	
Glarus		X		
Graubünden		X		
Jura				X
Luzern		X		
Neuchâtel				X
Nidwalden	X			
Obwalden		X		
Schaffhausen		X		
Schwyz	X			
Solothurn		X		
St. Gallen		X		
Ticino				X
Thurgau		X		
Uri		X		
Vaud			X	
Wallis		X		
Zug	X			
Zürich				X
	19 percent	50 percent	8 percent	23 percent

A relatively stable trend of cantonal income concentration can be seen in Figure 10 when analysing the cantons Appenzell a. Rh. (AR), Basel-Landschaft (BL), Jura (JU), Neuchâtel (NE), Ticino (TI) and Zürich (ZH). Half of all cantons follow a more or less clear downward trend in income concentration: Aargau (AG), Bern (BE), Fribourg (FR), Glarus (GL), Graubünden (GR), Luzern (LU), Obwalden (OW), Schaffhausen (SH), Solothurn (SO), St. Gallen (SG), Thurgau (TG), Uri (UR) and Wallis (VS) are experiencing a trend towards higher income equality (see Figure 11). Strikingly, almost all cantons show a significant downward trend in the mid-1970s, except for Geneva (GE) and Vaud (VD). Contrarily, Geneva (GE) and Vaud (VD) show an upward trend over the 20th century (see Figure 12). Table 3 provides a summary of the patterns of income concentration for the top 5 percent income shares in Swiss cantons over the 20th century.

Table 4: β coefficients for measuring inequality over the 20th century

<i>Canton</i>	$\bar{\beta}$ (17-07)
Aargau	1.87
Appenzell a. Rh.	2.08
Appenzell i. Rh.	2.03
Basel-Landschaft	1.97
Basel-Stadt	2.08
Bern	1.92
Fribourg	1.88
Geneva	2.08
Glarus	1.99
Graubünden	1.77
Jura	1.86
Luzern	1.96
Neuchâtel	1.95
Nidwalden	2.74
Obwalden	2.17
Schaffhausen	1.94
Schwyz	2.34
Solothurn	1.95
St. Gallen	2.01
Ticino	1.83
Thurgau	1.94
Uri	2.58
Vaud	1.89
Wallis	1.80
Zug	2.27
Zürich	2.13
Switzerland	2.04

Note: $\beta = 1/[\log(S_{1 \text{ percent}}/S_{0.1 \text{ percent}})/\log(10)]$.

As has been argued in section 3, the calculated β coefficients can be interpreted as a measure for income inequality. Table 4 displays these inverted Pareto-coefficients for Switzerland as well as for all 26 Swiss cantons (average values for the period of 1917-2007).

These results point to the fact that the Swiss society is neither very equal nor very unequal in terms of total income over the 20th century. Additionally, Appendix C shows that the variation of the β -coefficient over the century is quite stable. In an international comparison, Switzerland, with a β of slightly above 2, is situated just between the more equal and the more unequal societies (Atkinson, Piketty and Saez, 2011). However, similar to the situation from the different developments of the top income share on the cantonal level, there is considerable variation in the inequality measure among cantons. Nidwalden is the canton with the highest income concentration over the century with a β -value of 2.74. Jura has the smallest income concentration with a β -value of 1.86. Notably, a regional cluster of high-income concentration is located in the central part of Switzerland and in cantons with economically important cities, such as Zürich, Geneva and Basel-Stadt.

4. Conclusions

In this paper, we studied the evolution of top income shares in the Swiss federation over the 20th century. We have presented new data on top income shares for the 26 cantons on a homogenous basis. In Switzerland, the federal income tax is based on a federal law with a uniform definition of income and harmonized administrative procedures, but these data have to be levied and collected at the cantonal level. Consequently, the cantons have considerable taxing power and can levy their own cantonal income taxes; therefore, we can investigate income concentration and its determinants using comparable data.

Switzerland as a whole experienced a very stable development of income concentration with a slight upward trend occurring only recently (see also Dell et al. 2007). However, the picture on the cantonal level is much more diverse. Cantons have different trends: similar to the inter-country comparisons, there are cantons with U-shaped patterns of income concentration (19 percent of all cantons). Others follow a more or less stable trend, which is true in 23 percent of all cantons. Finally, half of the cantons experience a downward trend in their income concentration. However, two important cantons show an increase in the top income shares during the century.

Second, there is a great deal of variation in the beginning, as well as in the last, part of the 20th century. During the 1970s, income concentration between the cantons converged substantially. Third, small cantons that had favourable tax conditions, such as Schwyz (SZ), Zug

(ZG) and Nidwalden (NW), experienced a somewhat striking upward trend during the last 10 years across all top income shares. Fourth, the middle-top incomes, defined as the other 4 percent of the top 5 percent income shares, have a much more stable and homogenous development among the cantons. This gives support for the idea that cantonal strategies in tax competition within Switzerland are different, especially for the very top income earners depending on the specific situation of the canton. However, this is only one possible determinant that could shape the income concentration.

In many ways, income concentration in Swiss cantons appears to be a small copy of what we can observe among different countries as far as income concentration is concerned. With such a homogenous database, it is now possible to investigate the determinants of different developments in income concentrations in more detail. This topic remains an interesting avenue for further research.

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Appendix B: Cantonal abbreviations and Number of tax units in 2007

Aargau	AG	311'286
Appenzell a. Rh.	AI	7'913
Appenzell i. Rh.	AR	27'479
Basel-Landschaft	BL	526'611
Basel-Stadt	BS	144'603
Bern	BE	110'703
Fribourg	FR	138'124
Geneva	GE	241'483
Glarus	GL	19'948
Graubünden	GR	102'132
Jura	JU	35'366
Luzern	LU	194'946
Neuchâtel	NE	88'717
Nidwalden	NW	22'217
Obwalden	OW	17'722
Schaffhausen	SH	246'592
Schwyz	SZ	40'668
Solothurn	SO	133'569
St. Gallen	SG	76'660
Ticino	TI	125'607
Thurgau	TG	186'436
Uri	UR	18'103
Vaud	VD	357'139
Wallis	VS	162'568
Zug	ZG	59'446
Zürich	ZH	743'229
<i>Switzerland</i>	<i>CH</i>	4'139'266

Appendix C: Top income shares in Switzerland, 1917-2007

Time	Percent Tax units covered in statistics	10 percent	5 percent	1 percent	0.5 percent	0.1 percent	0.01 percent	5 percent-1 percent	β Coefficient
17-20	0.10	23.19	16.23	6.94	5.14	2.44	0.78	9.30	2.21
21-24	0.15	23.19	15.35	6.03	4.19	1.91	0.60	9.32	2.00
25-28	0.15	22.99	15.37	6.17	4.32	1.97	0.60	9.20	2.02
1933	0.14	31.68	22.29	10.15	7.31	3.33	0.95	12.14	2.06
34-35	0.13	31.67	22.14	9.93	7.12	3.22	0.92	12.21	2.05
36-37	0.13	31.29	22.07	10.21	7.41	3.45	1.02	11.86	2.12
1940	0.32	32.44	23.39	11.47	8.66	4.30	1.50	11.92	2.35
43-44	0.53	31.80	22.12	10.44	7.68	3.71	1.37	11.68	2.23
45-46	0.62	31.54	22.32	10.37	7.58	3.42	1.10	11.95	2.08
1947	0.54	30.76	21.67	10.07	7.23	3.31	1.05	11.60	2.07
1948	0.41	30.46	21.49	10.01	7.20	3.30	1.05	11.47	2.07
49-50	0.43	32.10	22.19	10.10	7.23	3.30	1.04	12.09	2.06
51-52	0.47	30.92	21.55	9.98	7.26	3.40	1.15	11.57	2.14
53-54	0.49	29.99	21.03	9.84	7.14	3.33	1.10	11.19	2.13
55-56	0.53	29.24	20.71	9.79	7.08	3.27	1.07	10.92	2.10
57-58	0.35	27.34	19.46	9.19	6.60	3.01	0.98	10.26	2.07
59-60	0.47	30.07	21.78	10.56	7.65	3.58	1.21	11.23	2.13
61-62	0.50	30.36	22.17	10.87	7.90	3.71	1.26	11.30	2.14
63-64	0.49	29.69	21.80	10.76	7.81	3.71	1.28	11.03	2.16
65-66	0.57	29.88	21.75	10.61	7.63	3.58	1.21	11.15	2.12
67-68	0.64	30.45	22.03	10.71	7.70	3.62	1.23	11.32	2.13
69-70	0.64	31.14	22.51	10.90	7.85	3.71	1.27	11.61	2.14
71-72	0.59	31.18	22.40	10.67	7.68	3.52	1.10	11.73	2.08
73-74	0.65	29.94	20.98	9.58	6.82	3.06	0.95	11.40	2.02
75-76	0.67	28.76	19.53	8.37	5.83	2.46	0.72	11.15	1.88
77-78	0.69	28.59	19.33	8.16	5.65	2.38	0.71	11.17	1.87
79-80	0.71	28.58	19.26	8.04	5.54	2.33	0.70	11.21	1.86
81-82	0.73	27.62	18.70	7.90	5.49	2.38	0.76	10.80	1.92
83-84	0.74	27.58	18.62	7.85	5.46	2.38	0.79	10.77	1.93
85-86	0.78	28.08	19.11	8.21	5.77	2.54	0.79	10.89	1.96
87-88	0.76	29.14	19.78	8.43	5.89	2.55	0.77	11.35	1.93
89-90	0.77	29.09	19.80	8.53	6.03	2.67	0.83	11.27	1.98
91-92	0.76	27.84	18.54	7.84	5.40	2.28	0.66	10.70	1.86
93-94	0.76	28.18	18.74	7.75	5.35	2.26	0.66	10.99	1.87
95-96	0.75	27.76	18.41	7.55	5.21	2.21	0.64	10.85	1.87
97-98	0.75	28.57	19.29	8.43	6.02	2.75	0.90	10.86	2.06
2001	0.80	28.86	19.87	9.03	6.51	3.05	1.03	10.84	2.12
2002	0.83	27.96	18.96	8.20	5.77	2.54	0.79	10.76	1.97
2003	0.83	28.05	19.04	8.34	5.91	2.66	0.85	10.70	2.01
2004	0.82	28.20	19.13	8.22	5.86	2.60	0.81	10.91	2.00
2005	0.82	28.87	19.74	8.79	6.26	2.84	0.92	10.95	2.04
2006	0.81	29.15	20.02	8.98	6.41	2.92	0.96	11.04	2.05
2007	0.81	29.45	20.30	9.18	6.55	3.00	0.99	11.13	2.06

Note: $\beta = 1/[\log(S_{1 \text{ percent}}/S_{0.1 \text{ percent}})/\log(10)]$.

Appendix D: Data coverage over the change from biannual to yearly assessment between 1995 and 2003

Fiscal period	Assessment period	Coverage of official data	Value for missing data
1997-1998	1995-1996	all cantons based on biannual assessment except for BS	For BS (period 1996 + period 1997)/2
1999-2000	1997-1998	all cantons based on biannual assessment except for BS, ZH, TG	For BS (period 1997 + period 1998)/2; for ZH, TG = period 1999
Missing values for the assessment period of all cantons and the federal level from 1999 and 2000			
2001	2001	all cantons on a yearly assessment except for TI, VD, VS	For TI, VD, VS = (period (1997-1998) + period (1999-2000))/2
2002	2002	all cantons on a yearly assessment except for TI, VD, VS	For TI, VD, VS = (period 2003 + period 2004)/2
2003	2003	all cantons on a yearly assessment	all cantons on a yearly assessment

Figure 2: 10 percent

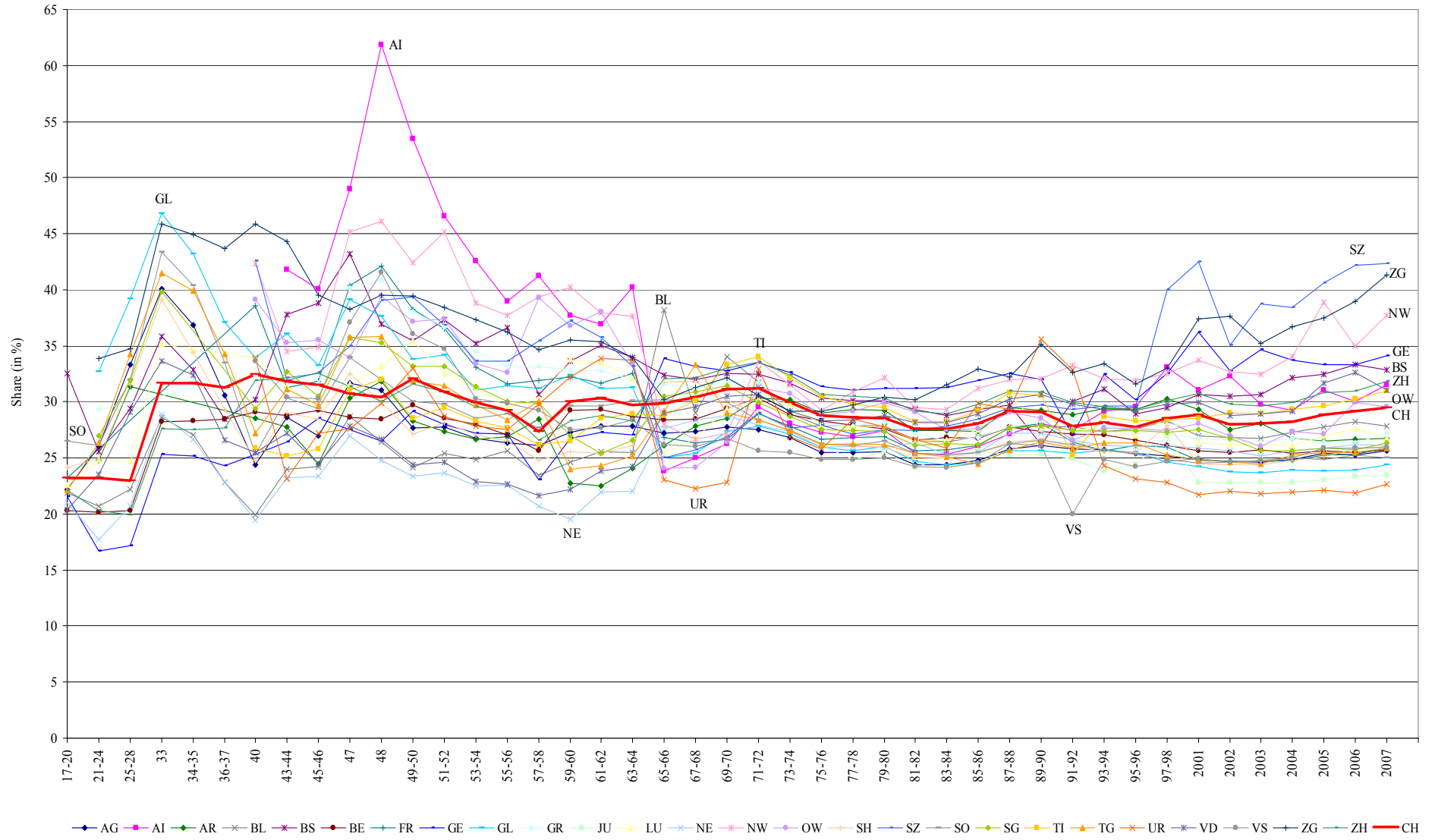


Figure 3: 5 percent

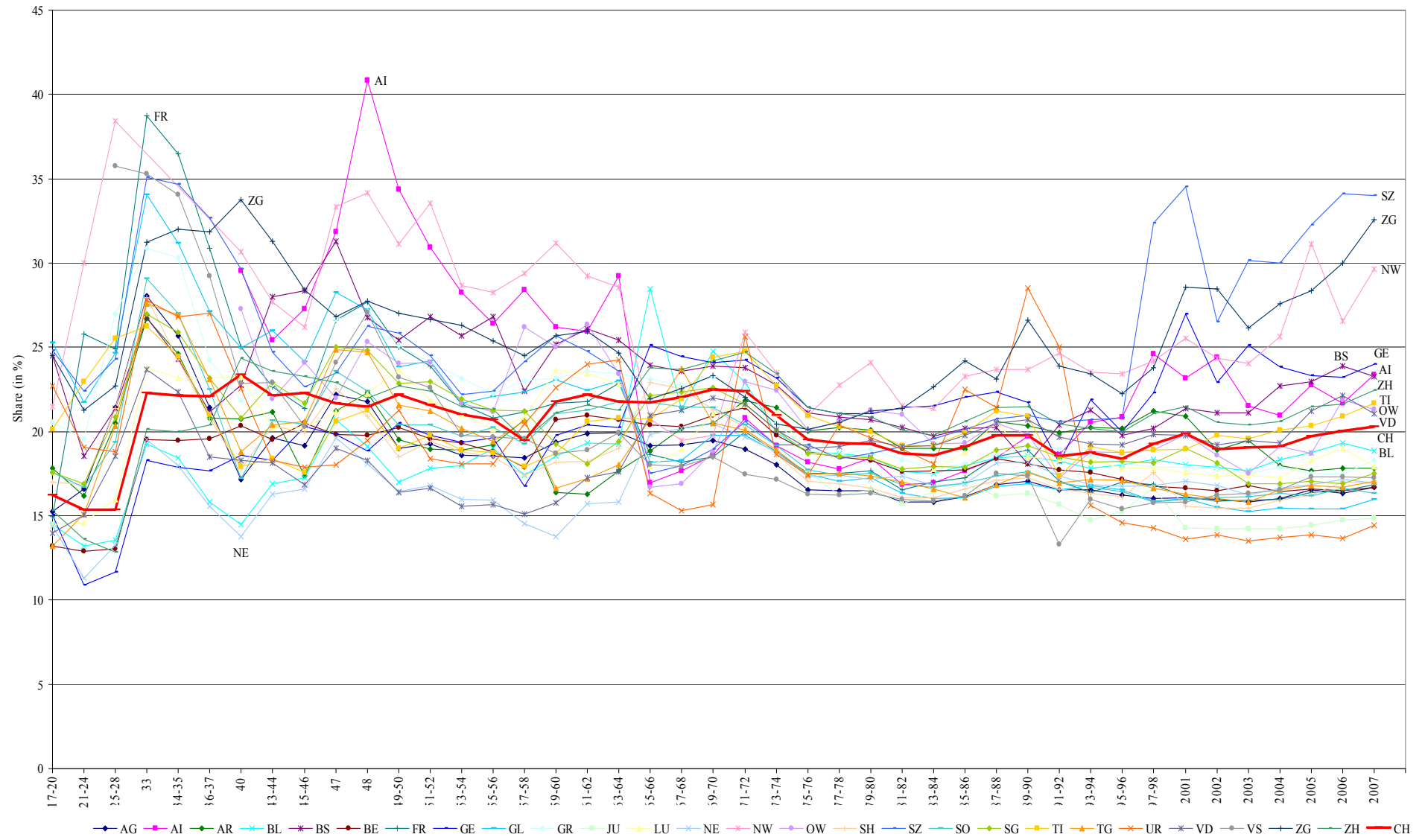


Figure 4: 1 percent

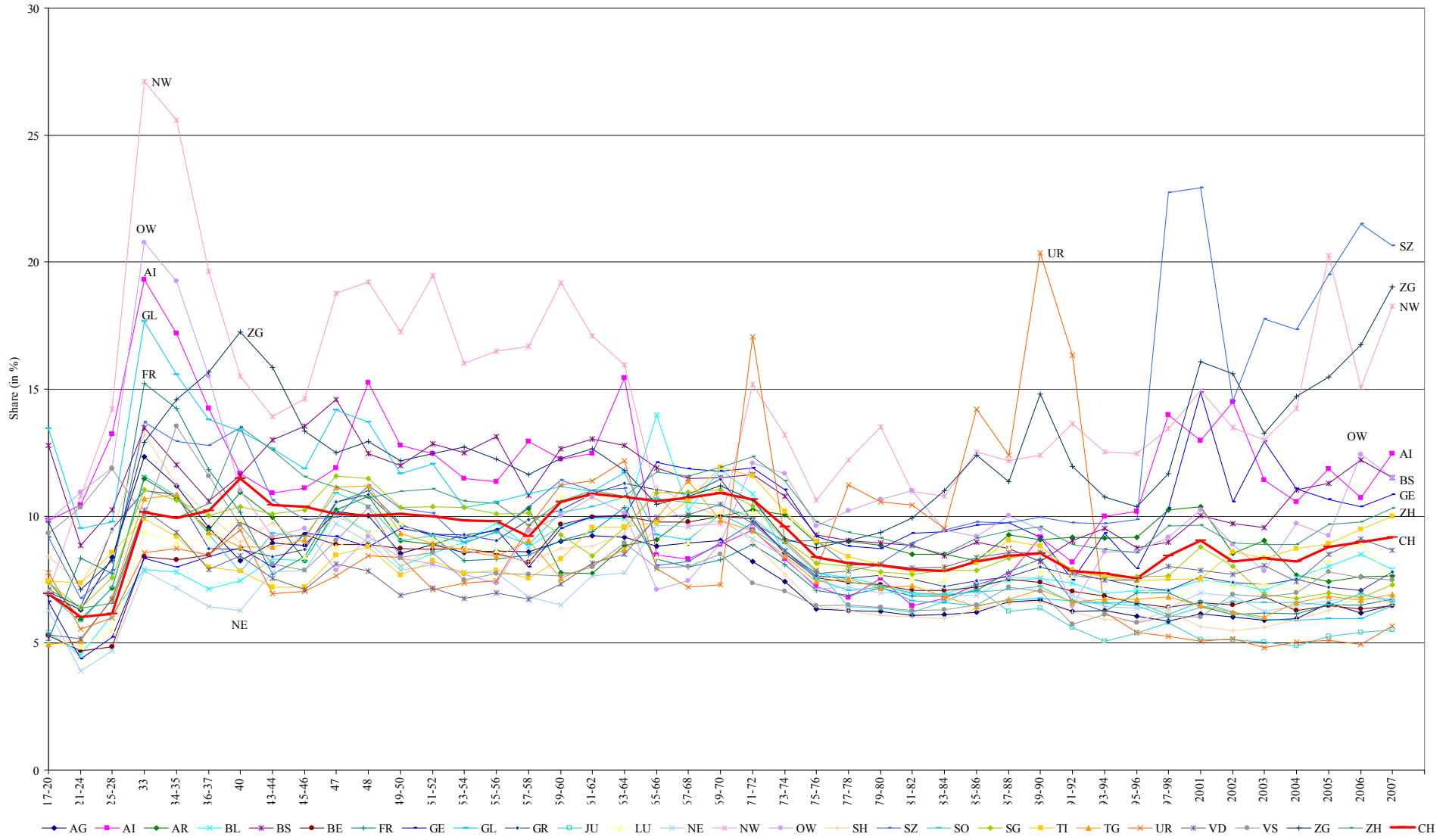


Figure 5: 0.5 percent

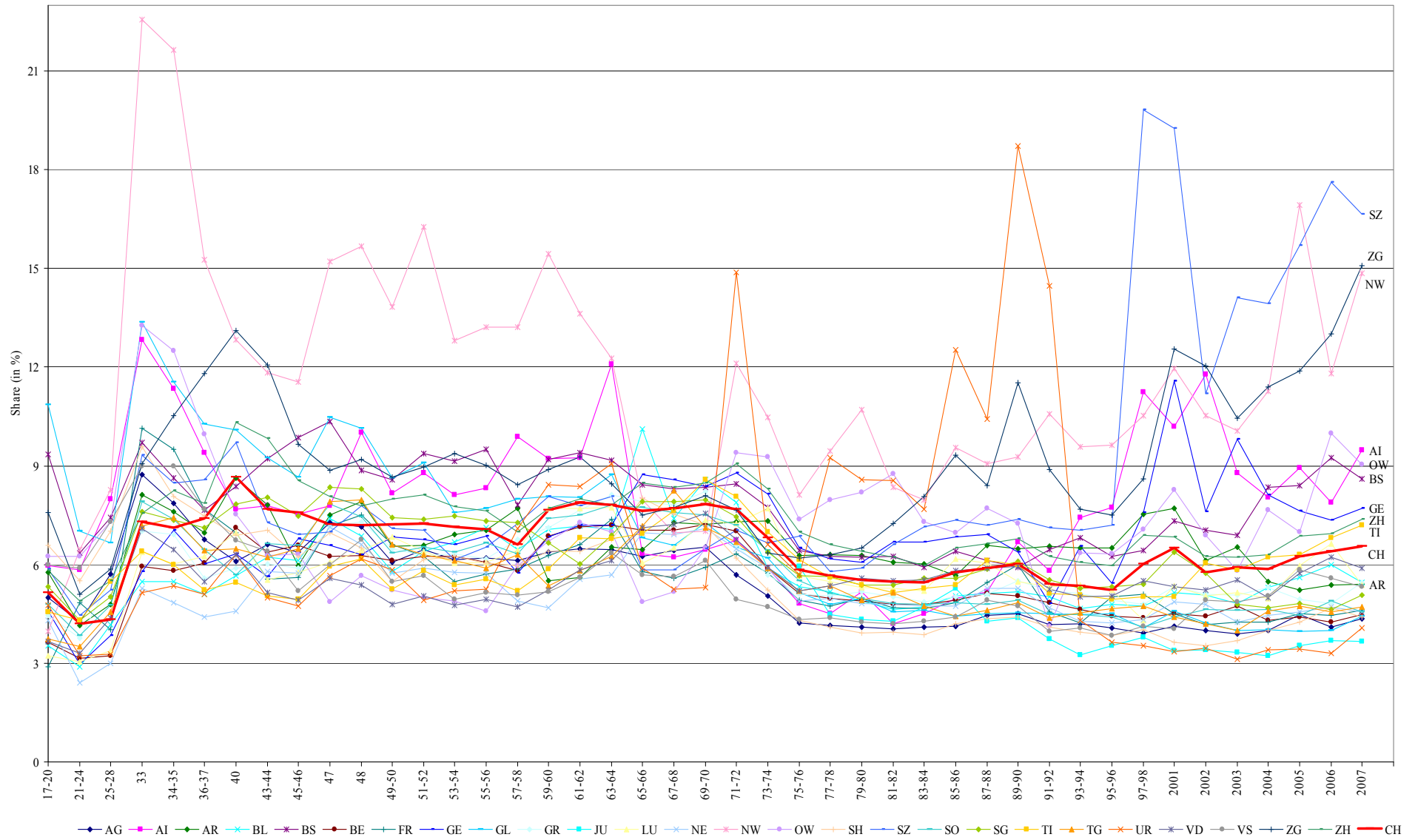


Figure 7: 0.01 percent

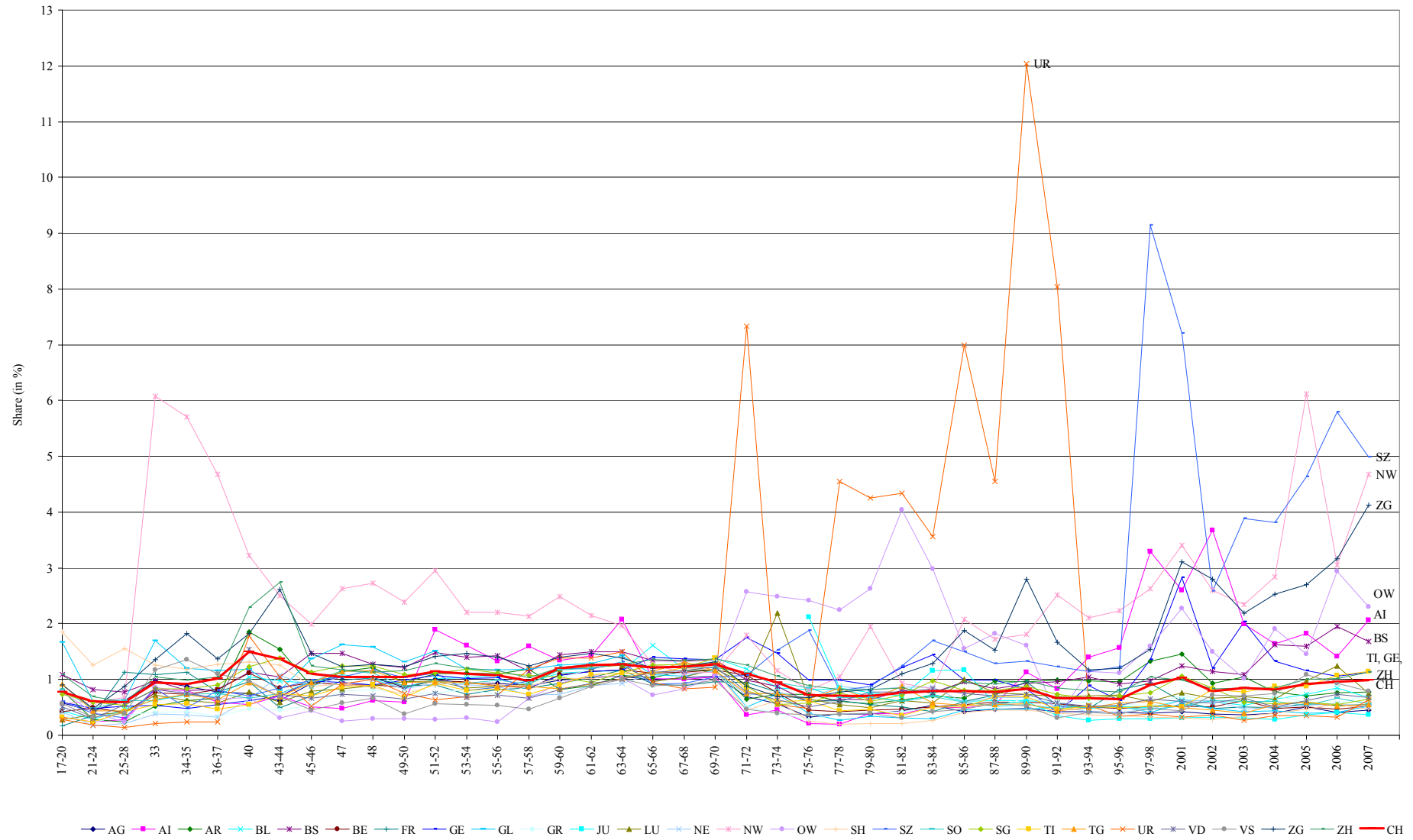


Figure 8: Next 4 percent

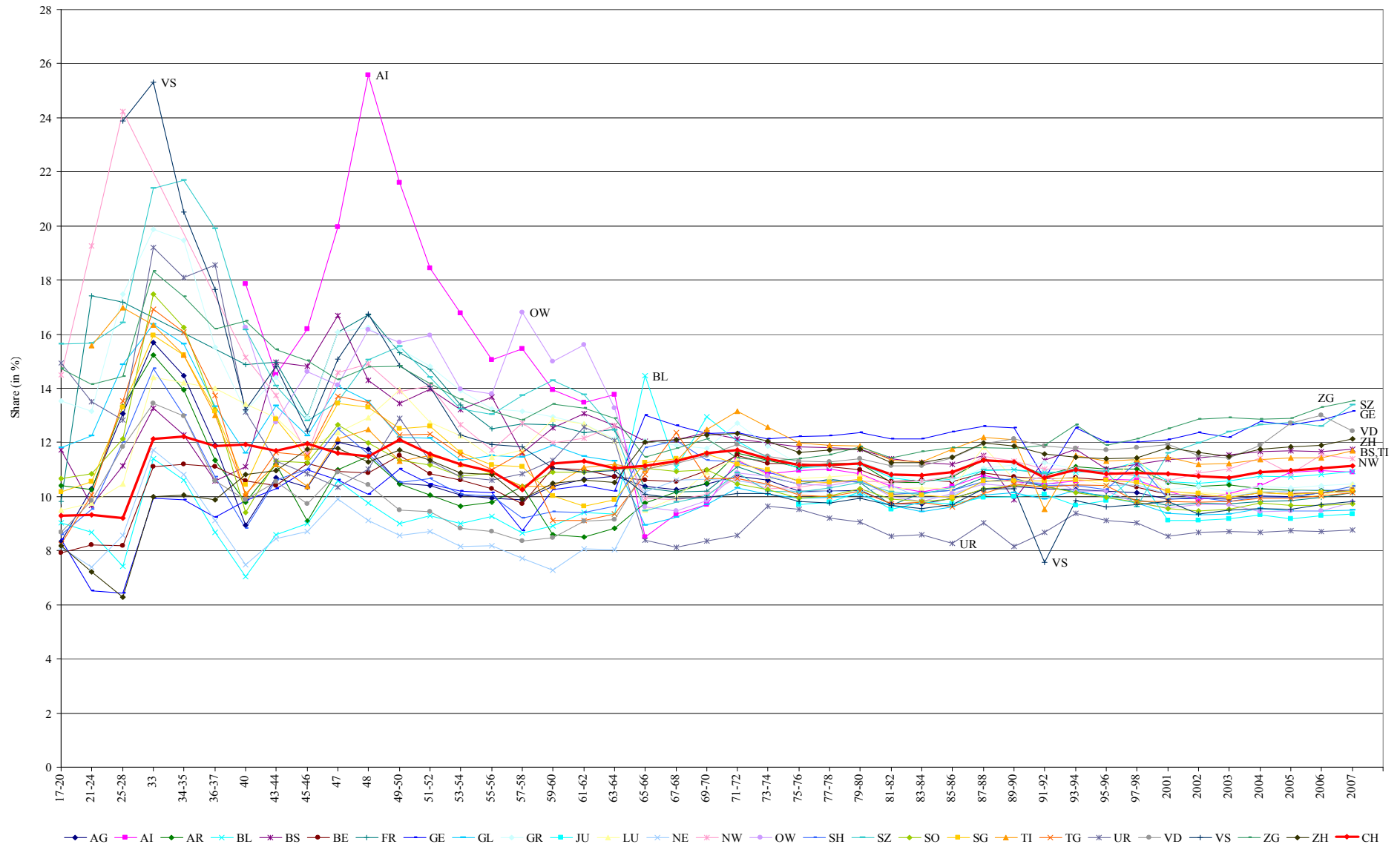


Figure 9: Cantons with U-shaped trend

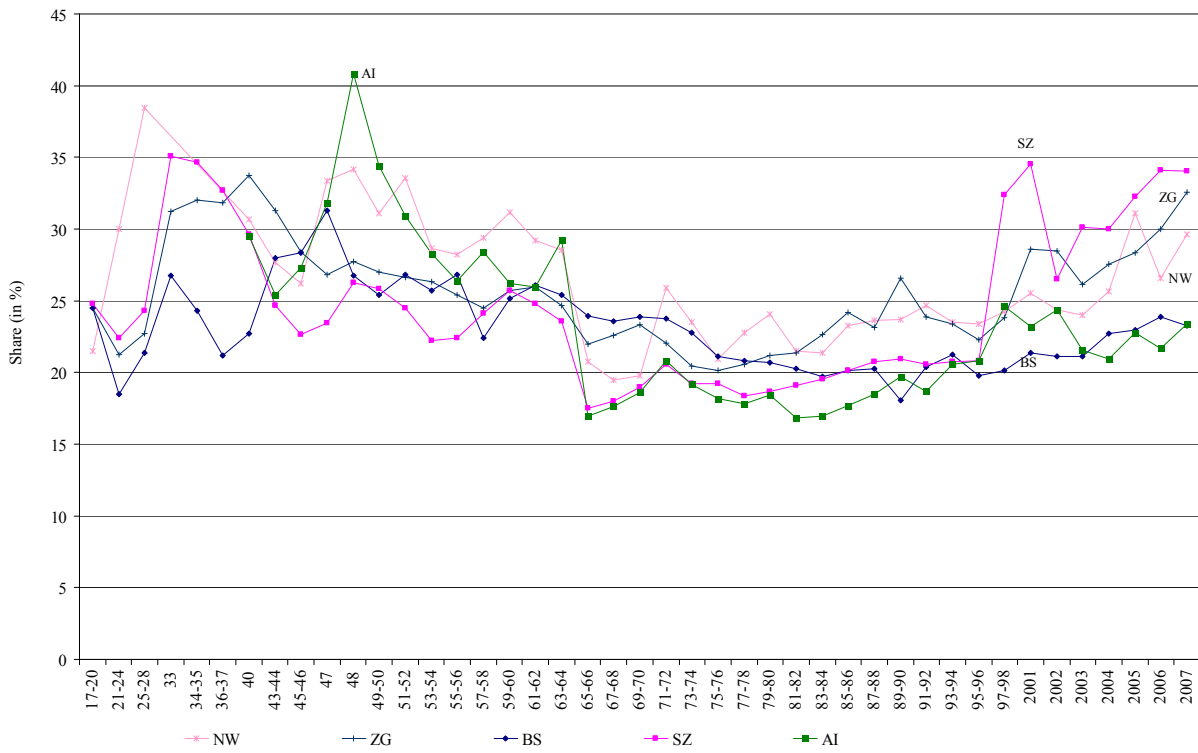


Figure 10: Cantons with constant trend

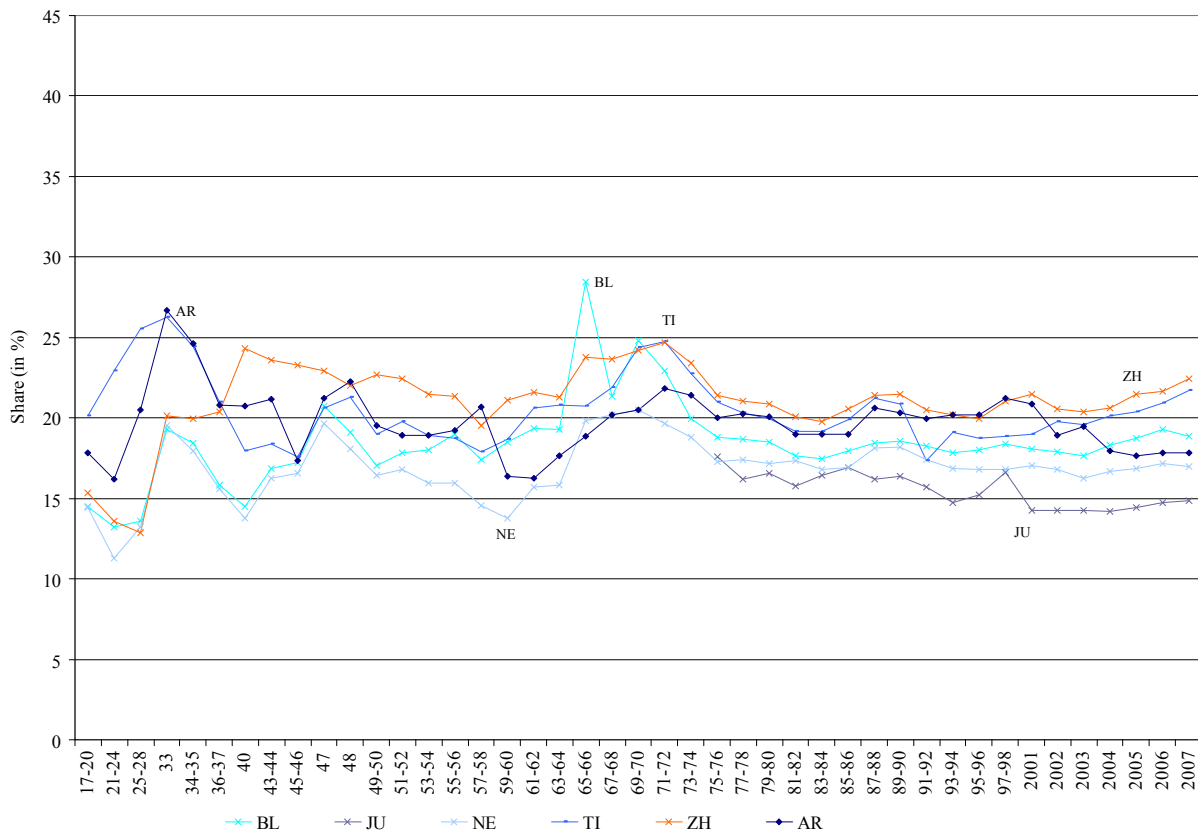


Figure 11: Cantons with downward trend

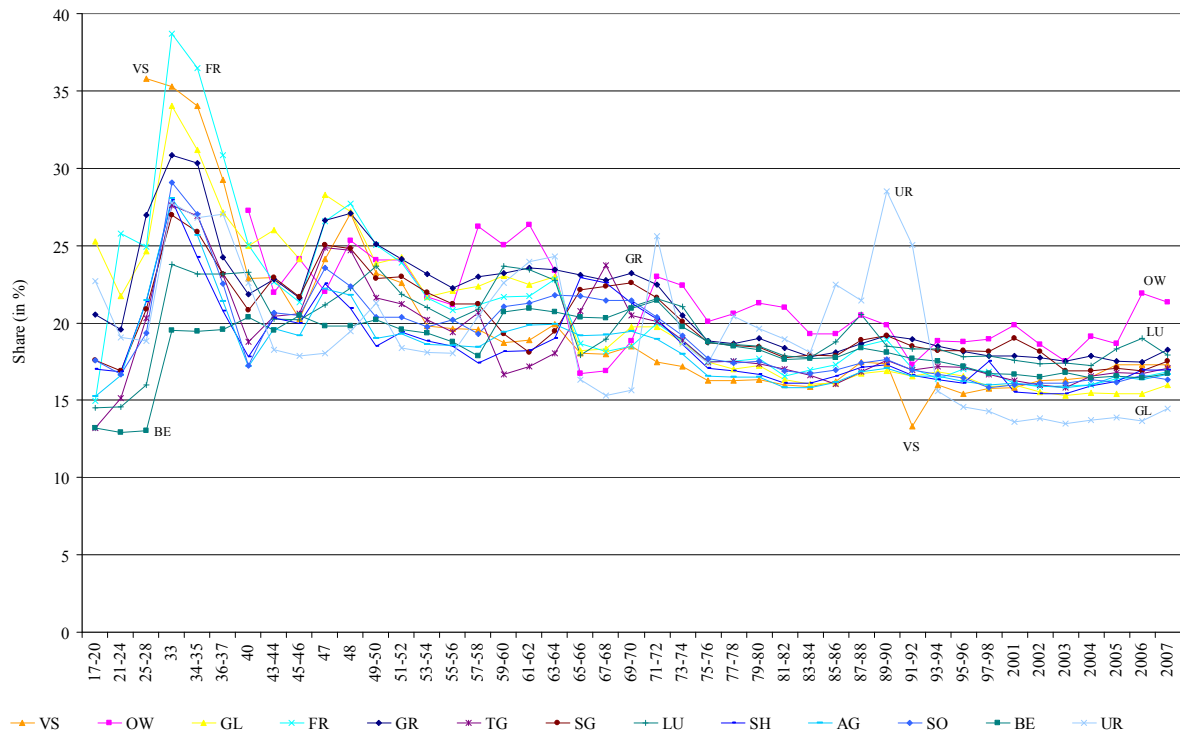


Figure 12: Cantons with upward trend

