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The Impact of Postal Voting on Participation: Evidence for Switzerland

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The Impact of Postal Voting on Participation

Evidence for Switzerland

Simon Luechinger^a, Myra Rosinger and Alois Stutzer^b

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Abstract: Many countries are forging ahead with convenient balloting methods, in particular electronic and postal voting, in order to re-engage voters. In this paper, we test whether the cost reductions with postal voting increase turnout. The empirical analysis is based on a newly collected data set on the introduction of postal voting in Swiss cantons. We take advantage of the unique fact that voting by mail was introduced at different times across cantons. This allows identifying the impact of postal voting on turnout, independent of time, issue and canton specific effects. The estimated average effect on turnout is roughly 4.1 percentage points for an average turnout of 43 percent between 1970 and 2005.

JEL-Classification: D72

Keywords: postal voting, voting costs, voting participation, turnout

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1 Introduction

Many countries are introducing convenient methods of balloting. In Switzerland, the cantons of Genève, Neuchâtel and Zürich gained some experience with electronic voting; similarly, Italy experimented with electronic voting in the last election. In the U.S., Washington and most states are forging ahead with postal voting, with the explicit aim of re-engaging voters and increasing turnout.¹ But what is the impact of postal voting on participation? Postal voting means that citizens get the ballot forms mailed to their home address, and can either go to the ballot box to vote or fill out the ballot forms and mail them back by a specified date in order to participate. Evidence on the subject informs at least three prominent debates in political science and political economics. First, there is substantial research on the determinants of voter turnout and the role of transaction costs.² Second, differences in voting technology affect the composition of the electorate, and thus the representation of different preferences in the political process, with potential consequences for policy outcomes.³ Third, the repercussions of postal voting on participation provide a preview on possible effects of e-voting on participation and the voting process in general. In relation to all three aspects, we focus, in this paper, on the role of voting costs associated with alternative balloting methods in people's decision to participate. We argue that these costs are reduced with all-mail voting and expect turnout to increase.

We study the effect of postal voting on participation in national ballots in Switzerland that were held between 1970 and 2005. We take advantage of the unique fact that eased voting by mail was introduced at different times across Swiss cantons. This allows to identify the impact of postal voting and to separate it from time, issue and canton specific effects on voting participation.

The basis for our analysis is a newly collected database on the introduction of different forms of postal voting in Swiss cantons. The first canton introduced unconditional all-mail voting in 1978 (canton Basel-Landschaft). By 2006, all 25 other cantons had changed over their system

¹ See, e.g., Economist (2006), Schweizerische Bundeskanzlei (2004), Solop (2001) and Trechsel and Mendez (2005).

² From the many surveys, see, e.g., Aldrich (1997) for the theoretical literature and Geys (2006) for the empirical literature. For Switzerland, see the recent study by Kirchgässner and Schulz (2005).

³ Most prominently, Lijphart (1997) wrote about 'unequal participation: democracy's unresolved dilemma'. The consequences for policy outcomes are studied, e.g., in Hill and Leighley (1992) and Mueller and Stratmann (2003).

as well, the last two being in 2005 (cantons Valais and Ticino). According to our econometric analysis, the average effect the changeover had on turnout (in national ballots) was roughly 4.1 percentage points with an average turnout of 43 percent during the last three and a half decades. According to our most refined estimation, with canton specific time trends, unrestricted postal voting led to a one time constant shift. We neither find a gradual increase in the effect of postal voting, nor robust evidence that the initial effect is gradually getting weaker.

The empirical account in this paper is the broadest analysis on the effect of postal voting on participation that we are aware of. Related research is mainly for the US and primarily investigates the experience with all-mail voting in Oregon. However, insights with regard to the effect on turnout are limited, because all-mail voting was first applied to single elections, that are difficult to compare, and was then introduced by citizen approval in a state ballot in 1998 for all forthcoming elections (see, e.g., Karp and Banducci 2000 and Southwell 2004). Closest to our analysis is the study by Funk (2006) on participation in Swiss elections for the federal parliament (Nationalrat). Based on a preliminary indicator for postal voting and a smaller database (restricted to 8 elections), an effect on turnout of between -0.84 percentage points and $+5.44$ percentage points (95% confidence interval) is found. Further longitudinal analyses are for single cantons, with no conclusive results (von Arx 1998). A recent survey by the Federal Chancellery (Klaus 2006) captured the use of postal voting in the national referendum held on November 27, 2005. It is found that 81.5 percent voted in advance by mail, whereby the fraction of voters taking advantage of this possibility varied between 15.8 percent (canton Glarus) and 97.3 percent (canton Luzern).

In the next section, we describe in detail how we generated the database about the gradual introduction of postal voting in Swiss cantons. We differentiate between four categories, capturing different degrees of eased voting. In a brief descriptive analysis, we present the compiled information on postal voting. A list of the relevant cantonal enactments is provided in the appendix. Section 3 presents the results of the empirical analysis on the effect of postal voting on participation in Swiss national votes. Section 4 offers concluding remarks.

2 The Introduction of Postal Voting in Swiss Cantons

2.1 Data Collection

In order to compile a complete list of the precise dates for the introduction of postal voting across Swiss cantons, we draw on three data sources: survey information from the federal chancellery, cantonal corpora juris and a survey conducted with the chancelleries of the cantons. Information was already available from an earlier survey conducted by one of the authors, as well as the one conducted by the federal chancellery in 1998 (Bundeskanzlei 1998). However, a separate data collection was necessary, because the survey of the federal chancellery was outdated and turned out to be incomplete. It focuses on the introduction of unconditional postal voting, and information on postal voting on request has not been collected systematically. Moreover, the survey contains no information on whether postal voting is restricted to a group of citizens. Further, a slightly different definition of voting on request is applied than the one we use here. It is self-evident that any changes in political rights since 1999 are missing.

In the first step, the corpora juris of all Swiss cantons for the period 1970-2005 were systematically searched (headword register or systematic register) for enactments on political rights. Enactments containing provisions on postal voting were further analyzed. First, the kind of postal voting was determined in order to enable classification into categories (see next section). Second, we extracted the date when a particular form of postal voting came into force. Appendix A.1 provides a list of the relevant enactments.

In the second step, legal information on introduction dates was compared to the information from the survey conducted by the federal chancellery. Inconsistencies were resolved by going back to the cantonal law.

In addition, the legal situation, with regard to postal voting prior to 1970, was clarified for cantons in which the oldest of the identified enactments was dated earlier than 1970. This provides a consistent picture of the legal situation in 1970 (the starting point of our empirical analysis presented in section 3).

In the third and final step, the compiled information for each canton was submitted to the cantonal chancelleries for verification. The response rate was 100% and led to seven corrections of our classification and fifteen (mostly small) corrections of dates.

Before we briefly discuss our findings for the cantonal introduction dates of postal voting, we explain the categorization of the different levels of eased participation.

2.2 Categories of Postal Voting

Postal voting in Switzerland has been introduced gradually. In order to differentiate between the different degrees to which voting has been eased, we distinguish four categories of postal voting.

In the majority of cantons, postal voting was introduced at the end of the 1960s. However, at that time, the possibility of voting by mail was restricted to selected persons. The cantons applied definitions of the groups of persons with access to postal voting that were very similar to each other. The corresponding definition in federal law served as an orientation. Typically, the groups covered were: people who are ill and either in hospital or house-bound; patients covered by military insurance, who require a rest cure or vocational retraining that takes them away from their domicile; citizens, who live away from home for work reasons; citizens who are prevented from going to the polls because of reasons of force majeure.⁴

In most of the cantons, postal voting was allowed only on request. In two cantons, explicit request was not required. Accordingly, we differentiate between two categories of postal voting for restricted groups of persons:

- postal voting for a restricted group of persons on request, and
- postal voting for a restricted group of persons with no request necessary.

Similarly, when postal voting for all citizens was introduced, some cantons made it conditional on the citizens making an official request or having to explicitly ask for the necessary material for postal voting. In contrast, in a regime of unconditional postal voting, the voting material is automatically delivered to the citizens. Thus, two further categories can be distinguished:

- postal voting for all citizens on request, and
- postal voting for all citizens with no request necessary (= unconditional postal voting).

In comparison, the survey by the federal chancellery only distinguishes between the two categories ‘unconditional postal voting’ and ‘postal voting on request’. The present categorization applies an additional differentiation criterion, namely the persons who have

⁴ See Art. 5, Abs. 1 Bundesgesetz über die Einführung von Erleichterungen der Stimmabgabe an eidgenössischen Wahlen und Abstimmungen vom 25. Juni 1965.

access to a particular form of postal voting. As the number of persons covered by restricted postal voting is small, this second differentiation is much more relevant. Furthermore, our category ‘on request’ also includes those cases where no formal request is necessary, but where the material for postal voting needed to be asked for. This categorization is chosen because not only having to write an official request, but also already having to ask for the material, raises the transaction costs of voting noticeably. A further aspect of postal voting in Switzerland is worth noting, as it differs from the practice in other countries, especially the U.S.: No Swiss canton has a mail-only voting regime, i.e. no canton abolished voting at ballot boxes.

2.3 Data Description: Introduction of Postal Voting

A list of cantonal introduction dates for four kinds of eased participation by postal voting is presented in Table 1. The abbreviations for the four categories are used in the appendix to link specific cantonal enactments to our classification.

Table 1. Cantonal introduction dates for four categories of postal voting

Canton	Postal voting for a restricted group of persons		Postal voting for all citizens	
	on request (rr)	no request necessary (rn)	on request (ar)	no request necessary (an)
Aargau	01.01.1967			01.01.1993
Appenzell Innerrhoden				11.06.1979
Appenzell Ausserrhoden	01.01.1967			24.05.1988
Bern	01.01.1967	01.05.1970		01.07.1991
Basel-Landschaft	01.05.1962			01.07.1978
Basel-Stadt	13.06.1976			30.12.1994
Fribourg	19.09.1966		01.09.1976	23.05.1995
Genève	25.06.1950			01.01.1995
Glarus	01.01.1967			01.07.1995
Graubünden	01.01.1967			01.01.1995
Jura	01.01.1979			01.05.1999
Luzern	01.01.1967		01.12.1978	01.10.1994
Neuchâtel	01.01.1967		26.04.1995	01.01.2001
Nidwalden			20.12.1979	29.06.1994
Obwalden	01.04.1974		01.07.1978	01.12.1995
St. Gallen	01.06.1967			01.05.1979
Schaffhausen	22.03.1968			01.08.1995
Solothurn			01.01.1981	01.01.1985
Schwyz	08.10.1971		01.03.1992	01.01.2000
Thurgau	01.01.1967	01.09.1978		01.08.1985
Ticino	01.12.1998			15.04.2005

table 1 continuation

Uri	04.06.1967		01.01.1995
Vaud	07.02.1979	01.01.1990	25.03.2002
Valais	01.10.1972	01.10.1996	01.01.2005
Zug	01.07.1969		01.04.1997
Zürich	17.12.1955	01.01.1985	01.10.1994
Schweiz	01.01.1967		15.12.1994

Sources: Cantonal enactments on political rights (see appendix), Bundeskanzlei (1998) and authors' survey of the cantonal chancelleries.

At least a few observations are noteworthy. Most cantons already made postal voting available to a restricted group of persons on request in the 1960s. Less than half the cantons offered postal voting at some point in time to all citizens on request. Most cantons rather switched directly from a regime with postal voting for a restricted group of persons to unconditional postal voting for all citizens eligible to vote.

The actual initiator of postal voting was the Swiss federal parliament. Most cantons introduced restricted postal voting following the enactment of a corresponding federal law in 1967 (Bundesgesetz über die Einführung von Erleichterungen der Stimmabgabe an eidgenössischen Wahlen und Abstimmungen vom 25. Juni 1965). Only the cantons of Genève and Zürich were familiar with the restricted form of postal voting before that, i.e. since the 1950s. All the other cantons introduced restricted postal voting towards the end of the 1960s or in the 1970s - with one exception: Canton Ticino only recently allowed for restricted postal voting, namely in 1998.

With regard to *unrestricted* postal voting, as early as 1976, the federal law called upon the cantons to introduce some form of eased postal voting for all citizens (Art. 8, Abs. 1 Bundesgesetz über die politischen Rechte). On the federal level, unconditional voting by mail was introduced in 1994. At the same time, the cantons were obligated to do so as well (Art. 5, Abs. 3 Bundesgesetz über die politischen Rechte). Despite this top-down enactment of general postal voting, the cantons introduced voting by mail at different times, due to varying local traditions, political constellations and specific problems related to implementation. The cantons of Basel-Land, St. Gallen and Appenzell Innerrhoden were precursors, introducing unconditional postal voting already at the end of the 1970s. At that time, some of the other cantons (Fribourg, Obwalden, Luzern, Nidwalden) also allowed general postal voting, but only on request. Roughly half of the cantons followed the change in federal law from March 18th 1994, and adapted their cantonal legislation accordingly within the following year. With

the exception of the canton of Genève, the French speaking cantons, as well as the canton of Ticino, the Italian speaking canton, were the last group to introduce unconditional postal voting. Schwyz is the only German-speaking canton belonging to the group of latecomers. They introduced unconditional postal voting noticeably later than both the federal state and the bulk of the other cantons. The last two cantons (Valais, Ticino) only changed their legislation as recently as 2005. Most of the latecomers, however, did have the possibility of postal voting on request.

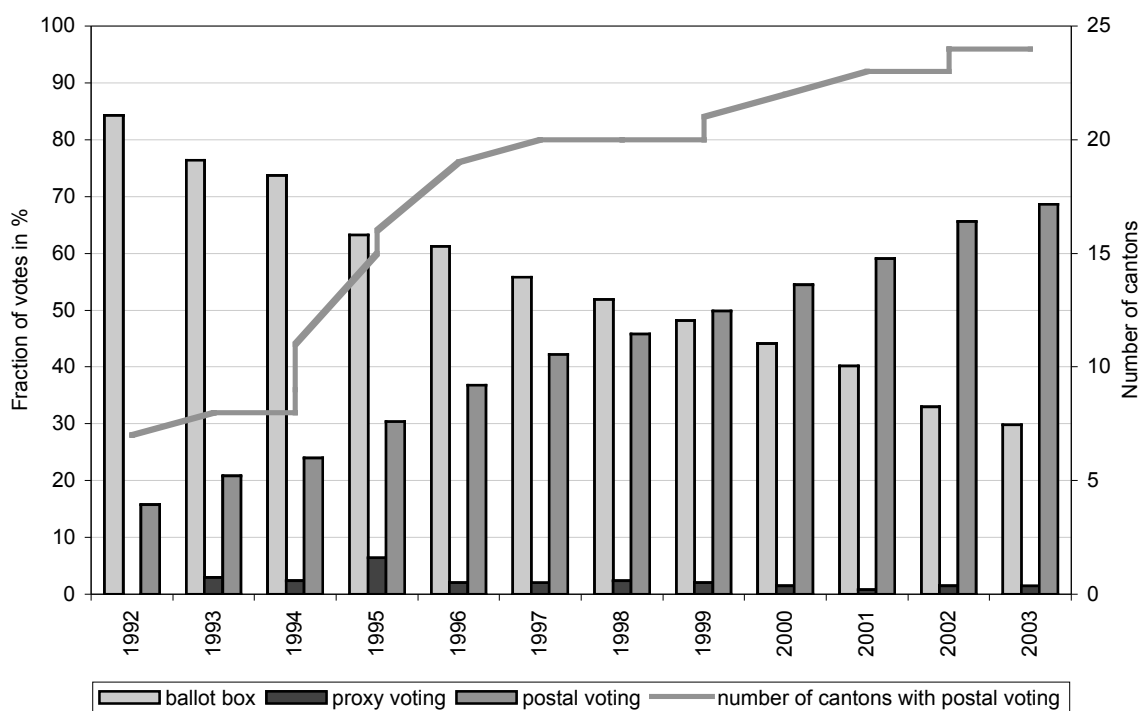
2.4 Use of Postal Voting

While the introduction of postal voting can be found in the law, there are no official statistics about its use across Swiss cantons (for an exception, see the recent study by the Federal Chancellery (Klaus 2006) cited in the introduction) and over time. The best information available is from the newly generated dataset VoxIt, which is based on standardized surveys (VOX) that are regularly conducted after a federal vote. Based on roughly 1,000 telephone interviews, *inter alia*, the mode of participation has been captured from 1992 to 2003.

The fraction of the votes cast by mail clearly rose from an average of 16% in 1992 to one of 69% in 2003. Figure 1 provides an overview of this development, including the number of cantons in which citizens had access to unconditional postal voting.

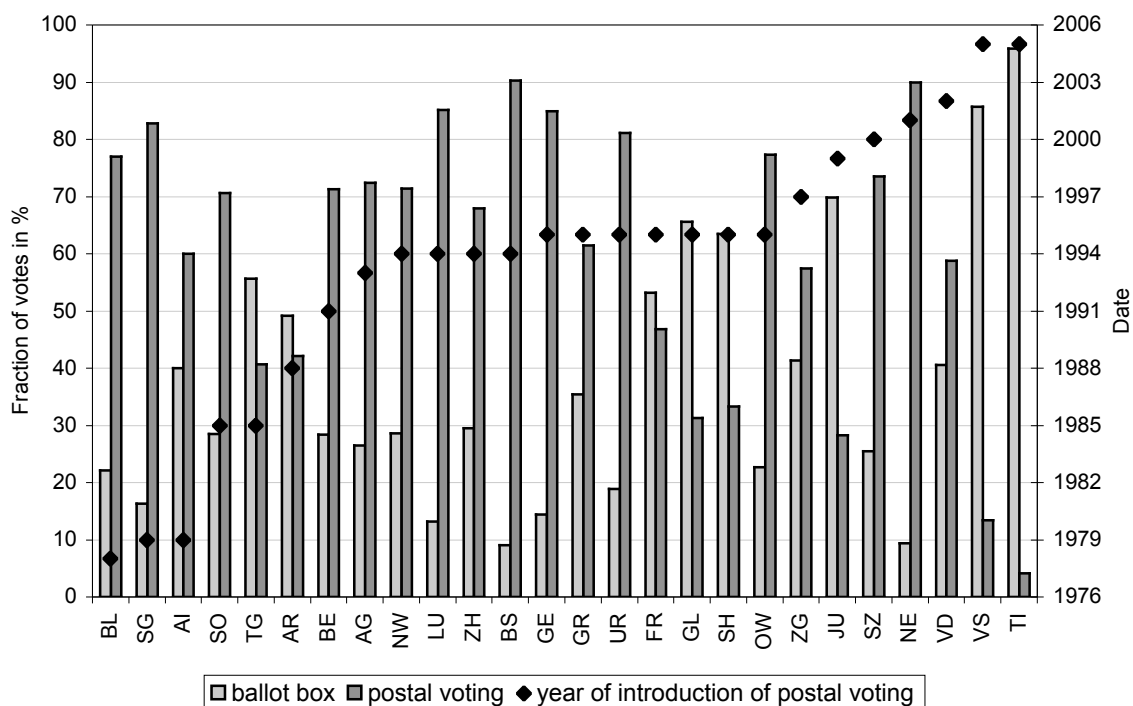
The intensity with which postal voting is used varies substantially between cantons. Figure 2 shows the fraction of voters who cast their vote by mail. Data is again from VoxIt, this time for the period 2001 to 2003. The differences in the introduction dates only partially account for the variations in use across cantons. For example, the average fraction of the votes cast by mail during 2001-2003 in canton Thurgau, which was relatively early in introducing unconditional postal voting in 1985, amounts to 41%. In contrast, in canton Neuchâtel, where unconditional postal voting was not introduced until 2001 (general postal voting on request has existed since 1995), 90% of the citizens are voting by mail.

Figure 1. Use of the different voting modes in Swiss federal ballots, 1992-2003



Source: VoxIt: The Standardized Post-Vote Surveys. Neuchâtel: SIDOS.

Figure 2. Use of the different voting modes across Swiss cantons, 2001-2003



Source: VoxIt: The Standardized Post-Vote Surveys. Neuchâtel: SIDOS.

3 The Effect of Postal Voting on Turnout

The empirical analysis on the effect of the introduction of postal voting on participation is presented in two steps. First, a short description of the empirical strategy and the dependent variable is provided. Second, the basic results are shown. We subject them to various sensitivity analyses. Moreover, we investigate the temporal pattern of the effect of the introduction of postal voting and the effect of the introduction of postal voting at the federal level.

3.1 Empirical Strategy and Turnout Data

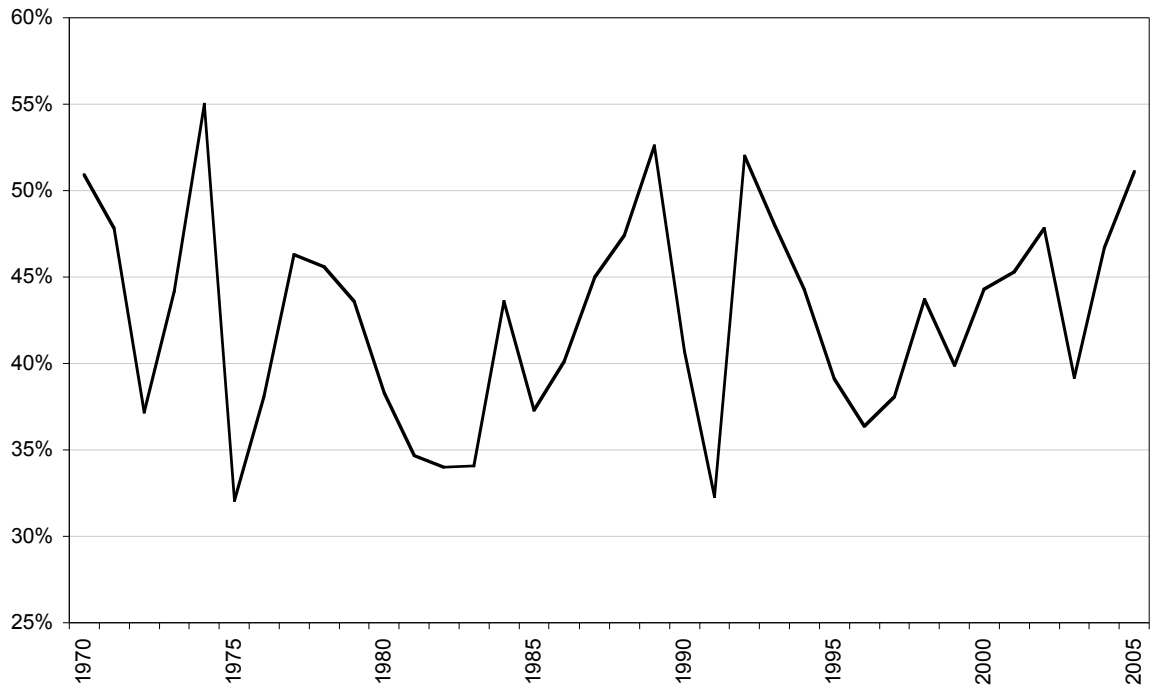
Our dependent variable is the cantonal voter turnout at federal ballots averaged over all ballots on a particular date (i.e. a ballot Sunday). Voter turnout exhibits marked variation, depending on the importance of the issue at stake; in our sample, voter turnout ranges from a low of 12 percent (June 4, 1974, in canton Fribourg) to a high of 89 percent (June 7, 1970, in canton Schaffhausen). Voter turnout at federal ballots averages 43 percent. Behind this average participation rate, there is substantial variation across cantons. Average turnout for the period 1970 to 2005 was lowest in canton Vaud (36.4 percent) and highest in canton Schaffhausen (69.3 percent). The latter canton still knows mandatory voting. Contrary to popular belief, voter turnout exhibits no time trend and remains approximately constant over the years under consideration. Figure 3 shows average voter turnout at federal ballots for the time period 1970 to 2005.

In the following, we refer to the 2752 observations on cantonal turnout from the 107 ballots held between 1970 and 2005. As depicted in Figure 4, cantonal voter turnout for federal ballots is slightly right skewed and has a mode of about 38 percent.

Throughout the empirical analysis, we identify the effect of the introduction of postal voting on voter turnout in four different empirical models. The main explanatory variable in all models is a dummy variable that takes on the value of one for cantons and ballots in which voters have access to *unconditional* postal voting, and zero otherwise.⁵ We restrict our empirical analysis to unconditional postal voting, because this is the only form reducing voting costs for the citizenry as a whole. In the first, most parsimonious, model, only canton-specific and ballot-specific fixed effects are included as control variables. Canton-specific

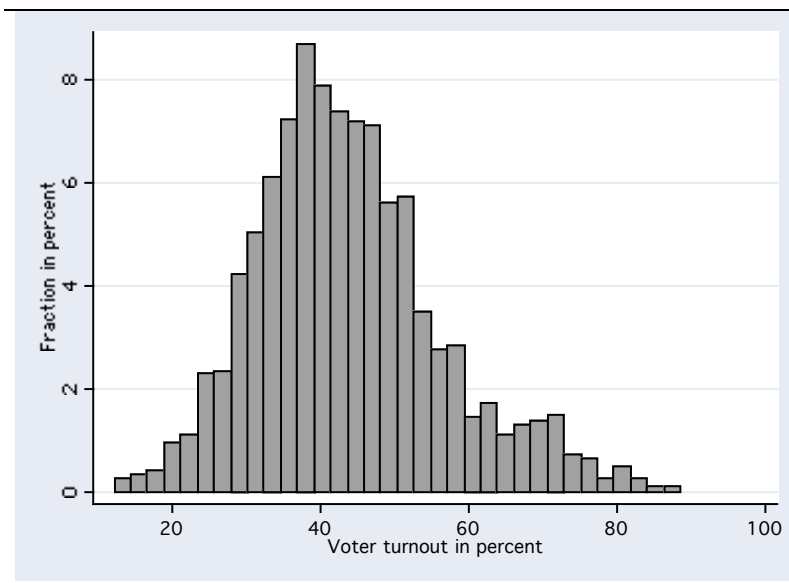
⁵ According to the cantonal chancelleries, there was no canton in which a delay occurred between the legal and the factual introduction.

Figure 3. Average voter turnout per year in Swiss federal ballots, 1970-2005



Source: <http://www.admin.ch/ch/d/pore/va/>; own calculations.

Figure 4. Distribution of cantonal voter turnout at federal ballots, Switzerland 1970-2005



Source: <http://www.admin.ch/ch/d/pore/va/>; own calculations.

fixed effects capture the variation in average turnout across cantons, and allow controlling for all time-invariant canton-specific determinants of voter turnout, such as e.g. the degree of urbanization or political culture. The ballot specific fixed effects account for all ballot-specific and time-specific influences on turnout, that are identical across cantons, such as the importance of the issue at stake and the perceived closeness of the result. In the second model, we additionally include three time-varying and canton-varying factors that potentially have an effect on voter turnout (see e.g. Kirchgässner and Schulz 2005), namely net cantonal income, population and age structure, captured by the fraction of people over the age of 65. The third model contains canton-specific linear time trends, together with the canton-specific and ballot-specific fixed effects. Although voter turnout exhibits no particular trend at the federal level (see Figure 3), time trends at the level of individual cantons may shade the effect of the introduction of postal voting. For example, if cantons, that introduced postal voting early, experience a secular downward trend, the effect of the introduction of postal voting would be underestimated. Similarly, a secular upward trend would artificially exaggerate the effect of postal voting. In the fourth and most comprehensive model, all control variables are included.

3.2 Empirical Results

Basic results. The introduction of postal voting increased voter turnout in a sizeable and statistically significant way, as can be seen from Table 2. Depending on the empirical model, the increase in turnout lies between around 3 percentage points (for models without canton-specific linear time trends) and around 4 percentage points (for models with time trends). In view of the large variation in voter turnout between ballots, an increase of between 3 to 4 percentage points might be viewed as negligible. However, compared to the long-run average in voter turnout and long-run cross-cantonal variation, the effect is rather large and amounts approximately to a 10 percent increase. The demographic variables have no additional explanatory power after controlling for canton-specific and ballot-specific fixed effects. Net cantonal income has a positive effect on voter turnout; however, this effect diminishes, and its statistical significance falls below conventional levels, if canton-specific linear time trends are controlled for. An F-test, that the time-varying factors in specification (4) have no effect on aggregate participation, is not rejected. The canton-specific linear time trends are jointly highly statistically significant.

Table 2. The effect of postal voting on voter turnout, Switzerland 1970-2005

Dependent variable:	(1)	(2)	(3)	(4)
Voter turnout				
Postal voting	2.995*** (6.96)	2.861*** (6.50)	4.071*** (9.52)	4.147*** (9.31)
GDP pc (in 000s)		0.095*** (2.59)		0.069 (1.40)
Population (in 000s)		-0.005 (0.80)		0.002 (0.12)
Fraction over 65 years		-23.101 (1.48)		8.565 (0.25)
Cantonal fixed-effects	Yes	Yes	Yes	Yes
Time fixed-effects	Yes	Yes	Yes	Yes
Cantonal spec. time trends	No	No	Yes	Yes
Constant	43.580*** (37.34)	44.585*** (14.93)	43.674*** (39.83)	40.107*** (6.32)
Observations	2752	2752	2752	2752
R-squared	0.73	0.73	0.78	0.78

Notes: (1) Absolute value of t statistics in parentheses; (2) * means significant at the 10% level, ** significant at the 5% level and *** significant at the 1% level.

Sensitivity analyses. In a first robustness check, we test whether the results reported in Table 2 are driven by a single canton and are thus not representative for the Swiss cantons at large. We rerun the regressions, excluding one canton at a time. The magnitude and statistical significance of the effect of postal voting changes little if individual cantons are excluded.⁶ In models 1, 2 and 4, the smallest coefficients are found if canton Solothurn is excluded (coeff. 2.56, std. err. 0.44 in model 1; coeff. 2.36, std. err. 0.46 in model 2; coeff. 3.64, std. err. 0.46 in model 4); in model 3, the smallest coefficient is found if canton Neuchâtel is excluded (coeff. 3.60, std. err. 0.44). For all empirical models, we find the largest effect of postal voting if canton St. Gallen is excluded (coeff. 3.44, std. err. 0.45 in model 1; coeff. 3.31, std. err. 0.47 in model 2; coeff. 4.70, std. err. 0.45 in model 3; coeff. 4.88, std. err. 0.48 in model 4).

Second, the ordinary least square estimates presented in Table 2 are based on two assumptions: (i) the variance of the unobservable error term, conditional on the explanatory variables, is constant (homoscedasticity), and (ii) all of the error processes are independent of each other. The latter assumption implies that errors for a particular canton at one point in time are unrelated to errors at all other points in time (no serial correlation), and that errors for one canton are unrelated to the errors for every other canton (no spatial correlation). Both

⁶ A complete table of coefficients for all four specifications is available from the authors on request.

conditions may be compromised in the present context. Regional, economical and cultural similarities between different cantons may result in a similar assessment of the importance of particular issues and, hence, in contemporaneous or spatial correlation between the errors in different groups of cantons. Similarly, it is likely that the errors show temporal dependence. Finally, the variance of the error processes may be different across cantons, e.g. if mandatory voting provisions, as in canton Schaffhausen, stabilize voter turnout, or it may differ before and after the introduction of postal voting, e.g. if postal voting increased the percentage of occasional voters compared to habitual voters and non-voters. If one of the conditions mentioned above is violated, the OLS standard errors are inaccurate. In order to avoid overconfident results, we estimate the models presented in Table 2 with a) panel corrected standard errors and correction for first-order autocorrelation (Beck und Katz 1995), and b) the heteroskedasticity-robust Huber/White/sandwich estimator of variance. As can be seen in Table A.1 in the appendix, the results are virtually unaffected by these corrections.

Postal voting at the federal level. The results presented above show the effect of the introduction of postal voting at the cantonal level on cantonal voter turnout in federal ballots. In December 1994, postal voting was introduced at the federal level. Citizens of cantons where postal voting was not yet introduced at the cantonal level could, from then on, make use of postal voting for federal, but not for cantonal and municipal ballots. This means that citizens having to go to the ballot box remained inevitable for the simultaneously occurring cantonal and communal ballots, and no reduction in transaction costs was realized. Nevertheless, if citizens in these cantons had made wide use of postal voting at the federal level before it was introduced at the cantonal level, we would underestimate the effect of postal voting. Therefore, we introduce a dummy variable that takes on value one for cantons and ballots with postal voting at the federal, but not yet the cantonal, level. The results are presented in Table 3. As can be seen from Table 3, the coefficients for the introduction of postal voting at the cantonal level are robust to the inclusion of the variable capturing the situation with postal voting at the federal level. However, the results regarding the latter variable itself are mixed. In the regression without linear cantonal time trends, we find no effect. This is consistent with the notion that people made no use of postal voting in federal ballots as long as they could not vote by letter at cantonal and municipal ballots. In the regression with linear cantonal time trends, we even find a negative effect. This result is difficult to interpret and possibly due to spurious correlations caused by non-linearities in cantonal time trends. The changes in the coefficients for the linear cantonal time trends foster

this conjecture. The coefficients for these control variables remain robust for all but the four cantons that were latest to introduce postal voting and, hence, have the longest interim period with postal voting at federal, but not cantonal, ballots. The coefficients of the linear time trends for these four cantons increase once postal voting at the federal level is controlled for.

Table 3. Voter turnout and postal voting at the federal level, Switzerland 1970-2005

Dependent variable:	(1)	(2)	(3)	(4)
Voter turnout				
Postal voting	2.832*** (5.33)	2.831*** (5.28)	3.361*** (6.86)	3.454*** (6.87)
Postal voting at national, but not yet cantonal, level	-0.411 (0.52)	-0.077 (0.10)	-2.326*** (2.95)	-2.344*** (2.97)
GDP pc (in 000s)		0.095** (2.58)		0.070 (1.43)
Population (in 000s)		-0.005 (0.79)		0.002 (0.12)
Fraction over 65 years		-22.992 (1.47)		15.847 (0.45)
Cantonal fixed-effects	Yes	Yes	Yes	Yes
Time fixed-effects	Yes	Yes	Yes	Yes
Cantonal spec. time trends	No	No	Yes	Yes
Constant	43.580*** (37.33)	44.568*** (14.89)	43.647*** (39.87)	39.209*** (6.18)
Observations	2752	2752	2752	2752
R-squared	0.73	0.73	0.78	0.78

Notes: (1) Absolute value of t statistics in parentheses; (2) * means significant at the 10% level, ** significant at the 5% level and *** significant at the 1% level.

In the opposite case, where postal voting was first introduced at the cantonal level, and only later at the federal level, voting by mail was, according to federal law, immediately allowed for both cantonal and federal ballots (Art. 5, Abs. 3-5 Bundesgesetz vom 17. Dezember 1976 über die politischen Rechte).

Temporal patterns in the effect of postal voting. In all the above specifications, we implicitly assume that the introduction of postal voting results in a constant shift in voter turnout. However, one could think of other temporal patterns. On the one hand, the novelty of voting by letter might have attracted a lot of additional voters in early years, but only a few in the longer term. On the other hand, voters might need time to get familiar with postal voting and, hence, effects on voter turnout materialize with some delay. In order to capture other temporal patterns than a constant shift, we include dummy variables representing different discrete time

intervals after the introduction of postal voting. As depicted in Table 4, the results again differ for specifications with and without linear cantonal time trends. According to the regressions without linear time trends, the effect of postal voting is largest in the first year and then declines. In contrast, the dummy variables in the regressions with linear cantonal time trends indicate a permanent shift in voter turnout due to postal voting. A secular downward trend in voter turnout in those cantons that introduced postal voting early is a possible explanation for the different results across the four specifications (and would also be consistent with the results reported in table 2). Moreover, the downward trend in specifications (1) and (2) is not necessarily a statistically significant phenomenon. The coefficient for the first year of postal voting differs in a statistically significant way from six of the other nine coefficients. However, the second highest coefficient for the second year only differs statistically significantly for two of the other nine coefficients.

Table 4. Temporal pattern of the effect of postal voting, Switzerland 1970-2005
Specification with discrete intervals

Dependent variable:	(1)	(2)	(3)	(4)
Voter turnout				
Postal voting				
- first year	4.411*** (5.64)	4.360*** (5.57)	4.953*** (6.89)	5.012*** (6.93)
- second year	3.512*** (4.29)	3.371*** (4.11)	4.122*** (5.40)	4.187*** (5.43)
- third year	2.913*** (3.39)	2.690*** (3.12)	3.663*** (4.57)	3.714*** (4.57)
- fourth year	2.640*** (3.31)	2.399*** (2.98)	3.655*** (4.85)	3.737*** (4.84)
- fifth year	2.601*** (3.09)	2.416*** (2.85)	3.693*** (4.61)	3.819*** (4.66)
- sixth year	3.141*** (3.82)	2.874*** (3.47)	4.844*** (6.11)	4.923*** (6.08)
- seventh year	2.207** (2.56)	2.019** (2.32)	4.004*** (4.78)	4.143*** (4.79)
- eighth year	1.651** (1.96)	1.506* (1.78)	3.855*** (4.62)	4.014*** (4.64)
- ninth year	2.144** (2.22)	1.829* (1.88)	4.558*** (4.79)	4.639*** (4.74)
- tenth year and more	1.940*** (2.98)	1.643** (2.45)	5.067*** (6.02)	5.140*** (5.76)
GDP pc (in 000s)		0.092** (2.49)		0.061 (1.23)
Population (in 000s)		-0.007 (0.99)		-0.000 (0.00)

table 4 continuation

Fraction over 65 years		-30.420*		12.542
		(1.93)		(0.35)
Cantonal fixed-effects	Yes	Yes	Yes	Yes
Time fixed-effects	Yes	Yes	Yes	Yes
Cant. spec. time trends	No	No	Yes	Yes
Constant	43.573***	45.832***	43.689***	40.465***
	(37.35)	(15.22)	(39.83)	(6.34)
Observations	2752	2752	2752	2752
R-squared	0.73	0.73	0.78	0.78

Notes: (1) Absolute value of t statistics in parentheses; (2) * means significant at the 10% level, ** significant at the 5% level and *** significant at the 1% level.

Essentially the same results (reported in Table 5) emerge if the temporal pattern is modeled as an interaction term of postal voting and the number of years since the introduction of postal voting. In the regressions without linear cantonal time trends, the coefficients for the interaction term are negative and statistically significant. This would mean that the initial positive effect of postal voting wears off over time. However, for reasons stated above, we tend to prefer the specification with linear cantonal time trends. In these regressions, the coefficients for the interaction term are statistically insignificant and small relative to the level effect. Hence, they suggest that the introduction of postal voting resulted in a permanent shift in voter turnout of around 4.1 percentage points.

Table 5. Temporal pattern of the effect of postal voting, Switzerland 1970-2005
Linear specification

Dependent variable:	(1)	(2)	(3)	(4)
Voter turnout				
Postal voting	3.249***	3.089***	4.052***	4.158***
	(7.39)	(6.91)	(9.46)	(9.33)
Years since introduction	-0.110***	-0.114***	0.103	0.112
	(2.75)	(2.81)	(1.00)	(1.05)
GDP pc (in 000s)		0.088**		0.071
		(2.40)		(1.43)
Population (in 000s)		-0.006		0.000
		(0.93)		(0.00)
Fraction over 65 years		-28.072*		17.075
		(1.79)		(0.48)

table 5 continuation

Cantonal fixed-effects	Yes	Yes	Yes	Yes
Time fixed-effects	Yes	Yes	Yes	Yes
Cant. spec. time trends	No	No	Yes	Yes
Constant	43.571*** (37.38)	45.564*** (15.17)	43.700*** (39.85)	39.656*** (6.23)
Observations	2752	2752	2752	2752
R-squared	0.73	0.73	0.78	0.78

Notes: (1) Absolute value of t statistics in parentheses; (2) * means significant at the 10% level, ** significant at the 5% level and *** significant at the 1% level.

4 Concluding Remarks

The pros and cons of postal voting might be seen as a settled issue in the case of Switzerland. However, the evaluation of its long-term consequences is only in the initial stages. Moreover, postal voting would still be an innovative balloting method in many other countries. Most importantly, we think that studying the political process with postal voting could give us information on how e-voting might change the nature of elections and direct democratic decision-making.

In our analysis, we find robust evidence that the introduction of unconditional postal voting increases voter turnout. Swiss cantons introduced unconditional postal voting at different times between 1978 and 2005. This allows taking statistically into account canton-specific effects as well as time-specific and issue-specific effects on turnout. The estimated average effect on turnout in federal ballots is roughly 4.1 percentage points, with an average turnout of 43 percent between 1970 and 2005.

We see this study as the first step in our work on the consequences of postal voting. Next steps should address issues like possible systematic changes in the composition of the electorate, or citizens' involvement in the process of opinion formation before voting take place.

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Appendix

The abbreviations added in parentheses at the end of the federal and cantonal laws indicate the kind of eased participation according to our categorization in section 2.2:

rr = postal voting for a restricted group of persons on request

rn = postal voting for a restricted group of persons with no request necessary

ar = postal voting for all citizens on request

an = postal voting for all citizens with no request necessary (= unconditional postal voting)

Federal law on eased voting participation

Art. 5-6 Bundesgesetz über die Einführung von Erleichterungen der Stimmabgabe an eidgenössischen Wahlen und Abstimmungen vom 25. Juni 1965, in Kraft seit 1. Januar 1967 (rr)

Art. 5, 8 Bundesgesetz über die politischen Rechte vom 17. Dezember 1976, in Kraft seit 1. Juli 1978. Fassung vom 18. März 1994, in Kraft seit 15. Dezember 1994 (an)

Cantonal enactments containing provisions on postal voting

AG	§ 1-2 Dekret über die Stimmabgabe auf dem Korrespondenzweg vom 18. Oktober 1966, in Kraft seit 1. Januar 1967 (rr) § 17 Gesetz über die politischen Rechte (GPR) vom 10. März 1992, in Kraft seit 1. Januar 1993 (an)
AI	Art. 12 Verordnung betreffend die politischen Rechte vom 11. Juni 1979, in Kraft seit 11. Juni 1979 (an)
AR	§ 4-5 Reglement über die erleichterte Stimmabgabe bei eidgenössischen, kantonalen und kommunalen Urnengängen vom 12. Dezember 1996, in Kraft seit 1. Januar 1997 (rr) Neither the legal text (§ 5), nor an inquiry at the cantonal chancellery, made it entirely clear how the citizens need to proceed in order to receive the material for postal voting. The formulation in the legal provision (§ 5), however, indeed suggests that a request is necessary: “The person entitled to vote by mail may have the material for postal voting delivered to him by the communal chancellery.” Therefore, the category <i>on request</i> is chosen. Art. 13 Gesetz über die politischen Rechte vom 24. April 1988, in Kraft seit 24. Mai 1988 (an)
BE	§ 1, 3 Verordnung über die briefliche Stimmabgabe vom 23. September 1966, in Kraft seit 1. Januar 1967 (rr) Art. 1 Gesetz vom 30. Januar 1921 über die Volksabstimmungen und Wahlen (Abänderung und Ergänzung) vom 1. März 1970, in Kraft seit 1. Mai 1970 (rn) Art. 8, 10 Gesetz über die politischen Rechte vom 5. Mai 1980, in Kraft seit 1. Januar 1981, Fassung vom 5. November 1990, in Kraft seit 1. Juli 1991 (an)
BL	Vollziehungsverordnung zum Gesetz vom 26. November 1959 über die Wahlen und Abstimmungen (Wahlgesetz) und zum Bundesgesetz vom 30. Juni 1960 über die Einführung der vorzeitigen Stimmabgabe in eidgenössischen Angelegenheiten vom 15. Februar 1962, in Kraft seit 1. Mai 1962 (rr)

	<p>§ 2 Verordnung zum Wahlgesetz vom 5. Juni 1978, in Kraft seit 1. Juli 1978 (an)</p> <p>Article 2, paragraph 3, says that “citizens who wish to vote by mail, and who are not yet in possession of the necessary material for voting, need to ask for the material at the communal administration”. However, according to the cantonal chancellery, this passage only regulates exceptional cases. In general, no request is necessary and the citizens are automatically mailed the material for postal voting. Accordingly, the category postal voting for <i>all citizens with no request necessary</i> is chosen.</p>
BS	<p>§ 13 Gesetz betreffend Wahlen und Abstimmungen (Wahlgesetz) vom 29. April 1976, in Kraft seit 13. Juni 1976 (rr)</p> <p>§ 6, 8 Gesetz über Wahlen und Abstimmungen (Wahlgesetz) vom 21. April 1994, in Kraft seit 30. Dezember 1994 (an)</p>
FR	<p>Art. 45 Gesetz vom 15. Juli 1966 über die Ausübung der bürgerlichen Rechte, in Kraft seit 19. September 1966 (rr)</p> <p>Art. 43 Gesetz vom 18. Februar 1976 über die Ausübung der bürgerlichen Rechte, in Kraft seit 1. September 1976 (ar)</p> <p>Art. 43 Gesetz vom 15. Februar 1995 zur Änderung des Gesetzes über die Ausübung der bürgerlichen Rechte, in Kraft seit 23. Mai 1995 (an)</p>
GE	<p>Art. 28-29 Loi sur les votations et élections du 29 avril 1950, entrée en vigueur le 25 juin 1950 (rr)</p> <p>Loi sur l’exercice des droits politiques (LEDP) du 15 octobre 1982, entrée en vigueur le 1er juillet 1983, Version du 20 octobre 1994, entrée en vigueur le 1er janvier 1995 (an)</p>
GL	<p>Art. 7, Abs. 4-6 Beschluss betr. Änderung von Art. 7 der Verordnung über die geheimen Abstimmungen und Wahlen vom 20. Dezember 1961 vom 1. Februar 1967, in Kraft seit 1. Januar 1967 (rr)</p> <p>Art. 13, 15 Gesetz über die Wahlen und Abstimmungen an der Urne (Abstimmungsgesetz) vom 7. Mai 1989, in Kraft seit 7. Mai 1989, Fassung vom 7. Mai 1995, in Kraft seit 1. Juli 1995 (an)</p> <p>Article 15, paragraph 1, says that “a citizen, who wishes to vote by mail, has to ask for the material at the communal administration, unless he has already been provided with it (...)”. According to the cantonal chancellery, in general no request has to be made, and the citizens are automatically provided with the material necessary for postal voting. The passage mentioned only applies when a person wishes to receive the voting material before the general delivery date.</p>
GR	<p>Art. 12-13 Teilrevision der Verordnung über die Führung der Stimmregister und das Abstimmungsverfahren vom 28. Dezember 1966, in Kraft seit 1. Januar 1967 (rr)</p> <p>Art. 27 Teilrevision des Gesetzes über die Ausübung der politischen Rechte im Kanton Graubünden vom 25. September 1994, in Kraft seit 1. Januar 1995 (an)</p>
JU	<p>Art. 18 Loi sur les droits politiques du 26 octobre 1978, entrée en vigueur le 13 novembre 1978/1er janvier 1979 (rr)</p> <p>Art. 18 Loi sur les droits politiques du 26 octobre 1978, entrée en vigueur le 13 novembre 1978/1er janvier 1979, Version du 9 décembre 1998, entrée en vigueur le 1er mai 1999 (an)</p>
LU	<p>§ 54-54a Gesetz über die Abänderung des Gesetzes über Wahlen und Abstimmungen vom 29. November 1966, in Kraft seit 1. Januar 1967 (rr)</p> <p>§ 63-64 Gesetz über die Volksabstimmungen (Abstimmungsgesetz), Änderung vom 12. September 1978, in Kraft seit 1. Dezember 1978 (ar)</p>

	<p>§ 61-62 Stimmrechtsgesetz, Änderung vom 21. März 1994, in Kraft seit 1. Oktober 1994 (an)</p>
NE	<p>Art. 23 Loi portant révision de la loi sur l'exercice des droits politiques du 1er octobre 1965, entrée en vigueur le 1er janvier 1967 (rr)</p> <p>Art. 13 Règlement d'exécution de la loi sur les droits politiques du 15 mai 1985, entré en vigueur le 1er octobre 1985, Version du 26 avril 1995, entrée en vigueur le 26 avril 1995 (ar)</p> <p>Art. 23 Loi sur les droits politiques (LDP) du 17 octobre 1984, entrée en vigueur le 1er octobre 1985, Version du 19 juin 2000, entrée en vigueur le 1er janvier 2001 (an)</p>
NW	<p>Art. 33 Einführungsverordnung zum Bundesgesetz über die politischen Rechte vom 12. Oktober 1979, in Kraft seit 20. Dezember 1979 (ar)</p> <p>Art. 32-34 Einführungsverordnung zum Bundesgesetz über die politischen Rechte vom 12. Oktober 1979, in Kraft seit 20. Dezember 1979, Fassung vom 19. April 1994, in Kraft seit 29. Juni 1994 (an)</p>
OW	<p>Art. 33-34 Vollziehungsverordnung zum Gesetz über die Volksabstimmungen (Abstimmungsverordnung) vom 1. März 1974, in Kraft seit 1. April 1974 (rr)</p> <p>Art. 33, 51c Nachtrag zur Abstimmungsverordnung vom 16. Dezember 1977, in Kraft seit 1. März 1978 (ar)</p> <p>According to articles 51a and 51c, the provisions on postal voting did not come into force until the corresponding federal law (Bundesgesetz über die politischen Rechte vom 17. Dezember 1976, in Kraft seit 1. Juli 1978) became effective, which was on July 1, 1978. Therefore, this later date has been chosen as the introduction date.</p> <p>Art. 29-30 Gesetz über die Ausübung der politischen Rechte (Abstimmungsgesetz) vom 17. Februar 1974, Fassung gemäss Nachtrag vom 25. Juni 1995, in Kraft seit 1. Dezember 1995 (an)</p>
SG	<p>Art. 4-5 Verordnung über die erleichterte Stimmabgabe vom 19. Dezember 1966, in Kraft seit 1. Juni 1967 (rr)</p> <p>Postal voting for a <i>restricted group of persons with no request necessary</i> was made possible by the "Gesetz über die Urnenabstimmung vom 4. Juli 1971, in Kraft seit 1. Oktober 1971", but only in cantonal and communal ballots. For postal voting in federal ballots, a request was still necessary.</p> <p>Art. 16 Gesetz über die Urnenabstimmungen vom 4. Juli 1971, in Kraft seit 4. Juli 1971, Fassung gemäss NG vom 11. Januar 1979, im Vollzug ab 1. Mai 1979 (an)</p>
SH	<p>Art. 53bis Gesetz über die vom Volke vorzunehmenden Abstimmungen und Wahlen sowie über die Ausübung der Volksrechte (Wahlgesetz) vom 15. März 1904, in Kraft seit 1. Oktober 1904, Fassung vom 20. November 1967, in Kraft seit 22. März 1968 (rr)</p> <p>Art. 53bis Gesetz über die vom Volke vorzunehmenden Abstimmungen und Wahlen sowie über die Ausübung der Volksrechte (Wahlgesetz) vom 15. März 1904, in Kraft seit 1. Oktober 1904, Fassung gemäss Gesetz vom 20. März 1995, in Kraft seit 1. August 1995 (an)</p>
SO	<p>§ 100-101 Gesetz über Wahlen und Abstimmungen (Wahlgesetz) vom 2. März 1980, in Kraft seit 1. Januar 1981 (ar)</p> <p>According to the federal chancellery's survey, Solothurn introduced unconditional postal voting in 1981. § 101, however, says that citizens who wish to vote by mail "have to ask for the voting material at the municipality". Accordingly, the category <i>on request</i> is chosen here. This classification has been approved by the cantonal</p>

	<p>chancellery.</p> <p>§ 101 Teilrevision des Gesetzes über Wahlen und Abstimmungen vom 2. März 1980 vom 2. Dezember 1984, in Kraft seit 1. Januar 1985 (an)</p> <p>With this change in legislation, the necessity of asking for the voting material has been abolished.</p>
SZ	<p>§1-2 Verordnung über die erleichterte Stimmabgabe an Wahlen und Abstimmungen vom 19. Juli 1971, in Kraft seit 8. Oktober 1971 (rr)</p> <p>§ 1-2 Verordnung über die briefliche Stimmabgabe vom 14. Januar 1992, in Kraft seit 1. März 1992 (ar)</p> <p>§ 28 Gesetz über die Wahlen und Abstimmungen vom 15. Oktober 1970, in Kraft seit 1. Juli 1971, Fassung vom 10. Februar 1999, in Kraft seit 1. Januar 2000</p> <p>§ 8 Verordnung zum Wahl- und Abstimmungsgesetz vom 19. Oktober 1999, in Kraft seit 1. Januar 2000 (an)</p>
TG	<p>§ 5, 7 Verordnung des Grossen Rates über die Stimmabgabe auf dem Korrespondenzwege vom 24. November 1966, in Kraft seit 1. Januar 1967 (rr)</p> <p>§ 3-5 Verordnung des Grossen Rates über Erleichterungen der Stimmabgabe vom 21. August 1978, in Kraft seit 1. September 1978 (rn)</p> <p>§ 22 Gesetz betreffend die Änderung des Gesetzes über Wahlen und Abstimmungen vom 10. Januar 1953 und des Gesetzes über die Organisation der Gemeinden vom 4. April 1944 vom 24. April 1984, in Kraft seit 1. August 1985 (an)</p>
TI	<p>Art. 32 Regolamento di applicazione della Legge sull'esercizio dei diritti politici del 18 novembre 1998, entrato in vigore il 1° dicembre 1998</p> <p>Art. 32 Legge sull'esercizio dei diritti politici del 7 ottobre 1998, entrata in vigore il 1° gennaio 1999 (rr)</p> <p>Art. 32-32a Legge sull'esercizio dei diritti politici del 7 ottobre 1998, entrata in vigore il 1° gennaio 1999, Fassung vom 22. Februar 2005, in Kraft seit 15. April 2005 (an)</p> <p>Unconditional postal voting at the federal, cantonal and communal level is only allowed for issue voting. For elections at the cantonal or communal level, postal voting is still restricted to certain groups of persons, and a request is necessary.</p>
UR	<p>Art. 6-7 Verordnung betreffend Erleichterung der Stimmabgabe vom 19. Dezember 1966, in Kraft seit 3. April 1967 (rr)</p> <p>According to the cantonal chancellery, postal voting was not introduced when this decree came into force, but only on June 4, 1967.</p> <p>Art. 19 Gesetz über die geheimen Wahlen, Abstimmungen und die Volksrechte (WAVG) vom 21. Oktober 1979, in Kraft seit 1. August 1980, Fassung vom 4. Dezember 1994, in Kraft seit 1. Januar 1995 (an)</p>
VD	<p>Art. 7, 31-33 Loi du 13 décembre 1978 modifiant celle du 17 novembre 1948 sur l'exercice des droits politiques, entrée en vigueur le 7 février 1979 (rr)</p> <p>Art. 20 Loi du 16 mai 1989 sur l'exercice des droits politiques (LEDP), entrée en vigueur le 1er janvier 1990 (ar)</p> <p>Art. 17b Loi du 3 juillet 2001 modifiant celle du 16 mai 1989 sur l'exercice des droits politiques, entrée en vigueur le 25 mars 2002 (an)</p> <p>(Postal voting at a communal level was not introduced until June 3, 2002.)</p>
VS	<p>Art. 24 Gesetz über die Wahlen und Abstimmungen vom 17. Mai 1972, in Kraft seit 1. Oktober 1972</p>

	<p>Art. 1 Reglement zur Festsetzung der Anwendungsmodalitäten der brieflichen Stimmabgabe vom 8. März 1972, date of entry into force unknown (rr)</p> <p>Art. 24 Gesetz über die Wahlen und Abstimmungen vom 17. Mai 1972, in Kraft seit 1. Oktober 1972, Fassung vom 28. März 1996, in Kraft seit 1. Oktober 1996 (ar)</p> <p>Art. 25-26 Gesetz über die politischen Rechte vom 13. Mai 2004, in Kraft seit 1. Januar 2005</p> <p>Art. 2 Verordnung über die briefliche Stimmabgabe vom 17. November 2004, in Kraft seit 1. Januar 2005 (an)</p>
ZG	<p>§ 30-31 Gesetz über die Wahlen und Abstimmungen vom 23. Januar 1969, in Kraft seit 1. Juli 1969 (rr)</p> <p>§ (1,) 30-32 Gesetz über die Wahlen und Abstimmungen, Änderung vom 30. Januar 1997, in Kraft seit 1. April 1997 (an)</p>
ZH	<p>§ 40-41 Gesetz über die Wahlen und Abstimmungen vom 4. Dezember 1955, in Kraft seit 17. Dezember 1955 (rr)</p> <p>§ 21 Gesetz über die Wahlen und Abstimmungen (Wahlgesetz) vom 4. September 1983, in Kraft seit 1. Januar 1985 (ar)</p> <p>§ 21 Wahlgesetz (Änderung) vom 28. November 1993, in Kraft seit 1. Oktober 1994 (an)</p>

Table A.1. Effect of postal voting on voter turnout; estimates with panel-corrected, and heteroskedasticity-robust, standard errors

Dependent variable:	(1)		(2)		(3)		(4)	
	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)
Voter turnout								
Postal voting	3.071*** (5.19)	2.995*** (7.13)	2.951*** (5.12)	2.861*** (6.89)	4.077*** (8.90)	4.071*** (10.37)	4.139*** (8.83)	4.147*** (10.25)
GDP pc (in 000s)			0.093** (2.33)	0.095*** (2.72)			0.064 (1.42)	0.069 (1.57)
Population (in 000s)			-0.005 (0.82)	-0.005 (0.74)			0.003 (0.22)	0.002 (0.17)
Fraction over 65 years			-22.452 (1.21)	-23.101 (1.55)			6.490 (0.16)	8.565 (0.24)
Cantonal fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cant. spec. time trends	No	No	No	No	Yes	Yes	Yes	Yes
Constant	41.499*** (74.08)	41.415*** (17.92)	43.241*** (11.03)	43.145*** (9.70)	46.799*** (59.01)	46.710*** (19.17)	42.509*** (5.53)	42.871*** (6.70)
Observations	2752	2752	2752	2752	2752	2752	2752	2752
R-squared	0.80	0.80	0.80	0.80	0.82	0.83	0.82	0.83

Notes: (1) Estimates with panel corrected standard errors and correction for first-order autocorrelation are in columns denoted with (a); estimates with the heteroskedasticity-robust Huber/White/sandwich estimator of variance are in columns denoted with (b); (2) z statistics in parentheses; (3) * means significant at the 10% level, ** significant at the 5% level and *** significant at the 1% level.