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THE GENERATION GAP IN DIRECT DEMOCRACY

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Abstract

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JEL Classification: D7, H3

Keywords: age, cohort, direct democracy, generation gap, status quo, Referendum, reform, utility

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1 Introduction

Age and birth-cohort affiliation are widely analyzed sources of heterogeneity in economic behavior (Chetty et al., 2014; Costa & Kahn, 2011; Demange & Laroque, 1999; Dynan et al., 2009; Giuliano & Spilimbergo, 2013; Juhn & McCue, 2016; Levin & Stephan, 1991; Messner & Polborn, 2004). Differences in the ways young and old consume, work, or vote are often referred to as a generation gap (Prasad, 1992). Popular voices argue that the generation gap today is wider than it has been at any time since the 1960s (The New York Times, 2012). Examples are countless. Older workers tend to be more hesitant to adopt new technologies because of the more limited time available to recover the cost of training (Acemoglu & Restrepo, 2017); however, those older workers are generally reported to be more hard-working (Jenkins, 2007). Pensioners in developed countries consume more than the young and hold a disproportionately large share of total financial assets and owner-occupied housing, despite having a lower savings rate (The Economist, 2010, 2016). Today's American young are much less mobile than previous cohorts at the same age (The Economist, 2017a).

In this paper, we provide the first systematic documentation of a generation gap in direct democracy across a broad range of topics, and the first econometric analysis of its origins. To this end, we utilize a large micro data set of postelection surveys in Switzerland, in which direct democracy is popular like in few other countries. Our data cover all 305 federal referenda held between 1981 and 2017, which we group into 24 officially defined topical themes. We exploit the time-dimension of this data set to analyze the extent to which generational differences in voting can be attributed to voter age or potentially correlated birth cohort effect, a challenge that the related literature has long faced. We find significant effects of ageing on voting outcomes, within cohorts. As they age, voters become less politically liberal and less supportive of policies that seek to protect the environment, support young workers and families, or redistribute wealth from the rich to the poor. Our novel results empirically substantiate conventional wisdom according to which over the lifecycle political orientations tend to change from the political left to the political right (The Guardian, 2015). Given the ongoing trend of population ageing, our estimated age effects are quantitatively relevant. Five referenda since 2004 would have had a different outcome, had the population distribution remained at 1981 levels.

Our analysis is quite topical against the background of three ongoing trends. First, direct democracy is on the rise.¹ Since 1978, there has been a storm of ballot-box lawmaking in the US in virtually every field of policymaking (Matsusaka, 2005). Over 70% of the US population live in states or cities in which direct democracy is an established option for political decision-making (Matsusaka, 2004). Moreover, direct democracy is spreading internationally. In many countries, it has become almost expected that first-order issues affecting national sovereignty be carried directly to the voters. Examples include various referenda on European Union monetary and market integration, including the 2016 Brexit referendum; the 2004 “peace referendum” in Taiwan to define relations with mainland China; the 2014 referendum on Scottish independence from the UK; and the 2017 referendum on Catalonia’s independence from Spain.

Second, population aging is set to become one of the major trends of the 21st century. Worldwide, the total population aged 60 or above is predicted to more than double in absolute and relative terms from 962 million in 2017 to 2.1 billion in 2050 and 3.1 billion in 2100. Over the same period, the population aged 80 or above is predicted to grow to 909 million, nearly seven times its value in 2017 (United Nations, 2017).

Third, the generation gap in political preferences is becoming increasingly apparent in anecdotal evidence. Surveys suggest that in the US, the young are significantly more likely to support free trade, immigration, gay marriage, and measures that seek to reduce economic inequality (Pew Research Center, 2018). In the 2016 US presidential elections, Trump won a 53% majority among voters aged 45 and over while Clinton voters outnumbered Trump voters among the 18-to-44 age group. Within the group of those under 30, Trump’s share was as low as 37% (Mccarthy, 2017). In the 2017 United Kingdom general election, the Labour Party won 43 of the 60 constituencies in which 15% or more of the adult population were full-time students, even though the Conservative Party won the most constituencies overall (The Economist, 2017b). In the 2016 “Brexit” (British exit) referendum, in which a majority of UK citizens voted to leave the European Union, a 59% majority of pensioners supported a British exit; that proportion was as low as 19% among the 18-to-24-year-olds (TIME Magazine, 2016).

¹ In the US, a referendum differs from an initiative in that the former is a vote on a law that is already approved by the legislature whereas the latter is a vote on a law proposed by citizens. Throughout this paper, we use the term referendum as referring to any election in which citizens have a direct vote on a law.

From a policy perspective, it is important to distinguish the origins of such generation gaps. In a theoretical paper, Messner & Polborn (2004) argue that many “reform projects” share similarities with investments in that they require some initial expenditure and pay dividends over a long period. Rational voters of all ages will maximize their individual expected utility conditional on their stage in the lifecycle accordingly; i.e., they weigh the expected costs against the discounted benefits expected over their remaining lifetime. As voters age, the period over which they expect to receive the benefits decreases so that they become less inclined to support projects with long-run returns. Therefore, a generation gap may imply that collective decisions are likely to deviate from decisions that would maximize the net present values (NPV) for subsequent generations. Moreover, in an ageing society, projects with long-run returns and short-run costs will have fewer and fewer chances of winning majorities.

However, there are competing explanations for a generation gap. A status-quo bias is a frequently documented feature of economic behavior (Ciccone, 2004; Fernandez & Rodrik, 1991; Kahneman et al., 1991). Theoretically, older voters could prefer the status quo because they have experienced it over a longer period. As voters age, they could become more averse to reform projects simply due to habituation (Samuelson & Zeckhauser, 1988). This hypothesis is consistent with the empirical observation that individuals become more risk-averse as they age (Dohmen et al., 2017). While population aging would still affect a society’s ability to respond to changing circumstances, a status-quo bias would not necessarily affect policies that benefited recent or future generations more than older generations.

Importantly, an empirically observed generation gap is not necessarily causally related to voter age. A generation gap that is observed at any given point in time may equally be attributed to cohort effects because differences in age directly map to differences in birth years. Individuals with similar birth years, often referred to as birth cohorts or social generations, live through their “impressionable years” in similar social and political environments. Consequently, values, attitudes and orientations tend to be similar within cohorts and different across cohorts (Krosnick et al., 1989; Mannheim, 1952). A generation gap that originates from cohort effects is unlikely to interact with population aging because today’s young will maintain their political attitudes and orientations as they age. If cohort effects follow a random walk, the generation gap could even shrink or reverse, irrespective of whether the population ages.

Our empirical strategy is designed to distinguish between age and cohort effects in referendum outcomes as well as utility-maximization and habituation as theoretical drivers of age-related vot-

ing. To this end, we use the individual yes vs. no voting decisions recorded in the data and a referendum-specific mapping that we overlaid on the official documentation to encode two binary outcome variables. With the reform orientation, we distinguish between a voting decision that supports the legal status quo and a vote for a change in legislation. To encode the political orientation, we use 24 officially defined topical themes to categorize the 305 referenda into four groups that relate to ideological, environmental, generational, and fiscal attitudes. Consistent with conventional definitions in the US political science literature, we define votes as left-wing if they correspond to positions that can be considered politically liberal (e.g. pro international integration or a smaller military), pro-environmental protection (e.g. in favor of climate change mitigation measures), in the interest of younger generations (e.g. workers and families with dependent children), or pro-progressive redistribution (e.g. favoring state revenues via income tax over tolls and user fees) (Budge et al., 2001a; Neumayer, 2004).

Our empirical objective is to analyze how the two outcomes, reform orientation and political orientation, vary by voter age. Our key contribution is to separate age and cohort effects by tracking how the attitude of voters belonging to the same cohort towards similar reform project changes over time as the cohort ages. In doing so, we face the problem that an individual's age is a linear combination of its birth year and the year in which it is observed. It is thus impossible to identify age, period, and cohort (APC) effects without constraints on the functional form, a problem that is known as the APC conundrum (Fienberg & Mason, 1985). From a methodical perspective, a novelty of our study is that we estimate an unconstrained rank model to distinguish between age and cohort effects in a flexible manner. We remove period effects by computing the rank a cohort occupies in the distribution of orientations within a period. Conditional on this transformation, we can separately identify age and cohort effects on orientation ranks non-parametrically and without imposing any constraints on functional form. As a welcome collateral effect, the estimated age parameter in this rank regression approach has convenient bounds of positive and negative unity. This is because if orientations strictly and monotonically changed in age, all cohorts would move along the rank distribution by one step each year they aged as a new cohort entered the data at the top or the bottom of the distribution.

The evidence substantiates the popular notion of a generation gap in direct democracy outcomes. Younger voters are more likely to vote for change and support reform projects, particularly those that can be associated with the political left. Younger voters, in their voting decisions, express more liberal views, attach a higher priority to protecting the environment and are more supportive of policies that, in relative terms, benefit the young. Voters in their 30s and 40s, more than those in

their 20s or at later stages of the lifecycle, tend to support policies that have progressive redistribution consequences.

These age-related patterns are strong features of the data and persist if we control for arbitrary cohort effects in unconstrained rank models. Controlling for cohort effects, the political orientation rank increases by, on average, 0.62 each year a voter ages (one is the theoretical upper bound), on a scale in which low ranking corresponds to a left-wing and high ranking corresponds to a right-wing political orientation. Political orientations change strongly around the retirement age, where our estimates of the conditional age effect on the orientation rank are near the theoretical upper bound of unity. Cohort effects are also evident in the data although many of the difference in voting behavior across social generations can be attributed to age differences. However, even after controlling for arbitrary age effects, we find that baby boomers (born between 1946 and 1964) are more inclined to support environmental protection, policies that benefit the young, and progressive redistribution than other generations. Recent generations (born since 1965), in terms of political preferences, are more similar to their prebaby-boomer ancestors (born up to 1945). On the rank scale, the age-adjusted difference in political orientation between cohorts born from 1935 to 1939 (more right-wing) and baby boomers born from 1955 to 1959 (more left-wing) is equivalent to the estimated effect of an individual aging by 32 years.

We generally find stronger age effects on political orientation than on reform orientation. Significant within-cohort effects of age on political orientation persist if we control for reform orientation. Thus, over their voting life, cohorts shift from the political left to the political right in a manner that is not determined by an increasing tendency to support the status quo. As cohorts age, the increasing support for the legal status quo goes hand in glove with a political orientation that shifts from the political left to the right for two of four groups of referenda (environmental and generational attitudes). Within another group (ideological attitudes), cohorts also tend to shift to the political right as they age (from liberal to conservative); however, there is no significant aging effect on reform orientation. In yet another category (fiscal attitudes), aging significantly increases the support for legal change whereas the effect on political orientation is non-monotonic. Overall, with regard to rationalizing the generation gap, there is more support for the utility-maximization than the habituation hypothesis.

Our study connects to several strands in the economics literature. One strand concerns how age shapes economic behavior (Chetty et al., 2014; Costa & Kahn, 2011; Dynan et al., 2009; Giuliano & Spilimbergo, 2013; Juhn & McCue, 2016; Levin & Stephan, 1991), particularly in the context of pop-

ulation aging (Abel, 2001; Acemoglu & Johnson, 2007; Acemoglu & Restrepo, 2017; Demange & Laroque, 1999; Poterba, 2001) and the resulting intergenerational conflicts (Abramson, 1979). Specifically, we add to a literature summarized by Ahlfeldt et al. (2017) that has considered age as an explanatory factor in cross-sectional referendum analyses and an emerging literature that seeks to separate age and cohort effects on political outcomes such as attitudes to political parties (Tilley & Evans, 2014) and European integration (Eichengreen et al., 2018).

We also relate to political economy literature that concerns the nature of direct-democratic decision-making (Deacon & Shapiro, 1975; Feld & Matsusaka, 2003; Matsusaka, 2004; Osborne & Turner, 2010) and specifically how interest groups seek to influence political outcomes (Ahlfeldt, Moeller, et al., 2017; Feinerman et al., 2004; Frey et al., 1996) leading to political opposition to projects with positive net present value (Ciccone, 2004; Kahneman et al., 1991). In analyzing the determinants of age-related opposition to reform projects, we connect to studies that distinguish between utility maximization and other determinants of economic behavior that lead to status-quo bias (Ciccone, 2004; Fernandez & Rodrik, 1991; Kahneman et al., 1991; Samuelson & Zeckhauser, 1988). Further, our analysis is connected to economics research on various types of publicly provided goods on which voters often decide directly, such as education (Cellini et al., 2010; Collins & Kaplan, 2017), accessibility and infrastructure (Ahlfeldt et al., 2015; Baum-Snow, 2007; Duranton et al., 2014), and the protection of health (Currie et al., 2015; Davis, 2004) and the environment (Chay & Greenstone, 2005; Greenstone & Gallagher, 2008).

Relevant to the wider social sciences literature, our unconstrained rank models used to separately identify age and cohort effects are a methodological contribution to a broad literature concerned with the analysis of APC effects (Bijlsma et al., 2017; Bloome, 2014; Chetty et al., 2014; Fu, 2016; Giuliano & Spilimbergo, 2013; Juhn & McCue, 2016; Levin & Stephan, 1991; Mason et al., 1973; O'Brien, 2016; Rodgers, 1982).

The remainder of the paper is structured as follows. Section 2 introduces our empirical strategy against the background of the challenges to the identification of APC effects. In Section 3, we discuss the Swiss context and our data. We document the existence of a generation gap in referenda on a wide range of subjects in Section 4 before we separate age and cohort effects in Section 5. In Section 6, we use our estimated aging effect to assess the degree to which population aging has affected direct votes since 1981. Section 7 concludes the study.

2 Identification

Consider a general model that describes the probability $V_{i,c,r,t}$ of an individual voter deciding to vote in line with a certain orientation (e.g. a vote that supports left-wing policies) or attitude (e.g. liberal or environmentalist).

$$V_{i,c,r,t} = f(X_{i,c,t}) + g(AGE_{c,t}) + h(B_c) + k(T_t) + \varepsilon_{i,c,r,t}, \quad (1)$$

where i indexes individuals belonging to birth cohort c and r indexes referenda held at time t . $f(X_{i,c,t})$ is a function of a vector of variables $X_{i,c,t}$ describing individual voter characteristics, $g(AGE_{c,t})$ is a function of the age $AGE_{c,t}$ of a voter belonging to cohort c at time t , $h(B_c)$ is a function of the voter cohort's birth year B_c , and $k(T_t)$ is a trend in time T_t . $\varepsilon_{i,c,r,t}$ is a random error that captures unobserved voter characteristics and idiosyncratic referendum effects.

We are primarily interested in an estimate of $g' = \partial V_{i,c,r,t} / \partial AGE_{c,t}$, i.e. the causal effect of aging holding other effects constant. We refer to this effect as the *aging effect*. An identification challenge originates from $AGE_{c,t}$ being a linear combination of the birth year B_c of cohort c and the time of the referendum T_t :

$$AGE_{c,t} = T_t - B_c, \quad (2)$$

The first problem common to the analysis of individual or grouped voting data is that in a cross section, age is a linear transformation of B_c because there is no variation in T_t ; i.e., $AGE_c = a - B_c$, where a is a constant. A cross-sectional estimation of the effect of voter age on voting outcomes inevitably identifies the composite effect of aging and cohort affiliation, i.e., $g' - h'$, where $h' = \partial V_{i,r,c,t} / \partial B_{c,t}$. There is no way to separate the effects of age and cohort affiliation other than by assumption (e.g., by assuming that $h' = 0$).

One positive feature of our data set, which is rare in the context of referendum data, is that we observe voting decisions across a relatively large number of referenda spread across several decades. Although this longitudinal dimension of our data helps overcome the first identification problem, there is a second. There is no variation in T_t conditional on $AGE_{c,t}$ and B_c because $T_t = AGE_{c,t} + B_c$. Without restrictions, it is, therefore, impossible to identify the effects of $AGE_{c,t}$, T_t , and B_c . This is the APC conundrum, a fundamental problem in the analysis of APC effects that has been faced by researchers from a wide range of disciplines for decades (Abel, 2001; Abramson, 1979; Costa & Kahn, 2011; Dynan et al., 2009; Giuliano & Spilimbergo, 2013; Hanoch, Giora; Honig, 1985;

Heathcote et al., 2005; Levin & Stephan, 1991; Mason et al., 1973). Despite a long tradition of dealing with this problem, the literature has achieved little consensus on how to address it.

One approach is to estimate age and cohort effects without controlling for period effects. If $k(\cdot)$ is an additive function, the researcher then identifies $\partial V_{i,c,t}/\partial AGE_{c,t} = g' + k'$ and $\partial V_{i,c,t}/\partial B_c = h' + k'$. Thus, to obtain unbiased estimates of g' and h' , the researcher must impose the strong identifying assumptions that $\partial V_{i,c,t}/\partial T_t = k' = 0$. Likewise, a control for cohorts can be omitted if one is willing to assume that $h' = 0$ (Heathcote et al., 2005; Juhn et al., 1993). To relax the identifying assumption, some researchers have proposed controlling for period effects by means of time-varying variables that capture the determinants of an outcome (Heckman & Robb, 1985) although concerns regarding unobserved time-varying controls naturally remain. Another approach is to impose constraints on the functional form of $g(AGE_{c,t})$ and $h(B_c)$. A classic approach is to assume a parametric function for the age effect (generally a polynomial function) and cohort effects that are common to groups of birth cohorts (e.g., birth cohorts defined by decades). The age effect is then identified from within cohort variation. However, such a control for cohort affiliation is naturally imperfect, and the results tend to be sensitive to the definition of cohort groups (Luo & Hodges, 2015). Ultimately, the separation of age and cohort effects relies on functional form assumptions (Rodgers, 1982).

In our analysis, we are primarily interested in how orientations and attitudes change as voters age; i.e., our aim is to estimate age effects conditional on arbitrary cohort effects. To achieve this goal, we desist from the identification of period effects. Because the number of referenda per period is limited, period effects are likely to capture referendum effects that depend on the varying cost-benefit cases of referenda. Thus, the interpretation of period effects is not particularly intuitive in our context. Aggregated to the cohort-period level, equation (1) can be rearranged:

$$\bar{V}_{c,t} - f(\bar{X}_{c,t}) = g(AGE_{c,t}) + h(B_c) + k(T_t) + \bar{\varepsilon}_{c,t}, \quad (3)$$

where upper bars indicate means across individuals within a cohort-period cell and the left-hand side of the equation describes the mix-adjusted (for observable individual characteristics) propensity of a voting outcome by cohort c in a period t . We then subject equation (3) to a transformation:

$$R_{c,t} = R\left(\bar{V}_{c,t} - f(\bar{X}_{c,t})\right) = m(AGE_{c,t}) + n(B_c) + \bar{\varepsilon}_{c,t}, \quad (4)$$

where $R(\cdot)$ is a function that gives a cohort's field rank (lowest rank to highest value) in the distribution of voting propensities within a period. The rank transformation removes period effects be-

cause the rank of a cohort within a period $R_{c,t}$ is independent of period effects $k(T_t)$. Conditional on the transformation, the longitudinal dimension then allows for the separate identification of aging effects and cohort effects without further constraints, which is why we refer to this approach as an unconstrained rank model.

Of course, the rank transformation removes cardinal information as (mean) orientations and attitudes are converted into an ordinal scale. However, the rank transformation also lends an intuitive interpretation to the marginal effects we estimate. If orientations and attitudes were exclusively determined by age and the propensity to support a certain type of initiative decreased with age, each cohort, as it reached the minimum voting age, would enter the data with a rank of one. Because in every period, a new cohort would enter the data with a rank of one, all other cohorts would climb up the rank scale by one step every period they age, until they eventually exited the data. Thus, the implied aging effect would be $\partial R_{c,t} / \partial AGE_{c,t} = m'(AGE_{c,t}) = 1$. Likewise, we'd expect $m'(AGE_{c,t}) = -1$ if aging was associated with increases in the propensity to support initiatives. These values thus represent convenient bounds for estimated aging effects. By contrast, an aging effect of zero would imply that any cross-sectional correlation between voting outcomes and voter age was spurious and attributable to correlated cohort effects.

3 Context and data

Direct democracy has a long tradition in Switzerland. For 150 years, voters have been routinely called to the polls to make decisions on a wide range of topics at the municipal, cantonal, and federal levels. Adjudications concerning changes to the constitution and the ratification of international treaties must be approved by the electorate by a direct vote. All other adjunctions can be subject to facultative referenda if a sufficient number of signatures are collected.² Occasionally, government authorities propose a counter initiative or alternative version to the original initiative on the same referendum ballot. In general, federal referenda – on which we focus in this paper – are held four times a year, with votes on up to ten to twelve referenda on each occasion. Eligible voters are automatically registered for the polls. Along with their polling cards, voters receive an information package that includes arguments in favor of and against each proposition, estimates of anticipated benefits and financial consequences, and where applicable, a summary of the parliamentary debate

² Henceforth, the term referenda refers to all forms of public votes on the federal level in Switzerland – public initiatives, facultative referenda, and obligatory referenda.

and outside opinions by interest groups. Swiss voters, therefore, may generally be considered experienced and well informed when they cast their votes.

Switzerland not only utilizes direct democracy decisions like few other countries in the world, its authorities also collect unique micro data on voter decisions and characteristics. Since 1977, representative postelection surveys have been conducted after each referendum, asking approximately 1,000 eligible voters about their voting decisions and a broad range of individual characteristics. These so-called VOX surveys occur within two to three weeks after a referendum by telephone interviews. The features covered in the data include the actual voting behavior (e.g., if they voted, what they voted for, whether they felt well-informed on the matter), political attitudes (e.g., party identification, trust in the government) and socio-economic attributes (e.g., age, household size, gender, education level, income).³ Because the design of the surveys has changed over time, the department of political science at the University of Geneva publishes standardized versions of the original data, which we use in our work. These VoxIt data cover virtually all referenda since 1981, combining a standardized set of variables from the VOX surveys with official referendum data, e.g., results, turnout, government and party endorsement. In 2016, the VOX project was replaced by the so called VOTO surveys, which are run by the Swiss Centre of Expertise in the Social Sciences (FORS), the Centre for Democracy Aarau (ZDA), and the LINK Institute for Market and Social Research. Since the VoxIt and VOTO surveys ask very similar questions, it is possible to pool the covered referenda, subject to some harmonization that we describe in the Appendix.⁴

We restrict the data set analyzed here to respondents who cast a vote in a referendum, i.e., those who had formulated a view. This mitigates many of the typical concerns regarding the validity of voting survey data (Bertrand & Mullainathan, 2001) at the cost of losing approximately half of the observations. Because of the frequency with which direct democracy decisions are made in Switzerland and the quality of the data, Swiss referenda have become a popular subject of political econo-

³ The VOX surveys are financed by the Swiss Federal Confederation as well as non-government and private organizations and institutions. Gfs.bern AG is an institute for political, communications and social research in Switzerland and was responsible for the collection and preparation of the VOX data. The political science institutes from the universities of Bern, Geneva, and Zurich are responsible for the questionnaire designs, analysis, reporting of results and the standardization process of the VoxIt surveys. For more information, see e.g., <http://www.gfsbern.ch/de-ch>.

⁴ FORS is the Swiss national Centre of Expertise in the Social Sciences. It maintains a national social science data archive and facilitates access to official statistical data. For more information on the VOX, VoxIt and VOTO surveys, see www.forscenter.ch and <http://www.voto.swiss>.

my research (Funk, 2016; Funk & Gathmann, 2015; Kovalchik et al., 2005). We refer to a growing number of studies for further details on the institutional setting and the Swiss post-vote survey data (Feld & Matsusaka, 2003; OECD, 2009). A complementary summary is in the Appendix.

Between June 14, 1981 and May 21, 2017, 312 public referenda took place at the federal level in Switzerland. Survey data availability constrains the set of analyzed referenda to 305. These referenda fall into 12 officially defined contextual *categories* (*Ebene-1 Deskriptoren*). Within each category, we define subcategories of contextually homogeneous referenda, which we refer to as *themes*. We define a total of 24 themes, which we then aggregate to four *attitude groups*. The ideological attitude group comprises referenda on questions that concern the constitutional order, foreign affairs and security policy and relate to voters' beliefs and values in a manner that a voter decision could be described as either conservative or liberal. The environmentalist attitude group comprises referenda in which voters' decisions have direct consequences for the protection of the environment, e.g., by affecting carbon emissions or protecting natural habitats. In the generational attitude group, we include referenda on policies that are specifically targeted at certain age groups, e.g., allowances for families (with dependent children) or labor market regulations (e.g., regarding maximum working hours) that affect those who are not yet retired. Finally, the fiscal attitude group includes referenda in which voters have the choice between options that have distributional consequences that may be described as either progressive (e.g., relatively more important income tax) or regressive (e.g., relatively more important tolls and user fees). In the interest of a transparent empirical analysis, we define attitude groups to render them mutually exclusive.

Table 1 summarizes the distribution of referenda and voting observations by categories and themes and how themes aggregate to attitude groups. We also compare the share of yes votes in the survey data to the official voting results published by the Swiss Federal Council. As expected, the yes-vote share of the survey data is close to the official result if the number of referenda (within a theme or category) is sufficiently large. However, across all referenda, we find the yes-vote share in the survey data to exceed the official results by some notable 3.1 percentage points, possibly due to a survey bias (Funk, 2016). Since we generally analyze the distribution of voting decisions within referenda, a potential bias will not affect our results to the extent that it is uncorrelated with voter characteristics.

Tab. 1. Summary by category, theme, and attitude group

#	Official categories (numbers) and defined themes (letters)	N		Share yes votes			Attitude group
		Ref.	Survey	Survey	Actual	Diff.	
-	01 Constitutional order	31	16,064	0.549	0.532	0.017	-
1	A Pro liberal law system	19	10,297	0.596	0.57	0.026	Ideological
2	B Pro direct democracy	12	5,767	0.466	0.465	0.001	Ideological
-	02 Foreign affairs	12	7,556	0.553	0.498	0.056	-
3	A Pro international integration	12	7,556	0.553	0.498	0.056	Ideological
-	03 Security policy	22	12,707	0.481	0.455	0.025	-
4	A Pro smaller military	22	12,707	0.481	0.455	0.025	Ideological
-	04 Markets (regulation)	20	12,092	0.452	0.438	0.014	-
5	A Pro worker protection	11	6,815	0.427	0.417	0.01	Generational
6	B Pro protection of consumers	9	5,277	0.484	0.467	0.017	Ideological
-	05 Agriculture	13	5,878	0.561	0.536	0.025	-
7	A Pro limiting intensive farming	13	5,878	0.561	0.536	0.025	Ideological
-	06 Public finance	28	15,293	0.517	0.513	0.004	-
8	A Pro progressive fiscal policy	17	10,119	0.504	0.494	0.01	Fiscal
9	B Pro fiscal expansion	11	5,174	0.541	0.55	-0.008	Fiscal
-	07 Energy	14	7,786	0.484	0.419	0.065	-
10	A Pro sustainable energy	14	7,786	0.484	0.419	0.065	Environmentalist
-	08 Transport and infrastructure	30	17,906	0.533	0.505	0.028	-
11	A Pro sustainable mode	25	15,052	0.528	0.503	0.025	Environmentalist
12	B Pro lower transport tolls and taxes	5	2,854	0.564	0.519	0.044	Fiscal
-	09 Environment	20	12,456	0.447	0.427	0.021	-
13	A Pro-environment protection	9	5,835	0.439	0.41	0.029	Environmentalist
14	B Pro more housing supply	11	6,621	0.455	0.442	0.013	Ideological
-	10 Social policy	92	58,418	0.46	0.461	-0.001	-
15	A Pro liberal health policies	14	7,904	0.483	0.472	0.011	Ideological
16	B Pro health expenditures	18	11,452	0.43	0.426	0.004	Fiscal
17	C Pro state pension	13	7,890	0.411	0.433	-0.022	Fiscal
18	D Pro lower retirement age	5	2,722	0.411	0.404	0.006	Generational
19	E Pro unemployment benefits	5	3,334	0.473	0.458	0.014	Generational
20	F Pro family allowances	12	8,360	0.401	0.39	0.011	Generational
21	G Pro liberal immigration policy	25	16,756	0.528	0.538	-0.01	Ideological
-	11 Research and education	15	7,905	0.543	0.5	0.043	-
22	A Pro expenditures on education	7	3,094	0.512	0.444	0.068	Fiscal
23	B Pro limiting in vivo studies	8	4,811	0.563	0.535	0.028	Ideological
-	12 Arts and culture	8	3,790	0.637	0.564	0.074	-
24	A Pro support of culture and media	8	3,790	0.637	0.564	0.074	Fiscal
-	All referenda	305	177,851	0.518	0.487	0.031	-

Notes: Data cover 305 referenda from 1981 to 2017. Categories are defined in the official data. Themes are our own definitions of subgroups of referenda within categories. All themes are defined to be in line with the orientation of the political left (as opposed to the political right). Attitude groups are our own definitions of contextual groups to which we aggregate themes. N ref. is the number of referenda within a category and theme. N sur. is the number of survey observations within a category and theme. Share yes votes survey is the proportion of yes votes in the survey data. Share yes votes actual is the proportion of yes votes of all votes cast in a referendum. Share yes votes diff. is the difference between the two.

To render the data amendable to pooled analysis, we define voting outcomes that are comparable across referenda. Our first outcome variable assumes the value of one if the vote is in line with a change in the legal status quo and zero otherwise. To this end, we combine a voter's individual voting decision (yes vs. no) as recorded in the survey and a referendum-specific mapping on whether a yes or a no vote would imply a change in legislation. We refer to this outcome variable as *reform*

orientation. Our second outcome variable assumes the value of one if the vote is in line with a position that can be ascribed to the political left, and zero if it is in line with the political right. For this purpose, we first create a referendum-specific mapping of voter decisions to attitudes (within attitude groups). Following conventions in the US political science literature, we then associate a left vote with the following attitudes: liberal (as opposed to conservative), high-priority (as opposed to low priority) environmentalist, pro-young (as opposed to pro-elderly), and pro progressive (as opposed to regressive) redistribution (Budge et al., 2001b). We refer to the resulting outcome variable as *political orientation*.

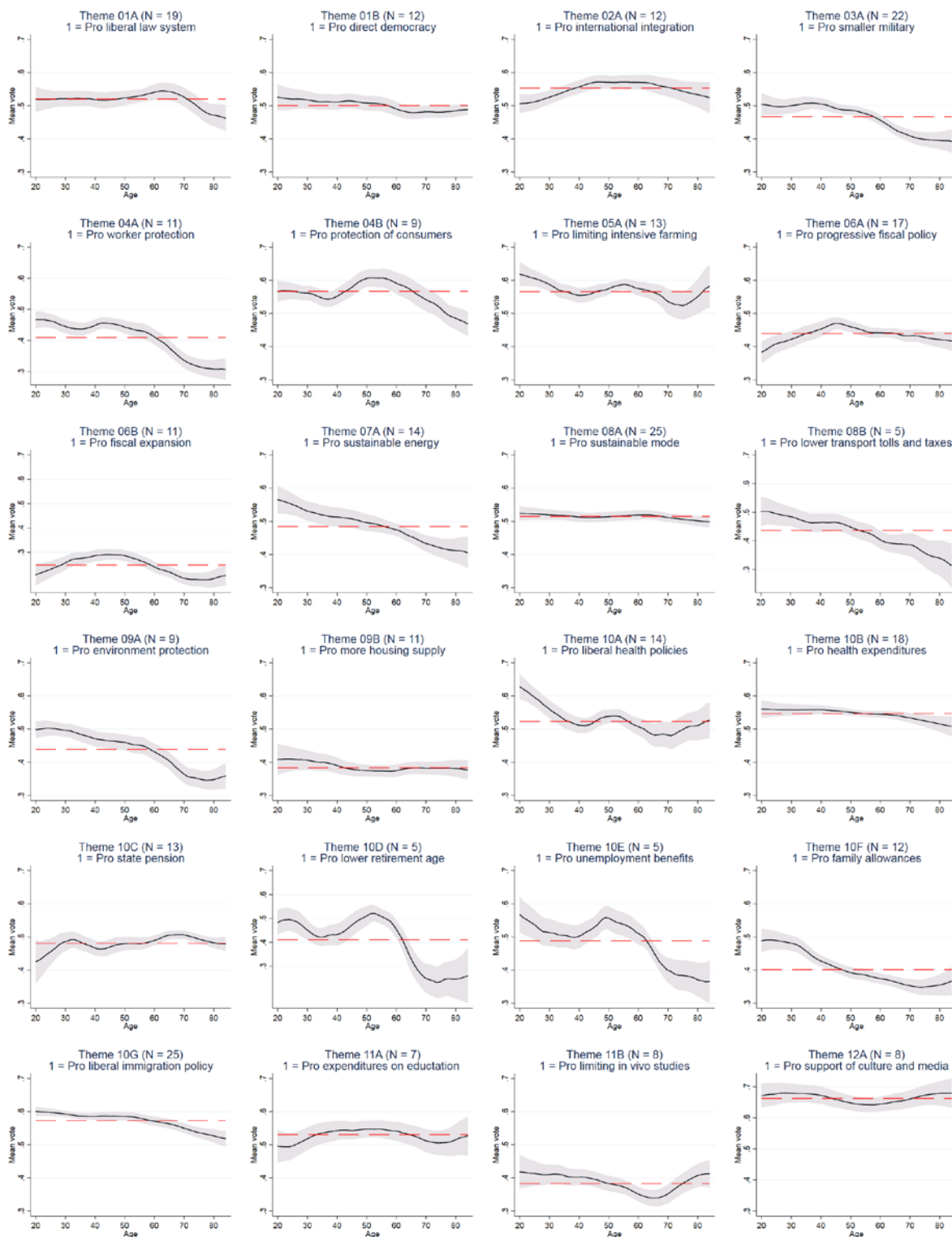
A full list of the referenda included in our study with the mapping of a yes vote to reform and political orientations is in Appendix II. For 17 referenda held before 1985, voter age is defined by five-year age categories (instead of integer values). In an auxiliary step summarized in Appendix I, Section 3.2, we predict a voter's age (within age categories) based on the wide range of socio-demographic variables in the data set. We also note that the minimum voter age in Switzerland was lowered from 20 to 18 in 1991. To maintain a consistent definition over the study period, we generally exclude responses from voters below the age of 20.

4 Voting outcomes by age

4.1 Generation gap by themes and attitude groups

Before we proceed to estimating the causal effects of aging on voting outcomes, we examine the extent to which generation gaps may be documented across a range of referendum topics. In Figure 1, we illustrate how the conditional mean political orientation controlling for voter characteristics and referendum effects changes by age for each of the 24 themes defined in Table 1. For each theme, we first run OLS regressions of the political orientation (defined in Section 3) against voter characteristics, referendum effects, and integer age-bin effects and then plot the results of local polynomial (degree = 0) regressions of the latter against age. The conditional mean political orientation may be interpreted as the propensity of a voter with average characteristics casting a vote that is consistent with the positions of the political left.

Fig. 1. Political orientation by age and theme



Notes: The figure summarizes the mean vote by voter age and 24 themes across 305 referenda from 1981 to 2017. Themes are defined so that a voting outcome of zero is in line with the political right and an outcome of one is in line with the political left. For each theme, we regress the voting outcome against a battery of individual controls, referendum fixed effects and one-year-age-bin fixed effects. The point estimates (solid lines) and 95% confidence intervals (gray-shaded areas) are from local polynomial regressions (degree = 0) of the age-bin fixed effects against (integer) age. Dashed lines are the mean outcome across all age groups within themes. N is the number of referenda within a theme.

A casual inspection of Figure 1 reveals reasonably well-defined downward trends for 17 of 24 themes, implying that younger voters are more likely to support the positions of the political left than are older voters. For the remaining seven themes (2A, 6A, 6B, 8A, 10C, 11A, 12A), the trend is less clear. No theme displays an unambiguously positive relationship between age and political orientation.

Replicating the same approach separately for referenda in the four attitude groups introduced in Section 3, we find similar downward trends in ideological, environmentalist, and generational attitudes. Younger voters, on average, tend to be less conservative, attach higher priorities to the protection of the environment, and are more supportive of policies that, in relative terms, benefit the young. Concretely, controlling for observable individual characteristics, the propensity of a 20-year-old voter casting a conservative vote is approximately six percentage points (11%) lower than that of an 80-year-old voter. The similarly defined generation gap in terms of a high vs. a low priority environmentalist attitude is approximately ten percentage points (18%). In referenda in which the decisions have consequences that directly depend on a voter's stage in the lifecycle, the generation gap is even larger. The propensity of casting a vote that favors the young declines by more than fifteen percentage points (30%) over the voting life.

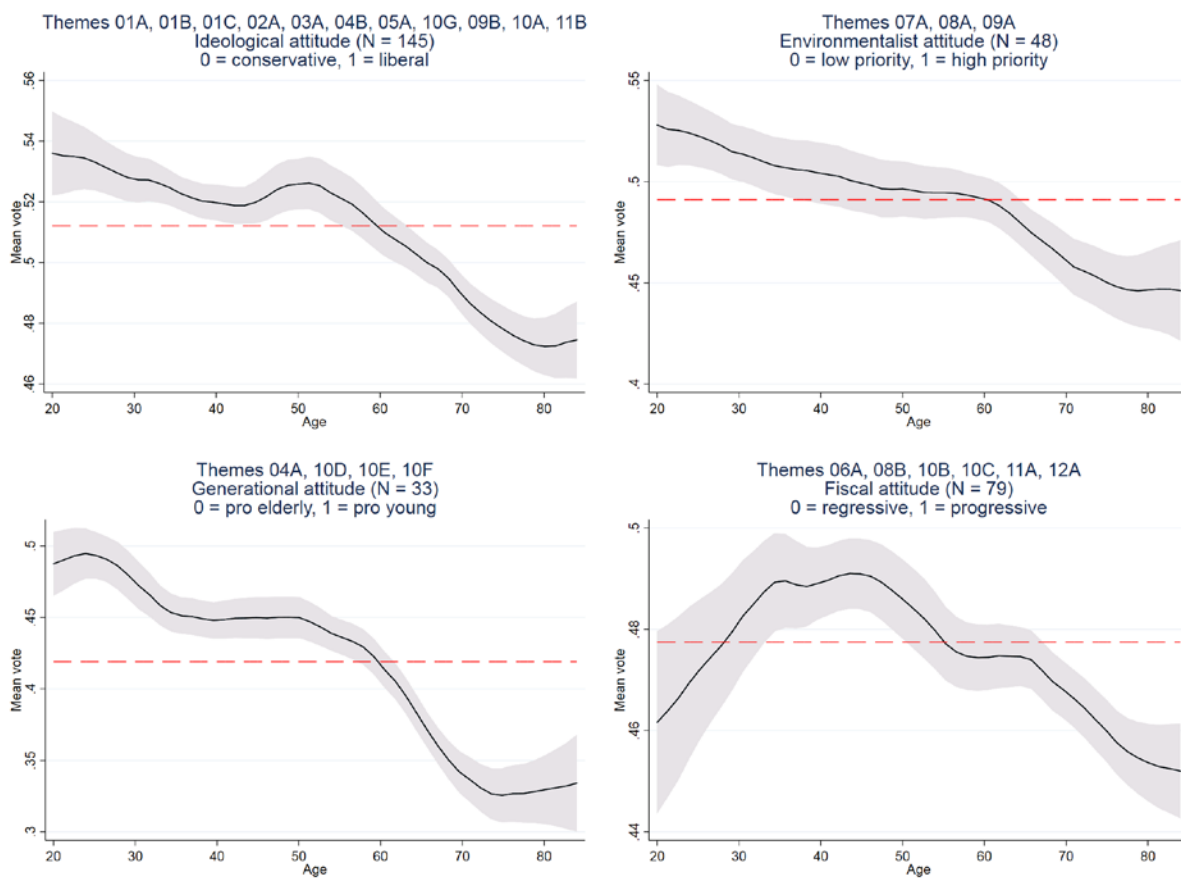
Within each group, there appears to be a retirement effect, i.e., a relatively sharp reduction in conditional mean attitudes around the age of 60, when many voters retire. The effect is particularly strong in the generational attitude group. Considering Figure 1, this retirement effect appears to be driven by referenda concerning unemployment benefits and retirement age (themes 10D and 10E). This is intuitive given that those who have already retired do not benefit from unemployment allowances. Similarly, they do not benefit from the opportunity to retire earlier. This generational attitude effect is also consistent with recent US survey evidence revealing that early generations are relatively less likely to support policies that benefit the young (Pew Research Center, 2018).

Within the fiscal attitude group, the age trend is non-monotonic. Up to their early 30s, voters are increasingly more likely to support progressive fiscal policies that are associated with redistribution from higher to lower income and wealth groups. From then on, voters become increasingly more averse to the same kind of policies. This lifecycle pattern is consistent with voters becoming more economically vulnerable as they start their own families and then less vulnerable due to increasing incomes and inherited wealth.

Briefly summarized, ideological, environmental, and generational attitudes tend to shift from positions that are associated with the political left toward the political right as voter age increases. Re-

garding fiscal attitudes, a similar trend exists over approximately two-thirds of the voting life (from the 40s onwards). In all four attitudes, the trend accelerates around retirement age. The age effect is particularly strong where the economic incentives are directly related to a voter’s stage in the lifecycle (in the generational attitude group). Overall, the evidence presented in this section provides systematic evidence that substantiates the notion of a generation gap in direct democracy outcomes, the origins of which are to be explored in the remainder of the paper.

Fig. 2. Voting by age and attitude group



Notes: This figure summarizes the mean vote by age and attitude groups across 305 referenda from 1981 to 2017. We group the referenda into attitude groups by the theme defined in Table 1. A voting outcome of zero is in line with the political right, while an outcome of one is in line with the political left. For each attitude group, we regress the voting outcome (one if in support of the theme, zero otherwise) against a battery of individual controls, referendum fixed effects and one-year-age-bin fixed effects. The point estimates (solid lines) and 95% confidence intervals (gray-shaded areas) are from local polynomial regressions (degree = 0) of the age-bin fixed effects against (integer) age. Dashed lines are the mean outcomes across all age groups within attitude groups. N is the number of referenda within an attitude group.

4.2 Reform orientation vs. political orientation

One question concerning the origin of the generation gap documented above is whether a negative effect of age and the political orientation indeed reflects an expected utility of (left) reform projects that increases during the remaining life time (Messner & Polborn, 2004). An alternative hypothesis

is that voters become more averse to reform projects due to habituation; i.e., older voters prefer the status quo because they will often have experienced it over a longer period (Samuelson & Zeckhauser, 1988). Distinguishing between utility-maximization and habituation as drivers of age effects would not be empirically feasible if our two primary outcomes (reform orientation and political orientation) were collinear, i.e., that a change in the legal status quo strictly implied a change in policy toward the political left.

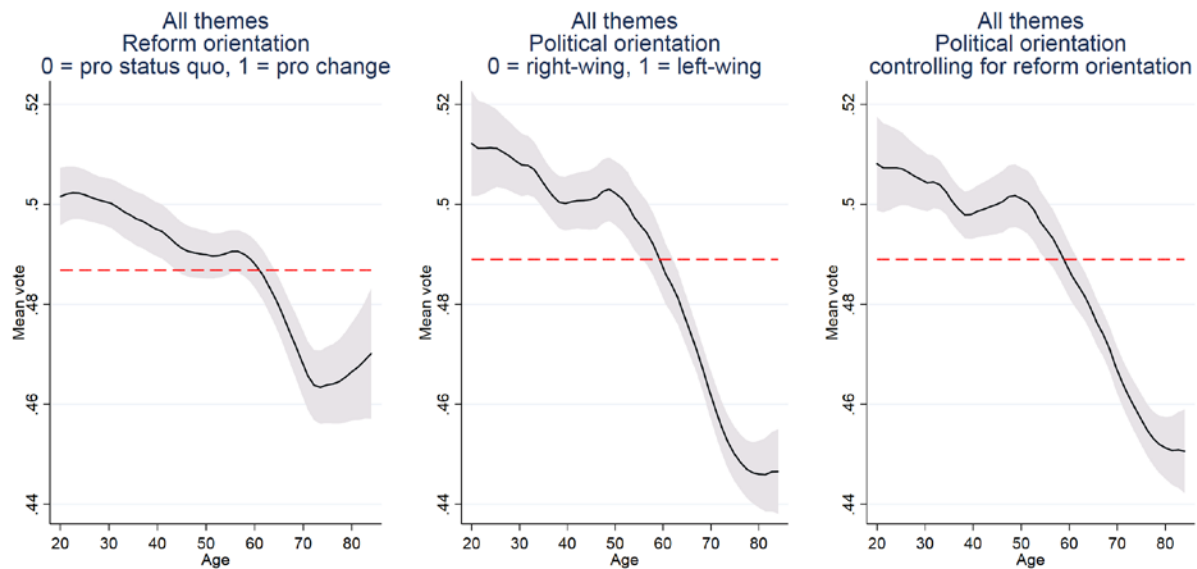
In Table 2, we cross-tabulate the two outcomes. Across all referenda, we find that a pro status quo vote is approximately twice as likely to be consistent with support for a right-wing policy outcome than a left-wing policy outcome. Evidently, the majority of referenda in Switzerland in recent decades have been concerned with “left” reform projects. Nevertheless, approximately 17.9% of all votes are in support of change and right-wing policies at the same time (a similar fraction votes for the status quo to preserve a left-wing policy), suggesting that reform orientation is an imperfect predictor of political orientation overall. There is a significant degree of variation in the correlation between the two outcome measures across attitude groups. Within the ideological attitude group, a relatively large fraction of 20.9% voted for change to support a conservative (right-wing) position. A similarly large fraction of voters in referenda in the fiscal attitude group voted for change to support regressive (right-wing) fiscal policies. The same fractions are as low as approximately 10% in the environmentalist and generational attitude groups, implying that it will be empirically difficult to distinguish between utility-maximization effects and habituation effects within these groups.

Tab. 2. Cross-tabulation of reform orientation and political orientation

<i>All referenda</i>				<i>All referenda</i>			
	Right	Left	Total		Right	Left	Total
Status quo	59,063	32,205	91,268	Status quo	33.2%	18.1%	51.3%
Change	31,821	54,762	86,583	Change	17.9%	30.8%	48.7%
Total	90,884	86,967	177,851	Total	51.1%	48.9%	100.0%
				N	177,851	Diagonal sum	64.0%
<i>Ideological attitude</i>				<i>Environmental attitude</i>			
	Right	Left	Total		Right	Left	Total
Status quo	27.9%	20.9%	48.7%	Status quo	40.2%	10.7%	50.9%
Change	20.9%	30.3%	51.3%	Change	10.7%	38.4%	49.1%
Total	48.8%	51.2%	100.0%	Total	50.9%	49.1%	100.0%
N	83,574	Diagonal sum	58.2%	N	28,673	Diagonal sum	78.6%
<i>Generational attitude</i>				<i>Fiscal attitude</i>			
	Right	Left	Total		Right	Left	Total
Status quo	48.1%	9.9%	58.0%	Status quo	31.6%	21.6%	53.2%
Change	10.0%	32.0%	42.0%	Change	20.6%	26.1%	46.8%
Total	58.1%	41.9%	100.0%	Total	52.3%	47.7%	100.0%
N	21,231	Diagonal sum	80.1%	N	44,373	Diagonal sum	57.7%

Notes: Data cover 305 referenda from 1981 to 2017. The reform orientation is encoded as status quo if the vote is in support of the status quo (often, but not always a no vote) and as change if the vote supports a change in legislation. The political orientation is encoded as right if it is in line with positions of the political right and left if it is in line with the positions of the political left. A summary of left-wing attitudes by themes is in Table 1.

Using the same empirical approach as in Figure 1 and Figure 2, we illustrate how the conditional mean reform orientation (left panel) and political orientation (middle panel) changes by age in Figure 3. We find a downward age trend in both outcomes although the age effect is stronger on political orientation. The right panel illustrates the same relationship as the middle panel, except that we control for the reform orientation in the first-stage regressions. Because the reform orientation is an endogenous variable, there is a risk of over-controlling with this approach. The variable may pick up the effects of unobserved characteristics, and if the correlation between the outcomes is too strong, there may not be sufficient conditional variation in the political orientation to identify an age effect. However, the age effect on political orientation is only marginally affected by holding reform orientation constant. One interpretation is that the differences in political orientations between the young (relatively more inclined to left-wing policies) and the old (relatively more inclined to right-wing policies) cannot be solely attributed to a habitation-induced status-quo preference by the latter.

Fig. 3. Reform orientation and political orientation by age

Notes: The figure summarizes the mean vote by age and attitude groups across 305 referenda. In the left panel, the voting outcome is encoded as zero if the vote is in support of the status quo (often, but not always a no vote) and as one if the vote supports a change in legislation. In the two remaining panels, the voting outcome is encoded as zero if it is in line with the political right and one if it is in line with the political left. In the first two panels, we regress different voting outcomes against a battery of individual controls, referendum fixed effects and one-year-age-bin fixed effects. In the third panel, we use the political orientation outcome as the dependent variable and control for the reform orientation in addition to the other covariates. The point estimates (solid lines) and 95% confidence intervals (gray-shaded areas) are from local polynomial regressions (degree = 0) of the recovered age-bin fixed effects against (integer) age. Dashed lines are the mean outcome across all age groups.

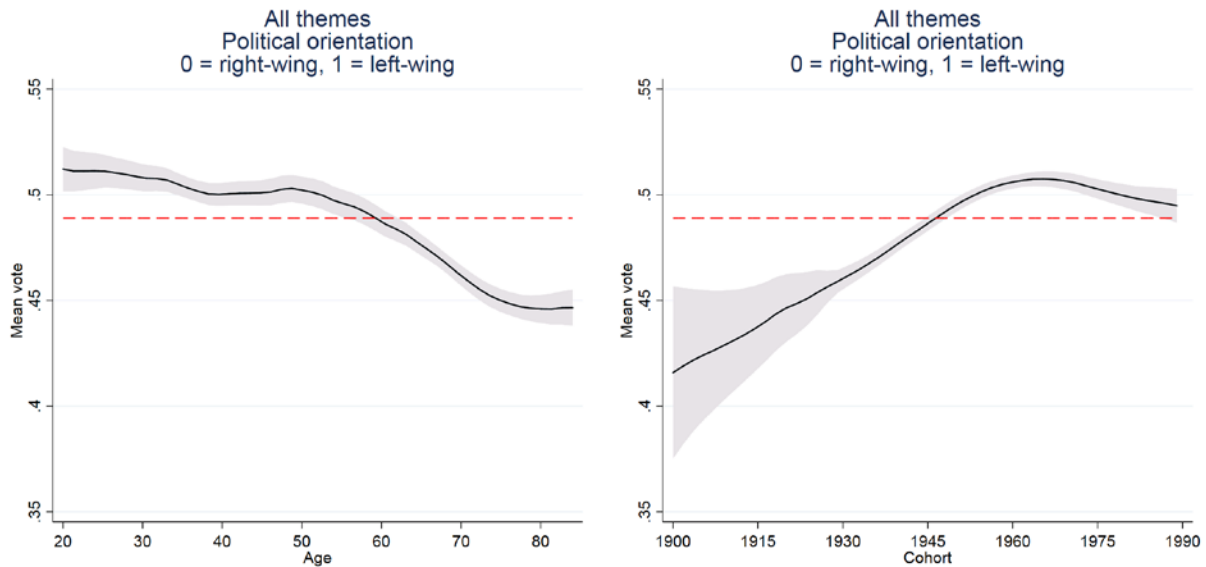
4.3 Age vs. cohort effects

Another question concerning the origin of the generation gap that is central to our analysis is whether the age correlations documented above are causal in the sense that they reflect the effect of the aging of individuals or spurious in the sense that they capture correlated cohort effects. Individuals belonging to different birth cohorts had different experiences at similar stages of their lifecycles and may consequently have developed different values, attitudes and orientations. In fact, numerous social science studies have ascribed different tastes, values, and political preferences to distinct social generations (Alwin & McCammon, 2012; Foner, 1974). Figure 4 shows how the negative association between political orientation and age directly maps to a positive association between voters' political orientation and birth year.

Those born up until 1945 (traditionalists) on average, vote more consistently with the positions of the political right whereas baby boomers (1946-1964) are much more positively inclined to left-wing policies. Generations X (1965-1976) and Y (from 1977), compared with the baby boomers, tend to lean somewhat more to the political right. Although this pattern is consistent with the

aforementioned social sciences literature, it is impossible to tell from a cross-sectional analysis if a generation gap is attributable to aging or cohort effects.

Fig. 4. Political orientation by age and by cohort



Notes: This figure summarizes the mean vote by age across 305 referenda. The voting outcome is encoded as zero if it is in line with the political right and one if it is in line with the political left. In each panel, we regress the voting outcome against a battery of individual controls, referendum fixed effects and one-year-age-bin fixed effects (left) or one-year-birth-cohort fixed effects (right). The point estimates (solid lines) and 95% confidence intervals (gray-shaded areas) are from local polynomial regressions (degree = 0) of the recovered fixed effects against age (left) and birth year (right). Dashed lines are the mean outcome across all age groups.

To separate aging and cohort effects, our approach is to analyze how orientations change within cohorts as they age. To this end, we tabulate the unconditional mean political attitude by cohorts and age groups in Table 3. Virtually all cohorts shift from a left to a right political orientation as they age. The exception are the earliest cohorts, which, however, are quite sparse in our data (they are already old when our observation period starts in 1980s). It is worth noting that Table 3 also reveals downward trends in age within groups of voters who voted for change or the status quo, once more indicating that habituation is an imperfect explanation for the generation gap. Age trends are also similar within referenda that won a majority or failed, which does not support a further alternative hypothesis that age effects could be driven by older voters being better at making choices that are in the interest of society as a whole. We also find downward age trends when differentiating by gender and periods.

Thus, overall, one may be inclined to read the evidence presented in Table 3 as supporting the presence of aging effects. However, highlighting the nature of the APC conundrum, it is worth not-

ing that the consistent within-cohort age trend could well be attributable to period effects, i.e., a shift in the mean orientation over time.

Tab. 3. Mean political orientation by age and other attributes

	Age								
	20s	30s	40s	50s	60s	70s	80s	90s	All
All	0.537	0.512	0.496	0.489	0.471	0.45	0.448	0.46	0.489
Status-quo vote	0.357	0.367	0.357	0.359	0.355	0.324	0.329	0.321	0.353
Change vote	0.703	0.66	0.641	0.63	0.596	0.597	0.575	0.596	0.632
Referendum won	0.591	0.56	0.544	0.545	0.523	0.519	0.508	0.548	0.543
Referendum failed	0.492	0.473	0.456	0.444	0.429	0.393	0.399	0.379	0.444
Female voter	0.548	0.52	0.504	0.501	0.479	0.455	0.463	0.471	0.498
Male voter	0.529	0.503	0.488	0.478	0.464	0.446	0.435	0.451	0.48
Period = 1980s	0.559	0.511	0.479	0.459	0.444	0.426	0.396		0.484
Period = 1990s	0.555	0.533	0.507	0.496	0.49	0.475	0.484	0.545	0.51
Period = 2000s	0.524	0.525	0.508	0.5	0.47	0.454	0.46	0.508	0.495
Period = 2010s	0.493	0.473	0.479	0.486	0.467	0.435	0.427	0.424	0.468
Cohort = 1900s							0.396	0.545	0.408
Cohort = 1910s						0.426	0.484	0.508	0.454
Cohort = 1920s					0.444	0.475	0.46	0.424	0.464
Cohort = 1930s				0.459	0.49	0.454	0.427		0.463
Cohort = 1940s			0.479	0.496	0.47	0.435			0.469
Cohort = 1950s		0.511	0.507	0.5	0.467				0.491
Cohort = 1960s	0.559	0.533	0.508	0.486					0.513
Cohort = 1970s	0.555	0.525	0.479						0.516
Cohort = 1980s	0.524	0.473							0.489
Cohort = 1990s	0.493								0.493

Notes: Data cover 305 referenda from 1981 to 2017. The political orientation is encoded as zero if the vote is in line with the political right and one if it is in line with the political left. A summary of left-wing attitudes by themes is in Table 1. Cells in the table show the unconditional mean vote by age group (columns) and the attributes (rows). Number of observations by cells are reported in Appendix I, Section 5.

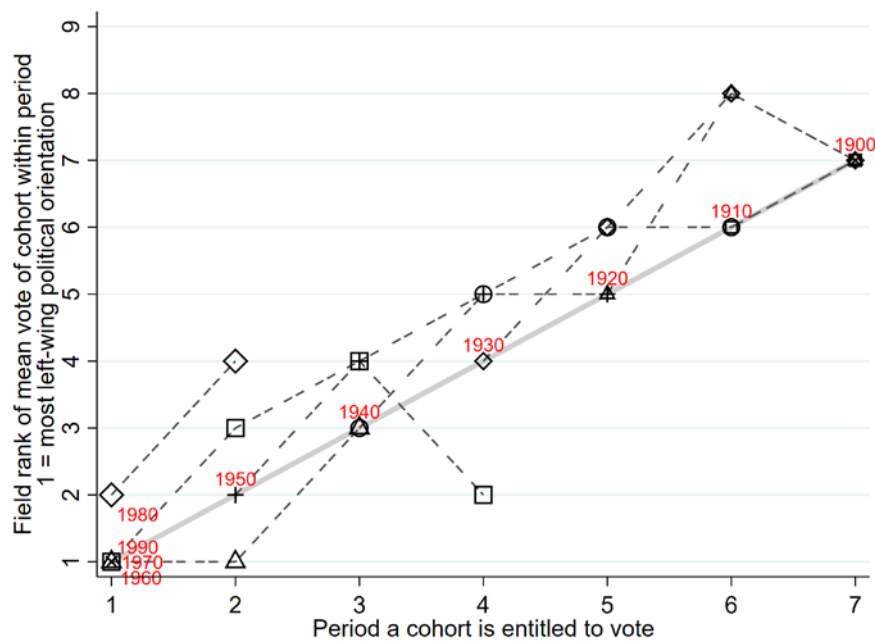
Figure 5 illustrates the intuition behind the separate identification of age and cohort effects in the unconstrained rank model described in Section 2. For this purpose, we convert the unconditional mean political orientations in the age group-cohort cells reported in Table 3 into within-period field ranks. Within each period (decade), each cohort is assigned a rank in the distribution of political orientation in which left political orientations correspond to low ranks and right political orientations correspond to high ranks. As discussed in Section 2, this transformation removes period effects so that we can focus on the separation of age and cohort effects.

We note that we do not observe the full voting life for any cohort (seven ten-year periods from the 20s to the 80s, excluding sparsely populated older age groups), but at most four periods per cohort due to the limited longitudinal dimension of our data. Nevertheless, the pattern in the data is quite unambiguous. Cohorts generally begin their voting life with a left political orientation. In our data, we observe the 1960s, 1970s, 1980s, and 1990s birth cohorts in the first period in which they are entitled to vote (when they are in their 20s). All of them occupy a low orientation rank of one or

two during this period, and all step up in the rank scale toward a more right-wing rank as they age in the subsequent periods, except for the 1970s cohort. Likewise, cohorts that we observe for the first time at higher ages enter the data with higher ranks and then also climb the rank scale as they age. By the end of their voting lives (we set this to period 7 for consistency), the cohorts that we observe at that stage of their voting lives (1900s, 1910s, 1920s, and 1930s birth cohorts) are those with the most right-wing political orientation (ranks 7-8). In addition, they all occupy a lower political orientation rank the first time we observe them in the data.

A casual inspection of Figure 5 further suggests that cohorts, on average, climb up the rank distribution by approximately one step each period. As discussed in Section 2, this is the upper-bound that we can expect from the aging effect. Figure 5 thus suggests that aging effects (and not correlated cohort effects) are likely to account for much of the generation gap documented above. We provide an econometric analysis of the unconstrained rank model to affirm this notion in the next section.

Fig. 5. Cohort rank in political orientation distribution by period



Notes: Data cover 305 referenda from 1981 to 2017. The field rank (lowest rank to highest value) is computed as the rank in the distribution of unconditional means in political orientation of cohorts within periods (the values reported in Table 3). A summary of left-wing attitudes by themes is in Table 1. The temporal unit of observation is periods defined as decades. Our data cover four periods (1980s, 1990s, 2000s, and 2010s) and 10 birth cohorts (1900s, 1910s, ..., 1990s). During the first/second/.../seventh periods a cohort is entitled to vote, voters are in their 20s/30s/.../80s. We ignore the remaining periods because the data for voters aged 90 and above are sparse. Cohorts are labeled when they first appear in our data. For example, the 1950-cohort is observed first in their second voting period when they are in their 30s (during the 1980s) and then in three subsequent periods (3, 4, and 5) when they are in their 40s, 50s and 60s (during the 1990s, 2000s, and 2010s). Light thick line is the 45-degree line (the upper bound of the ageing effect).

5 Age and cohort effects in an unconstrained rank model

5.1 Empirical implementation

Throughout this section, we aggregate the individual data to five-year cohort-period cells using an approach that shares similarities with Mincer regression, which is a popular tool in labor economics (Rosen, 1992). To control for individual voter characteristics, we run first-stage regressions of the individual voting outcomes against a large set of individual characteristics and cohort-referendum effects, recover the latter, and collapse the data onto that level. The first-stage regression results are presented in Section 6 of Appendix I. The result is a panel data set of adjusted voting outcome propensities (the left-hand side in equation (3)) in which birth cohorts $c = (1895 - 1899, 1900 - 1904, \dots, 1995 - 1999)$ are observed over periods $t = (1980 - 1984, 1985 - 1989, \dots, 2015 - 2017)$. In each of the eight periods, we observe 14 age groups $a = t - c = (20 - 24, 25 - 29, \dots, 85 - 89)$. We drop cohort-period cells for older age groups because these are sparsely populated with survey observations.⁵ As discussed in Section 2, the marginal aging effect in the rank model has intuitive bounds (-1 to 1). To maintain the intuitive interpretability in the aggregated (to five-year age groups) data, we rescale the rank measure to $\tilde{R}_{c,t} = R_{c,t} \times 5 - 2$, where $R_{c,t}$ is the rank of a five-year age group in the distribution of voting propensities within a period (1-14). This transformation ensures that voters can climb up as many steps on the rank scale as they can age in years over their voting life and that the rank of a five-year age group (e.g. $\tilde{R}_{c,t} = 3$ for the first-ranked age group) corresponds to the mean rank of five-integer-age groups with the same relative location in the distribution (e.g., ranks one to five).

After applying the adjusted rank transformation to the adjusted voting propensities, we use the data set to estimate a version of equation (4). We do not have theoretical priors regarding the functional form of the aging effect $m(AGE_{c,t})$. Orientations and attitudes may change linearly in time or change more rapidly at some stages of the lifecycle than at others. To obtain estimates of the lifecycle-specific average field rank (lowest rank to the largest orientation value) conditional on arbitrary cohort effects as well as on marginal aging effects that are specific to age groups \tilde{a} , we estimate the following empirical specification:

⁵ For a handful of cohort-period observations, we impute the propensity of voting outcomes due to missing values. This is required to ensure the comparability of the rank measure across periods. See Section 7 in the Appendix for details.

$$\tilde{R}_{c,t} = \beta_{\tilde{a}} AGE_{c,t} + \varphi_{c,\tilde{a}} + \epsilon_{c,t,\tilde{a}}, \quad (5)$$

where $AGE_{c,t}$, as before, is the age of cohort c in period t , $\beta_{\tilde{a}}$ is the marginal effect of aging for age group \tilde{a} , $\varphi_{c,\tilde{a}}$ is a cohort effect, and $\epsilon_{c,t,\tilde{a}}$ is an error term. We estimate this model in a series of locally weighted (linear) regressions (LWR) (Cleveland & Devlin, 1988). In each regression, we weight all observations by their distance from age group \tilde{a} using weights that are defined by a Gaussian kernel of the form

$$w_{c,t,\tilde{a}} = \frac{1}{\kappa\sqrt{2\pi}} \exp\left(-\frac{1}{2}\left(\frac{AGE_{t,c} - \tilde{a}}{\kappa}\right)^2\right), \quad (6)$$

where κ is the bandwidth defined as $\kappa = \mu\lambda$, λ is the Silverman rule-of-thumb bandwidth and μ is a multiplier.⁶ We note that before we run the LWR, we run an additional auxiliary regression of ranks against cohort fixed effects to remove any time-invariant components from the data.

Using this empirical approach, we obtain a local estimate of the marginal effect of aging $\hat{\beta}_{\tilde{a}}$ for each age group. Age-group- \tilde{a} -specific predicted (conditional on cohort effects) ranks are recovered as $\hat{\beta}_{\tilde{a}} AGE_{c,t} + \bar{\varphi}$, where $\bar{\varphi}$ is the mean over the cohort effect of any cohort at any period. Specification obviously (5) collapses to the standard linear parametric model as $w_{c,t,\tilde{a}}$ approaches a uniform distribution ($\mu \rightarrow \infty$).

5.2 Aging effects

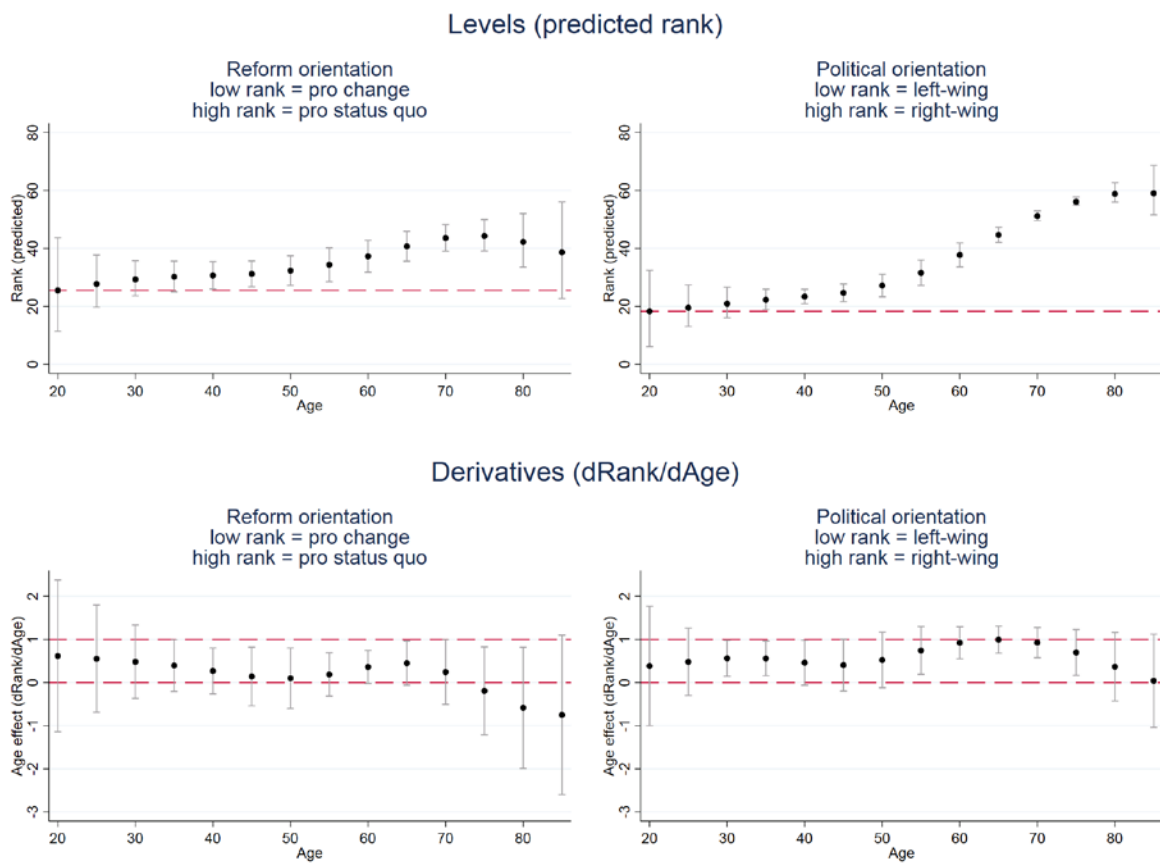
In the first implementation of the LWR approach described above, we estimate the effect of aging on reform orientation and political orientation across all referenda. The results are presented in Figure 6 for the rule-of-thumb bandwidth ($\mu = 1$). In the Appendix, we also present results using larger bandwidth multipliers because non-parametric estimation of derivatives (here $\partial R_{c,t} / \partial AGE_{c,t}$) often requires more smoothing than levels.

Up to the age of 70, the general trend is that voters increasingly support the status quo as they age. Further aging, however, is associated with increasing support for change. Over the entire voting lifetime there is a significant but moderate increase in the mean reform orientation rank by 12 steps, which corresponds to 0.18 (= 12/(85 – 20)) ranks per year. The marginal aging effects are mostly close to zero and even negative for the oldest age groups. They are not statistically significant at the 95% level for any age group.

⁶ The (Silverman, 1986) rule defines the bandwidth as $\lambda = 1.06 \times \sigma N^{-\frac{1}{5}}$.

In keeping with the cross-sectional effects in Figure 2, the aging effects on political orientation are larger. The political orientation continuously changes from left to right as cohorts age. The mean political orientation rank increases by 41 from 19 to 60 over the course of the lifecycle. This corresponds to more than 0.6 ranks per year. The marginal aging effects are positive (and often significant at the 95% level). There appears to be a particularly strong shift in the political orientations when voters are in their 60s, when the marginal effect is close to the upper bound of one, confirming the retirement effect suggested by the cross-sectional analysis in Section 4.

Fig. 6. Semi-non-parametric aging effect on reform and political orientation rank



Notes: This figure is based on individual data from exit polls from 305 referenda from 1981 to 2017. Upper panels show the predicted rank from locally weighted polynomial (degree = 1) regressions (LWR) of reform/political orientation rank against voter age while controlling for cohort effects. Before running the LWR, cohort fixed effects are removed in auxiliary linear regressions. LWRs are weighted by distance from an age bin (the black dots) using a Gaussian kernel and a Silverman rule-of-thumb bandwidth. Bottom panels show the marginal effect of age on the orientation rank. Individual data are aggregated to the age-group-period level. Reform [political] orientation rank is the rank in the distribution of mean (adjusted) reform [political] orientation within five-year age (20-24, 25-29,..., 85-89) x five-year period (1980-1984, 1985-1989,..., 2015-2017) cells. Reform [political] orientation ranks are field ranks that increase in status-quo [right-wing] orientation. The reform [political] orientation is encoded as zero if the vote is in line with the status quo [the political right] and one if the vote is in line with a vote for change [the political left]. The reform [political] orientation is adjusted in a first-stage regression of the reform [political] orientation against a battery of first-stage controls and referendum-age-bin fixed effects in which the latter are used to generate the rank measures used here. 95% confidence intervals (bars) based on standard errors clustered on cohort fixed effects.

An increase in the bandwidth multiplier results in a more linear age effect, as expected. As the bandwidth increases, the marginal aging effects on the reform orientation remain insignificant whereas the marginal aging effects on the political orientation all eventually become significantly different from zero and statistically indistinguishable from one (see Section 8 in Appendix I). As the bandwidth approaches infinity, we obtain the linear parametric rank models (4) and (10) reported in Table 4, in which we also report models excluding cohort effects (1, 3, 7, 9) and individual controls (1, 2, 7, 8). One insight from Table 4 is that controlling for individual effects (in the first-stage) has a minor effect on the orientation ranks; if anything, the aging effect increases. Thus, the aging effect is independent of income, housing tenure (renter vs. owner), marital status, number of children, and many other individual attributes that may change as voters age.

More central to the research question, Table 4 also reveals that controlling for cohort effects reduces the age effect. The age effect on the reform orientation rank, in the preferred models controlling for voter characteristics (4 vs. 3), decreases by more than one-third. The age effect also changes from being significant to being insignificant. For the aging effect on the political orientation rank, the effect of controlling for cohort effects, at -16%, is smaller in relative terms. Conditional on cohort effects, the aging effect on the orientation rank, at 0.62, is large, highly significant, and consistent with the non-parametric results in Figure 6. In keeping with the non-parametric estimates, we find that the aging effect on the political orientation rank is particularly strong among older age groups (model 12).

In terms of political orientations, the overall evidence suggests that as cohorts age, they become less supportive of left-wing policies and more supportive of right-wing policies. Evidence of an aging effect on the reform orientation is weak at best. The results thus support the notion from the more descriptive analyses in Section 4. The generation gap in political orientation largely appears to originate from aging effects and not just from correlated cohort effects. Moreover, an increasing status-quo preference due to habituation does not appear to be the primary driver of the aging effect on the political orientation because in that case, larger effects on the reform orientation would have been expected.

Tab. 4. Parametric aging effects on reform and political orientation rank

<i>Reform orientation rank</i>	(1)	(2)	(3)	(4)	(5)	(6)
Age (years)	0.301 ^{***}	0.146	0.291 ^{***}	0.187	0.406	0.060
	(0.104)	(0.196)	(0.106)	(0.197)	(0.389)	(0.386)
r2	0.091	0.326	0.085	0.371	0.459	0.343
<i>Political orientation rank</i>	(7)	(8)	(9)	(10)	(11)	(12)
Age (years)	0.720 ^{***}	0.576 ^{***}	0.738 ^{***}	0.617 ^{***}	0.583 [*]	0.920 ^{***}
	(0.081)	(0.156)	(0.071)	(0.201)	(0.292)	(0.232)
r2	0.519	0.737	0.545	0.737	0.437	0.798
Cohort effects	-	Yes	-	Yes	Yes	Yes
Controls	-	-	Yes	Yes	Yes	Yes
Ages	All	All	All	All	< 50	>= 50
N	112	112	112	112	48	64

Notes: The output is inferred from individual data from exit polls from 305 referenda from 1981 to 2017. Individual data are aggregated to the age-group-period level. Reform [political] orientation rank is the rank in the distribution of mean (adjusted) reform [political] orientation within five-year age (20-24, 25-29, ...) x five-year period (1980-1984, 1985-1989, ..., 2010-2014) cells. Prior to the LWR, cohort effects are removed after running an auxiliary regression of the orientation rank against cohort fixed effects where indicated. Reform [political] orientation ranks are field ranks that increase in status-quo [right-wing] orientation. The reform [political] orientation is encoded as zero if the vote is in line with the status quo [the political right] and one if the vote is in line with a vote for change [the political left]. The addition of controls means that the reform [political] orientation is adjusted in a first-stage regression of the reform [political] orientation against a battery of first-stage controls and referendum-age-bin fixed effects in which the latter are used to generate the rank measures used here. Standard errors are clustered on cohort fixed effects where included. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Figure 7 replicates the analysis separately for referenda in the four different attitude groups defined in Table 1. We focus on the level effects for brevity (the marginal effects are reported in Section 8 in Appendix I).

We find a relatively strong effect of aging on ideological attitudes. As they age, cohorts' attitudes shift from liberal (left-wing) to conservative (right-wing). Controlling for cohort effects, the average rank increases by approximately 40 ranks over one's voting life, which corresponds to approximately two-thirds of a rank for every year of aging. Within referenda in this attitude group, the effect of aging on reform orientation ranks is smaller and more ambiguous as cohorts over their voting life become first more reform-affine and then more reform-averse.

Within the environmentalist attitude group, there is a similar transition from left-wing (high priority to environment protection) to right-wing attitudes (low priority). The age trend is fairly linear, implying that changes in attitudes occur at an approximately constant rate over one's voting life. By contrast, the shift from a pro-young (left-wing) to a pro-elderly (right-wing) attitude occurs quite sharply near the retirement age, which, as previously discussed, is plausible given that many reform projects in this group do not benefit those who have already retired (fewer maximum working hours, earlier retirement age, minimum wages, etc.). Within both the environmentalist and genera-

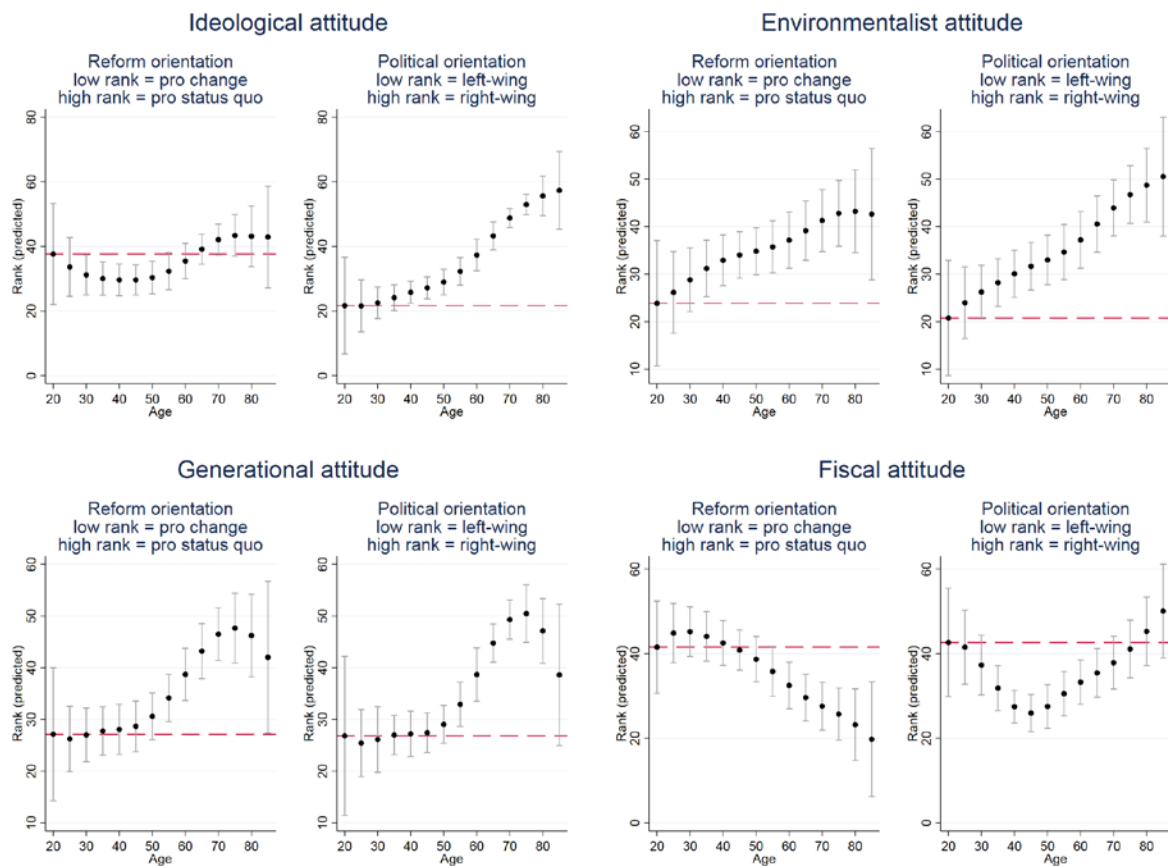
tional attitude groups, the aging effect on reform orientation are slightly muted but generally similar to the effects on attitudes.

The aging effect on fiscal attitude is non-monotonic. Until the age of 40, voters in relative terms are increasingly more inclined to support fiscally progressive policies (left-wing). Over their remaining life, voters gravitate back toward a greater preference for regressive policies. The aging effect on the reform orientation rank within the same set of referenda is more monotonic. Voters, as they age, increasingly vote for change in order to support policies that have fiscally regressive implications.

Overall, the age trends in attitude ranks controlling for cohort effects are quite consistent with the cross-sectional age effect on attitudes reported in Figure 2, once again suggesting that genuine aging effects drive the generation gap. A comparison between the age effects on the political orientation ranks and the reform orientation ranks within the ideological and fiscal attitude groups suggests that the motivation behind the voters' shift in orientation is more likely to be utility-maximization than habituation. The strong retirement effect on generational attitudes further supports this interpretation. Nevertheless, given the strong collinearity between reform orientation and political orientation within the environmentalist and generational attitude groups (see Table 2), it is difficult to formally reject the utility-maximization hypothesis in favor of the habituation hypotheses within these groups.

To save space, we leave the presentation of the results from linear parametric models that correspond to Figure 7 to Appendix I (Section 8). The results substantiate the interpretations presented here.

Fig. 7. Semi-non-parametric estimates of rank by age and attitude group



Notes: This figure is based on individual data from exit polls from 305 referenda from 1981 to 2017. All panels show the predicted rank from locally weighted polynomial (degree 1) regressions (LWR) of reform/political orientation rank against voter age controlling cohort effects. LWRs are weighted by distance from an age bin (the black dots) using a Gaussian kernel and a Silverman rule-of-thumb bandwidth. Individual data are aggregated to the age-group-period level. Prior to the LWR, cohort effects are removed after running an auxiliary regression of the orientation rank against cohort fixed effects. Reform [political] orientation rank is the rank in the distribution of mean (adjusted) reform [political] orientation within five-year age (20-24, 25-29, ...) x five-year period (1980-1984, 1985-1989, ..., 2010-2014) cells. Reform [political] orientation ranks are field ranks that increase in status-quo [right-wing] orientation. The reform [political] orientation is encoded as zero if the vote is in line with the status quo [the political right] and one if the vote is in line with a vote for change [the political left]. The reform [political] orientation is adjusted in a first-stage regression of the reform [political] orientation against a battery of first-stage controls and referendum-age-bin fixed effects, in which the latter are used to generate the rank measures used here. 95% confidence intervals (bars) based on standard errors clustered on cohort fixed effects. LWR estimates of the marginal aging effects are in Section 8.2 in the Appendix.

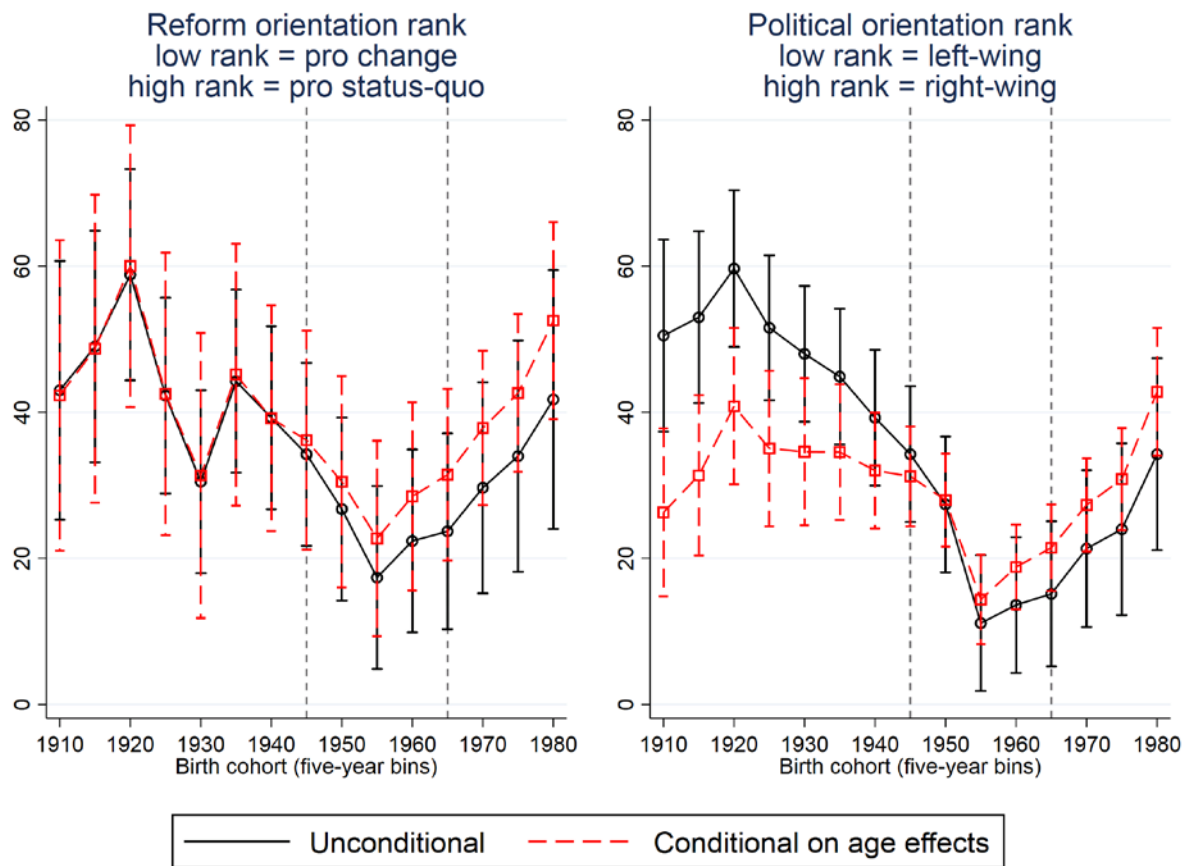
5.3 Cohort effects

Although age is a significant determinant of voter orientations, the significant increase in the explanatory power of the models in Table 4 once cohort effects are added also suggests a role for cohort effects. The figure below illustrates the effects of cohort affiliation on reform orientation and political orientation. To this end, we report the unconditional mean orientation (adjusted for indi-

vidual characteristics) ranks by cohort group as well as the conditional means controlling for age. The latter are recovered from regressions of orientation ranks against age and cohort effects.

Figure 8 shows remarkable changes in voter orientations across cohort groups, which generally seem to coincide with popular definitions of social generations. The traditionalists (until 1945) tend to support the status quo and right-wing policies; the baby boomers (1946-1964) have the strongest inclination to support changes in legislation in general and left-wing policies in particular; generation X (1965-1976), and even more so generation Y (from 1977), are more similar to the traditionalists in terms of reform orientation and political orientation, broadly defined (Smola & Sutton, 2002). Notably, there is less variation in the mean political orientation ranks across cohorts once age is controlled for. The implication is that some of the voting behavioral differences across generations that have been observed in past decades are attributable to the generations' being in different stages in their lifecycles rather than differences in shared experiences. For example, much of the difference in political orientation between the traditionalists and the baby boomers can be attributed to the fact the former, at any given point in time, are older than the latter. Nevertheless, even conditional on age effects, cohort effects remain quantitatively important. Controlling for age, traditionalists born in 1935-1939, compared with baby boomers born in 1955-1959, are, on average 20 steps higher in the political orientation rank distribution (more right-wing). At an average aging effect on the orientation rank of 0.62 (Table 4, model 10), this cohort effect is equivalent to the effect of a cohort aging by 32 years (approximately half of a voting life).

Fig. 8. Cohort effects on orientation ranks

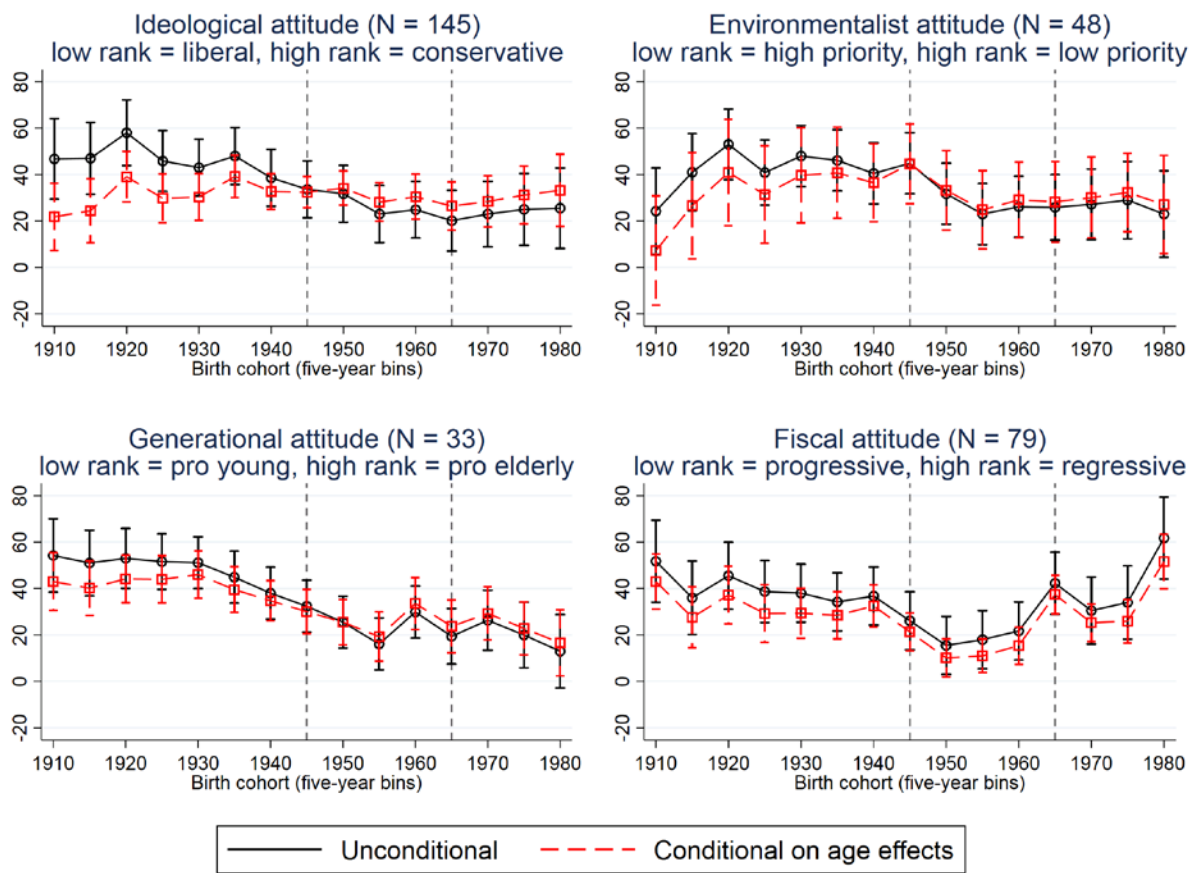


Notes: The output is inferred from individual data from exit polls from 305 referenda from 1981 to 2017. Data are aggregated to the age-group-period level. Reform [political] orientation rank is the rank in the distribution of mean (adjusted) reform [political] orientation within five-year age (20-24, 25-29, ...) x five-year period (1980-1984, 1985-1989, ..., 2010-2014) cells. Reform [political] orientation ranks are field ranks that increase in status-quo [right-wing] orientation. The reform [political] orientation is encoded as zero if the vote is in line with the status quo [the political right] and one if the vote is in line with a vote for change [the political left]. The reform [political] orientation is adjusted in a first-stage regression of the reform [political] orientation against a battery of first-stage controls and referendum-age-bin fixed effects in which the latter are used to generate the rank measures used here. Unconditional cohort effects are the mean orientation ranks by cohort. Conditional cohort effects are recovered from regressions of orientation ranks against age group dummies omitting the 40-44 group as reference category and cohort fixed effects. Vertical dotted lines bond the social generation of “baby boomers”. Earlier cohorts are “traditionalists”. Later cohorts belong to “generation X” and “generation Y”. Error bars indicate confidence intervals at the 95% level based on cluster-robust standard errors.

Analogous to Figure 8, we illustrate the conditional and unconditional mean cohort ranks by cohort and attitude group in Figure 9. The distribution of unconditional mean ideological attitude ranks by cohort is consistent with a conservative attitude that is often ascribed to the traditionalist generation (Pew Research Center, 2011). However, once we control for age effects, ideological attitudes vary only moderately across cohorts, suggesting that the traditionalists’ conservative attitude – at least with regard to votes in Swiss referenda – is attributable to the generation’s age and not cohort-specific values. For the other attitude groups, the cohort affiliation net of the age effect is more

important. Starting with the baby boomers, cohorts have a stronger environmentalist attitude, possibly because of experiencing a more prominent public debate on environmental issues during their formative years. A similar transition is evident for generational attitudes although at a smoother rate. From 1930 to the 1950, birth cohorts have gradually become more sympathetic to policies that – in relative terms – benefit the workforce and families with dependent children (the young). In terms of fiscal attitudes, the baby boomers stand out because they, more than other generations, are willing to support progressive fiscal policies, possibly because of strong preferences for social equality. In general, these results substantiate descriptive evidence from US surveys (Pew Research Center, 2018).

Fig. 9. Cohort effects by attitude groups



Notes: The output is inferred from individual data from exit polls from 305 referenda from 1981 to 2017. Data are aggregated to the age-group-period level. Reform [political] orientation rank is the rank in the distribution of mean (adjusted) reform [political] orientation within five-year age (20-24, 25-29, ...) x five-year period (1980-1984, 1985-1989, ..., 2010-2014) cells. Reform [political] orientation ranks are field ranks that increase in status-quo [right-wing] orientation. The reform [political] orientation is encoded as zero if the vote is in line with the status quo (the political right) and one if the vote is in line with a vote for change [the political left]. The reform [political] orientation is adjusted in a first-stage regression of the reform [political] orientation against a battery of first-stage controls and referendum-age-bin fixed effects, in which the latter are used to generate the rank measures used here. Unconditional cohort effects are the mean orientation ranks by cohort. Conditional cohort effects are recovered from regressions of orientation ranks against age group dummies omitting the 40-44 group as reference category and cohort effects. Vertical dotted lines bond the social generation of “baby boomers”. Earlier cohorts are “traditionalists”. Later cohorts belong to “generation X” and “generation Y”. N is the number of referenda per attitude group. Error bars indicate confidence intervals at the 95% level based on cluster-robust standard errors.

5.4 Robustness and extensions

In this section, we summarize the results of several additional pieces of analysis that substantiate the interpretations presented thus far and whose detailed presentation, to save space, we relegate to Appendix I, Section 9. First, we estimate the effects of aging on the political orientation rank, controlling for reform orientation rank (and cohort effects) and vice versa. The results further substantiate the impression that compared with the habitation hypothesis, the utility-maximization hypothesis has more support in the data with regard to explaining the generation gap in direct de-

mocracy. Second, we examine the serial correlation in cohorts' orientation ranks. We find that lagged political orientation ranks are strong predictors of contemporary political orientation ranks, suggesting a role for cohort effects. However, we also find that this serial correlation is largely attributable to serial correlation in age, providing further support for the importance of aging in addition to cohort effects. Third, we show that in our data, the time-invariant components in orientation ranks (cohort effects) are correlated with age. This is a source of bias in the cross-sectional analysis of age effects, highlighting the importance of exploring panel data to control for cohort effects. Fourth, we back out the implied effect of aging on reform orientation and political orientation levels combining the estimated aging effects on orientation ranks (from Table 4, fourth column) with estimates of the relationship between orientation ranks and orientation levels. Accordingly, aging by one year reduces the probability of voting for change by 0.08 percentage points and the probability of voting for a left-wing policy by 0.13 percentage points. These effects are roughly consistent with, although marginally smaller than, the aging effects obtained from individual-level regressions of orientation levels against individual controls, referendum effects, and generation (those defined in Figure 8) effects. Fifth, and related to the previous point, not controlling for period effects (explicitly or implicitly by means of the rank transformation) and instead controlling for arbitrary cohort effects results in aging effects on orientation levels that are substantially larger. To the extent that period effects capture the effect of average population aging on the average electoral outcome, the aging effects identified from changes in the relative positioning within periods are of a conservative nature. Sixth, we show that our main results are robust to the exclusion of referenda that are likely to pass with a large majority as well as ambiguous referenda that are not straightforward to assign to the attitude groups introduced in Table 1 (see Appendix I, Section 9.5).

6 Impact of population aging on direct democracy outcomes

The results presented thus far indicate a causal effect of aging on voter orientation. The implication is that in aging societies, voters become more resistant to change and more inclined to support policies that are commonly associated with the political right. In particular, voter attitudes are expected to become less liberal and environmentalist and more pro-elderly. To gauge the quantitative relevance of population aging in a rapidly aging country such as Switzerland, it is useful to approximate the effect that population aging had on voter orientations over the course of our study period.

We begin by presenting the average voting outcome $\bar{V}_{a,t}$ of age group a in period t as a function of AGE_a and an arbitrary age group-period effect $b_{a,t}$:

$$\bar{V}_{a,t} = b_{a,t} + g(AGE_{a,t}) \quad (7)$$

The mean vote in the voting population is defined by:

$$\bar{V}_t = \sum_a n_{a,t} \bar{V}_{a,t}, \quad (8)$$

where $n_{a,t} = N_{a,t}/N_t$ and $N_{a,t}$ is the number of voters within age group a in period t and $N_t = \sum_a N_{a,t}$ is the number of voters in a period. In our thought experiment, we compare the average vote to a counterfactual average vote \hat{V}_t in a hypothetical scenario in which the population does not age.

$$\hat{V}_t = \sum_a \hat{n}_a \bar{V}_{a,t}, \quad (9)$$

where $\sum_a \hat{n}_a = \sum_a n_{a,t} = 1$ and \hat{n}_a are time-invariant shares of age groups within the total number of voters. The effect of a change in the age distribution on the average vote is then simply the difference between the counterfactual vote and the observed average vote.

$$\Delta V_t = \hat{V}_t - \bar{V}_t, \quad (10)$$

Substituting equations (7-9) into (10) yields:

$$\Delta V_t = \sum_a (\hat{n}_a - n_{a,t}) g(AGE_a) \quad (11)$$

In Section 2, we discussed at length that $g(AGE_a)$ cannot be estimated without constraints. However, we estimated the causal effect of age on the orientation rank, i.e., the rank a cohort occupies in the distribution of votes within a period. Since the orientation rank is a function of the orientation (the mean vote), we can describe the average relationship (across all periods) between the orientation rank \bar{R}_a and age as $\bar{R}_a = R(\bar{V}_a(AGE_a)) = \bar{m}(AGE_a)$. Solving for $\bar{V}_a = R^{-1}(\bar{m}(AGE_{c,t}))$ and substituting into equations (8) and (9) and then into (10) yields

$$\Delta V_t = \sum_c (\hat{n}_a - n_{a,t}) R^{-1}(\bar{m}(AGE_a)) \quad (12)$$

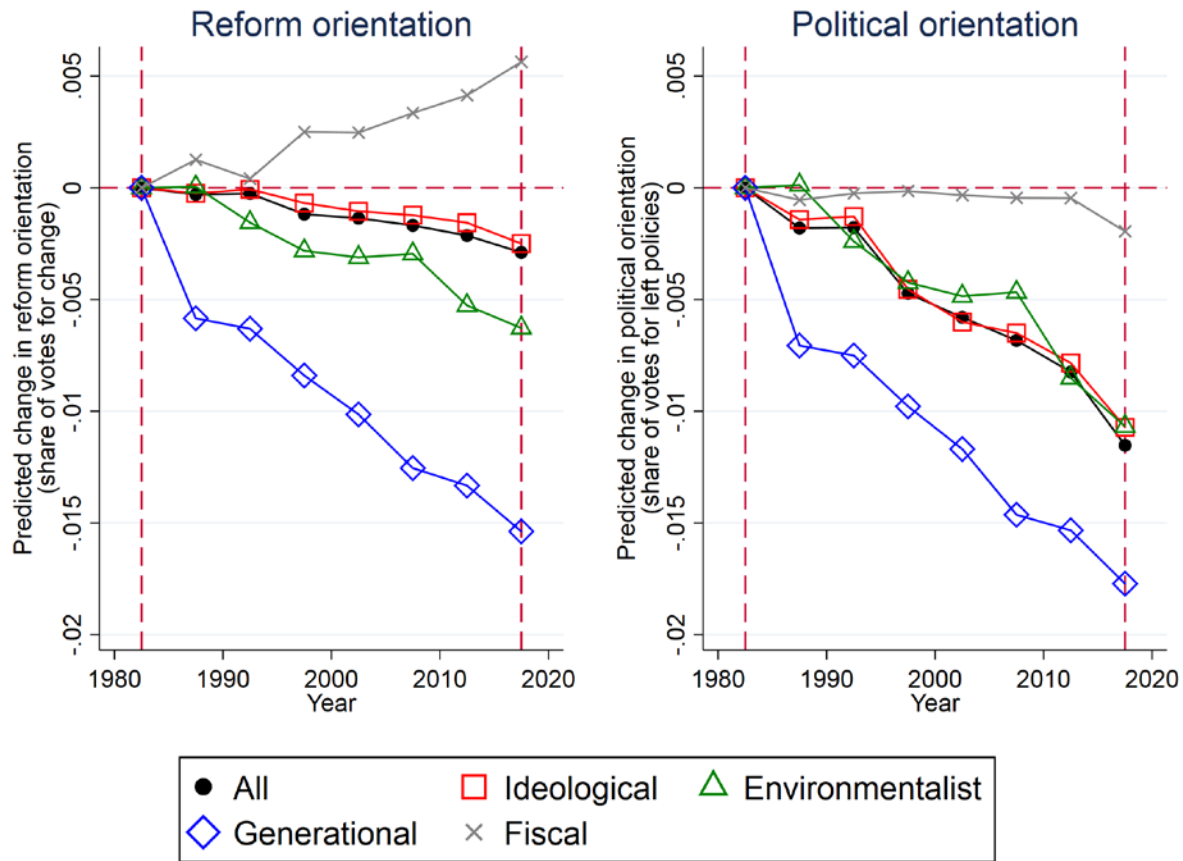
Consistent with the analysis in Section 6, we analyze the data at the level of five-year bins; i.e., periods are defined as $t = (1980-1984, 1985-1989, \dots, 2015-2017)$ and age groups are defined as $a = (20-24, 25-29, \dots, 85-89)$. To quantitatively assess the impact of population aging on reform orientation and political orientation, we hold the counterfactual age distribution constant at the levels of the first period, i.e., $\hat{n}_a = n_{c,t=1980-1984}$. As an approximation of $\bar{m}(AGE_a)$ we use the predicted values from the LWR estimates displayed in Figure 6 (all referenda) and Figure 7 (by attitude

groups). Further, we approximate $R^{-1}(\bar{m}(\cdot))$ in a local polynomial (degree = 0) regression of the adjusted orientation (the mean vote controlling for individual covariates) against the orientation rank measures used throughout Section 6. Note that in computing \hat{n}_a and n_a , we use the age distribution as recorded in the survey data (as opposed to the aging of the total population) because in this manner, we implicitly account for the potential effects of aging on voter turnout (Goerres, 2007).

The aging effects ΔV_t by period and attitude groups are illustrated in Figure 10. As expected, given the evidence in Section 6, the effect of population aging was to increase the share of votes for the legal status quo as well as right-wing policies. The effect on the latter is somewhat stronger than on the former. In relative terms, the effects are greatest on referenda in the generational attitude group. This is the combined effect of attitudes in this group changing sharply once voters age beyond 50 and the most populous cohorts aging from below 50 to above 50 over the course of our study period. Compared with the other attitude groups, the effects on referendum outcomes in the fiscal attitude group differs in that there is a positive effect on the share of pro-change votes.

Overall, the effects of population aging are quantitatively relevant although not yet dramatic. In relative terms, the support of left policies, on average, would have been 2.4% higher in 2017 (relative to the mean share) if the age distribution had remained constant at 1981 levels. Within the generational attitude group, support for pro-young policies would have been 5.3% higher. To further assess the effect population aging had on direct democracy outcomes in Switzerland over the past four decades, we merge the effects displayed in the right panel of Figure 8 with the actual referendum outcomes by period and attitude group. Computing the counterfactual outcome without ageing, we identify five referenda for which the outcome would have been different (the left-wing instead of right-wing position option would have been chosen), all of which occurred since 2004. This is just 1.7% of the 305 referenda held since 1981 but 5.2% of the referenda held since 2004. Thus, the effects of population aging are limited and have not been decisive until recently. However, the effects will accumulate as population aging progresses unless the established age-orientation relationship changes. As discussed at the end of Section 6, it is also worth recalling that the aging effects we used in the counterfactual analysis are likely conservative estimates.

Fig. 10. Predicted effect of population aging on reform and political orientation



Notes: We analyze the micro data at the level of five-year bins; i.e., periods are defined as $t = (1980-1984, 1985-1989, \dots, 2015-2017)$ and age groups are defined as $a = (20-24, 25-29, \dots, 85-89)$. The predicted orientation is the difference in the mean predicted vote by age groups weighted by the shares of total voters between a scenario with the actual age distribution and a counterfactual scenario in which the age distribution is set to the 1980-84 level. Predicted votes are generated using the non-linear effect of age on the orientation rank (see Figures 6 and 7), and a non-linear mapping of orientation ranks to orientations obtained using pooled local polynomial (degree = 0) regressions. Age group shares are from the representative VoxIt surveys.

7 Conclusion

We document the existence of a generation gap in direct democracy outcomes across a wide range of topics using a pooled data set of postelection surveys covering 305 referenda held in Switzerland since 1981. Older voters express more conservative attitudes with regard to decisions on constitutional order, foreign affairs, or security policy. Older voters are also less likely to support policies that seek to protect the environment or benefit the working population, including families with children. Compared to younger and older voters, those in their 30s and 40s have the greatest taste for policies with progressive distributional consequences. These differences in attitudes and orientations originate at least partially from lifecycle-specific voting behavior. Different experiences shared by distinct generations are not sufficient to rationalize the generation gap. Utility maximiza-

tion rather than habituation to a status quo seems to be driving the changes in attitudes over the lifecycle.

One implication of our results is that population aging, one of the major global trends since the second half of the 20th century, has specifically affected direct democracy outcomes and perhaps the political economy more generally. Using a lower-bound estimate of the population aging effect, a counterfactual analysis identifies five referenda (5%) held since 2004 for which the majority vote would have been different if the age distribution had remained constant at the 1981 level. As population aging progresses, direct democracy outcomes are likely to become increasingly biased against the interests of the young and future generations. As an example, it will become more difficult to find support for reform projects that pay dividends in the long-run such as climate change mitigation policies or investments in durable infrastructure. Given that voters do not seem to fully internalize the benefits that accrue to the following generations, decisions on investment-like reform projects that involve long-run benefits and short-run costs may be better based on alternative decision-making processes.

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The generation gap in direct democracy: Appendix I

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1 Introduction

This appendix provides additional information on the data used in this study, includes auxiliary results, and complements our primary analysis by adding robustness checks and model extensions. Although this appendix replicates some text from the main paper for reasons of clarity, we note that it is not meant to stand alone.

2 Direct democracy in Switzerland

Direct democracy has been an established tool for making collective decisions in Switzerland since 1848. Obligatory and facultative referenda are a form of the right to veto Acts of Parliament. Adjudications concerning changes to the constitution and the ratification of international treaties must, by law, be put to public votes. All other adjunctions may be subject to facultative referenda although their implementation requires the collection of at least 50,000 signatures of eligible voters within a 100-day period. Whereas obligatory referenda as well demand a double majority to be accepted, facultative referenda only require a simple majority of the electorate.

Citizens who want to implement a popular initiative that facilitates amendments to the constitution must gather at least 100,000 signatures of eligible voters within an 18-month period. Occasionally, government authorities propose a counter initiative or alternative version to the original initiative on the same referendum ballot. For either the popular initiative, counter initiative, or alternative

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proposal to be accepted, a double majority is required (a majority of the electorate and a majority of the cantons). Nevertheless, the electorate decides individually on each referendum. The acceptance of two alternative versions on the same ballot hereby builds a special case, whose implications are determined *ex ante* by governmental and electoral campaign authorities.

In general, referenda on the federal level are held four times a year, with votes on up to ten to twelve referenda. Citizens are not required to register, and prior to each vote, every eligible voter receives the respective ballot documentation by mail with detailed material on the relevant referenda. These information include *inter alia* the pro and con arguments for each proposition, the estimated benefits and financial consequences, and optional information on the parliamentary debate and outside opinions by interest groups. Consequently, Swiss citizens have easy access to information regarding each referendum both through distributed information material and general discussion in the media. We therefore assume that the electorate is able to make informed decisions regarding the referenda under consideration.

The Swiss democratic system is rooted far back in history; thus, the Swiss have more than 150 years of experience exercising their political rights at the federal level. Women had no voting rights until 1971, which was years before our study period begins. Before March 1991, the eligible voter had to be at least 20 years old. To accommodate this fact, we only consider survey answers by voters aged 20 years or older.

3 Data and empirical specification

3.1 Sources

Our empirical analysis uses standardized repeated cross-sectional sample surveys for each referendum. Beginning in 1977, VOX surveys were conducted in the form of representative samples of approximately 1,000 eligible voters following each referendum. These telephone interviews take place during the three weeks following a referendum and cover three different categories of variables. First, questions regarding people's actual voting behavior and decisions with regard to the referendum under consideration, e.g. whether the person voted, what the person voted for, and whether she was well informed on the matter. Second, questions regarding individual political attitudes and voting behavior in general, e.g. party identification, trust in the government, participation frequency. Third, information on socio-economic data, e.g. age, gender, education level, income, home ownership, household size, marital status and geographical variables.

The VOX surveys changed significantly over time, which leads to substantial problems when we consider a set of referenda from different periods. To render these surveys comparable across time, the department of political science at the University of Geneva standardized the VOX surveys. These so called harmonized VoxIt surveys cover virtually all referenda since 1981. The data combine a standardized set of variables from the VOX surveys with official information regarding the corresponding referendum, e.g. results, turnout, government and party endorsement.

In 2016, the VOX project was replaced by the so-called VOTO surveys. The Swiss Federal Council announced public bidding, and the new institutions in charge of the postvote surveys were the Swiss Centre of Expertise in the Social Sciences (FORS), the Centre for Democracy Aarau (ZDA), and the LINK Institute for Market and Social Research. The VoxIt and VOTO surveys ask very similar questions. However, to include both survey data in our analysis, we harmonize the corresponding encoding of possible answers as presented in Section 3.3.¹

It is important to emphasize that survey data suffer from several weaknesses. Moreover, voting behavior and policy preferences may be subject to specific bias and fallacies (Bertrand & Mullainathan, 2001; Fowler & Margolis, 2014; Krosnick, 1999). Survey respondents may not have acquired sufficient information or simply may not have formed an opinion regarding specific questions and thus may not respond at all. Moreover, although people are aware of their guaranteed anonymity, scientists have noted a tendency to reply in a “politically correct” manner (Morris, 2001). However, another advantage of the VOX surveys is that they allow specific questions to be answered by indicating “Not Specified” or “Don’t Know/Not Sure”. This should mitigate the probability of the aforementioned bias (Groothuis & Whitehead, 2002; Krosnick, Alwin, & Krosniek, 1989).

Due to the long tradition of extensive political rights in Switzerland, citizens are experienced and used to communicating and expressing their political beliefs in the form of public votes and opinion polls. Correspondingly, every eligible voter automatically receives detailed information on each referendum, which is why we assume that the electorate is able to make informed decisions on each referendum (Funk & Gathmann, 2015).

¹ FORS is the Swiss national Centre of Expertise in the Social Sciences. It maintains a national social science data archive and facilitates access to official statistical data. For more information on the VOX, VoxIt and VOTO surveys, see www.forscenter.ch and <http://www.voto.swiss>.

With regard to the extensively practiced form of direct democracy in Switzerland, we must also consider the possible effects of ‘vote fatigue’. Because of the long tradition and acceptance of public votes in combination with the rather small number of referenda per year, we assume the potential effects of vote fatigue to be of less concern to our analysis (Funk & Gathmann, 2015).

A great advantage of the postvote surveys is that we use only information on voting behavior associated with real political and financial implications instead of responses to hypothetical survey questions. The electorate therefore has an incentive to answer truthfully because the official postvote survey analysis can be expected to affect the government’s future policy course. We furthermore restrict our analysis to the electorate who actually voted on the referenda under consideration. Hence, voters who answered the VOX surveys should not be prone to mask their true votes and political beliefs (Funk & Gathmann, 2015).

All data concerning the official referenda outcomes, e.g. voting results, turnout, topic, etc., come from the Federal Chancellery of Switzerland and can be found on their official web page (<https://www.bfs.admin.ch>). We also made use of the SWISSVOTES database, which provides the same data on Swiss referenda as the SFSO (<http://swissvotes.ch>). SWISSVOTES comprises several research projects. It is a service provided by the Institute of Political Science at the University of Bern and the Annual book of Swiss Politics (*Année Politique Suisse*). It was founded by the Swiss Confederation and the Swiss Federal Statistical Office (SFSO) and is supported by the Swiss National Science Foundation (SNSF).

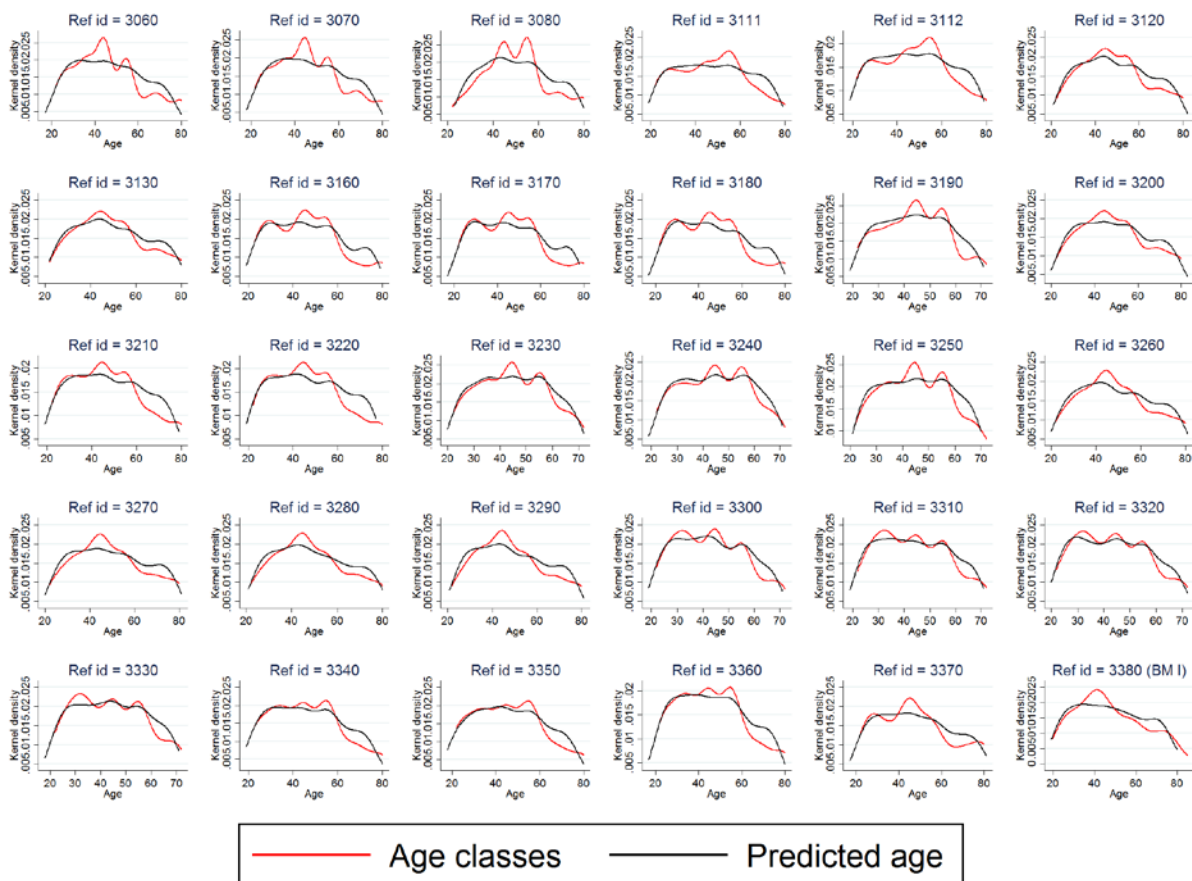
We note that the minimum voter age in Switzerland was lowered from 20 to 18 in 1991. To maintain a consistent definition over the study period, we exclude responses from voters below the age of 20. Moreover, we treat two specific initiatives and their counter-proposals as not mutually exclusive (VoxIt Nr. 781, 782). This means that we code a double yes vote as well as a yes vote in either one of the initiatives as only one observation and drop the other. We also drop one of the observations for double no votes. We apply the same procedure to one “unofficial counter-proposal” (VoxIt Nr. 711 and 712).

Lastly, the surveys for the referenda until 1985 did not ask for an integer for the respondent’s age, but for age classes of different intervals. There are 17 referenda included in our analysis subject to this matter. We predict an integer value of the individuals’ age using a procedure that we describe in Appendix I Section 3.2.

3.2 Imputation of age integers within age categories

We first apply a polynomial regression on an individual’s age by education level, homeowner status, and further control variables for all 12 pooled VoxIt survey data from 1985. We then sort the observations by age class and predicted age. Individuals with a low predicted age are sorted in descending order within age classes, i.e. the lowest predicted age is at the top. We then estimate a trend for each age class along the ranked order. Finally, we predict the individuals’ age for the surveys before 1985 by the respective estimated age-trend together with the estimated coefficients for the control variables from step one. The age-trend should function as a strong instrument. This should also avoid potential problems concerning our two-stage APC regression model since we use these controls in the first stage as well. Figure A1 shows the plots for age classes and predicted age for all affected referenda.

Fig A1. Age prediction for referenda that only ask for age classes, 1981-1985



Notes: Kernel is Gaussian. Predicted age is recovered from regressions of age bins against covariates; see Section 3.3 and Section 6. Figure A1 shows the predictions for the 17 referenda that only ask for age classes from 1981 to 1984 (Ref id=3060, ..., 3250) together with the predictions for our training data that comprise the 12 referenda that were held in 1985 (Ref id=3260, ..., 3379), and the first referendum held in 1986 (Ref id=3380) as benchmark and test set, respectively.

3.3 VoxIt and VOTO survey data harmonization

The VoxIt and VOTO surveys ask very similar questions. However, to merge and include the data of both surveys in our analysis, we harmonize the corresponding encoding of possible answers as shown in Table A1.

Tab A1. Post vote survey harmonization scheme

Variable	VOXIT	Recoding	VOTO	Recoding
Vote decision	a02x	vote	vote_1/_2/_3	vote
Referendum year	annee	year	year	year
Age	age	age	age	age=year-cohort
Cohort	cohort=year-age	cohort	birthyear	cohort
Gender	sexe	Sex	sex	sex
Female	0	0	2	0
Male	1	1	1	1
NS/Missing	9/.	9999	-	9999
Living-Standard	nivmena	income	income	income
Low-Mid	3	0	5/6/7/8	0
Low	4	1	1/2/3/4	1
High-Mid	2	2	9/10/11/12	2
High	1	3	13/14/15	3
NS/Missing	9/.	9999	98/99/.	9999
Education-lvl	educ	education	educ	education
Low	2	0	1/10	0
Min	1	1	22/31/32	1
Low-Mid	3	2	33	2
High-Mid	4	3	40	3
High	5	4	51	4
Max	6	5	52/60	5
NS/Missing	9/.	9999	97/98/99/.	9999
Carownership/HH	voiture	car	auto_besitz	car
Car	1	0	2/3	0
No Car	0	1	1/4/3	1
NS/Missing	9/.	9999	8/9/.	9999
Confession	confess	confession	confess	confession
Protestant	1	0=0	1	0
Roman-Catholic	2	1=2/5	2	1
Christ-Catholic	5	2=3/4	3/4/5	2
Other	3	9999= 9999	9/.	9999
Atheist	4	-	-	-
NS/Missing	9/.	-	-	-
Employment	actilu	employed	acti	employed
Employed	1	0	1/2/3/4/6	0
Not Employed	2	1	5/7/8/9/10	1

Variable	VOXIT	Recoding	VOTO	Recoding
NS/Missing	9/.	9999	98/99/.	9999
Employment lvl	actitauX	lvl_employed	workload	lvl_employed
30+ h/w	1	0	10	0
6-29 h/w	2	1	21/22	1
1-5 h/w	3	2	23	2
NS/Missing	9/.	9999	98/99/.	9999
Homeowner	statloge	homeowner	habitat	homeowner
Rent/Coop	2/3	0	1	0
Property	1	1	2	1
NS/Missing	9/.	9999	7/8/9/.	9999
Persons/HH	tmenage	pers_hh	hhsizE	Pers_hh
2 Persons	2	0	2	0
1 Person	1	1	1	1
3 Persons	3	2	3	2
4+ Persons	4/5/6	3	4	3
NS/Missing	9/.	9999	.	9999
Marital Status/HH	etatciv	civil_status	maritalstatus	civil_status
Married	2	0	2	0
Single	1	1	1/7	1
Divorced	3	2	4	2
Widowed	4	3	3	3
Living w Partner	5	4	5/6	4
NS/Missing	7	7/9/.=9999	9/.	9999
Region	vilcamp	city1	inhabitants	city1
City	1	0	1/2/3	0
Rural	2	1	4/5/6	1
NS/Missing	9/.	9999	.	9999
Canton / Location	location_help	location	bigregion	location
0 ZH	3 Zurich	0 Middleland	1 Lake Geneva	0 Middleland
1 BE	1 Middleland	1 Central	2 Middleland	1 Central
2 LU	5 Central	2 Lake Geneva	3 North-West	2 Lake Geneva
3 UR	5 Central	3 East	4 Zurich	3 East
4 SZ	5 Central	4 North-West	5 East	4 North-West
5 OW	5 Central	5 Ticino	6 Central	5 Ticino
6 NW	5 Central	6 Zurich	7 Ticino	6 Zurich
7 GL	4 East	9999	9999	9999
8 ZG	5 Central	-	-	-
9 FR	1 Middleland	-	-	-
10 SO	1 Middleland	-	-	-
11 BS	2 North-West	-	-	-
12 BL	2 North-West	-	-	-
13 SH	4 East	-	-	-
14 AR	4 East	-	-	-
15 AI	4 East	-	-	-

Variable	VOXIT	Recoding	VOTO	Recoding
16 SG	4 East	-	-	-
17 GR	4 East	-	-	-
18 AG	2 North-West	-	-	-
19 TG	4 East	-	-	-
20 TI	6 Ticino	-	-	-
21 VD	0 Lake Geneva	-	-	-
22 VS	0 Lake Geneva	-	-	-
23 NE	1 Middleland	-	-	-
24 GE	0 Lake Geneva	-	-	-
25 JU	1 Middleland	-	-	-
8888/9999 NS/Missing	9999	-	-	-
Participation	p01	particip	part2	particip
10/10	10	0	10	0
1/10	1	1	1	1
2/10	2	2	2	2
3/10	3	3	3	3
4/10	4	4	4	4
5/10	5	5	5	5
6/10	6	6	6	6
7/10	7	7	7	7
8/10	8	8	8	8
9/10	9	9	9	9
NS/Missing	98/99/.	9999	98/99/.	9999
Party-Identification	party_help	party	party	party
0 None	0	0	96	0
1 PCS/CSP	1/13/21	1	1	1
2 PDC/CVP	12	2	2	2
3 PEP/EVP	20/4	3	3	3
4 PRD/FDP	2	4	4	4
5 PdL/FPS	6/5	5	5	5
6 PES/GPS	19	6	6	6
7 AdI/LdU	7/18	7	7	7
8 Lega	3	8	8	8
9 PLS/LPS	8/9	9	9	9
10 PdT/PdA	30/31/10/11/14/15/ 16/17	10	90/97/10	10
11 DS/SD	32	11	95	11
12 PSS/SPS	8888/9999	9999	98/99/.	9999
13 UDC/SVP	-	-	-	-
14 FraP	-	-	-	-
15 AV/GB	-	-	-	-
16 AdG	-	-	-	-
17 UDF/EDU	-	-	-	-

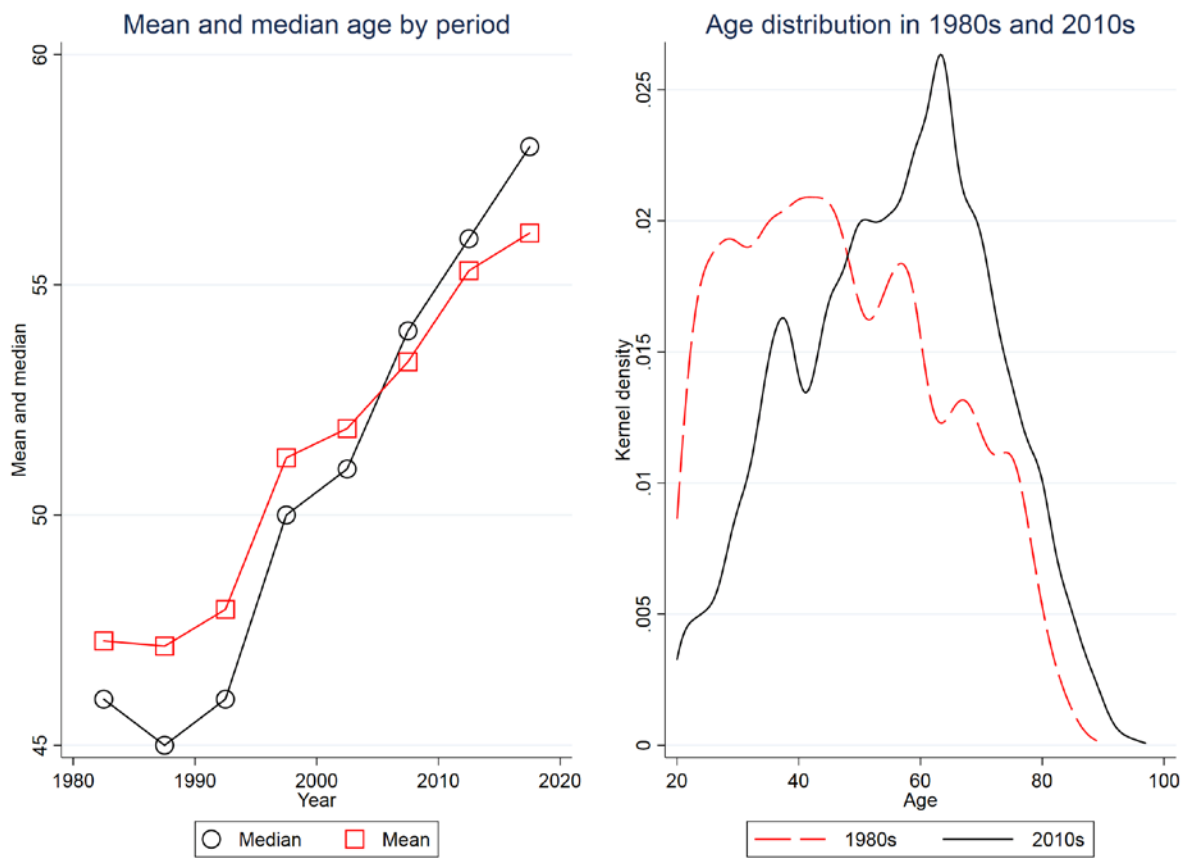
Variable	VOXIT	Recoding	VOTO	Recoding
18 PBD/BDP	-	-	-	-
19 GLP	-	-	-	-
20 PLR/FDP	-	-	-	-
21 PDC+PCS Group	-	-	-	-
22 Other Party	-	-	-	-
23 Other Parties	-	-	-	-
24 Specific Person	-	-	-	-
88889/9999 NS/Missing	-	-	-	-
Gov trust	a22	gov_trust	trust_1	gov_trust
Trust	1	0	6/7/8/9/10	0
Mistrust	2	1	1/2/3/4/5	1
NS/Missing	8/9/.	9999	98/99/.	9999
Ref type	typex	ref_type	-	ref_type
Initiative	1	0	-	0
Facultative Ref	2	1	-	1
Mandatory Ref	3	2	-	2
Counter Ref	4	3	-	3
Gov recom	motcfx	recom	-	recom
Yes	1	1	-	1
No	0	0	-	0
NS/Missing	.	9999	-	9999

Notes: Data correspond to the Swiss VOXIT and VOTO post-vote referendum surveys. See <http://forscenter.ch> and <http://www.voto.swiss> for detailed information on each survey question.

4 Aging in Switzerland

Figure A2 shows the age distribution in the VoxIt and VOTO survey data. In this context, it is important to note that we only considered voters who effectively participated in the respective referenda. Hence, the age distribution presented in Figure A2 is not representative of the overall Swiss population structure; instead, it represents the actual voting population. In addition to higher turnout rates for older voters, we further note that the minimum voter age in Switzerland was lowered from 20 to 18 in 1991. To maintain a consistent definition over the study period, we exclude responses from voters below the age of 20.

Fig A2. Age distributions in survey data



Notes: Individual voting data on 177,851 observations from the VoxIt and VOTO postvote surveys corresponding to 305 referenda from 1981 to 2017 in Switzerland. We restrict our data set to survey respondents who effectively casted a Yes or No vote in a referendum. In addition, we only consider voters who were 20 years or older. See Section 3 for further information.

5 Voting results by age: Complementary evidence

To provide complementary descriptive evidence of the existence of a generation gap in direct democracy in Switzerland, we show the distribution of voters' mean political orientations by sex and age, period, and birth cohort defined by decades in Table A2. The political orientation is encoded as zero if the vote is in line with the political right and one if it is in line with the political left. A summary of left-wing attitudes by theme is presented in Table 1 (see main text, Section 3).

Tab A2. Mean political orientation by age and other attributes

	Age								All
	20s	30s	40s	50s	60s	70s	80s	90s	
All	17,160	30,804	33,224	33,581	32,383	22,481	7,809	391	177,833
Status-quo vote	8,222	15,528	16,944	17,402	16,832	12,116	4,031	193	91,268
Change vote	8,938	15,284	16,284	16,182	15,551	10,368	3,778	198	86,583
Referendum won	7,926	13,730	15,274	15,124	14,554	10,108	3,515	188	80,419
Referendum failed	9,234	17,082	17,954	18,460	17,829	12,376	4,294	203	97,432
Female voter	7,754	15,937	17,234	16,578	14,668	10,163	3,589	187	86,110
Male voter	9,406	14,867	15,990	17,003	17,715	12,318	4,220	204	91,723
Period = 1980s	3,577	3,996	4,216	3,591	2,599	2,088	374		20,441
Period = 1990s	6,547	10,025	11,153	8,974	7,256	5,813	1,788	33	51,589
Period = 2000s	3,745	8,739	8,734	8,940	8,807	6,047	2,219	120	47,351
Period = 2010s	3,291	8,052	9,125	12,079	13,721	8,536	3,428	238	58,470
Cohort = 1900s							374	33	407
Cohort = 1910s						2,088	1,788	120	3,996
Cohort = 1920s					2,599	5,813	2,219	238	10,869
Cohort = 1930s				3,591	7,256	6,047	3,428		20,322
Cohort = 1940s			4,216	8,974	8,807	8,536			30,533
Cohort = 1950s		3,996	11,153	8,940	13,721				37,810
Cohort = 1960s	3,577	10,025	8,734	12,079					34,415
Cohort = 1970s	6,547	8,739	9,125						24,411
Cohort = 1980s	3,745	8,052							11,797
Cohort = 1990s	3,291								3,291

Notes: Data covers 305 referenda from 1981 to 2017. The political orientation is encoded as zero if the vote is in line with the political right and one if it is in line with the political left. A summary of left-wing attitudes by theme is presented in Table 1 (see main text, Section 3).

6 Recovering cohort-referendum effects

The first stage adjusts for observable voter characteristics, similar to Mincerian wage equations, and is our empirical attempt to remove $f(X_{icr})$ in our theoretical equation (1) in the main paper.

Stage 1:

$$V_{icr} = X_{icr}b + \tau_c \times \sigma_r + \mu_{icr}$$

V_{ibr} represents the 0, 1 voting decision of a voter i associated with birth cohort c in referendum r . In our analysis, we only consider survey respondents who reported actually participating and voting in the referendum under consideration. X is a vector of control variables, including amongst other: education level, income, gender, home ownership, household structure, marital status and geographical variables. In general, we encode all control variables so that the baseline (0 value) refers to the voter with mean characteristics i over the entire sample period, i.e. the modus is subtracted from the observed outcome of the respective variable. We use categorical variables to control for observations with missing and not specified values as well as “don’t know” responses. First-stage regression results are presented in Table A3.

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Tab A3. Age effects on political orientation - first stage

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Political orientation	Political orientation	Political orientation	Political orientation	Political orientation	Reform orientation	Reform orientation	Reform orientation	Reform orientation	Reform orientation
Male	-0.0106 ^{***} (0.0026)	-0.0052 (0.0037)	-0.0363 ^{***} (0.0065)	-0.0071 (0.0075)	-0.0055 (0.0051)	-0.0023 (0.0026)	-0.0060 (0.0037)	-0.0115 [*] (0.0066)	0.0022 (0.0075)	0.0084 [*] (0.0051)
NS/Missing	-0.1475 (0.1089)	-0.4043 ^{**} (0.1754)	-0.0541 (0.1927)	0.0829 (0.2362)	0.4591 (0.4526)	-0.1076 (0.1092)	-0.3025 [*] (0.1758)	-0.0484 (0.1949)	0.0851 (0.2374)	0.2366 (0.4535)
Low	0.0077 (0.0074)	0.0063 (0.0119)	-0.0160 (0.0129)	0.0563 [*] (0.0303)	0.0350 ^{**} (0.0161)	0.0020 (0.0075)	0.0157 (0.0119)	-0.0179 (0.0131)	0.0747 ^{**} (0.0304)	-0.0112 (0.0162)
High-Mid	-0.0147 ^{***} (0.0052)	0.0031 (0.0080)	-0.0317 ^{***} (0.0093)	-0.0512 ^{**} (0.0202)	-0.0158 (0.0114)	-0.0086 [*] (0.0052)	0.0040 (0.0080)	-0.0158 [*] (0.0094)	-0.0636 ^{***} (0.0203)	-0.0016 (0.0115)
High	-0.0370 ^{***} (0.0077)	-0.0077 (0.0122)	-0.0829 ^{***} (0.0137)	-0.0891 ^{***} (0.0303)	-0.0269 (0.0168)	-0.0217 ^{***} (0.0077)	-0.0013 (0.0122)	-0.0575 ^{***} (0.0139)	-0.1108 ^{***} (0.0305)	0.0201 (0.0169)
NS/Missing	-0.0218 [*] (0.0113)	-0.0092 (0.0187)	-0.0433 ^{**} (0.0187)	-0.0962 (0.0716)	-0.0141 (0.0232)	-0.0252 ^{**} (0.0114)	0.0040 (0.0187)	-0.0540 ^{***} (0.0189)	-0.0975 (0.0720)	-0.0223 (0.0233)
Min	-0.0049 (0.0039)	-0.0036 (0.0057)	-0.0211 ^{**} (0.0089)	0.0041 (0.0119)	0.0038 (0.0078)	-0.0128 ^{***} (0.0039)	-0.0113 ^{**} (0.0057)	-0.0189 ^{**} (0.0090)	-0.0076 (0.0119)	-0.0117 (0.0078)
Low-Mid	0.0390 ^{**} (0.0041)	0.0557 ^{**} (0.0060)	0.0531 ^{***} (0.0094)	0.0330 ^{***} (0.0122)	-0.0007 (0.0083)	0.0325 ^{***} (0.0041)	0.0307 ^{***} (0.0060)	0.0382 ^{**} (0.0095)	0.0243 ^{**} (0.0123)	0.0363 ^{***} (0.0083)
High-Mid	0.0181 ^{***} (0.0038)	0.0254 ^{**} (0.0054)	0.0371 ^{***} (0.0114)	0.0169 (0.0106)	-0.0088 (0.0073)	0.0192 ^{***} (0.0038)	0.0246 ^{***} (0.0055)	0.0287 ^{**} (0.0115)	0.0271 ^{**} (0.0107)	-0.0014 (0.0073)
High	0.0191 ^{***} (0.0047)	0.0345 ^{***} (0.0068)	0.0091 (0.0131)	0.0040 (0.0132)	0.0001 (0.0092)	0.0174 ^{***} (0.0047)	0.0223 ^{***} (0.0068)	0.0299 ^{**} (0.0133)	0.0179 (0.0132)	0.0003 (0.0092)
Max	0.0389 ^{***} (0.0032)	0.0489 ^{***} (0.0047)	0.0891 ^{***} (0.0084)	0.0299 ^{***} (0.0092)	-0.0072 (0.0063)	0.0291 ^{***} (0.0032)	0.0196 ^{***} (0.0047)	0.0466 ^{***} (0.0085)	0.0418 ^{***} (0.0093)	0.0270 ^{***} (0.0063)
NS/Missing	-0.0111 (0.0143)	-0.0277 (0.0206)	-0.0422 (0.0366)	0.0458 (0.0476)	0.0190 (0.0272)	-0.0227 (0.0144)	-0.0299 (0.0207)	-0.0463 (0.0370)	0.0883 [*] (0.0478)	-0.0343 (0.0273)
No Car	0.0447 ^{***} (0.0034)	0.0380 ^{***} (0.0049)	0.1238 ^{***} (0.0085)	0.0623 ^{***} (0.0098)	-0.0041 (0.0068)	0.0321 ^{***} (0.0034)	0.0103 ^{**} (0.0049)	0.0829 ^{***} (0.0086)	0.0355 ^{***} (0.0098)	0.0383 ^{***} (0.0069)
NS/Missing	0.0028 (0.0122)	-0.0320 [*] (0.0183)	0.0475 (0.0371)	0.0695 (0.0424)	0.0090 (0.0202)	0.0175 (0.0123)	0.0025 (0.0184)	0.0136 (0.0376)	0.0551 (0.0426)	0.0287 (0.0202)
Roman-/Christ-Catholic	0.0059 ^{**} (0.0026)	-0.0041 (0.0038)	0.0085 (0.0064)	0.0294 ^{**} (0.0082)	0.0154 ^{***} (0.0055)	-0.0013 (0.0027)	-0.0118 ^{***} (0.0038)	0.0119 [*] (0.0065)	0.0155 [*] (0.0083)	0.0016 (0.0055)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Political orientation	Political orientation	Political orientation	Political orientation	Political orientation	Reform orientation	Reform orientation	Reform orientation	Reform orientation	Reform orientation
Other	0.0328*** (0.0038)	0.0197*** (0.0053)	0.0483*** (0.0099)	0.0444*** (0.0116)	0.0469*** (0.0079)	0.0229*** (0.0038)	0.0140*** (0.0053)	0.0328*** (0.0100)	0.0434*** (0.0116)	0.0243*** (0.0079)
NS/Missing	0.0297*** (0.0088)	0.0232 (0.0148)	0.0338** (0.0153)	0.0445 (0.0436)	0.0319* (0.0173)	0.0124 (0.0089)	0.0046 (0.0148)	0.0091 (0.0155)	-0.0050 (0.0438)	0.0333* (0.0174)
Not Employed	0.0298** (0.0124)	0.0469** (0.0218)	0.0354* (0.0196)	-0.1187 (0.0900)	-0.0002 (0.0247)	0.0050 (0.0124)	-0.0091 (0.0219)	0.0186 (0.0198)	-0.0462 (0.0905)	0.0111 (0.0248)
NS/Missing	-0.0013 (0.0186)	0.0060 (0.0296)	0.0152 (0.0363)	-0.1741* (0.1004)	-0.0214 (0.0370)	0.0103 (0.0186)	-0.0032 (0.0297)	0.0143 (0.0367)	-0.1011 (0.1009)	0.0361 (0.0371)
6-29 h/w	0.0245*** (0.0035)	0.0234*** (0.0051)	0.0253*** (0.0089)	0.0264*** (0.0102)	0.0239*** (0.0070)	0.0164*** (0.0035)	0.0103** (0.0051)	0.0075 (0.0090)	0.0300*** (0.0102)	0.0276*** (0.0070)
1-5 h/w	0.0033 (0.0096)	0.0083 (0.0142)	-0.0406* (0.0237)	-0.0359 (0.0275)	0.0396** (0.0186)	0.0111 (0.0096)	0.0175 (0.0143)	0.0092 (0.0240)	-0.0338 (0.0277)	0.0214 (0.0187)
NS/Missing	-0.0175 (0.0126)	-0.0348 (0.0220)	-0.0283 (0.0202)	0.1374 (0.0902)	0.0097 (0.0250)	0.0046 (0.0126)	0.0125 (0.0220)	-0.0034 (0.0204)	0.0552 (0.0906)	0.0076 (0.0250)
Property	-0.0226*** (0.0025)	-0.0178*** (0.0036)	-0.0246*** (0.0062)	-0.0325*** (0.0071)	-0.0236*** (0.0049)	-0.0159*** (0.0025)	-0.0123*** (0.0036)	-0.0216*** (0.0063)	-0.0204*** (0.0071)	-0.0173*** (0.0049)
NS/Missing	-0.0124 (0.0126)	-0.0058 (0.0186)	0.0223 (0.0287)	-0.0246 (0.0412)	-0.0369 (0.0245)	-0.0239* (0.0126)	-0.0039 (0.0187)	-0.0234 (0.0291)	-0.0104 (0.0414)	-0.0580** (0.0246)
1 Person	-0.0089 (0.0060)	-0.0035 (0.0086)	-0.0151 (0.0122)	-0.0314 (0.0194)	-0.0141 (0.0140)	-0.0107* (0.0060)	-0.0079 (0.0087)	-0.0086 (0.0123)	-0.0185 (0.0195)	-0.0190 (0.0140)
3 Persons	0.0063 (0.0059)	0.0239** (0.0087)	-0.0090 (0.0114)	-0.0132 (0.0196)	0.0010 (0.0137)	-0.0107* (0.0059)	-0.0153 (0.0087)	-0.0068 (0.0115)	0.0016 (0.0197)	-0.0056 (0.0137)
4+ Persons	-0.0088 (0.0053)	-0.0018 (0.0078)	0.0132 (0.0106)	-0.0635*** (0.0176)	-0.0248** (0.0124)	-0.0100* (0.0053)	-0.0146* (0.0078)	0.0059 (0.0107)	-0.0353** (0.0177)	-0.0014 (0.0124)
NS/Missing	0.0640 (0.0435)	0.0512 (0.0592)	0.1321 (0.0855)	-0.0567 (0.1515)	0.1749 (0.1314)	0.0699 (0.0436)	0.1102* (0.0593)	0.1017 (0.0865)	-0.0032 (0.1523)	-0.1343 (0.1317)
Single	0.0106*** (0.0038)	0.0121** (0.0055)	0.0152 (0.0095)	-0.0217** (0.0110)	0.0232*** (0.0073)	0.0047 (0.0038)	0.0025 (0.0055)	0.0108 (0.0096)	-0.0228** (0.0111)	0.0184** (0.0073)
Divorced	0.0011 (0.0050)	-0.0029 (0.0073)	-0.0293** (0.0139)	-0.0103 (0.0138)	0.0308*** (0.0094)	0.0036 (0.0050)	-0.0039 (0.0074)	-0.0099 (0.0141)	-0.0098 (0.0139)	0.0322*** (0.0095)
Widowed	-0.0050 (0.0053)	-0.0092 (0.0076)	-0.0163 (0.0154)	-0.0049 (0.0147)	0.0114 (0.0102)	-0.0065 (0.0053)	0.0003 (0.0076)	-0.0197 (0.0156)	0.0062 (0.0147)	-0.0168 (0.0102)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Political orientation	Political orientation	Political orientation	Political orientation	Political orientation	Reform orientation	Reform orientation	Reform orientation	Reform orientation	Reform orientation
Partner	0.0055 (0.0059)	0.0105 (0.0083)	-0.0077 (0.0182)	-0.0134 (0.0158)	0.0116 (0.0116)	0.0006 (0.0059)	0.0008 (0.0083)	0.0094 (0.0184)	-0.0055 (0.0159)	-0.0015 (0.0116)
NS/Missing	-0.0282* (0.0155)	-0.0290 (0.0222)	0.0529 (0.0449)	-0.0484 (0.0462)	-0.0443 (0.0292)	-0.0214 (0.0155)	-0.0410* (0.0222)	0.0781* (0.0455)	-0.0921** (0.0465)	0.0018 (0.0293)
Rural	-0.0125*** (0.0025)	-0.0146*** (0.0037)	-0.0439*** (0.0064)	-0.0075 (0.0075)	0.0076 (0.0050)	-0.0235*** (0.0025)	-0.0277*** (0.0037)	-0.0308*** (0.0065)	-0.0182** (0.0076)	-0.0134*** (0.0050)
NS/Missing	-0.0000 (0.0456)	-0.0355 (0.0696)	0.3375* (0.1879)	-0.0180 (0.0862)	0.0113 (0.1004)	-0.0422 (0.0457)	-0.0449 (0.0698)	0.2225 (0.1901)	-0.0119 (0.0866)	-0.1336 (0.1006)
Central	0.0234*** (0.0035)	0.0104** (0.0051)	-0.0011 (0.0093)	0.0658*** (0.0102)	0.0420*** (0.0070)	0.0036 (0.0035)	-0.0001 (0.0051)	0.0207** (0.0094)	0.0114 (0.0103)	-0.0030 (0.0070)
North-west	-0.0072* (0.0038)	-0.0201*** (0.0055)	0.0209** (0.0096)	-0.0312*** (0.0112)	0.0114 (0.0076)	-0.0099*** (0.0038)	-0.0121** (0.0055)	0.0229** (0.0097)	-0.0432*** (0.0113)	-0.0106 (0.0076)
Ticino	0.0149** (0.0066)	0.0110 (0.0097)	-0.0089 (0.0158)	0.0603*** (0.0192)	0.0181 (0.0129)	0.0007 (0.0066)	0.0012 (0.0097)	-0.0110 (0.0160)	-0.0080 (0.0193)	0.0145 (0.0129)
East	-0.0064* (0.0038)	-0.0093* (0.0055)	0.0199** (0.0099)	-0.0137 (0.0112)	-0.0148* (0.0077)	-0.0106*** (0.0038)	-0.0107* (0.0055)	0.0057 (0.0101)	-0.0329*** (0.0113)	-0.0110 (0.0077)
Lake Geneva	-0.0000 (0.0033)	-0.0094* (0.0048)	0.0228*** (0.0085)	-0.0071 (0.0099)	0.0092 (0.0066)	-0.0102*** (0.0033)	-0.0147*** (0.0048)	0.0128 (0.0086)	-0.0326*** (0.0099)	-0.0045 (0.0066)
Zurich	0.0205*** (0.0049)	-0.0063 (0.0071)	0.0194 (0.0127)	0.0959*** (0.0136)	0.0311*** (0.0095)	0.0122** (0.0049)	0.0171** (0.0072)	0.0232* (0.0128)	0.0253* (0.0136)	-0.0102 (0.0095)
NS/Missing	-0.0017 (0.0093)	-0.0031 (0.0135)	-0.0289 (0.0252)	-0.0034 (0.0314)	0.0110 (0.0168)	0.0154* (0.0093)	-0.0032 (0.0136)	-0.0289 (0.0255)	-0.0203 (0.0316)	0.0635*** (0.0169)
1/10	0.0073 (0.0186)	0.0162 (0.0255)	-0.0113 (0.0481)	-0.0271 (0.0530)	0.0239 (0.0413)	0.0000 (0.0186)	-0.0070 (0.0256)	-0.0253 (0.0487)	-0.0016 (0.0533)	0.0348 (0.0414)
2/10	-0.0057 (0.0131)	-0.0012 (0.0192)	-0.0066 (0.0291)	0.0196 (0.0388)	-0.0306 (0.0281)	-0.0040 (0.0131)	-0.0021 (0.0192)	-0.0173 (0.0294)	-0.0232 (0.0390)	0.0106 (0.0281)
3/10	-0.0013 (0.0099)	0.0010 (0.0143)	-0.0217 (0.0238)	0.0075 (0.0285)	0.0020 (0.0207)	0.0025 (0.0099)	0.0043 (0.0143)	0.0264 (0.0241)	-0.0111 (0.0286)	-0.0147 (0.0208)
4/10	-0.0044 (0.0097)	-0.0194 (0.0140)	-0.0251 (0.0218)	0.0297 (0.0273)	0.0375* (0.0215)	-0.0214** (0.0097)	-0.0078 (0.0140)	-0.0386* (0.0220)	-0.0339 (0.0275)	-0.0292 (0.0215)
5/10	-0.0109** (0.0048)	-0.0076 (0.0068)	-0.0283** (0.0121)	-0.0156 (0.0135)	-0.0013 (0.0100)	0.0005 (0.0048)	0.0104 (0.0069)	-0.0075 (0.0122)	-0.0085 (0.0136)	-0.0132 (0.0100)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Political orientation	Political orientation	Political orientation	Political orientation	Political orientation	Reform orientation	Reform orientation	Reform orientation	Reform orientation	Reform orientation
6/10	-0.0046 (0.0064)	-0.0021 (0.0093)	-0.0244 (0.0155)	0.0051 (0.0188)	-0.0015 (0.0132)	-0.0085 (0.0064)	-0.0045 (0.0093)	-0.0171 (0.0157)	-0.0258 (0.0189)	-0.0034 (0.0132)
7/10	0.0063 (0.0048)	0.0072 (0.0069)	-0.0131 (0.0124)	-0.0004 (0.0139)	0.0189* (0.0096)	-0.0037 (0.0048)	0.0004 (0.0069)	-0.0135 (0.0126)	-0.0113 (0.0139)	-0.0018 (0.0097)
8/10	0.0072** (0.0035)	0.0135*** (0.0050)	0.0124 (0.0088)	-0.0062 (0.0101)	-0.0027 (0.0069)	0.0081** (0.0035)	0.0141*** (0.0051)	0.0139 (0.0089)	-0.0016 (0.0101)	-0.0047 (0.0069)
9/10	0.0116*** (0.0037)	0.0104* (0.0055)	0.0383*** (0.0091)	-0.0038 (0.0112)	0.0015 (0.0074)	0.0097*** (0.0038)	0.0078 (0.0055)	0.0250*** (0.0092)	-0.0050 (0.0113)	0.0080 (0.0074)
NS/Missing	0.0118 (0.0089)	0.0217* (0.0127)	-0.0299 (0.0254)	0.0118 (0.0282)	0.0127 (0.0163)	0.0201** (0.0089)	0.0316** (0.0127)	0.0016 (0.0257)	-0.0020 (0.0283)	0.0128 (0.0164)
PCS/CSP/UDC/SVP/PDC+PCS Group	-0.0727*** (0.0079)	-0.0642*** (0.0133)	-0.0822*** (0.0132)	-0.1079*** (0.0262)	-0.0420** (0.0176)	-0.0512*** (0.0079)	-0.0349*** (0.0133)	-0.1005*** (0.0134)	-0.1133*** (0.0263)	0.0412** (0.0176)
PSS/SPS	0.2441*** (0.0155)	0.1982*** (0.0308)	0.2307*** (0.0222)		0.2915*** (0.0307)	0.1245*** (0.0155)	0.1179*** (0.0308)	0.1845*** (0.0225)		0.0059 (0.0307)
PRD/FDP/PLR/FDP	-0.1333*** (0.0161)	-0.0163 (0.0320)	-0.1725*** (0.0232)		-0.1783*** (0.0318)	-0.0185 (0.0162)	0.0966*** (0.0321)	-0.0979*** (0.0234)		0.0128 (0.0318)
PDC/CVP	-0.0371* (0.0202)	-0.0034 (0.0410)	-0.0189 (0.0287)		-0.1152*** (0.0403)	0.0351* (0.0203)	0.1895*** (0.0411)	0.0030 (0.0290)		-0.0618 (0.0404)
PdL/FPS/PES/GPS	0.3162*** (0.0262)	0.2009** (0.0543)	0.3530*** (0.0362)		0.3101*** (0.0529)	0.1455*** (0.0262)	0.0448 (0.0544)	0.2526*** (0.0367)		-0.0043 (0.0530)
GLP	0.1087*** (0.0333)	0.0827 (0.0704)	0.1884*** (0.0449)		-0.0896 (0.0706)	0.1472*** (0.0334)	0.1446** (0.0705)	0.2082*** (0.0454)		-0.0074 (0.0707)
AdI/LdU/PBD/BDP	0.0132 (0.0515)	0.1753* (0.0995)	-0.0520 (0.0747)		-0.0081 (0.1010)	0.0073 (0.0516)	0.0347 (0.0998)	0.0322 (0.0755)		-0.0476 (0.1012)
PEP/EVP	0.1352** (0.0590)	0.0991 (0.1114)	0.2382*** (0.0891)		0.0081 (0.1104)	0.0907 (0.0591)	0.1735 (0.1116)	0.1646* (0.0901)		-0.0788 (0.1106)
Lega/PLS/LPS	-0.0527 (0.0440)	-0.0475 (0.0909)	-0.0702 (0.0646)		-0.0405 (0.0801)	0.0842* (0.0441)	-0.0959 (0.0912)	-0.0223 (0.0653)		0.3887*** (0.0802)
Other Party	0.0982*** (0.0216)	0.0415 (0.0418)	0.1132*** (0.0316)		0.1015** (0.0419)	0.0564*** (0.0216)	0.0958** (0.0419)	0.0725** (0.0319)		-0.0219 (0.0420)
Specific Person	0.0131 (0.0323)	0.0784 (0.0658)	-0.0145 (0.0453)		0.0134 (0.0640)	0.0354 (0.0323)	0.1635** (0.0659)	0.0347 (0.0458)		-0.0821 (0.0642)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Political orientation	Political orientation	Political orientation	Political orientation	Political orientation	Reform orientation	Reform orientation	Reform orientation	Reform orientation	Reform orientation
NS/Missing	0.0040 (0.0046)	0.0055 (0.0067)	0.0025 (0.0128)	-0.0258** (0.0130)	0.0147* (0.0084)	-0.0140*** (0.0046)	-0.0042 (0.0067)	0.0195 (0.0130)	-0.0189 (0.0131)	-0.0381*** (0.0085)
Misstrust	0.0021 (0.0025)	-0.0386*** (0.0036)	-0.0195*** (0.0063)	0.0447*** (0.0072)	0.0677*** (0.0049)	-0.0349*** (0.0025)	-0.0294*** (0.0036)	-0.0229*** (0.0064)	-0.0024 (0.0073)	-0.0699*** (0.0049)
NS/Missing	0.0242*** (0.0033)	0.0096** (0.0047)	0.0076 (0.0086)	0.0638*** (0.0095)	0.0404*** (0.0065)	0.0006 (0.0033)	0.0007 (0.0047)	-0.0048 (0.0087)	0.0281*** (0.0095)	-0.0116* (0.0065)
Constant	0.4351*** (0.0303)	0.4780*** (0.0423)	0.4158*** (0.0429)	0.4910*** (0.1265)	0.2966*** (0.1021)	0.4683*** (0.0304)	0.4580*** (0.0424)	0.4440*** (0.0434)	0.5132*** (0.1272)	0.5894*** (0.1023)
Attitude groups	All	Ideological	Environ.	Gener.	Fiscal	All	Ideological	Environ.	Gener.	Fiscal
Ref. x cohort effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	177851	83574	28673	21231	44373	177851	83574	28673	21231	44373
r2	.209	.215	.202	.179	.231	.206	.211	.183	.171	.226

Notes: Unit of observation is individual voting decision. Cohort effects are defined for five-year bin of birth cohort (e.g. 1900-1904). Reform [political] orientation is 0 if pro status quo [right-wing] and 1 if pro change [left-wing]. Missing values in variables are set to zero and indicated by variable-specific 0,1 dummies (labeled NS/Missing). Standard errors (in parentheses) are clustered on cohort-referendum effects. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

7 Imputation of missing cohort-referendum effects

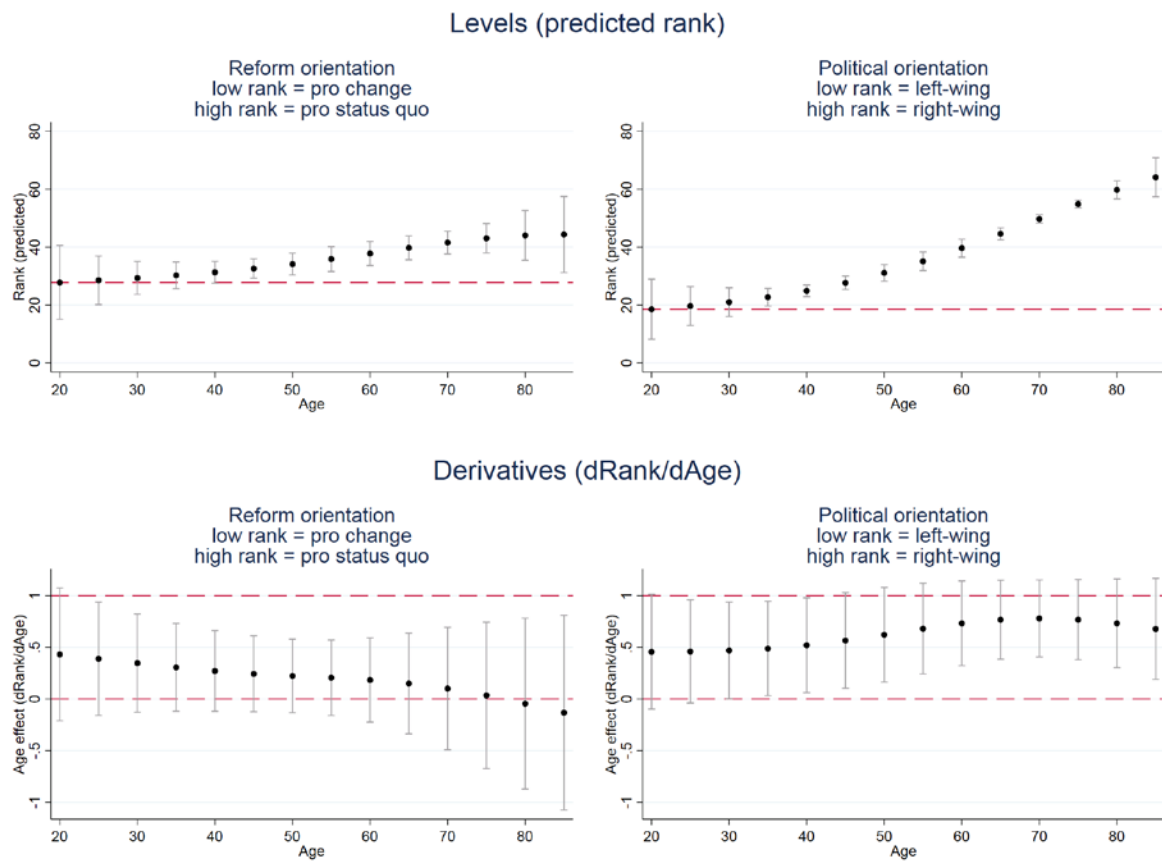
As a matter of course, the VoxIt surveys do not cover all relevant chronological ages and birth cohorts across all 305 referenda. Although their number is negligible, we perform a data imputation and re-rank-ranking approach. This is to avoid a distortion across the entire distribution of higher ranks that would arise from one missing cohort in a referendum. It is reasonable that cohort effects do not differ excessively from adjacent birth cohorts. We therefore impute missing cohort fixed effects by linear interpolation of adjacent cohorts' estimated coefficients. We only impute missing cohort fixed effects if these missing cohort effects are adjacent to observed cohorts (ages), i.e. we do not extrapolate. If the oldest cohort is missing in the data, there will be no effect on higher ranks.

8 Unconstrained rank model

Throughout this section, we show the remaining results of variations of our unconstrained rank model approach that we discuss in Section 5 of the main text.

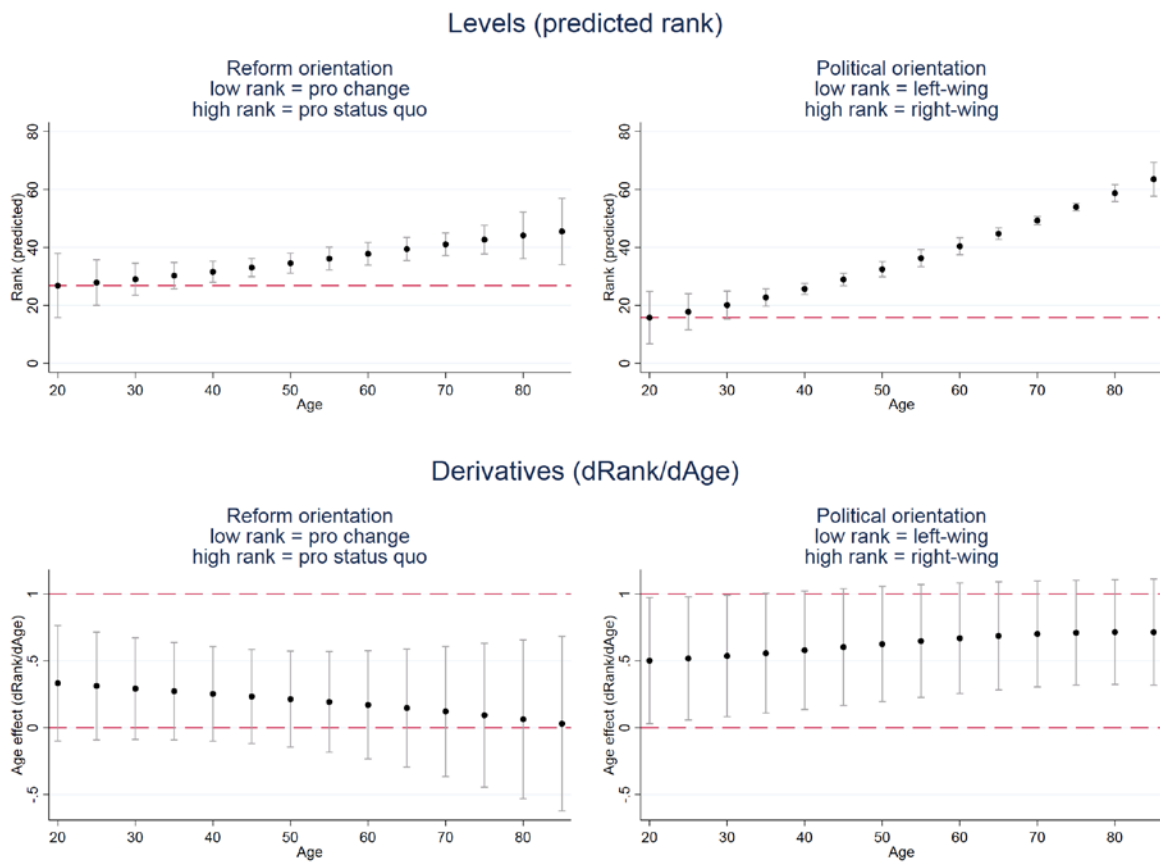
8.1 Semi-non-parametric effects by reform orientation and political orientation: Varying bandwidths

Fig A3. Semi-non-parametric aging effect on reform and political orientation rank: $\mu = 2$



Notes: The figure is based on individual data from exit polls from 305 referenda from 1981 to 2017. Upper panels show the predicted rank from locally weighted polynomial (degree = 1) regressions (LWR) of reform/political orientation rank against voter age controlling cohort effects. Before running the LWR, cohort fixed effects are removed in auxiliary linear regression. LWRs are weighted by distance from an age bin (the black dots) using a Gaussian kernel and twice the Silverman rule-of-thumb bandwidth. Bottom panels show the marginal effect of age on the orientation rank. Individual data are aggregated to the age group – period level. Reform [political] orientation rank is the rank in the distribution of mean (adjusted) reform [political] orientation within five-year age (20-24, 25-29, ..., 85-89) x five-year period (1980-1984, 1985-1989, ..., 2015-2017) cells. Reform [political] orientation ranks are field ranks that increase in status-quo [right-wing] orientation. The reform [political] orientation is encoded as zero if the vote is in line with the status quo [the political right] and one if the vote is in line with a vote for change [the political left]. The reform [political] orientation is adjusted in a first-stage regression of the reform [political] orientation against a battery of first-stage controls and referendum-age-bin fixed effects in which the latter are used to generate the rank measures used here. 95% confidence intervals (bars) based on standard errors clustered on cohort fixed effects.

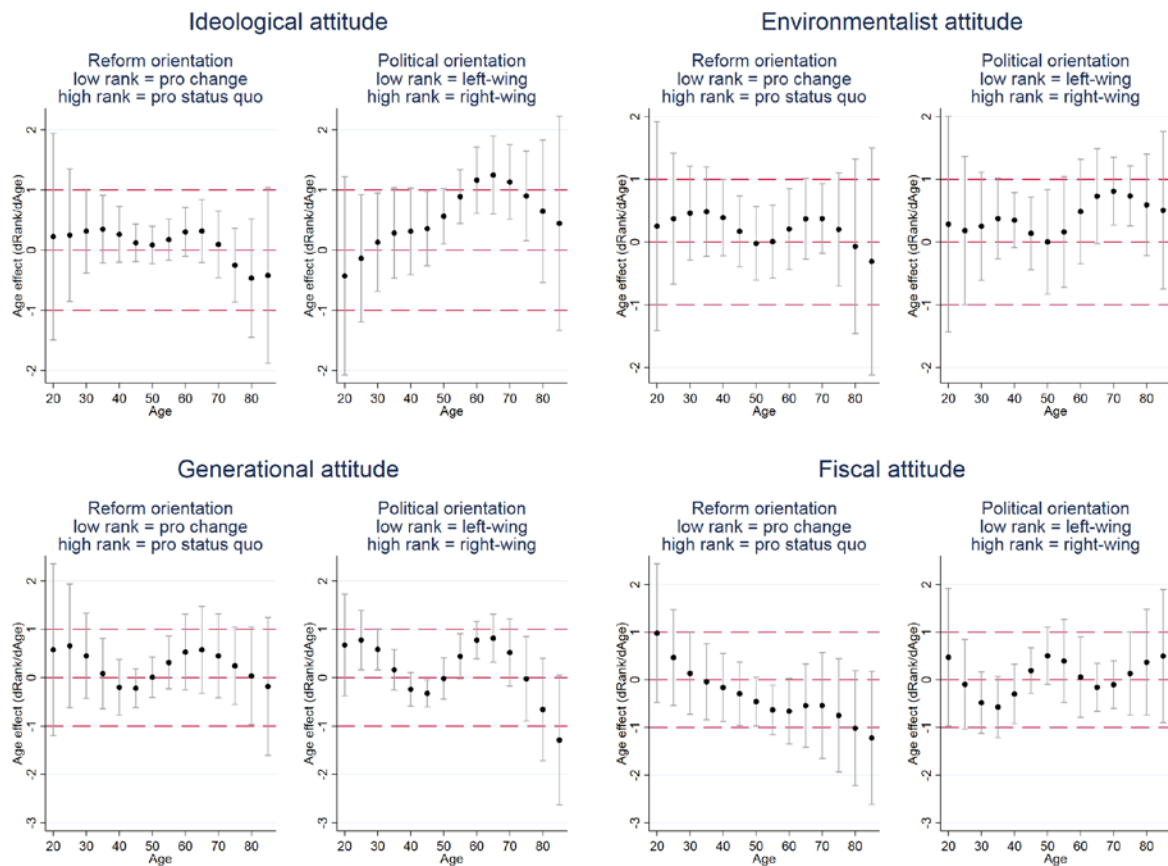
Fig A4. Semi-non-parametric aging effect on reform and political orientation rank: $\mu = 3$



Notes: The figure is based on individual data from exit polls from 305 referenda from 1981 to 2017. Upper panels show the predicted rank from locally weighted polynomial (degree = 1) regressions (LWR) of reform/political orientation rank against voter age controlling cohort effects. Before running the LWR, cohort fixed effects are removed in auxiliary linear regression. LWRs are weighted by distance from an age bin (the black dots) using a Gaussian kernel and three times the Silverman rule-of-thumb bandwidth. Bottom panels show the marginal effect of age on the orientation rank. Individual data are aggregated to the age group – period level. Reform [political] orientation rank is the rank in the distribution of mean (adjusted) reform [political] orientation within five-year age (20-24, 25-29, ..., 85-89) x five-year period (1980-1984, 1985-1989, ..., 2015-2017) cells. Reform [political] orientation ranks are field ranks that increase in status-quo [right-wing] orientation. The reform [political] orientation is encoded as zero if the vote is in line with the status quo [the political right] and one if the vote is in line with a vote for change [the political left]. The reform [political] orientation is adjusted in a first-stage regression of the reform [political] orientation against a battery of first-stage controls and referendum-age-bin fixed effects in which the latter are used to generate the rank measures used here. 95% confidence intervals (bars) based on standard errors clustered on cohort fixed effects.

8.2 LWR estimates of marginal aging effects by attitude groups

Fig A5. Semi-non-parametric aging effects by attitude group (Silverman-rule bandwidth)



Notes: The figure is based on individual data from exit polls from 305 referenda from 1981 to 2017. All panels show marginal aging effects from locally weighted polynomial (degree = 1) regressions (LWR) of reform/political orientation rank against voter age controlling cohort effects. LWRs are weighted by distance from an age bin (the black dots) using a Gaussian kernel and a Silverman rule-of-thumb bandwidth. Individual data are aggregated to the age-group-period level. Prior to the LWR, cohort effects are removed after running an auxiliary regression of the orientation rank against cohort fixed effects. Reform [political] orientation rank is the rank in the distribution of mean (adjusted) reform [political] orientation within five-year age (20-24, 25-29, ...) x five-year period (1980-1984, 1985-1989, ..., 2010-2014) cells. Reform [political] orientation ranks are field ranks that increase in status-quo [right-wing] orientation. The reform [political] orientation is encoded as zero if the vote is in line with the status quo [the political right] and one if the vote is in line with a vote for change [the political left]. The reform [political] orientation is adjusted in a first-stage regression of the reform [political] orientation against a battery of first-stage controls and referendum-age-bin fixed effects in which the latter are used to generate the rank measures used here. 95% confidence intervals (bars) based on standard errors clustered on cohort fixed effects.

8.3 Parametric aging effects by attitude group and age group

Tab A4. Parametric aging effects on reform and political orientation rank by attitude group

<i>Attitude Group</i>	Ideological	Environmentalist	Generational	Fiscal
<i># of referenda</i>	145	48	33	79
<i>Reform orientation rank</i>	(1)	(2)	(3)	(4)
Age (years)	0.115 (0.131)	0.285* (0.138)	0.281 (0.171)	-0.456* (0.228)
r2	0.452	0.264	0.391	0.371
<i>Political orientation rank</i>	(7)	(8)	(9)	(10)
Age (years)	0.601** (0.242)	0.398* (0.219)	0.265* (0.146)	0.033 (0.151)
r2	0.475	0.333	0.509	0.366
Cohort effects	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
Ages	All	All	All	All
N	112	112	112	112

Notes: The output is inferred from individual data from exit polls from 305 referenda from 1981 to 2017. Data are aggregated to the age-group-period level. Reform [political] orientation rank is the rank in the distribution of mean (adjusted) reform [political] orientation within five-year age (20-24, 25-29, ...) x five-year period (1980-1984, 1985-1989, ..., 2010-2014) cells. Reform [political] orientation ranks are field ranks that increase in status-quo [right-wing] orientation. The reform [political] orientation is encoded as zero if the vote is in line with the status quo [the political right] and one if the vote is in line with a vote for change [the political left]. The reform [political] orientation was adjusted in a first-stage regression of the reform [political] orientation against a battery of first-stage controls and referendum-age-bin fixed effects in which the latter are used to generate the rank measures used here. Standard errors clustered on cohort fixed effects. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Tab A5. Age effects on reform orientation rank by attitude group and age group

<i>Attitude group</i>	Ideological		Environmentalist		Generational		Fiscal	
<i># of referenda</i>	145		48		33		79	
<i>Reform orientation</i>	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Age (years)	0.331 (0.295)	0.000 (0.269)	0.429 (0.335)	0.202 (0.278)	0.177 (0.454)	0.494 (0.398)	0.206 (0.388)	-0.661 (0.390)
r2	0.397	0.477	0.307	0.206	0.275	0.367	0.109	0.492
<i>Political orientation</i>	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Age (years)	0.251 (0.494)	1.146*** (0.307)	0.257 (0.400)	0.717** (0.314)	0.411 (0.278)	0.440 (0.344)	-0.669 (0.447)	0.095 (0.177)
r2	0.175	0.546	0.202	0.387	0.391	0.492	0.534	0.282
Cohort effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cohorts	All	All	All	All	All	All	All	All
Ages	< 50	>= 50	< 50	>= 50	< 50	>= 50	< 50	>= 50
N	48	64	48	64	48	64	48	64

Notes: The output is inferred from individual data from exit polls from 305 referenda from 1981 to 2017. Data are aggregated to the age group – period level. Reform [political] orientation rank is the rank in the distribution of mean (adjusted) reform [political] orientation within five-year age (20-24, 25-29, ...) x five-year period (1980-1984, 1985-1989, ..., 2010-2014) cells. Reform [political] orientation ranks are field ranks that increase in status-quo [right-wing] orientation. The reform [political] orientation is encoded as zero if the vote is in line with the status quo [the political right] and one if the vote is in line with a vote for change [the political left]. The reform [political] orientation is adjusted in a first-stage regression of the reform [political] orientation against a battery of first-stage controls and referendum-age-bin fixed effects in which the latter are used to generate the rank measures used here. Standard errors clustered on cohort fixed effects. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

9 Robustness and extension

9.1 Age effect on political orientation conditional on reform orientation

In the table below, we present estimates of the aging effect on the political orientation rank, controlling for the reform orientation rank. Models (1) and (3) replicate models (9) and (10) from Table 4 in the main paper. In models (2) and (4), we add the political orientation rank. In keeping with the cross-sectional results presented in Figure 3 in the main paper, the additional control has a small effect on the aging effect, especially if cohort effects are controlled for (model 4 vs. 3). A status-quo orientation that increases in age, thus, is an insufficient explanation for the change in political orientation from left-wing to right-wing over the course of voters' life cycle.

In model (5) we, replicate model (4) from Table 4, in which we estimate the aging effect on the reform orientation rank conditional on cohort effects. Further controlling for the political orientation rank in model (6) reduces the already small and insignificant aging effect by approximately 50%. These results further substantiate the impression that compared with the habituation hypothesis, the utility-maximization hypothesis has more support in the data with regard to explaining the generation gap in direct democracy.

Tab A6. Age effects on political orientation rank conditional on reform orientation rank

	(1)	(2)	(3)	(4)	(5)	(6)
	Political orientation rank	Political orientation rank	Political orientation rank	Political orientation rank	Reform orientation rank	Reform orientation rank
Age (years)	0.738 ^{***} (0.071)	0.664 ^{***} (0.080)	0.617 ^{***} (0.201)	0.605 ^{***} (0.201)	0.187 (0.197)	0.094 (0.263)
Reform orientation rank		0.256 ^{***} (0.078)		0.063 (0.079)		
Political orientation rank						0.151 (0.194)
Attitude group	All	All	All	All	All	All
Cohort effects	-	-	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Ages	All	All	All	All	All	All
N	112	112	112	112	112	112
r ²	0.545	0.605	0.737	0.740	0.371	0.377

Notes: The output is inferred from individual data from exit polls from 305 referenda from 1981 to 2017. Individual data are aggregated to the age-group-period level. Reform [political] orientation rank is the rank in the distribution of mean (adjusted) reform [political] orientation within five-year age (20-24, 25-29, ...) x five-year period (1980-1984, 1985-1989, ..., 2010-2014) cells. Prior to the LWR, cohort effects are removed after running an auxiliary regression of the orientation rank against cohort fixed effects where indicated. Reform [political] orientation ranks are field ranks that increase in status-quo [right-wing] orientation. The reform [political] orientation is encoded as zero if the vote is in line with the status quo [the political right] and one if the vote is in line with a vote for change [the political left]. Addition of controls means that the reform [political] orientation is adjusted in a first-stage regression of the reform [political] orientation against a battery of first-stage controls and referendum-age-bin fixed effects in which the latter are used to generate the rank measures used here. Standard errors clustered on cohort fixed effects where included. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

9.2 Serial correlation in political orientation ranks

If cohort effects are a strong determinant of voter orientation, the lagged rank of a cohort will be a strong predictor of the contemporary rank since the cohort effect is time-invariant. In Table A7, we test this hypothesis by regressing the orientation rank against its own lag (one period is equivalent to five years). We find no significant serial correlation in the reform orientation ranks, regardless of whether we control for age or period effects.

By contrast, we find strong and positive serial correlation in political orientation ranks. However, lagged effect becomes insignificant once we control for age. This suggests that the serial correlation in political orientation is largely attributable to serial correlation in age. The aging effect is within close range of the benchmark estimate in Table 4, column (4) in the main paper.

Tab A7. Serial correlation in political orientation ranks

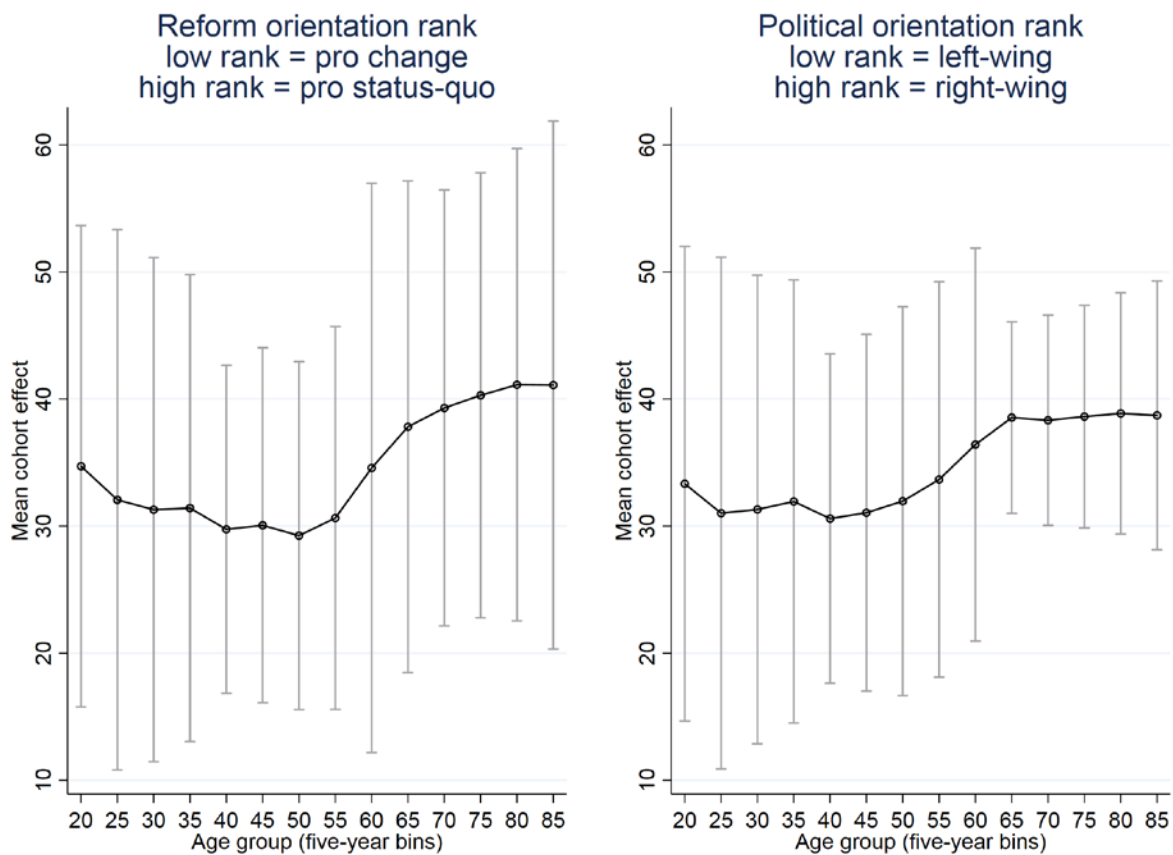
	(1) Reform orientation rank	(2) Reform orientation rank	(3) Reform orientation rank	(4) Political orientation rank	(5) Political orientation rank	(6) Political orientation rank
Lagged (by one period) orientation rank	0.029 (0.130)	-0.105 (0.116)	-0.051 (0.129)	0.628*** (0.128)	0.097 (0.156)	0.221 (0.176)
Age (years)		0.198 (0.165)	0.249 (0.170)		0.587*** (0.146)	0.547*** (0.161)
Period effects	Yes	-	Yes	Yes	-	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes
N	91	91	91	91	91	91
r2	.0174	.0468	.0782	.524	.582	.604

Notes: The output is inferred from individual data from exit polls from 305 referenda from 1981 to 2017. Individual data are aggregated to the age-group-period level. Reform [political] orientation rank is the rank in the distribution of mean (adjusted) reform [political] orientation within five-year age (20-24, 25-29, ...) x five-year period (1980-1984, 1985-1989, ..., 2010-2014) cells. Prior to the LWR, cohort effects are removed after running an auxiliary regression of the orientation rank against cohort fixed effects where indicated. Reform [political] orientation ranks are field ranks that increase in status-quo [right-wing] orientation. The reform [political] orientation is encoded as zero if the vote is in line with the status quo [the political right] and one if the vote is in line with a vote for change [the political right]. The addition of controls means that the reform [political] orientation is adjusted in a first-stage regression of the reform [political] orientation against a battery of first-stage controls and referendum-age-bin fixed effects in which the latter are used to generate the rank measures used here. Standard errors clustered on cohort fixed effects where included. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

9.3 Correlation between age and cohort effects

Table 4 in the main paper reveals that controlling for cohort effects reduces the age effect on the reform orientation rank and to a relatively more limited extent, the age effect on the political orientation rank. This indicates a positive correlation between cohort effects and age. The time-invariant component in reform and political orientation should be larger (leaning toward the status quo and the political right) for those who are old when we observe them in our data. This correlation, which leads to biased estimates of aging effects in the cross-section, is illustrated in the figure below. As expected, the correlation is positive, illustrating the importance of controlling for cohort effects when estimating aging effects on political outcomes, especially if the longitudinal dimension of a data set is limited (covering less than a voting life).

Fig A6. Mean orientation rank by age group



Notes: The output is inferred from individual data from exit polls from 305 referenda from 1981 to 2017. Data are aggregated to the age-group-period level. Reform [political] orientation rank is the rank in the distribution of mean (adjusted) reform [political] orientation within five-year age (20-24, 25-29, ...) x five-year period (1980-1984, 1985-1989, ..., 2010-2014) cells. Reform [political] orientation ranks are field ranks that increase in status-quo [right-wing] orientation. The reform [political] orientation is encoded as zero if the vote is in line with the status quo [the political right] and one if the vote is in line with a vote for change [the political left]. The reform [political] orientation is adjusted in a first-stage regression of the reform [political] orientation against a battery of first-stage controls and referendum-age-bin fixed effects in which the latter are used to generate the rank measures used here. Unconditional cohort effects are the mean orientation ranks by cohort. Cohort effects are recovered from regressions of orientation ranks against age and cohort effects. Mean cohort effects are the means within age groups, and the vertical error bars are the associated standard deviations.

9.4 Age effects on reform and political orientation

The focus of our econometric analysis has been to distinguish between aging effects and cohort effects on orientation ranks because the APC effects on orientation levels cannot be separately identified without further constraints.

In the table below, we complement the analysis by exploring the relationship between voter orientations and APC effects in levels. Unlike in the rank analysis, the unit of observation is an individual voting decision. We begin with cross-sectional models that exclude and include individual controls

in the first two columns and add referendum effects in the third column. The age effect decreases as the controls are being added. The models in the third column (3 and 9) are the parametric equivalents to Figure 3 in the main paper. Consistent with that figure, the probability of voting for a change in the legal status quo over a 60-year voting life declines by $0.0006 \times 60 = 0.036$ percentage points. Likewise, the probability of supporting left-wing policies declines by $0.001 \times 60 = 0.06$.

By controlling for referendum effects, we assume that differences in the mean vote across referenda are attributable to different NPVs of the proposed referenda and not to average increases in age. Alternatively, we can assume that the NPV of the proposed reforms does not follow a time trend and that there are no period effects. In this case, we can omit referendum effects, and, instead, control for arbitrary cohort effects, as in the fourth column. The aging effect increases significantly by a factor of 4 (political orientation) to 7 (reform orientation).

In the fifth column, we combine the control for referendum effects with a control for social generation effects (as defined in Figure 8 in the main paper), so that the aging effect is identified by aging within generations. This is our preferred model because it identifies the aging effect conditional on arbitrary period (referendum) effects and a large fraction of the time-invariant variation across birth cohorts. A regression of the cohort effects in the reform orientation ranks and the political orientation ranks displayed in Figure 8 in the main paper against generation fixed effects yields an r^2 of 53% (reform orientation) and nearly 70% (political orientation). Accordingly, aging by one year reduces the probability of voting for change by 0.08 percentage points and the probability of voting for a left policy by 0.13 percentage points.

To compare these aging effects on orientation levels to the effects implied by our rank models, we estimate the relationship between orientation ranks and levels in the last column. The marginal effect on the orientation level implied by a rank model is simply the product of the age effect on the rank (from Table 4, fourth column 4 in the main paper) and the rank effect on the level (last column in the table below). The result is that per year of aging, the probability of voting for change decreases by 0.03 while the probability of voting for a left-wing policy decreases by 0.13 percentage points.

Reassuringly, aging effects on levels from both approaches are within the same range although the implied level effects from the rank models are somewhat smaller, possibly due to the stronger control for correlated cohort effects. One insight from all models reported below is that our benchmark aging effects are conservative in the sense that we potentially overcontrol for the effect of aging on the average vote (as reflected by the large estimates reported in the fourth column).

Tab A8. Age effects on reform orientation

<i>Reform orientation</i>	(1)	(2)	(3)	(4)	(5)	(6)
Age	-0.0008*** (0.0001)	-0.0007*** (0.0001)	-0.0006*** (0.0002)	-0.0046*** (0.0002)	-0.0008*** (0.0003)	
Reform orientation rank						-0.0014*** (0.0003)
Marginal age effect on orientation	-	-	-	-	-	-.0003
r2	.000699	.0124	.176	.0154	.176	.158
<i>Political orientation</i>	(7)	(8)	(9)	(10)	(11)	(12)
Age	-0.0015*** (0.0001)	-0.0012*** (0.0001)	-0.0010*** (0.0001)	-0.0036*** (0.0002)	-0.0013*** (0.0002)	
Political orientation rank						-0.0018*** (0.0003)
Marginal age effect on orientation	-	-	-	-	-	-.0011
r2	.00257	.0154	.181	.0172	.181	.344
Controls	-	Yes	Yes	Yes	Yes	Yes
Referendum effects	-	-	Yes	-	Yes	-
Cohort effects	-	-	-	Yes	-	Yes
Generation effects	-	-	-	-	Yes	-
Ages	All	All	All	All	All	All
N	177,851	177,851	177,851	177,851	177,851	112

Notes: Unit of observation is individual voting decision throughout columns (1-4) and age bin-period in column (5). Cohort effects are defined for integer birth years. Generation effects are defined for traditionalists (birth years up to 1945), baby boomers (1946-1964), generation X (1965-76), and generation Y (from 1977 on). The marginal effect of aging on outcome in models (6) and (12) is the rank effect on orientation multiplied by the aging effect on rank from Table 4, model (4) and model (10). Reform (political) orientation rank is the rank in the distribution of mean (adjusted) reform (political) orientation within five-year age group (20-24, 25-29, ...) x five-year period (1980-1984, 1985-1989, ...) cells. Reform [political] orientation is 0 if pro status quo [right-wing] and 1 if pro change [left-wing]. Ranks increase from the largest pro change [left-wing] to the smallest pro status quo [right-wing] reform [political] orientation value. In models (6) and (12), orientations are adjusted in first-stage regressions of orientation against a battery of individual controls and cohort-referendum effects. Standard errors are generally clustered on referendum fixed effects where included and on cohort effects in models (4) and (10). * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

9.5 Excluding ambiguous referenda

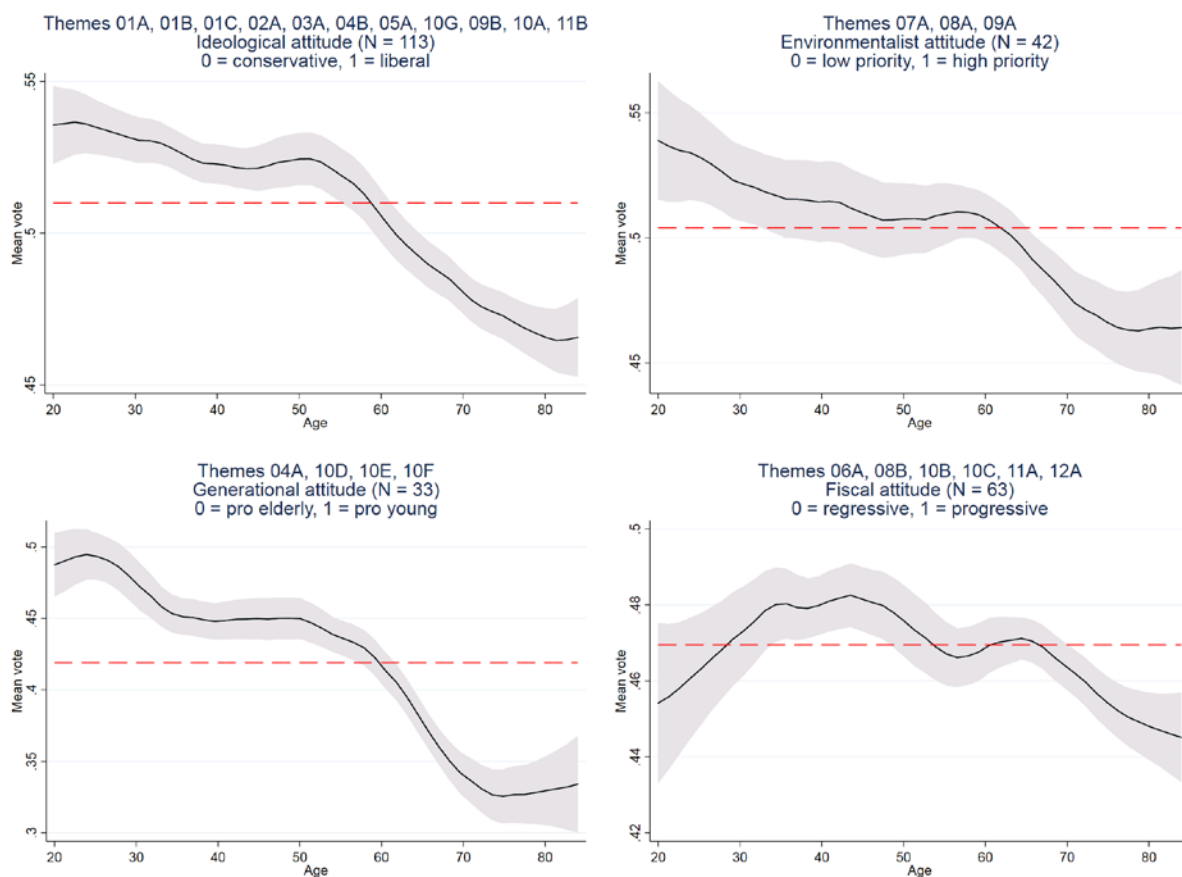
In our empirical research design, we include data from all referenda surveys mainly for two reasons. First, to separately identify age and cohort effects, we require rich variation over time. Second, we avoid making subjective choices on which referenda to include in the analysis, which may influence the results. Not surprisingly, however, the allocation of referenda to the attitude groups defined in Table 1 in the main paper (on which the mapping to political orientations is based) is not straightforward for all referenda. In particular, the mapping from yes and no votes to political attitudes (liberal vs. conservative; high vs. low environmentalist attitudes; pro elderly vs. pro young; progressive vs. regressive) and orientations (left-wing vs. right-wing) is sometimes potentially controversial.

To rule out that our results are driven by these ambiguous referenda, we replicate our main stages of the analysis of aging effects on voting behavior using exclusively those referenda where we view

the encoding as uncontroversial. This results in the exclusion of 54 out of a total of 305 referenda. To be fully transparent about the selection, we indicate the referenda for which we view the mapping as potentially controversial in Appendix II. In the remainder of this section, we present figures and tables generated in perfect analogy to their counterpart in the main paper, except for a restriction to the remaining 251 unambiguous referenda. Reassuringly, the relatively substantial alteration of the referendum the sample (almost 20%) has marginal effects on the results.

In Figure A7, we replicate the descriptive illustration of generation gaps by political attitude groups from Figure 2 In the main paper.

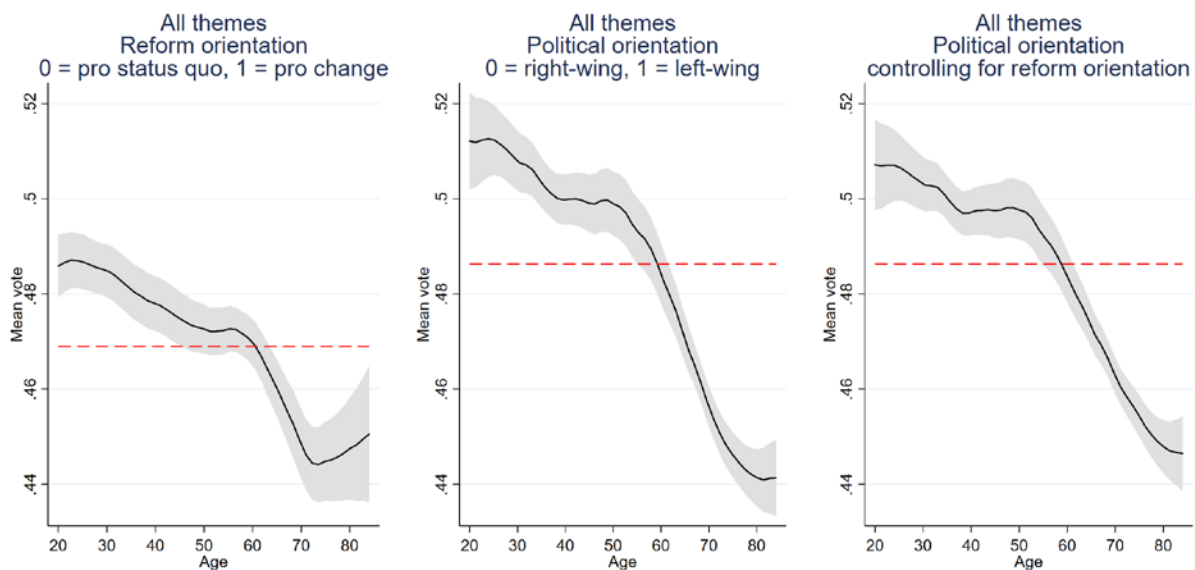
Fig A7. Voting by age and attitude group for unambiguous referenda



Notes: This figure summarizes the mean vote by age and attitude groups across for 251 unambiguous referenda from 1981 to 2017 out of a total of 305 referenda. We group the referenda into attitude groups by the theme defined in Table 1 (see main text, Section 3). A voting outcome of zero is in line with the political right, while an outcome of one is in line with the political left. We note that we restrict the data to unambiguous referenda. For each attitude group, we regress the voting outcome (one if in support of the theme, zero otherwise) against a battery of individual controls, referendum fixed effects and one-year-age-bin fixed effects. The point estimates (solid lines) and 95% confidence intervals (gray-shaded areas) are from local polynomial regressions (degree = 0) of the age-bin fixed effects against (integer) age. Dashed lines are the mean outcomes across all age groups within attitude groups. N is the number of referenda within an attitude group.

A comparison to Figure 2 in the main paper reveals that most of the referenda with a perhaps ambiguous mapping from voting decisions to attitudes fall into the ideological (32) and fiscal (16) attitude groups. Only six belong to the environmentalist attitude group and none of the referenda in the generational attitude group appears particularly controversial with respect to the interpretation of voting decisions. Yet, point estimates and confidence intervals remain close to the results reported in the main paper for all attitude groups.

Fig A8. Reform and orientation and political orientation by age for unambiguous referenda

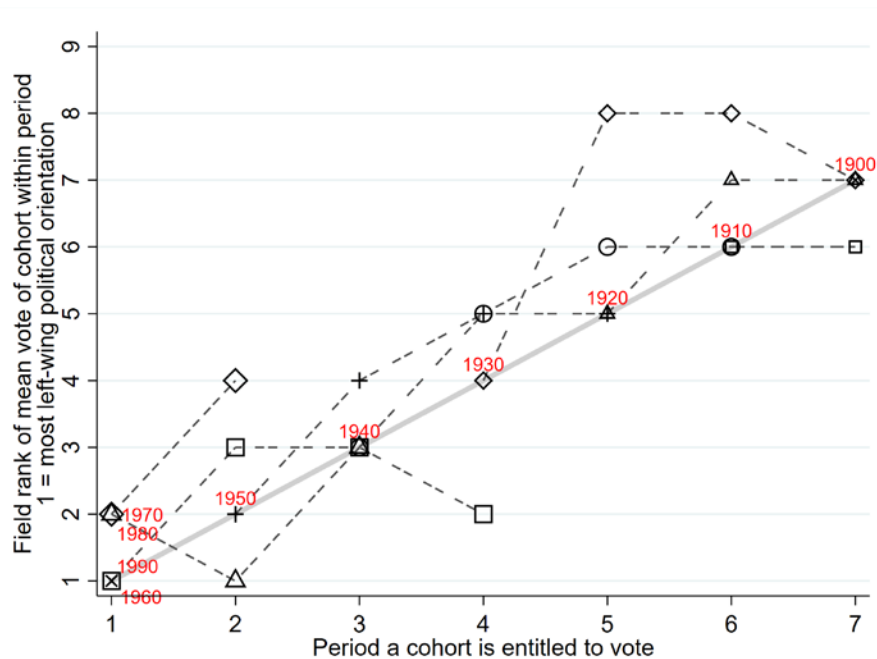


Notes: The figure summarizes the mean vote by age and attitude groups across 251 unambiguous referenda from 1981 to 2017 out of a total of 305 referenda. In the left panel, the voting outcome is encoded as zero if the vote is in support of the status quo (often, but not always a no vote) and as one if the vote supports a change in legislation. In the two remaining panels, the voting outcome is encoded as zero if it is in line with the political right and one if it is in line with the political left. In the first two panels, we regress different voting outcomes against a battery of individual controls, referendum fixed effects and one-year-age-bin fixed effects. In the third panel, we use the political orientation outcome as the dependent variable and control for the reform orientation in addition to the other covariates. The point estimates (solid lines) and 95% confidence intervals (gray-shaded areas) are from local polynomial regressions (degree = 0) of the recovered age-bin fixed effects against (integer) age. Dashed lines are the mean outcome across all age groups.

The results from the replication of the analysis of the impact of age-related differences on reform and political orientations also closely resemble the results using from the unrestricted referendum sample (see main text, Section 4.1 Figure 3).

Figure A9 directly corresponds to Figure 5 in Section 4.3 of the main text: the distribution of the unconditional within-period cohort's ranks in political orientation on the basis of unambiguous referenda only. Abstracting from some smaller differences for selected cohorts, the main insight that the cohort time-trends follow the 45-degree line remains unchanged.

Fig A9. Reform and orientation and political orientation by age for unambiguous referenda



Notes: Data cover 251 unambiguous referenda from 1981 to 2017 out of a total of 305 referenda. The field rank (lowest rank to highest value) is computed as the rank in the distribution of unconditional means in political orientation of cohorts within periods (the values reported in Table 3). A summary of left-wing attitudes by themes is in Table 1 (see main text, Section 3). The temporal unit of observation is periods defined as decades. Our data cover four periods (1980s, 1990s, 2000s, and 2010s) and 10 birth cohorts (1900s, 1910s, ..., 1990s). During the first/second/.../seventh periods a cohort is entitled to vote, voters are in their 20s/30s/.../80s. We ignore the remaining periods because the data for voters aged 90 and above are sparse. Cohorts are labeled when they first appear in our data. For example, the 1950-cohort is observed first in their second voting period when they are in their 30s (during the 1980s) and then in three subsequent periods (3, 4, and 5) when they are in their 40s, 50s and 60s (during the 1990s, 2000s, and 2010s). Light thick line is the 45-degree line (the upper bound of the ageing effect).

Lastly, to complete our sensitivity, we present the results of parametric regressions of aging effects on reform and political orientation ranks that correspond to Table 4 in the main paper in Table A9.

Tab A9. Parametric aging effects on reform and political orientation rank

Reform orientation rank	(1)	(2)	(3)	(4)	(5)	(6)
Age (years)	0.274** (0.105)	0.123 (0.211)	0.223** (0.107)	0.079 (0.195)	0.251 (0.442)	0.080 (0.493)
r2	0.075	0.288	0.050	0.346	0.422	0.320
Political orientation rank	(7)	(8)	(9)	(10)	(11)	(12)
Age (years)	0.694*** (0.082)	0.513*** (0.124)	0.717*** (0.073)	0.568*** (0.183)	0.434 (0.359)	0.872*** (0.234)
r2	0.482	0.734	0.514	0.742	0.445	0.482
Cohort effects	-	Yes	-	Yes	Yes	Yes
Controls	-	-	Yes	Yes	Yes	Yes
Ages	All	All	All	All	< 50	>= 50
N	112	112	112	112	48	64

Notes: The output is inferred from individual data from exit polls from 251 unambiguous referenda from 1981 to 2017 out of a total of 305 referenda. Individual data are aggregated to the age-group-period level. Reform [political] orientation rank is the rank in the distribution of mean (adjusted) reform [political] orientation within five-year age (20-24, 25-29, ...) x five-year period (1980-1984, 1985-1989, ..., 2010-2014) cells. Prior to the LWR, cohort effects are removed after running an auxiliary regression of the orientation rank against cohort fixed effects where indicated. Reform [political] orientation ranks are field ranks that increase in status-quo [right-wing] orientation. The reform [political] orientation is encoded as zero if the vote is in line with the status quo [the political right] and one if the vote is in line with a vote for change [the political left]. The addition of controls means that the reform [political] orientation is adjusted in a first-stage regression of the reform [political] orientation against a battery of first-stage controls and referendum-age-bin fixed effects in which the latter are used to generate the rank measures used here. Standard errors are clustered on cohort fixed effects where included. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Once more, the effect of restricting the referendum sample is relatively small. With respect to the aging effect on reform orientation, excluding the referenda that are very likely to be accepted (or rejected) decreases the point estimates from 0.301 (1) and 0.291 (3) (see Table 4) to 0.274 (1) and 0.223 (3). Controlling for socio-economic determinants and cohort effects, the estimated aging effect on political orientations in terms of rank-steps per year is 0.717 (9) and 0.568 (10) in Table A9. The corresponding coefficient values exploiting all referenda are 0.738 (9) and 0.617 (10) (see main text, Section 5.2, Table 4). Only model (11) in Table A9 yields an insignificant ageing effect on political orientation, whereas all other estimates remain highly statistically significant. This is in line with the central insight from the main analysis, that the marginal ageing effect becomes empirically relevant once voters approach the retirement age.

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The generation gap in direct democracy: Appendix II

Version: January 2019

1 Introduction

This appendix complements the main paper by providing a concise list of the Swiss referenda considered in this study in Table 1. Between June 14, 1981 and May 21, 2017, 312 public referenda took place at the federal level in Switzerland. We include all 305 referenda in our analysis for which there exist survey data. These referenda fall into 12 officially defined contextual *categories* (*Ebene-1 Deskriptoren*). Within each category, we define subcategories of contextually homogenous referenda, which we refer to as *themes*. In total, we define 24 themes, which we then aggregate to four *attitude groups*. The ideological attitude group comprises referenda on questions that concern the constitutional order, foreign affairs and security policy and relate to voters' beliefs and values in such a manner that a voter decision can be described as either conservative or liberal. The environmentalist attitude group comprises referenda in which voters' decisions have direct consequences for the protection of the environment, e.g. by affecting carbon emissions or protecting natural habitats. In the generational attitude group, we include referenda on policies that are specifically targeted at certain age groups, e.g. allowances for families (with dependent children) or labor market regulations (e.g. regarding maximum working hours) that affect those who are not yet retired. Finally, the fiscal attitude group includes referenda in which voters have the choice between options that have distributional consequences that can be described as either progressive (e.g. relatively more important income tax) or regressive (e.g. relatively more important tolls and user fees). In the interest of a transparent empirical analysis, we define attitude groups to render them mutually exclusive.

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Tab. 1. Referenda included in the analysis

#	VOXIT/ VOTO id	Year	Subject	Theme	Vote	Reform orientation	Political orientation	Attitude group
1	151	1981	Equal rights for men and women	01A	Yes	Pro change	Left-wing	Ideological
2	152	1981	Consumer protection	04B	Yes	Pro change	Left-wing	Ideological
3	161	1981	Continuation of the financial order	06A	Yes	Pro status quo	Right-wing	Fiscal
4	181	1982	Consumer protection	04B	Yes	Pro change	Left-wing	Ideological
5	182	1982	Consumer protection	04B	Yes	Pro change	Left-wing	Ideological
6	191	1983	Regulation of fuel tax	08B	Yes	Pro change	Right-wing	Fiscal
7	192	1983	Federal energy act	07A	Yes	Pro change	Left-wing ^a	Environmentalist
8	211	1984	Imposition of a heavy vehicle charge	08A	Yes	Pro change	Left-wing	Environmentalist
9	212	1984	Charges for use of national roads	08B	Yes	Pro change	Right-wing	Fiscal
10	213	1984	Introduction of a civilian service	03A	Yes	Pro change	Right-wing	Ideological
11	221	1984	Against the misuse of banking secrecy	06A	Yes	Pro change	Left-wing	Fiscal
12	222	1984	Against the sell-off of the home land	09B	Yes	Pro change	Left-wing	Ideological
13	232	1984	Moratorium on nuclear power plants	07A	Yes	Pro change	Left-wing	Environmentalist
14	231	1984	Energy supply	07A	Yes	Pro change	Left-wing	Environmentalist
15	241	1984	Protection of motherhood	10F	Yes	Pro change	Left-wing	Generational
16	242	1984	Radio and television article	12A	Yes	Pro change	Left-wing ^a	Fiscal
17	243	1984	Compensation to victims of violent crime	01A*	Yes	Pro change	Left-wing ^a	Ideological
18	252	1985	Repeal contributions for primary schools	11A	Yes	Pro change	Left-wing ^a	Fiscal
19	253	1985	Abolition of federal contributions to health care	06B	Yes	Pro change	Right-wing	Fiscal
20	254	1985	Federal education contributions	11A	Yes	Pro change	Right-wing	Fiscal
21	251	1985	Extension of paid holidays	04A	Yes	Pro change	Left-wing	Generational
22	261	1985	Abortions and the right to live	10A	Yes	Pro change	Right-wing	Ideological
23	262	1985	Canton's share of the net yield of stamp taxes	06B	Yes	Pro status quo	Right-wing	Fiscal
24	263	1985	Redistribution of net income from spirits	06B	Yes	Pro status quo	Right-wing ^a	Fiscal
25	264	1985	Subsidies for self-sufficiency in grain	05A	Yes	Pro change	Left-wing ^a	Ideological
26	271	1985	Coordination of school year period	11A	Yes	Pro change	Left-wing ^a	Fiscal
27	272	1985	Innovation risk guarantee for companies	04A	Yes	Pro change	Left-wing	Generational

#	VOXIT/ VOTO id	Year	Subject	Theme	Vote	Reform orientation	Political orientation	Attitude group
28	273	1985	Changes to the Swiss Civil Code	01A	Yes	Pro change	Left-wing	Ideological
29	281	1985	Abolition of vivisection	11B	Yes	Pro change	Right-wing	Ideological
30	291	1986	Accession to the United Nations	02A	Yes	Pro change	Left-wing	Ideological
31	301	1986	'Culture initiative'	12A	Yes	Pro change	Left-wing	Fiscal
32	302	1986	Alternative draft 'Culture initiative'	12A	Yes	Pro change	Left-wing	Fiscal
33	303	1986	Support of education and retraining	11A	Yes	Pro change	Left-wing	Fiscal
34	304	1986	Domestic sugar industry	05A	Yes	Pro change	Right-wing ^a	Ideological
35	321	1987	Asylum Act	10G	Yes	Pro change	Right-wing	Ideological
36	322	1987	Residence and establishment of foreigners	10G	Yes	Pro change	Right-wing	Ideological
37	323	1987	People's rights in military expenses	03A	Yes	Pro change	Left-wing	Ideological
38	324	1987	Counter-proposals and public votes	01B	Yes	Pro change	Left-wing	Ideological
39	341	1987	'Concept Train 2000'	08A	Yes	Pro change	Left-wing	Environmentalist
40	342	1987	Health insurance	10F	Yes	Pro change	Left-wing	Generational
41	343	1987	Protect the moors - Rothenthurm initiative	09A	Yes	Pro change	Left-wing	Environmentalist
42	351	1988	Coordinated transport policy	08A	Yes	Pro change	Left-wing ^a	Environmentalist
43	352	1988	Decrease in retirement age	10D	Yes	Pro change	Left-wing	Generational
44	361	1988	Against land speculation	09B	Yes	Pro change	Left-wing	Ideological
45	362	1988	Shorter working hours	04A	Yes	Pro change	Left-wing	Generational
46	363	1988	Limiting immigration	10G	Yes	Pro change	Right-wing	Ideological
47	371	1989	Factory farming and ecological agriculture	09A	Yes	Pro change	Left-wing	Environmentalist
48	382	1989	Defense policy	03A	Yes	Pro change	Left-wing	Ideological
49	381	1989	Reducing speed limit	08A	Yes	Pro change	Left-wing	Environmentalist
50	391	1990	Limiting road construction	08A	Yes	Pro change	Left-wing	Environmentalist
51	392	1990	Limiting road construction	08A	Yes	Pro change	Left-wing	Environmentalist
52	393	1990	Limiting road construction	08A	Yes	Pro change	Left-wing	Environmentalist
53	394	1990	Limiting road construction	08A	Yes	Pro change	Left-wing	Environmentalist
54	395	1990	Viticulture	05A	Yes	Pro change	Left-wing ^a	Ideological
55	396	1990	Federal Legal Administration	01A	Yes	Pro change	Left-wing ^a	Ideological
56	401	1990	Exit nuclear energy	07A	Yes	Pro change	Left-wing	Environmentalist

#	VOXIT/ VOTO id	Year	Subject	Theme	Vote	Reform orientation	Political orientation	Attitude group
57	402	1990	Moratorium on nuclear power plants	07A	Yes	Pro change	Left-wing	Environmentalist
58	403	1990	Energy Article	07A	Yes	Pro change	Left-wing	Environmentalist
59	404	1990	Road traffic	08A	Yes	Pro change	Right-wing	Environmentalist
60	411	1991	Reducing voting age	01B	Yes	Pro change	Left-wing	Ideological
61	412	1991	Support public transport	08A	Yes	Pro change	Left-wing ^a	Environmentalist
62	421	1991	Reorganization of federal finances	06A	Yes	Pro change	Right-wing ^a	Fiscal
63	422	1991	Military Penal Code	03A	Yes	Pro change	Left-wing	Ideological
64	431	1992	Support affordable health insurance	10B	Yes	Pro change	Right-wing	Fiscal
65	432	1992	Against animal experiments	11B	Yes	Pro change	Left-wing	Ideological
66	441	1992	Access to Bretton Woods	02A	Yes	Pro change	Left-wing	Ideological
67	442	1992	Water Protection Act	09A	Yes	Pro change	Left-wing	Environmentalist
68	443	1992	Water protection	09A	Yes	Pro change	Left-wing	Environmentalist
69	444	1992	Reproductive and genetic engineering	11B	Yes	Pro change	Left-wing	Ideological
70	445	1992	Introduction of a civilian service	03A	Yes	Pro change	Left-wing	Ideological
71	446	1992	Swiss Penal Code and Military Penal Code	01A	Yes	Pro change	Right-wing ^a	Ideological
72	461	1992	Swiss railway ('Alpentransit')	08A	Yes	Pro change	Left-wing	Environmentalist
73	462	1992	Commercial Traffic Act	01A	Yes	Pro change	Left-wing ^a	Ideological
74	463	1992	Compensation Act	01A	Yes	Pro change	Left-wing ^a	Ideological
75	464	1992	Infrastructure Act	01A	Yes	Pro change	Left-wing ^a	Ideological
76	465	1992	Swiss federal stamp tax	06A	Yes	Pro change	Right-wing	Fiscal
77	466	1992	Farming land rights	05A	Yes	Pro change	Left-wing ^a	Ideological
78	471	1992	European Economic Area	02A	Yes	Pro change	Left-wing	Ideological
79	481	1993	Increase in fuel tax	08B	Yes	Pro change	Right-wing	Fiscal
80	482	1993	Abolition of the ban on casinos	10C*	Yes	Pro change	Left-wing ^a	Fiscal
81	483	1993	Against animal experiments	11B	Yes	Pro change	Left-wing	Ideological
82	491	1993	Environmental protection in the military	03A	Yes	Pro change	Left-wing	Ideological
83	492	1993	Military expenses on aircraft	03A	Yes	Pro change	Left-wing	Ideological
84	501	1993	Law on fire arms	01A	Yes	Pro change	Right-wing	Ideological
85	502	1993	Reallocation of administrative districts	01B	Yes	Pro change	Left-wing ^a	Ideological

#	VOXIT/ VOTO id	Year	Subject	Theme	Vote	Reform orientation	Political orientation	Attitude group
86	503	1993	Introduction of a new public holiday	04A	Yes	Pro change	Left-wing	Generational
87	504	1993	Health Insurance	10B	Yes	Pro change	Right-wing	Fiscal
88	505	1993	Unemployment insurance	10E	Yes	Pro change	Left-wing	Generational
89	511	1993	Financial order	06A	Yes	Pro change	Right-wing ^a	Fiscal
90	512	1993	Recovery of federal finances	06A	Yes	Pro change	Right-wing	Fiscal
91	513	1993	Support social insurance	10C	Yes	Pro change	Left-wing	Fiscal
92	514	1993	Special excise taxes	06A	Yes	Pro change	Right-wing	Fiscal
93	515	1993	Reducing alcohol problems	10A	Yes	Pro change	Right-wing	Ideological
94	516	1993	Reducing tobacco problems	10A	Yes	Pro change	Right-wing	Ideological
95	521	1994	Continuation of the national road tax	08B	Yes	Pro status quo	Right-wing	Fiscal
96	522	1994	Continuation of the heavy vehicle charge	08A	Yes	Pro status quo	Left-wing	Environmentalist
97	523	1994	Special heavy vehicle charge	08A	Yes	Pro change	Left-wing	Environmentalist
98	524	1994	Protection of Alpine area	08A	Yes	Pro change	Left-wing	Environmentalist
99	525	1994	Aviation Act	08A	Yes	Pro change	Right-wing ^a	Environmentalist
100	532	1994	Cultural promotion article	12A	Yes	Pro change	Left-wing ^a	Fiscal
101	533	1994	Revision of civil rights regulation	10G	Yes	Pro change	Left-wing	Ideological
102	531	1994	Peacekeeping Operations (BTFO)	02A	Yes	Pro change	Left-wing	Ideological
103	541	1994	Abolition of domestic grain subsidies	05A	Yes	Pro change	Left-wing	Ideological
104	542	1994	Antiracism and criminal code	10G	Yes	Pro change	Left-wing	Ideological
105	551	1994	Revision of health insurance	10B	Yes	Pro change	Right-wing	Fiscal
106	552	1994	For sound health insurance	10B	Yes	Pro change	Left-wing	Fiscal
107	553	1994	Compulsory measures in the Aliens Act	10G	Yes	Pro change	Left-wing	Ideological
108	561	1995	For environmentally sound agriculture	09A	Yes	Pro change	Left-wing	Environmentalist
109	562	1995	Dairy Decision 1988 (MWB)	05A	Yes	Pro change	Left-wing ^a	Ideological
110	563	1995	Agriculture Act	05A	Yes	Pro change	Right-wing ^a	Ideological
111	564	1995	Federal expenditure caps	06B	Yes	Pro change	Right-wing	Fiscal
112	571	1995	Age insurance	10C	Yes	Pro change	Left-wing	Fiscal
113	572	1995	Support age and disability insurance	10C	Yes	Pro change	Left-wing	Fiscal
114	573	1995	Acquisition of land by persons abroad	09B	Yes	Pro change	Right-wing	Ideological

#	VOXIT/ VOTO id	Year	Subject	Theme	Vote	Reform orientation	Political orientation	Attitude group
115	581	1996	Revision language article	12A	Yes	Pro change	Left-wing ^a	Fiscal
116	582	1996	Reallocation of administrative districts	01B	Yes	Pro change	Left-wing ^a	Ideological
117	583	1996	Cantonal military expenses	06B	Yes	Pro change	Right-wing ^a	Fiscal
118	584	1996	Issues in federal expenses and subsidies	05A	Yes	Pro change	Left-wing ^a	Ideological
119	585	1996	Issues in federal expenses and subsidies	08A	Yes	Pro change	Left-wing	Environmentalist
120	591	1996	Environmentally sound agriculture	05A	Yes	Pro change	Right-wing	Ideological
121	592	1996	Administration Organization Act (RVGO)	06A	Yes	Pro change	Right-wing ^a	Fiscal
122	601	1996	Against illegal immigration	10G	Yes	Pro change	Right-wing	Ideological
123	602	1996	Working conditions in industry	04A	Yes	Pro change	Right-wing	Generational
124	611	1997	People's rights in EU accession negotiations	01B	Yes	Pro change	Left-wing	Ideological
125	612	1997	Prohibition of military exports	03A	Yes	Pro change	Left-wing	Ideological
126	613	1997	Gun powder production and distribution	03A	Yes	Pro change	Left-wing ^a	Ideological
127	622	1997	Financing unemployment insurance	10E	Yes	Pro change	Right-wing	Generational
128	621	1997	'Youth Without Drugs'	10A	Yes	Pro change	Right-wing	Ideological
129	632	1998	Federal expenses and budget balancing	06B	Yes	Pro change	Right-wing	Fiscal
130	631	1998	Reproductive and genetic engineering	11B	Yes	Pro change	Left-wing	Ideological
131	633	1998	State surveillance and political persecution	03A	Yes	Pro change	Left-wing	Ideological
132	641	1998	Special heavy vehicle charge	08A	Yes	Pro change	Left-wing	Environmentalist
133	642	1998	Food prices and ecological farming	05A	Yes	Pro change	Right-wing	Ideological
134	643	1998	Revision age insurance	10D	Yes	Pro change	Left-wing	Generational
135	651	1998	Support public transport	08A	Yes	Pro change	Left-wing	Environmentalist
136	652	1998	Temporary new grain article	05A	Yes	Pro change	Left-wing ^a	Ideological
137	653	1998	Reasonable drug policy	10A	Yes	Pro change	Left-wing	Ideological
138	654	1998	Working conditions in industry	04A	Yes	Pro change	Right-wing	Generational
139	661	1999	Requirements for eligibility in the Bundesrat	01A	Yes	Pro change	Left-wing	Ideological
140	664	1999	Transplantation medicine	10A	Yes	Pro change	Right-wing	Ideological
141	662	1999	Residential property	09B	Yes	Pro change	Left-wing	Ideological
142	663	1999	Spatial planning	09B	Yes	Pro change	Right-wing	Ideological
143	671	1999	New federal constitution	01A	Yes	Pro change	Left-wing ^a	Ideological

#	VOXIT/ VOTO id	Year	Subject	Theme	Vote	Reform orientation	Political orientation	Attitude group
144	681	1999	Asylum Act	10G	Yes	Pro change	Right-wing	Ideological
145	682	1999	Asylum policy and Aliens Act	10G	Yes	Pro change	Right-wing	Ideological
146	683	1999	Medical prescription of heroin	10A	Yes	Pro status quo	Left-wing	Ideological
147	684	1999	Disability insurance	10B	Yes	Pro change	Right-wing	Fiscal
148	685	1999	Mother insurance	10F	Yes	Pro change	Left-wing	Generational
149	691	2000	Judicial reform	01A	Yes	Pro change	Left-wing ^a	Ideological
150	692	2000	Acceleration of direct democracy	01B	Yes	Pro change	Left-wing	Ideological
151	693	2000	Contingent of women in federal authorities	01A	Yes	Pro change	Right-wing	Ideological
152	694	2000	Reproductive technology	10A	Yes	Pro change	Right-wing	Ideological
153	695	2000	Limiting road traffic	09A	Yes	Pro change	Left-wing	Environmental
154	701	2000	Sectoral agreements with the EU	02A	Yes	Pro change	Left-wing	Ideological
155	712	2000	Support solar energy	07A	Yes	Pro change	Left-wing	Environmental
156	712	2000	Support renewable energy	07A	Yes	Pro change	Left-wing	Environmental
157	713	2000	Pigouvian tax on energy	07A	Yes	Pro change	Left-wing	Environmental
158	714	2000	Regulation of immigration	10G	Yes	Pro change	Right-wing	Ideological
159	715	2000	Referendums and counter-proposals	01B	Yes	Pro change	Left-wing	Ideological
160	721	2000	Against increasing retirement age	10D	Yes	Pro change	Left-wing	Generational
161	722	2000	Flexible age insurance with 62	10D	Yes	Pro change	Left-wing	Generational
162	723	2000	Military expenses and defense policy	03A	Yes	Pro change	Left-wing	Ideological
163	724	2000	Lower hospital costs	10B	Yes	Pro change	Right-wing	Fiscal
164	725	2000	Federal personnel law	01A	Yes	Pro change	Left-wing ^a	Ideological
165	731	2001	Accession to the EU	02A	Yes	Pro change	Left-wing	Ideological
166	732	2001	Lower medicine prices	10B	Yes	Pro change	Left-wing	Fiscal
167	733	2001	Reducing speed limit	10F*	Yes	Pro change	Left-wing	Generational
168	741	2001	Military Administration (armament)	03A	Yes	Pro change	Right-wing	Ideological
169	742	2001	Military Administration (education)	03A	Yes	Pro change	Right-wing ^a	Ideological
170	743	2001	Construction of dioceses	12A	Yes	Pro change	Left-wing ^a	Fiscal
171	751	2001	Federal expenses and debt caps	06B	Yes	Pro change	Right-wing	Fiscal
172	752	2001	Secure age insurance by taxing energy	10C	Yes	Pro change	Right-wing	Fiscal

#	VOXIT/ VOTO id	Year	Subject	Theme	Vote	Reform orientation	Political orientation	Attitude group
173	753	2001	Defense policy	03A	Yes	Pro change	Left-wing	Ideological
174	754	2001	Alternative civilian service	03A	Yes	Pro change	Left-wing	Ideological
175	755	2001	Capital gains tax	06A	Yes	Pro change	Left-wing	Fiscal
176	761	2002	Accession to the UN	02A	Yes	Pro change	Left-wing	Ideological
177	762	2002	Shorter working hours	04A	Yes	Pro change	Left-wing	Generational
178	771	2002	Abortion law	10A	Yes	Pro change	Left-wing	Ideological
179	772	2002	Protection of motherhood	10F	Yes	Pro change	Left-wing	Generational
180	782	2002	Excessive gold reserves for age insurance	10C	Yes	Pro change	Left-wing	Fiscal
181	783	2002	Electricity Market Act	04B	Yes	Pro change	Right-wing	Ideological
182	791	2002	Against asylum abuse	10G	Yes	Pro change	Right-wing	Ideological
183	792	2002	Unemployment insurance	10E	Yes	Pro status quo	Left-wing	Generational
184	801	2003	Changes to the people's rights	01B	Yes	Pro change	Left-wing ^a	Ideological
185	802	2003	Cantonal contribution to hospital costs	10B	Yes	Pro change	Right-wing ^a	Fiscal
186	811	2003	Military administration	03A	Yes	Pro change	Left-wing	Ideological
187	812	2003	Civil protection	03A	Yes	Pro change	Left-wing	Ideological
188	821	2003	Social tenancy law	09B	Yes	Pro change	Right-wing	Ideological
189	813	2003	Limiting road traffic	08A	Yes	Pro change	Left-wing	Environmental
190	814	2003	Support health insurance	10B	Yes	Pro change	Left-wing	Fiscal
191	815	2003	Equality of treatment for the disabled	10B	Yes	Pro change	Left-wing	Fiscal
192	822	2003	Exit nuclear energy	07A	Yes	Pro change	Left-wing	Environmental
193	823	2003	Moratorium on nuclear power plants	07A	Yes	Pro status quo	Left-wing	Environmental
194	824	2003	For sufficient vocational training	11A	Yes	Pro change	Left-wing	Fiscal
195	831	2004	Safe and efficient motorways	08A	Yes	Pro change	Right-wing	Environmental
196	832	2004	Code of Obligations (tenancy)	04B*	Yes	Pro change	Right-wing	Ideological
197	833	2004	Confinement of nontreatable pedophiles	01A	Yes	Pro change	Right-wing ^a	Ideological
198	841	2004	Revision age insurance	10C	Yes	Pro change	Right-wing	Fiscal
199	842	2004	Increasing VAT for age insurance	10C	Yes	Pro change	Left-wing	Fiscal
200	843	2004	Issues in private taxation	10F	Yes	Pro change	Left-wing	Generational
201	851	2004	Naturalization of young foreigners	10G	Yes	Pro change	Left-wing	Ideological

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202	852	2004	Citizenship of third generation foreigners	10G	Yes	Pro change	Left-wing	Ideological
203	853	2004	Postal service	04B*	Yes	Pro change	Left-wing ^a	Ideological
204	854	2004	Income Substitution Act (EOG)	10F	Yes	Pro change	Left-wing	Generational
205	861	2004	Federal and cantonal revenue equalization	06B	Yes	Pro change	Right-wing ^a	Fiscal
206	862	2004	New federal order	06B	Yes	Pro status quo	Right-wing ^a	Fiscal
207	863	2004	Research on embryonic stem cells	11B	Yes	Pro change	Right-wing	Ideological
208	871	2005	Schengen and Dublin agreements	02A	Yes	Pro change	Left-wing	Ideological
209	872	2005	Partnership Act	01A	Yes	Pro change	Left-wing	Ideological
210	881	2005	Free movement of persons	02A	Yes	Pro change	Left-wing	Ideological
211	891	2005	Genetic engineering and agriculture	05A	Yes	Pro change	Left-wing	Ideological
212	892	2005	Working time regulations	04A	Yes	Pro change	Right-wing	Generational
213	901	2006	Constitutional provisions on education	11A	Yes	Pro change	Left-wing	Fiscal
214	911	2006	Central bank profits for age insurance	10C	Yes	Pro change	Left-wing	Fiscal
215	912	2006	Aliens Act	10G	Yes	Pro change	Right-wing	Ideological
216	913	2006	Changes to the law on foreign nationals	10G	Yes	Pro change	Right-wing	Ideological
217	921	2006	Cooperation with Eastern Europe states	02A	Yes	Pro status quo	Left-wing	Ideological
218	922	2006	Support family income	10F	Yes	Pro change	Left-wing	Generational
219	931	2007	Social health insurance fund	10B	Yes	Pro change	Left-wing	Fiscal
220	941	2007	Revision Disability insurance	10B	Yes	Pro change	Right-wing	Fiscal
221	951	2008	Against jet fighter noise in tourism areas	03A	Yes	Pro change	Left-wing	Ideological
222	952	2008	Corporate Tax Reform Act	06A	Yes	Pro change	Right-wing	Fiscal
223	961	2008	Democratic naturalizations	10G	Yes	Pro change	Right-wing	Ideological
224	962	2008	Distributed information on public votes	01B	Yes	Pro change	Right-wing ^a	Ideological
225	963	2008	Quality and efficiency of health insurance	10A	Yes	Pro change	Left-wing	Ideological
226	973	2008	Stricter laws on sexual offenses	01A	Yes	Pro change	Right-wing ^a	Ideological
227	971	2008	Flexible age insurance	10D	Yes	Pro change	Left-wing	Generational
228	972	2008	Associations' right of appeal	09B	Yes	Pro change	Left-wing	Ideological
229	974	2008	Cannabis policy and youth protection	10A	Yes	Pro change	Left-wing	Ideological
230	975	2008	Narcotics and psychotropic substances	10A	Yes	Pro change	Right-wing	Ideological

#	VOXIT/ VOTO id	Year	Subject	Theme	Vote	Reform orientation	Political orientation	Attitude group
231	981	2009	Free movement of persons	02A	Yes	Pro status quo	Left-wing	Ideological
232	991	2009	Support complimentary medicine	10B	Yes	Pro change	Left-wing	Fiscal
233	992	2009	Exchange of passport information	02A	Yes	Pro change	Left-wing ^a	Ideological
234	1001	2009	Disability insurance	06A	Yes	Pro change	Right-wing	Fiscal
235	1002	2009	General popular initiatives	01B	Yes	Pro change	Right-wing ^a	Ideological
236	1011	2009	Financing aviation tasks	08A	Yes	Pro change	Right-wing ^a	Environmentalist
237	1012	2009	Prohibition of military exports	03A	Yes	Pro change	Left-wing	Ideological
238	1013	2009	Against the construction of minarets	10G*	Yes	Pro change	Right-wing	Ideological
239	1021	2010	Regulations on human research	11B	Yes	Pro change	Right-wing	Ideological
240	1022	2010	Legal protection of animals	09A	Yes	Pro change	Left-wing	Environmentalist
241	1023	2010	Age insurance	10B	Yes	Pro change	Right-wing	Fiscal
242	1031	2010	Unemployment insurance	10E	Yes	Pro change	Right-wing	Generational
243	1042	2010	Expulsion of criminal foreigners	10G	Yes	Pro change	Right-wing	Ideological
244	1042	2010	Expulsion of criminal foreigners	10G	Yes	Pro change	Right-wing	Ideological
245	1043	2010	Support tax fairness	06A	Yes	Pro change	Left-wing	Fiscal
246	1051	2011	Protection against armed violence	01A*	Yes	Pro change	Right-wing	Ideological
247	1061	2012	Limiting construction of second homes	09B	Yes	Pro change	Right-wing	Ideological
248	1062	2012	Tax-privileged home purchase savings	09B	Yes	Pro change	Left-wing	Ideological
249	1063	2012	Support more leave days paid	04A	Yes	Pro change	Left-wing	Generational
250	1064	2012	Regulation of money games	06A	Yes	Pro change	Left-wing	Fiscal
251	1065	2012	Book price fixing	12A	Yes	Pro change	Right-wing	Fiscal
252	1071	2012	Home purchase savings	09B	Yes	Pro change	Left-wing	Ideological
253	1072	2012	People's rights in foreign policy	01B	Yes	Pro change	Left-wing	Ideological
254	1073	2012	Health Insurance (Managed Care)	10B	Yes	Pro change	Right-wing	Fiscal
255	1083	2012	Support youth music promotion	12A*	Yes	Pro change	Left-wing	Fiscal
256	1082	2012	'Support old age living/residency'	10C	Yes	Pro change	Left-wing	Fiscal
257	1081	2012	Protection against passive smoking	09A	Yes	Pro change	Left-wing ^a	Environmentalist
258	1091	2012	Animal Disease Act	05A	Yes	Pro change	Right-wing ^a	Ideological
259	1101	2013	Family policy	10F	Yes	Pro change	Left-wing	Generational

#	VOXIT/ VOTO id	Year	Subject	Theme	Vote	Reform orientation	Political orientation	Attitude group
260	1102	2013	Consumer protection	04B	Yes	Pro change	Left-wing	Ideological
261	1103	2013	Spatial Planning Act	09B	Yes	Pro change	Right-wing ^a	Ideological
262	1111	2013	People's election of the Federal Council	01B	Yes	Pro change	Left-wing	Ideological
263	1112	2013	Urgent changes to the Asylum Act	10G	Yes	Pro change	Right-wing	Ideological
264	1121	2013	Abolition of the military service	03A	Yes	Pro change	Left-wing	Ideological
265	1122	2013	Epidemics Act	10A	Yes	Pro change	Right-wing ^a	Ideological
266	1123	2013	Labor law	04A	Yes	Pro change	Right-wing	Generational
267	1131	2013	Fair wages	04B	Yes	Pro change	Left-wing	Ideological
268	1132	2013	Family policy: Tax reduction	10F	Yes	Pro change	Left-wing	Generational
269	1133	2013	National Road Expense Article	08B	Yes	Pro change	Right-wing	Fiscal
270	1141	2014	Support railway infrastructure	08A	Yes	Pro change	Left-wing	Environmentalist
271	1142	2014	Excluding abortion cost from basic insurance	10B	Yes	Pro change	Right-wing	Fiscal
272	1143	2014	Against mass immigration	10G	Yes	Pro change	Left-wing	Ideological
273	1151	2014	Issues in basic Health Insurance	10B	Yes	Pro change	Left-wing	Fiscal
274	1152	2014	Against pedophiles working with children	01A	Yes	Pro change	Right-wing ^a	Ideological
275	1153	2014	Rise in minimum wage	04A	Yes	Pro change	Left-wing	Generational
276	1154	2014	Fund for the procurement of jet fighters	03A	Yes	Pro change	Right-wing	Ideological
277	1161	2014	Taxes in hospitality industry	06B	Yes	Pro change	Left-wing	Fiscal
278	1162	2014	Public health insurance	10B	Yes	Pro change	Left-wing	Fiscal
279	1171	2014	Abolition of flat-rate taxation	06A	Yes	Pro change	Left-wing	Fiscal
280	1172	2014	Against overpopulation	10G	Yes	Pro change	Right-wing	Ideological
281	1173	2014	National Bank's gold storage in Switzerland	06B*	Yes	Pro change	Left-wing	Fiscal
282	1181	2015	Tax free child benefit and training bonus	10F	Yes	Pro change	Left-wing	Generational
283	1182	2015	Higher energy taxes instead of VAT increases	07A	Yes	Pro change	Left-wing	Environmentalist
284	1191	2015	Reproductive and genetic engineering	11B	Yes	Pro change	Right-wing	Ideological
285	1192	2015	Support scholarships	11A	Yes	Pro change	Left-wing	Fiscal
286	1193	2015	Increasing inheritance tax for age insurance	10C	Yes	Pro change	Left-wing	Fiscal
287	1194	2015	Changes to the Radio and Television Article	06A*	Yes	Pro change	Right-wing ^a	Fiscal
288	1201	2016	Family and marriage policy	10F	Yes	Pro change	Left-wing	Generational

#	VOXIT/ VOTO id	Year	Subject	Theme	Vote	Reform orientation	Political orientation	Attitude group
289	1202	2016	Expulsion of criminal foreigners	10G	Yes	Pro change	Right-wing	Ideological
290	1203	2016	Against financial speculation on food prices	04B	Yes	Pro change	Left-wing	Ideological
291	1204	2016	Reconstruction of the Gotthard road tunnel	08A	Yes	Pro change	Right-wing	Environmentalist
292	1211	2016	Public services	06A*	Yes	Pro change	Left-wing	Fiscal
293	1212	2016	Unconditional basis income	10E	Yes	Pro change	Left-wing	Generational
294	1213	2016	'Fair funding of transport'	08A	Yes	Pro change	Right-wing	Environmentalist
295	1214	2016	Reproductive Medicine Act	10A	Yes	Pro change	Left-wing	Ideological
296	1215	2016	Changes to the Asylum Act	10G	Yes	Pro change	Left-wing	Ideological
297	100001	2016	Support 'green economy'	09A	Yes	Pro change	Left-wing	Environmentalist
298	100002	2016	Support age insurance	10C	Yes	Pro change	Left-wing	Fiscal
299	100003	2016	Revision intelligence service	03A	Yes	Pro change	Right-wing	Ideological
300	100004	2016	Exit nuclear energy	07A	Yes	Pro change	Left-wing	Environmentalist
301	100005	2017	Support immigration	10G*	Yes	Pro change	Left-wing	Ideological
302	100006	2017	Fund for national roads and urban traffic	08A	Yes	Pro change	Right-wing	Environmentalist
303	100007	2017	Corporate Tax Reform Act	06A	Yes	Pro change	Right-wing	Fiscal
304	100008	2017	Federal Energy Act	07A	Yes	Pro change	Left-wing	Environmentalist

Notes: To save space, we only list the mapping of a yes vote to the reform orientation and the political orientation. A no vote mechanically maps to the opposite orientation (e.g. pro status quo if yes vote is pro change and right-wing if yes is left-wing). Themes are defined in Table 1 in the main paper. After consulting with Swissvotes (the consortium providing Swiss referendum data), we assign 12 referenda to themes that do not match the primary official category defined by the Swiss Statistical Office (SFSO) where indicated by * (in 12 cases). This was to ensure the best contextual fit and a mutually exclusive definition of themes and attitude groups. Furthermore, with reference to the robustness checks in Section 9.5 of Appendix I, we indicate 54 referenda where we view the mapping from a yes vote to attitudes and political orientation as potentially controversial by ^a (in 54 cases).