Online appendix for

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Alternative specifications, robustness checks and further discussion

This document provides more methodological discussions and presents robustness checks for the analysis of the above-mentioned article. Data and code used for the analysis of the paper area available here: https://github.com/david-reichel/treaty-acceptance-paper.

Additional clarifications concerning the data used for analysis

We use the term ratification of treaties, while other terms might be used and be more appropriate for some contexts. Ratification is more easily understood by many people, and means acceptance or commitment, meaning being bound by a treaty – to be party to that treaty. In a legal sense, becoming party to a treaty requires both signature and ratification, but note that in cases of state succession states may also become party to a treaty when they are considered legal successor of a state that previously was party to that treaty. We make four additional clarifications as to the empirical focus of our analysis. First, we focus in this paper on treaty ratification and not on signature. The latter may indicate the political willingness commit to the 'object and purpose' of a treaty, yet this remains a non-binding commitment until a treaty is ratified. Second, countries can make reservations, in the process of becoming party to a treaty. This has legal implications as countries can and do opt out of certain requirements stipulated in the treaties and this way avoid commitment, particularly to treaties that would create stronger legal constraints (Hill 2016). While this aspect should not be

ignored in more in-depth studies measuring which rights are accepted under international law, we do not account for reservations, since the majority of Council of Europe treaties are accepted without any reservation and the main focus of the analysis are general patterns of ratification across all treaties. Third, countries can denounce the ratification of a treaty, or parts of a treaty. For example, the Convention on the Reduction of Cases of Multiple Nationality and on Military Obligations in Cases of Multiple Nationality (ETS 043) was ratified by Germany in 1969 and denounced in 2001. Since this happens seldom, we do not consider this further in this paper. Fourth, we consider optional or additional protocols as 'normal treaties' as the general pattern in ratifying protocols does not differ substantially when controlling for type of treaty. We do acknowledge, however, that the scope of treaties as well as protocols may differ substantially, covering a limited or extensive area, covering substantive or more procedural aspects, or covering relatively simple technical elements or requiring radical shifts and modifications to existing *modus operandi*. The Council of Europe started an initiative in 2012 which also acknowledges differences in the status of treaties, where treaties are reviewed and classified into different groups, including key, other active and inactive treaties, proposing several measures for different types of treaties.[1]

There are 10,387 possible country and treaty combinations (i.e. 47 states multiplied by 221 treaties). These data were transformed into treaty-country-year observations, where a treaty-country combination was included starting in the year a treaty was opened until either the year of ratification of the country or until the end of the period of observation, which was 30 December 2016. This means that a country was included in the dataset as long as it was 'at risk' of ratifying a treaty. States that did not exist at the time of opening of a treaty only

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[1] For details see: https://www.coe.int/en/web/conventions/review-of-the-council-of-europe-conventionsreview-of-the-council-of-europe-conventions, accessed 12 August 2018.

entered the dataset in the year the country became independent or achieved statehood. However, not all treaties by the Council of Europe are open to all states and several treaties are exclusively for Council of Europe members. Therefore, for these treaties the time period, when a country starts being at risk was the year of opening for Council of Europe members and the year of accession to the Council of Europe for countries that were not members at the time of opening. The creation of treaty-country-year observations was important to allow for varying covariates overtime with respect to countries. Since treaties can also be accessed through succession (i.e. when a state is a successor state and the ratification of the previous state is counted in), some states ratified a treaty before becoming independent. For example, Montenegro accepted treaties as Serbia and Montenegro and some cases of the Czech Republic and Slovakia, accepting as Czechoslovakia. These cases were excluded.

This led to a full dataset of 181,820 observations. After adding covariates, described below, the number of observations decreased to 142,336, mainly because six smaller countries were excluded due to unavailability of data on covariates.

Covariates include the type of treaty, where each of the 221 treaties was categorised based on whether it was considered to be foundational for the CoE, a core human rights treaty or any other treaty that aims at harmonising the legal framework across countries in other areas. Other variables include information on whether or not a country became independent recently (in the past three years) and if a country is about to join the EU (in the coming four years).[2]

Regional diffusion of ratification is operationalised as a variable that takes the value of 1, if one of the neighbouring countries of a country has ratified the same treaty in the past

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[2] We use a slightly longer period of four years for upcoming EU membership as EU accession negotiations tend to be protracted over a longer period.

or the same year and 0 if otherwise. Neighbouring countries are defined based on a distance

of 500 km or if it was one of the three closest countries.[3] Additionally, the level of democracy

in a country is measured using the polity IV indicator for each year available for each of the

countries (Marshall, Gurr and Jaggers 2014).[4] The number of violations of the ECHR was

taken as the (logged) total number of judgements by the European Court of Human Rights

that have found at least one violation since 1959 (Council of Europe 2017). As we could only

obtain the total number of violations for each country, we assess the time-invariant number of

overall level of violations of the ECHR of a country.

Finally, after a treaty is opened for signature and ratification, there is typically a

requirement of a minimum number of ratifications for it to enter into force. We include the

required number of ratifications for treaties to come into force. Additionally, we measure

number of countries that sign a treaty on the opening day, by simply adding the numerical

value of how many countries signed a treaty on the same day it is opened.

Modelling strategy, robustness and alternative model specifications

Determinants of treaty ratification are analysed using a multilevel Cox proportional-hazard

regression models with varying covariates, which is a semi-parametric regression model. Cox

proportional-hazard regression was used in several similar studies (e.g. Elsig, Milewicz and

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[3] Usually this does not make much of a difference; however, this way also islands, for
  example Iceland, were included, since there are no other European countries within 500
  km from their borders. Calculations of distances used the dataset and R package "cshapes"
  (Weidmann and Gleditsch 2016).

[4] To allow for a more complete dataset the years 2015 and 2016 were imputed with the value
  of the year 2014.

Stürchler 2011; Neumayer 2003) and is known as a robust statistical method for dealing with time-to-event data (Box-Steffensmeier and Jones 2004 or Mills 2011). The data used for this study are clustered at two levels, the country level (41 countries) and the treaty level (221 treaties). The method allows for modelling the influence of covariates on the probability of an event to occur without having to specify the baseline probability distribution or 'hazard rate': $h_i(t) = h_0(t) \exp(X_{ik}\beta)$. The baseline hazard function $h_0(t)$ is left un-specified, as the hazard function of an individual i whose k covariates (X_i) have the value zero. This semi-parametric model is widely used in the social and medical sciences and, for our purposes, has been applied in several studies analysing treaty ratification (e.g. Wotipka and Ramirez 2008; Wotipka and Tsutsui 2008; Zhou 2014). The data used for this study are clustered at two levels, the country level (41 countries) and the treaty level (221 treaties). Since there remains unobserved heterogeneity at the level of countries and treaties, we use crossed random effects (as compared to nested random effects). This means that we accept some unexplained peculiarity for each of the countries' and treaties' hazard of ratification, which is accounted for and modelled in the 'random effects'. While classical multilevel regression models allow the intercept (and potentially coefficients) to vary at the group level, random effects in Cox regression have a multiplicative effect on the baseline hazard function:

$h_i(t) = h_0(t) \exp(\alpha_j) \exp(X_i\beta) = h_0(t) \exp(X_j\beta + \alpha_j)$, where α_j denotes the random effect associated with jth cluster (cf. Austin 2017). The models in this paper are calculated using the *coxme* package (Therneau 2015) available for the R statistical software (R Core Team 2017).

While there is no definitive answer to whether or not preferring fixed over random effects in survival analysis (whereas fixed effects refers to the use of dummy variables for all groups), there are advantages of random effects over fixed effects. These include being able to model group level predictors, which is not possible with fixed effects, and pooling of information across group levels, which means that information from groups with more

observations have a stronger influence. While some scholars, in general, argue that multilevel models should be the default approach or starting point in the presence of clustered data, as it most often outperforms other approaches (e.g. McElreath 2016 or Gelman and Hill 2006), some instances are not ideal for random effect approaches, particularly in the presence of correlation of predictors with random effects. However, these issues can be addressed and need to be considered alongside the research question of any study (Clark and Linzer 2012; Bell and Jones 2015). Fixed effects with many groups, used as dummy variables, can, however, also lead to biased estimates in logistic or cox regression, and using strata for the groups would be the preferred option for Cox regression compared to fixed effects (Allison 2002). Specifying groups as strata means that the baseline risk differs across groups (strata), which are completely unrelated nuisance functions, but that the regression coefficients are the same in each stratum.[5] Yet, using strata does not allow for including predictors at the level of strata, which needs to be done in this study (e.g. level of democracy of a country). Moreover, the predicted values from the multilevel models are much smoother and compared to the stratified estimates and provide more general results of the co-variates on treaty ratification and country. This means that the results of the models take information of the distribution of the unobserved effects on the treaty and country level by modelling the clusters. Hence, the estimation method is much more efficient and generalise much better compared to using strata, where no information across different clusters is used in the estimation procedure. Robustness tests of the results using strata instead of random effects and other alternative specifications will be discussed and presented below.

The models were tested in a multilevel model with crossed levels over a long period of time, without controlling specifically for the period of opening of treaties. While the

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[5] It can be expressed as: $h_{ij}(t) = h_{j0}(t) \exp(X_{ij}\beta)$.

specification used in the paper is in line with our assumptions of the general data generation process, we also tested other specifications to see if the patterns observed and reported above hold. The results are reported in Table A1. Running Model 3 with treaties unspecified and standard errors robust on country clusters, we observe similar results. The results are, however, for the core human rights treaties not significant for upcoming EU membership, democracy and its interaction with diffusion, but remain so for the harmonisation treaties. Yet, given the strong differences in acceptance of treaties, differences should be accounted for. An alternative way is running Model 3 without specifying the treaties as random effects, but more conservatively as strata – with the disadvantages of the approach outlined above (most notably that we cannot include treaty level co-variates). However, it is important to see what happens if the assumptions for the model change, i.e. what if we do not partially pool information on the treaty level. In this specification the results for upcoming EU membership hold true, however, the effect of diffusion is not constant over time, a basic assumption of the Cox proportional hazard regression, and declines over time. This means that, when pooling information over all treaties, but stratifying, the effect of diffusion only holds in the first years, when most ratifications take place. This is related to the fact that it cannot be observed consistently for all treaties and therefore only works in the conditional (random effects) model. In essence, after ten years the effect actually turns negative, which means that countries more often ratify alone for treaties that have not yet been ratified for ten years or more. For the core human rights treaties, the effects of diffusion and democracy are partly not significant as well. An alternative specification helps to overcome the problem of non-proportional hazards, with the level of democracy and ratification of neighbours specified in three groups of time strata – in the years 0 to 2, the years 3 to 9 and after 10 years – showing the patterns described above with a declining importance of diffusion of time.

Additionally, we run Model 3 on a limited number of countries – only those that have been independent already before 1989. This was done, since the landscape in Europe has changed dramatically in the beginning of the 1990s due to the collapse of the Soviet Union and dissolution of Yugoslavia. A good deal of what we observe when looking at all countries, is what the "new" countries after the beginning of the 1990s until now have done in terms of treaty ratification. In general, the results hold for all treaties with a few exceptions. The effect of diffusion is much weaker, the interaction of democracy and diffusion as well as the number of ratifications needed are not significant anymore. When looking at core human rights treaties only among countries that have been independent before 1989, we cannot see any impact of diffusion anymore, but number of ratifications needed. Hence, diffusion for human rights treaties can only be confirmed for the entire sample, but not for countries that have been independent already before 1989 – hence core human rights diffused at the same time among neighbours mainly in the newly established countries after the end of the Cold War.

Finally, since most ratifications occur in the first few years after opening of a treaty, we run Model 3 on a dataset that only includes observations after 5 years of opening of a treaty (more than 50 percent of ratifications took place in the first five years after opening). The results show that the effect of diffusion is not as strong as compared to the full dataset starting immediately after opening, which again suggests the declining importance of diffusion after some years of opening a treaty. Yet, overall the results hold apart from the ECHR violations – an effect that was anyway not strong and consistent. Using alternative specifications and subsets of the sample helps a great deal to further understand where the results hold and how these are driven by modelling assumptions. Especially the impact of diffusion is not unconditional and needs to be understood in the historical context when it comes to diffusion of human rights. It is not consistent among type of treaties and countries

and also reflects the historical European integration of countries. The diffusion of rights among neighbouring countries reflecting European integration in the sense of geographical expansion of the Council of Europe and EU enlargement can be visualised by a network graph, which shows that countries closer together ratify more often together. Figure A 1 shows the network of countries, where a link between two countries is defined as having ratified the same treaty in the same year. It shows the centrality of Nordic countries ratifying often together. Most often Norway and Sweden ratified treaties in the same year, followed by Denmark and Sweden, Denmark and Norway as well as the United Kingdom with Denmark and with Norway. The network also points to two main groups of countries ratifying together, which are the 'old' 15 EU member states, the EFTA countries,[6] Turkey, Cyprus, San Marino, Andorra and Monaco on the one hand, and the 'new' EU member states (EU members since 2004 or later, except Cyprus) and the other Eastern European countries. It also shows that Russia rarely ratifies together with other countries.[7]

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[6] EFTA stands for European Free Trade Association and include Iceland, Liechtenstein, Norway and Switzerland.

[7] The differentiation into groups is supported by group identifying algorithms used in network analysis. We used a community identifier based on leading eigenvectors.

Figure A1: Network of countries that ratify in the same year the same treaties
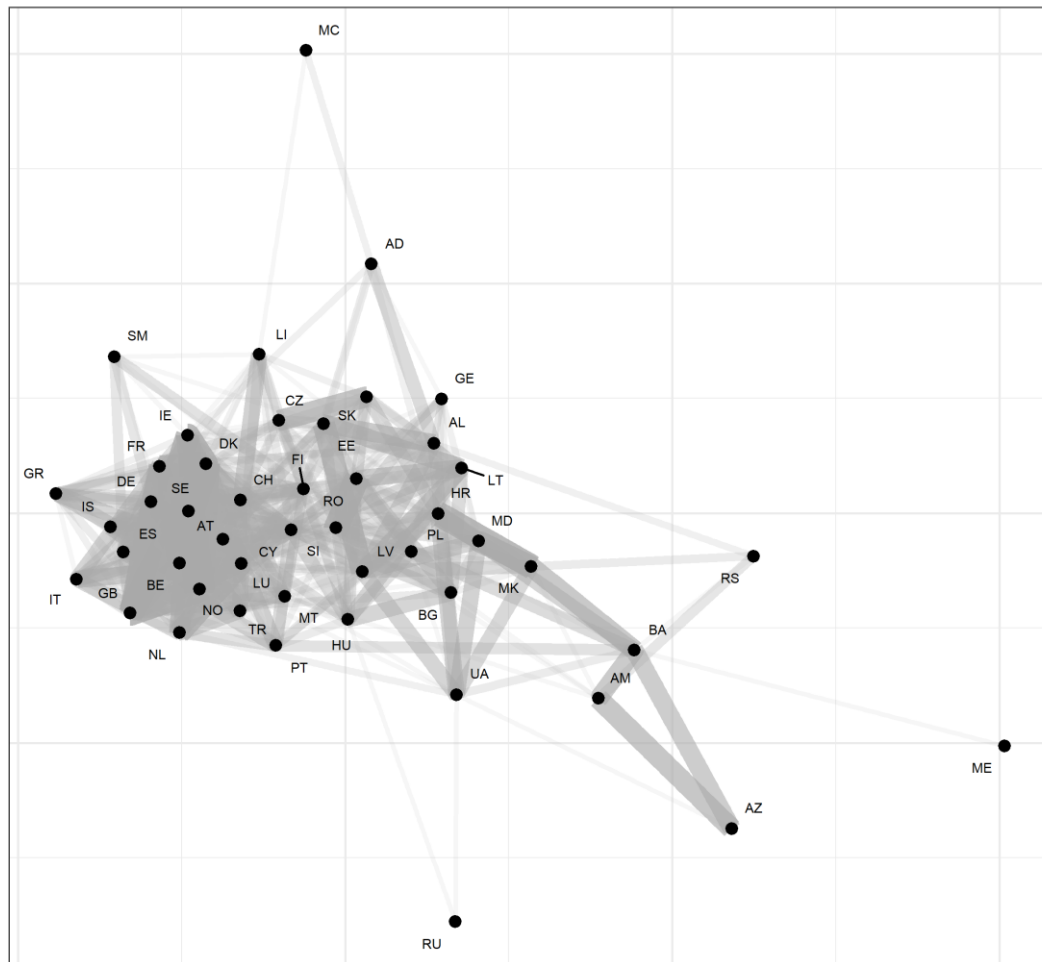
Notes: It shows linkages of more than 5 ratifications that occur at the same time to increase the visibility of the network

Alternative measurements and other control variables

First of all, we tested how much variation can be observed for different types of treats, by checking bootstrapped samples. Figure A2 shows the hazard ratios of Model 3 of 500 bootstrapped samples for the different types of treaties and visualises the variation of different coefficients specified in the model. When comparing the results for the two types of treaties, it can be seen that the hazard ratios for EU accession, diffusion, democracy and the number of signatures on the opening day are somewhat larger for general harmonisation treaties compared to core human rights treaties. The number of ratifications needed is much

stronger associated with human rights treaties compared to harmonisation treaties. In general, there is more variation for the core human rights treaties.

Figure A2: Hazard ratios of coefficients from 500 bootstrapped multilevel Cox regressions, by type of treaty
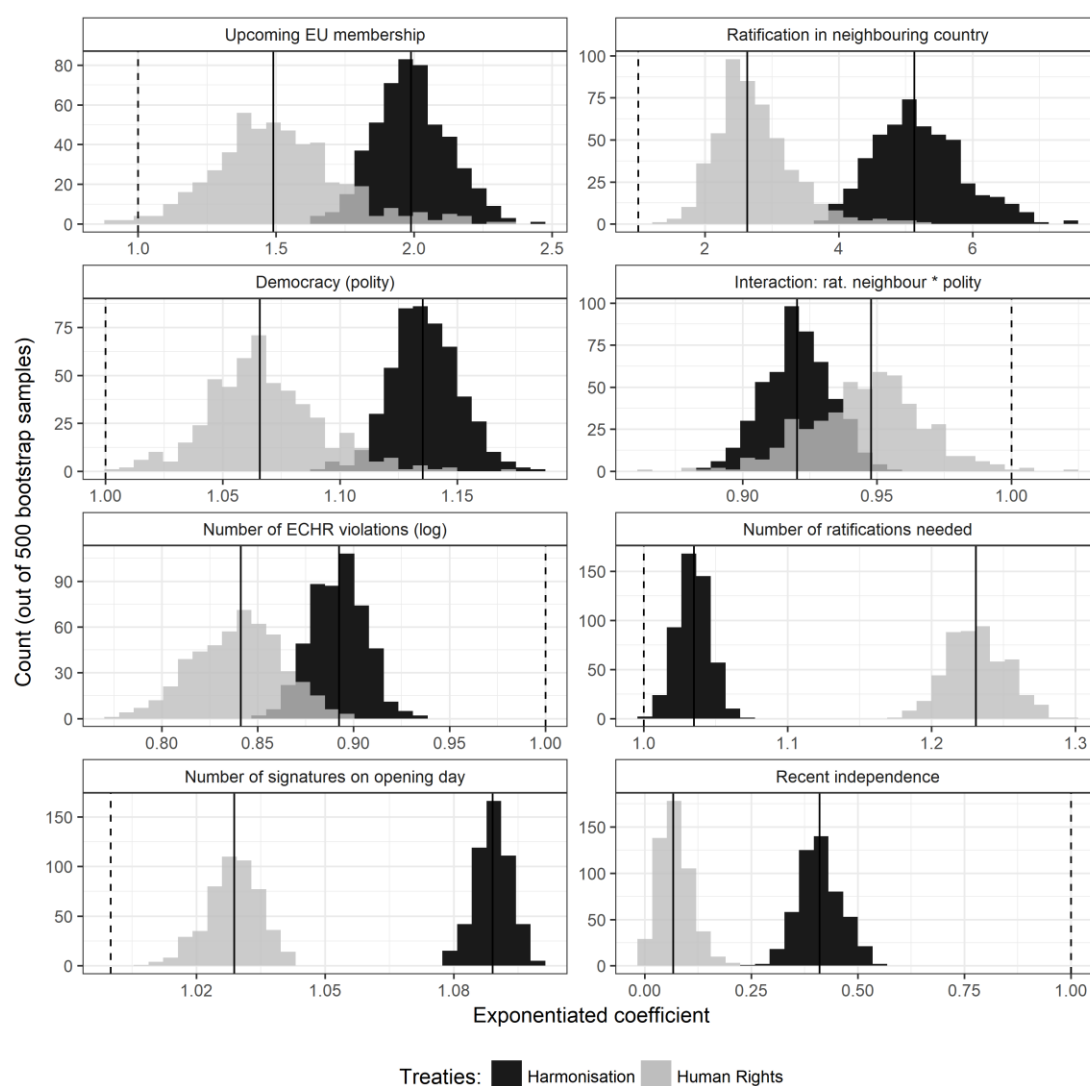
Notes: vertical full lines indicate the median estimate; the dashed line is set to 1

In addition, we tested the inclusion of other/alternative measurements of variables used in the main paper and also tested for the inclusion of other controls. The first was done to check the alternative ways for measurement and the latter to see if the inclusion of typical control variables would impact on the results of the main model. Table A2 presents these alternative

models. The additional control variables are added in model am1 to am7. Model am0 is the main model 3 from the paper. Model am1 includes GDP (logged GDP per capita) – it shows that GDP actually has a slightly negative effect, which is probably related to the small and richer countries not ratifying that frequently. Importantly though, it does not affect the results of the other coefficients. Model am2 including the population size (logged population size) – it does not affect the results of the other coefficients and has no impact on the ratification likelihood. Model am3 includes the Human Rights Protection Score from Fariss (2014) – it has no impact itself and does not impact the other variables. Model am4 includes a dummy variable for countries with a common law system – it has not impact. Model a5 includes dummy variables for European regions with Eastern Europe as baseline – except Asian countries with slightly higher hazard ratio, all other regions are not significantly different. Finally, model a6 includes an alternative specification for ratification in a neighbouring country, but using a ratification in the same geographical region. It has a similar and in fact slightly higher impact compared to the specification of a neighbouring country within 500 km from its borders.

Table A1: Alternative specifications of the models - hazard ratios and 95% confidence intervals

Variable	Subset of observations after 5 years not ratifying	All countries that were already independent before 1989		Treaties as strata and time interaction		Treaties as strata		Treaty level ignored and standard errors clustered by country	
Treaties	All	HA	HR	HA	HR	HA	HR	HA	HR
Upcoming EU membership	2.16 (1.87-2.49)	1.98 (1.62-2.4)	1.81 (1.15-2.85)	2.21 (1.91-2.56)	1.56 (1.14-2.15)	2.21 (1.91-2.55)	1.53 (1.12-2.11)	1.64 (1.26-2.13)	1.3 (0.94-1.8)
Ratification in neighbouring country	2.64 (2.06-3.39)	2.28 (1.55-3.36)	1.08 (0.37-3.13)	n/a	n/a	2.85 (2.23-3.65)	2.22 (1.45-3.4)	7.15 (4.28-11.97)	3.16 (1.49-6.72)
Democracy (polity)	1.1 (1.08-1.13)	1.14 (1.11-1.18)	1.11 (1.02-1.21)	n/a	n/a	1.15 (1.12-1.18)	1.1 (1.04-1.15)	1.12 (1.05-1.18)	1.03 (0.97-1.09)
Interaction: rat. neighbour * polity	0.95 (0.92-0.97)	0.99 (0.95-1.03)	1.03 (0.93-1.16)	n/a	n/a	0.9 (0.87-0.92)	0.92 (0.87-0.96)	0.93 (0.88-0.98)	0.96 (0.89-1.04)
Recent independence	n/a	0 (0-Inf)	3.85 (0.89-16.59)	0.37 (0.27-0.49)	0.05 (0.02-0.15)	0.32 (0.24-0.41)	0.05 (0.02-0.14)	0.47 (0.26-0.88)	0.18 (0.06-0.54)
Number of ECHR violations (log)	0.96 (0.89-1.03)	0.94 (0.84-1.05)	0.83 (0.73-0.95)	n/a	n/a	n/a	n/a	n/a	n/a

Number of ratifications needed	1.11 (1.03-1.2)	0.96 (0.89-1.04)	1.23 (1.08-1.39)	n/a	n/a	n/a	n/a	1.03 (1-1.05)	1.15 (1.12-1.19)
Number of signatures on opening day	1.1 (1.07-1.13)	1.08 (1.05-1.1)	1.03 (0.98-1.08)	n/a	n/a	n/a	n/a	1.05 (1.04-1.06)	1.01 (1-1.02)
Ratification in neighbouring country:strata(year 0-2)	n/a	n/a	n/a	1.57 (1.3-1.9)	1.22 (0.96-1.56)	n/a	n/a	n/a	n/a
Ratification in neighbouring country:strata(year 3-9)	n/a	n/a	n/a	1.28 (1.12-1.47)	1.23 (0.92-1.64)	n/a	n/a	n/a	n/a
Ratification in neighbouring country:strata(year > 9)	n/a	n/a	n/a	0.73 (0.61-0.88)	0.45 (0.27-0.74)	n/a	n/a	n/a	n/a

Democracy (polity):strata(year 0-2)	n/a	n/a	n/a	1.09 (1.06-1.12)	1 (0.96-1.03)	n/a	n/a	n/a	n/a
Democracy (polity):strata(year 3-9)	n/a	n/a	n/a	1.09 (1.06-1.11)	1.13 (1.07-1.2)	n/a	n/a	n/a	n/a
Democracy(polity):strata(year > 9)	n/a	n/a	n/a	1.05 (1.02-1.08)	1.12 (1.02-1.24)	n/a	n/a	n/a	n/a
Type: Foundational	3.29 (1.54-7.02)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Type: Human Rights (core)	1.38 (0.84-2.28)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Table A2: Models including alternative variables as controls - hazard ratios and 95% confidence intervals

Variable	Model						
	am0	**am1**	**am2**	**am3**	**am4**	**am5**	**am6**
Upcoming EU membership	1.77 (1.58-1.98)	1.88 (1.68-2.11)	1.9 (1.7-2.14)	1.78 (1.59-1.99)	1.77 (1.58-1.98)	1.78 (1.59-1.99)	1.77 (1.58-1.98)
Ratification in neighbouring country	4.38 (3.62-5.3)	4.15 (3.39-5.07)	4.23 (3.49-5.12)	4.58 (3.76-5.57)	4.38 (3.62-5.29)	4.43 (3.66-5.36)	NA
Democracy (polity)	1.11 (1.09-1.13)	1.1 (1.08-1.13)	1.1 (1.08-1.13)	1.12 (1.09-1.14)	1.11 (1.09-1.13)	1.11 (1.09-1.14)	1.12 (1.09-1.14)
Interaction: rat. neighbour * polity	0.93 (0.91-0.95)	0.93 (0.91-0.95)	0.92 (0.9-0.94)	0.92 (0.9-0.94)	0.93 (0.91-0.95)	0.93 (0.91-0.95)	NA
Recent independence	0.37 (0.3-0.46)	0.28 (0.21-0.39)	0.37 (0.29-0.46)	0.36 (0.29-0.45)	0.37 (0.3-0.46)	0.37 (0.3-0.46)	0.37 (0.3-0.46)
Number of ECHR violations (log)	0.89 (0.83-0.95)	0.85 (0.78-0.93)	0.91 (0.83-0.99)	0.87 (0.81-0.93)	0.89 (0.83-0.95)	0.92 (0.85-0.99)	0.92 (0.86-0.99)
Number of ratifications needed	1.08 (1.02-1.15)	1.12 (1.05-1.19)	1.11 (1.04-1.18)	1.09 (1.02-1.15)	1.08 (1.02-1.15)	1.08 (1.02-1.15)	1.08 (1.02-1.15)
Number of signatures on opening day	1.08 (1.05-1.1)	1.08 (1.05-1.1)	1.07 (1.05-1.1)	1.07 (1.05-1.1)	1.08 (1.05-1.1)	1.08 (1.05-1.1)	1.08 (1.05-1.1)
Type: Foundational	4.39 (2.46-7.83)	4.69 (2.61-8.44)	5.2 (2.8-9.64)	4.26 (2.41-7.54)	4.39 (2.46-7.83)	4.38 (2.45-7.81)	4.42 (2.46-7.95)
Type: Human Rights (core)	1.47 (0.99-2.17)	1.55 (1.05-2.31)	1.54 (1.01-2.34)	1.45 (0.98-2.14)	1.47 (0.99-2.17)	1.46 (0.99-2.17)	1.45 (0.97-2.16)
Gross Domestic Product (log)	NA	0.86 (0.81-0.9)	NA	NA	NA	NA	NA
Population (log)	NA	NA	0.98 (0.89-1.07)	NA	NA	NA	NA

Human Rights Protection Score – latent mean (Fariss 2014)	NA	NA	NA	0.97 (0.91-1.03)	NA	NA	NA
Common law country	NA	NA	NA	NA	1.08 (0.77-1.5)	NA	NA
Region Northern Europe	NA	NA	NA	NA	NA	1.27 (0.94-1.72)	NA
Region Southern Europe	NA	NA	NA	NA	NA	1.27 (0.99-1.64)	NA
Region Western Asia	NA	NA	NA	NA	NA	1.4 (1.02-1.92)	NA
Region Western Europe	NA	NA	NA	NA	NA	1.18 (0.88-1.57)	NA
Ratification in the same or previous year by a country in the same region	NA	NA	NA	NA	NA	NA	5.43 (4.51-6.54)
Interaction: ratification in same region * polity2	NA	NA	NA	NA	NA	NA	0.91 (0.89-0.93)

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