Legal Traditions and the Ratification of the Paris Agreement

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Abstract

We study whether legal traditions matter for the propensity of countries to ratify the Paris Agreement (PA), and thus to cooperate on addressing climate change. On the one hand, the economics literature argues that civil law countries are generally more prone to intervene to address negative externalities. On the other hand, the international law literature argues that the legal traditions' compatibility with international agreements depends on their designs. While civil law countries prefer binding obligations within international agreements, common law countries prefer nonbinding obligations. To empirically test these hypotheses, we use survival analysis to analyze the timing of the ratification of the PA by 175 countries. Crucially, the PA includes nonbinding obligations, in particular the emissions-cut pledges denoted Nationally Determined Contributions. Our baseline estimate suggests that common law countries have a 71% higher conditional probability of ratifying the PA than do civil law countries, supporting the international law hypothesis. This novel result holds up to a host of robustness checks and may help inform the design of future agreements.

Keywords: Legal Origin; Ratification; International Environmental Agreement; Survival Analysis; Obligations; Political Economy.

JEL Codes: Q54; Q58; K15; K33; D78; F53.

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1. Introduction

Multilateral solutions such as the Paris Agreement form major attempts to address the free-riding incentives associated with the climate change challenge. The Paris Agreement (PA) was adopted in December 2015 and entered into force in November 2016.[1] Progress in the ongoing and repeated game of climate change negotiations depends on countries ratifying agreements in a timely manner. In this paper, we contribute to the empirical study of ratification decisions regarding international environmental agreements (IEAs) as a measure of cooperation (e.g., Congleton, 1992; Fredriksson and Gaston, 2000; Sauquet, 2014; Cazals and Sauquet, 2015; Bellelli et al., 2023a). Our focus is on the role of legal traditions (La Porta et al., 2008). Do the two major legal systems, common law, and civil law, result in different PA ratification probabilities?

One hypothesis builds on the Legal Origin Theory (LOT) in economics (Botero et al., 2004; La Porta et al., 2008). La Porta et al. (2008) suggest that legal origin is a form of social control of the economic system, and likely of other dimensions of life. The different legal traditions that emerged from England and France centuries ago have yielded strategies and ideas that have influenced the organization, principles, ideologies of legal systems, details of legal codes and rules, legal human capital, and, as a result, economic and social outcomes. The civil law legal philosophy encourages a centralized system where direct government regulations address market failures but where property rights are sometimes less well protected. In contrast, the common law approach is to rely less on direct government regulation of externalities, and more on property rights, decentralized markets, private contracts, and ensuing litigation. The resulting hypothesis is that civil law countries should have a higher probability of ratifying international environmental agreements (IEAs), including the PA.

The alternative hypothesis builds on the international law literature. This literature argues that a country's legal tradition, combined with the design of an international agreement, jointly

[1] The Paris agreement entered into force 30 days after at least 55 countries representing at least an estimated 55 percent of the total global greenhouse gas emissions had ratified the agreement (United Nations, 2016).

determine the approach to international cooperation (Koch Jr, 2003; Jouannet, 2006; Mitchell and Powell, 2011; Efrat, 2016). While civil law countries have a favorable view of legally binding obligations in agreements, common law countries prefer nonbinding obligations. Civil law systems emphasize clear and formal international rules that yield certainty, while common law countries favor flexible agreements that may be adapted to local conditions and legal systems. The PA involves nonbinding obligations, including the country pledges of emissions cuts denoted (intended) nationally determined contributions (NDCs) (Bodansky, 2016; Jacquet and Jamieson, 2016; Rajamani, 2016).[2] Thus, the design of obligations under the PA has implications for common law and civil law countries' predicted relative probabilities of ratifying this agreement. The alternative hypothesis is that common law countries should have a greater probability of ratifying the PA than civil law countries.

We test our contrasting hypotheses using a survival analysis approach with a semi-parametric estimator (Cox proportional hazard model), panel data on the timing of PA ratification by up to 175 countries during 2016-2021, and Nunn and Puga's (2012) classification of legal traditions. Studying the drivers of early ratification appears relevant due to the urgency to address climate change: globally, the 10 warmest years in 143 years of record keeping have all occurred since 2010, with the years 2014-2022 ranking as the nine hottest on record (NOAA, 2023). Early ratification contributes to an IEA entering into force, may encourage other countries to ratify, and signals leadership and openness to global cooperation.

We find consistent support for the hypothesis emerging from the international law literature. Our baseline estimate suggests that having a common law legal origin raises the conditional probability of ratification by 71 percent. This result holds up to a host of robustness

[2] Article 4.2 of the PA outlines that "Parties shall pursue domestic mitigation measures, with the aim of achieving the objectives of such NDCs". As discussed by Bodansky (2016), Article 4.2 does not create an individual obligation on each party to the agreement to implement or achieve its NDC, i.e., the PA is nonbinding. First, parties should "pursue" domestic mitigation measures, not implement them. Second, using the word "aim" implies that a legal obligation is not created. Third, the obligation to pursue domestic mitigation measures applies to the collective of parties and not to each individual party. Fourth, the aim is to achieve the "objectives" of the NDCs, which are not well defined.

analyses, including controlling for colonizer identity, various measures of institutions, cultural attributes, and multiple political economy pressures including environmental and industry lobbying. Using alternative classifications of legal traditions by La Porta et al. (2008) and Klerman et al. (2011), respectively, taking regional interactions into account, or using different sub-samples, do not affect our main conclusion. Moreover, our main estimation result remains robust to the use of alternative empirical approaches such as Weibull and Gompertz distributions, and stratification of the Cox proportional hazard model based on Kyoto Protocol group affiliation (Annex I versus non-Annex 1) and OECD membership, respectively.

One concern that arises is that the stringency of the NDC pledges may influence countries' ratification behavior. However, the stringency of the (non-binding) NDC pledges is likely to be endogenously determined by similar factors as the IEA ratification decisions. Using data on the stringency of NDCs constructed by Tolliver et al. (2020), we also show that legal tradition has no significant association with the NDC pledges.

The recent literature on ratification frequently utilizes large samples of heterogenous IEAs addressing a large variety of environmental externalities over an extended time period (e.g., Bellelli et al., 2023a). This approach yields valuable insights into common and general determinants of IEA ratification but may mask relevant determinants of ratification of individual IEAs. In contrast, our analysis is better tailored towards understanding international cooperation directly related to the PA. This single focus has the advantage of providing insights into an IEA with nonbinding obligations on climate change with significant contemporary and future relevance. An improved understanding of cooperation on the PA could help policymakers improve the design of future IEAs. The 2023 Dubai climate change agreement has a non-binding design similar to the PA (United Nations, 2023a), and future agreements may follow the same approach.[3] The present study

[3] Despite relying on non-binding obligations, countries reduced the level of global greenhouse gas emissions (Salman et al., 2022) and the expected temperature increases declined (UNFCCC, 2023) due to the PA.

provides policy-relevant insights into on this type of agreement and the current process with ratchet up NDC pledges every five years, e.g., regarding likely leaders and laggards.[4]

The paper is organized as follows. Section 2 provides a literature review and a conceptual framework. Section 3 outlines the empirical approach, and Section 4 provides the results and the robustness analysis. Section 5 concludes.

2. Literature Review and Conceptual Framework

This section gives an overview of the strands of literature discussing IEA ratification and legal origins and states the hypotheses that emerge.

2.1 *International Environmental Agreements*

The empirical analysis of IEA ratification started with Congleton (1992).[5] His theoretical model suggests that democracies are more likely to participate in environmental cooperation, and empirical evidence from the Montreal Protocol supports this hypothesis. The subsequent literature confirmed the importance of democracy for ratification, frequently employing duration analysis which takes into account both whether and when a country ratifies (Fredriksson and Gaston, 2000; Neumayer, 2002a; Bernauer et al., 2010). Electoral rules and concerns play a role for ratification (Böhmelt et al., 2015; Cazals and Sauquet, 2015).

International interactions based on countries' similarities in geography and wealth play a role in ratification decisions (Bernauer et al., 2010; Perrin and Bernauer, 2010; Davies and

[4] Future work may study the pattern of ratification of the Dubai Agreement.

[5] See Bellelli et al. (2023b) for a survey. The theoretical literature generally argues that free-riding will make cooperation beyond the noncooperative level difficult (Barrett, 1994; Finus, 2008; Battaglini and Harstad, 2016; 2020), although improvements can occur with side transfers, trade barriers, minimum participation rules, permit trading schemes, industry lobbying, ratification constraints, beliefs, penalties, delay avoidance, loose agreements, and investment lags (Barrett, 2001; Carraro et al., 2009; Karp and Zhao, 2010; Harstad, 2023; Köke and Lange, 2017; Marchiori et al., 2017; Li and Rus, 2019; Karp and Sakamoto, 2021; Colombo et al., 2022; Eichner and Kollenbach, 2023). Kováč and Schmidt (2021) argue that, on the one hand, a country may ratify today because a climate agreement is sufficiently favorable that it makes up for missed opportunities for future free riding. On the other hand, a country may delay the ratification in anticipation of an improved agreement becoming available in the future. To avoid inefficient delay, countries may ratify a worse agreement today compared to one expected to emerge later due to postponement.

Naughton, 2014; Bellelli et al., 2023a), as do their trading partners (Sauquet, 2014) and the level of integration with the rest of the world (Frank, 1999; Bernauer et al., 2010; Yamagata et al., 2013; 2017; Wagner, 2016). Bellelli et al. (2023a) report that regional environmental agreements are more likely to yield ratification than their multilateral counterparts. Stricter obligations in agreements and hurdles in parliamentary voting reduce the probability of ratification, while flexibility enhances it (von Stein, 2008; Bernauer et al., 2013; Spilker and Koubi, 2016). Bernauer et al. (2013) suggest that stricter monitoring and enforcement activities have no adverse effects on ratification.

A related literature has focused on overall climate change cooperation (rather than ratification specifically). Fredriksson and Wollscheid (2015) use a climate change policy stringency index for 2004-08 to study the effect of legal traditions in former colonies. The index, compiled by Bernauer and Böhmelt (2013), includes an emissions component and a policy component, weighted equally. Half of the policy component (25%) is made up of ratification data (if and when it occurred) from the United Nations Framework Convention on Climate Change (UNFCCC; nonbinding) and the Kyoto Protocol (binding commitments for Annex 1 countries, nonbinding for non-Annex 1 countries). Consequently, a relatively minor share of this index is related to the timing of ratification of an IEA with nonbinding obligations.[6] Fredriksson and Wollscheid (2015) find that civil law countries set stricter climate change policies than common law countries. Using the same climate change stringency index but for the years 1996-2008, Ang and Fredriksson (2017) report that the length of statehood experience matters for the divergence in policy stringency between civil law and common law systems, with again the civil law countries setting stricter policies.

Fredriksson et al. (2007) find support for the hypothesis that environmental lobbying raises the probability of Kyoto Protocol ratification, and this effect is increasing the level of corruption.

[6] The emissions component (50% weight) weighs the CO_2 emissions level and CO_2 emissions growth rates by GDP per capita (Bernauer and Böhmelt, 2013). The policy component (50% weight) is made up of submissions of national climate reports (whether submission occurred and when), UNFCCC and Kyoto Protocol ratification data (whether and when ratification occurred), and whether timely financial contributions to the UNFCCC secretariat were made during years 1996–2005.

That is, lobbying and corruption are complements (c.f., Campos and Giovannoni, 2007). In contrast, the hypothesis that industry lobbying has a negative effect on ratification conditional on corruption does not receive support; this (unexpected) finding is corroborated by Sauquet (2014) and Bellelli et al. (2023) who analyze 257 IEAs. Similarly, von Stein (2008) found evidence that environmental but not industry lobbying influenced UNFCCC ratification; however, this pattern was reversed for the Kyoto Protocol (see also Yamagata et al., 2013). Böhmelt et al. (2015) suggest that because democracies with presidential systems (proportional electoral rules) tend to provide more (fewer) environmental public goods, the marginal impact of environmental lobby groups is smaller (larger).

2.2 *Legal Traditions*

Colonization and conquests historically transplanted legal systems around the world (Zweigert and Kötz, 1998), which has created path dependencies (McNeill and McNeill, 2003) that affect the policy responses also to relatively recent social issues including climate change. The legal institutions represent general philosophies guiding societies in their methods to tackle social problems, and they differ in terms of flexibility, efficiency, and view of international law (La Porta et al., 2008; Efrat, 2016). We add to the literature by analyzing the role of legal traditions in the timing of IEA ratification, focusing on the difference between common law versus civil law legal systems.[7]

The hypothesis emerging from the economics literature builds on the role of legal traditions according to Legal Origin Theory (LOT) (La Porta et al., 2008).[8] According to LOT, legal traditions should be viewed as different institutional technologies for controlling economic

[7] We aggregate the French, German, and Scandinavian civil law legal systems into the civil law category.

[8] The transfer and adoption of colonizers' legal systems around the world gave rise to different philosophies regarding the organization, principles, and ideologies of legal systems; specifications of legal codes and rules; and consequently, social, and economic outcomes. The literature argues that legal origins influence the regulation of firm entry; securities, bankruptcy, and company laws; the level of formalism of judicial procedures and judicial independence; government bank ownership; labor regulations; female HIV rates; property rights; and arms control, e.g. (La Porta et al.,1997; 1999, 2008; Djankov et al., 2002, 2003; Botero et al., 2004; Anderson, 2018; Bradford et al., 2021; Klomp and Beeres, 2022).

systems and addressing social problems (Botero et al., 2004). LOT focuses on domestic policies, does not discuss international law, and obligations are implicitly viewed as binding. The civil law approach favors a centralized system with strict and rigid government regulations of externalities, while the common law philosophy tends to provide stronger property rights and less regulation (Botero et al., 2004; La Porta et al., 2008; Bradford et al., 2021).[9] Common law countries tend to take a more decentralized market-oriented approach to societal problems. Civil law employs comprehensive and rigid legal codes that do not progress with changing conditions (Beck et al., 2003), and thus may become increasingly ill-fitting over time.[10] Civil law legal culture restricts arguments between judges on the application of laws to new situations (Dawson, 1968).

While civil law countries should favor a centralized approach such as an IEA, common law countries should be relatively hesitant to ratify an international agreement (a highly centralized policy instrument) that involves infringement on property rights (such as historical rights to pollute) and stricter environmental regulations. LOT suggests that civil law systems should have a higher probability to ratify the PA. As discussed above, the existing empirical evidence on climate policy cooperation supports this hypothesis (Fredriksson and Wollscheid, 2015; Ang and Fredriksson, 2017).

The literature on international law suggests that civil law systems favor formal international rules as useful tools for governing interstate relations and emphasize multilateral agreements with nonflexible binding (hard) rules and formal procedures (Koch Jr, 2003; Jouannet, 2006; Merryman and Perez-Perdomo, 2007). Civil law values certainty and judge-proof law more than flexibility (Merryman and Perez-Perdomo, 2007) and tends to be specific and legalistic in its emphasis on existing rules and formal procedures. Civil law countries tend to more willingly enter into binding international legal commitments, one reason being that the rules and procedures resemble those

[9] For example, Botero et al. (2004) show that civil law countries set more strict labor regulations.
[10] Merryman (1996) suggests that while the French invented ways to avoid the most detrimental aspects of the civil codes in France, in its former colonies the rigidity held back the civil law legal systems where the codes were strictly implemented.

of civil law (Mitchell and Powell, 2011; Efrat, 2016). In a sense, treaties are the international law equivalents to the codes used in the civil law tradition (Koch Jr, 2003). In contrast, international agreements with flexible and nonbinding obligations are not a good fit with the civil law tradition (Efrat, 2016). It follows that civil law countries are likely to be hesitant to ratify the PA with its central focus on the nonbinding emission cut proposals (NDCs).

Turning to common law countries, the literature on international law suggests that this group of countries favors the flexibility of nonbinding (soft) rules. A major reason is that international agreements may be incompatible with domestic policies and laws (Abbott and Snidal, 2000; McClean, 2002; Charlesworth et al., 2003; Efrat, 2016).[11] Charlesworth et al. (2003) argue that imposing binding international rules on a common law country may cause instability in the legal system. This suggests that common law countries should have a relatively benign view of the PA, considering the centrality of its nonbinding NDCs. Common law countries can be expected to ratify the PA relatively quickly due to the flexibility it affords.

In the related literature, Kiesow Cortez and Gutmann (2017) find that civil law and common law democracies enter a similar number of international agreements (all types of international agreements included), while Klomp and Beeres (2022) report that civil law countries ratify more arms control treaties than common law countries. Efrat (2016) finds that common law countries are more likely to ratify nonbinding UN agreements on commercial legislation.

2.3 *Hypotheses*

Based on the existing literature, we distill two main hypotheses to be tested. The first hypothesis stems from the legal origin theory in economics. Civil law counties should have a greater probability of ratifying international environmental agreements such as the PA, whether

[11] Common law has a greater ability than civil law to adapt efficiently to evolving conditions (Posner, 1973; Beck et al., 2003; Gennaioli and Shleifer, 2007; La Porta et al., 2008). Common law is often viewed as more flexible and efficient because it relies more on jurisprudence as a source of law than does civil law (Posner, 1973; Rubin, 1977; Ponzetto and Fernandez, 2008; see, however, Garoupa et al., 2016).

binding or nonbinding. The second hypothesis builds on the literature on international law. Common law countries should have a greater probability of ratifying the PA than civil law countries since this IEA has nonbinding obligations.

3. Empirical Approach

3.1 *Empirical model*

The data required to analyze the continuous nature of the ratification process include multiple records per country. To be compatible with the observation frequencies of the explanatory variables, the time-variant data is grouped as yearly observations per country. However, the time to ratification is computed in days. For every observation per country, we have a binary response variable that takes a value of 1 if ratification occurred, and 0 otherwise. Using a Cox proportional hazard model, our baseline estimation model is as follows:

$$h(t) = h_0(t)\exp(\beta_1 CommonLawLT + \beta_2 x_1(t_a) + \beta_3 x_2), \quad (1)$$

where $h(t)$ is the hazard function representing the conditional probability of observing ratification at time t, given that the country has not ratified before t. $h_0(t)$ is the baseline hazard when all predictors are null. Common law legal tradition ($CommonLawLT$) is the main variable of interest. $x_1(t_a)$ is a vector of time-variant controls (annual data), and x_2 is a vector of time-invariant controls. β_1, β_2 and β_3 are the parameters to be estimated. The Efron (1977) method is used for ties.

3.2 *Data*

Detailed descriptions and definitions of all variables are presented in Table A1 in the appendix, and descriptive statistics are reported in Table 1. The construction of key variables is discussed below.

3.2.1 Ratification Data

Data on PA ratification provide two pieces of information: whether ratification takes place (outcome) and the time to ratification (duration). Using information on when ratification occurred provides the most complete picture of the drivers of international cooperation (Bellelli et al., 2023a). Moreover, since the overall ratification rate is comparatively high for the PA, the level of variation would be relatively low were we to examine ratification at one moment in time. Therefore, we adopt a survival analysis approach, which previously has been utilized in the literature to examine the ratification of IEAs (e.g., Fredriksson and Gaston, 2000). The survival analysis approach allows for incorporating the time dynamics of ratification and manages the right-censoring problem of observing the ratification process as it progresses.

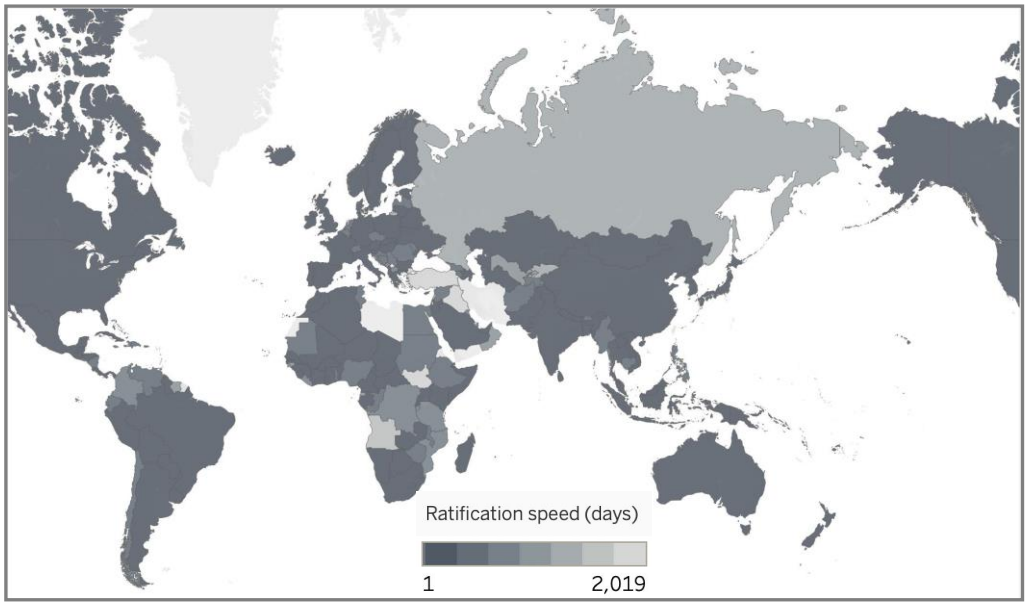

Figure 1. Ratification speeds.
Notes: The ratification speed in days for all ratifying countries in the sample.

Based on United Nations (2023b) PA ratification data, our sample records the ratification decision of 175 countries over the period of 2016-2021, resulting in a total of 284 observations. The time of ratification is measured in days, rather than years as is common in the literature. We start the count of the number of days starting on April 22, 2016, when the PA was opened for signature and subsequent ratification. While signature signals a willingness to continue the treaty-

making process, ratification represents consent to be bound by the agreement. Upon signing the agreement and before ratification, countries made their emissions cut pledges, denoted nationally determined contributions (NDCs). Countries either exit the sample by ratifying or remain at risk until December 31, 2021. 173 countries ratified before this date, 58 common law countries, and 115 civil law countries (see Table A2 in the appendix). Two civil law countries left the risk set without ratifying the agreement. The first group of countries ratified on April 22, 2016.[12] Iraq was the last country to ratify on November 1, 2021.[13] Figure 1 shows the ratification speed of ratifying countries in our sample.

Figure 2 shows the Kernel density estimates of PA ratification duration. This figure shows that there is one peak in the data distribution, and the majority of ratification events occur within approximately two years. The upward-sloping part reflects the quickly rising probability of ratification within around the first 200 days, after which the probability of ratification decays rapidly. This suggests that early ratification matters.

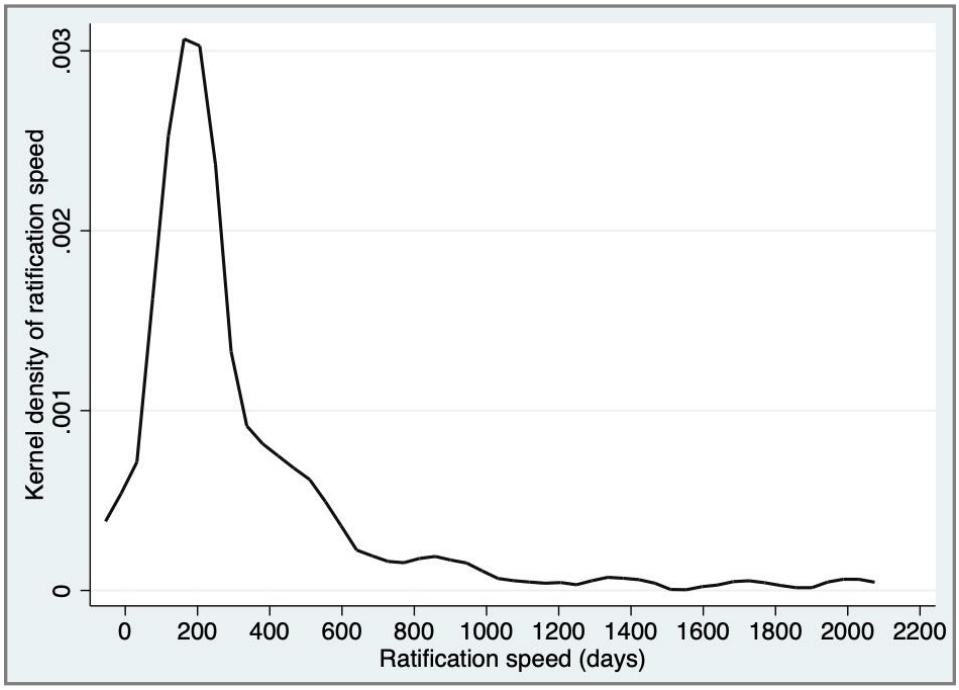

Figure 2. Kernel density estimates of the PA ratification duration.

[12] The countries included in our data set that ratified on April 22, 2016, are the common law countries Barbados, Belize, Fiji, Grenada, Maldives, Samoa, Saint Kitts and Nevis, and Saint Lucia, and the civil law country Mauritius.
[13] If a county ratified more than once, the first date of ratification is used for consistency. For example, the US ratified the PA on September 3, 2016, withdrew from the PA on November 4, 2020, but ratified the treaty again on January 20, 2021.

3.2.2 Legal tradition data

The main variable of interest is the legal tradition dummy. We use the legal tradition classification by Nunn and Puga (2012) who expand the La Porta et al. (1999; 2008) dataset. Figure 3 shows the geographical distribution of countries by legal tradition.

Figure 3. The spatial distribution of common law and civil law countries.

3.2.3 Control variables

To mitigate the problem of unobserved heterogeneity, we include a number of control variables. The degree of political rights (democracy) and corruption have been shown to affect ratification (Congleton, 1992; Murdoch and Sandler, 1997; Neumayer, 2002b; Fredriksson et al., 2007). Population size reflects the number of individuals potentially affected by climate change and environmental regulations and has been used as a proxy for the "resource base" (Congleton, 1992). Climate vulnerability mirrors the potential exposure to extreme events, which may affect the propensity to ratify. Geographical factors such as being landlocked and the distance to the coast are potential determinants of long-term patterns of economic activity (Ang and Fredriksson, 2021). Per capita income (logged) and its squared term account for potentially non-linear associations suggested by the inverted-U hypothesis (Sauquet, 2014; Bellelli et al., 2023a). Table

A1 in the appendix provides further details and sources. Table 1 provides descriptive statistics for the dependent variable and control variables.

Table 1. Descriptive statistics

Variable	Mean	Std. Dev.	Min.	Max.
Ratification time (days)	319.89	327.18	1	2019
Common Law LT	0.25	0.44	0	1
Political rights	21.94	12.72	0	40
Corruption control	-0.26	0.95	-1.63	2.28
Landlocked	0.22	0.42	0	1
Distance to the coast (1000 km)	0.36	0.45	0	2.21
Population size (mn)	36.91	120.29	0.05	1387.79
Climate vulnerability	94.09	42.75	10.17	175.5
Per capita income (log)	9.28	1.12	6.64	11.64

Notes: Descriptive statistics for the baseline specification in column 3, Table 2. Number of observations equals 284. Ratification time is reported for the 173 countries that had ratified by the end of the sample period.

4. Results

4.1 *Main Results*

We estimate Eq. (1) using a semi-parametric Cox proportional hazard model. The main estimation results are reported in Table 2. Column (1) includes a dummy for common law legal tradition along with political rights and corruption control. Column (2) adds geographic controls, population size, and climate vulnerability. The baseline model in column (3) also accounts for per capita income (log) and its squared term. The global proportional hazards test by Grambsch and Therneau (1994) based on Schoenfeld residuals suggests that the proportional hazard assumption cannot be rejected.

Table 2 also reports hazard ratios (H.R.). Common law legal tradition has a positive and significant association with the probability of ratification in all three columns. In particular, the baseline model in column (3) estimates that common law legal tradition countries are 71% more likely to ratify the PA compared to their civil law counterparts (H.R. = 1.71). This provides initial

support for our main hypothesis. Control of corruption similarly has a positive effect on the probability of ratification in all three columns.

Using our baseline specification from column (3), Table 2, evaluated at the means, Figure 4 plots the estimated survival function for common law and civil law legal tradition countries, respectively. The common law countries' survival rate is lower than for civil law countries, indicating that ratification occurs earlier for the former group.

Table 2. Legal Traditions and PA Ratification

	(1)		(2)		(3)	
			Geo. controls, population size and vulnerability		Baseline specification: adding income	
	Coefficient (S.E.)	H.R.	Coefficient (S.E.)	H.R.	Coefficient (S.E.)	H.R.
Common Law LT	**0.62*** (0.17)**	**1.86**	**0.63*** (0.17)**	**1.89**	**0.53*** (0.17)**	**1.71**
Political rights	0.01 (0.01)	1.01	0.01 (0.01)	1.01	0.01 (0.01)	1.01
Corruption control	0.21** (0.10)	1.24	0.22** (0.11)	1.25	0.43** (0.17)	1.54
Per capita income (log)					0.97 (1.24)	2.63
Squared per capita income (log)					-0.06 (0.07)	0.94
Geo. controls and population size	No		Yes		Yes	
Climate vulnerability	No		Yes		Yes	
Proportional Hazard Test	1.10 [0.78]		3.19 [0.87]		6.65 [0.67]	
Log-likelihood	-713.98		-711.68		-709.84	
Countries	175		175		175	
Observations	284		284		284	

Notes: The table presents Cox proportional hazard model estimates and hazard ratios (H.R.). Geographic controls are landlocked dummy and distance to coast. The Efron method is used for ties. Robust standard errors in parenthesis. *, ** and *** indicate significance at the 10%, 5% and 1% level, respectively. The table reports the Grambsch and Therneau (1994) global proportional hazards test with p-values in brackets.

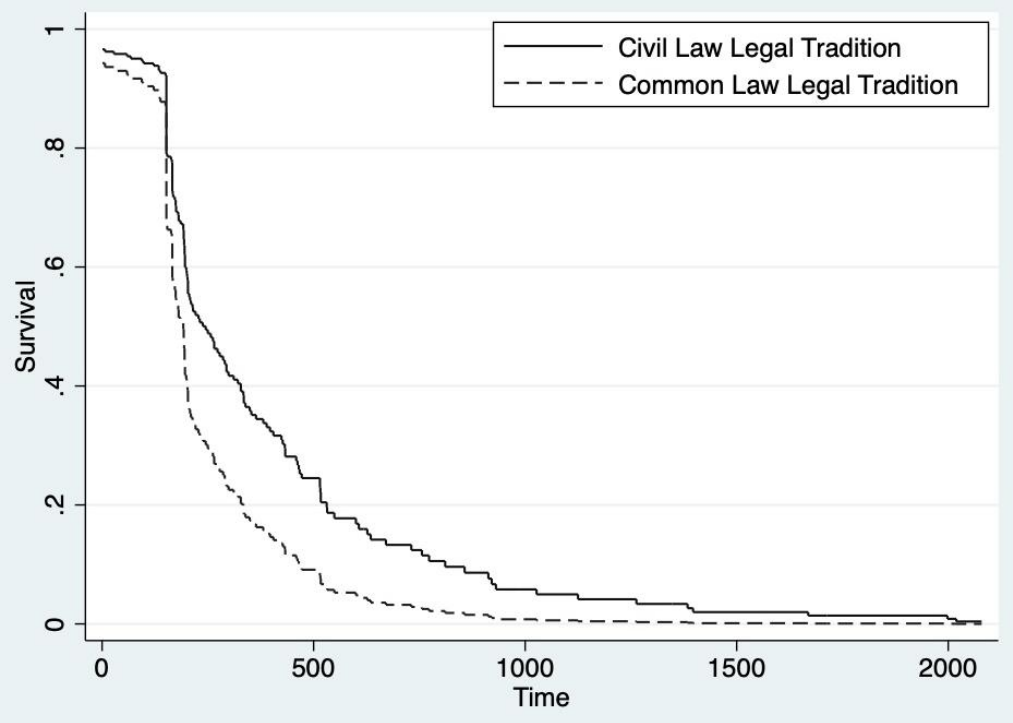

Figure 4. Survival function of ratification event; Cox proportional hazard estimator based on column (3), Table 2.

The relatively parallel curves in Fig. 4 further suggest that the proportional hazard assumption holds. To provide some initial robustness analysis, Table A3 in the appendix re-estimates Table 2 using only time-invariant control variables, i.e., we use only the starting values for the time-variant controls. The results remain robust, and the hazard ratio rises to 1.76 in the baseline model.

4.2 *Robustness analysis*

Using the baseline estimate in Table 2, we examine the robustness of our results to controlling for a battery of variables that the literature identifies as potentially relevant. Table A4 in the appendix provides descriptive statistics for the additional variables used in the robustness analysis.

4.2.1 Historical and institutional controls

Table 3 provides a robustness check focused on possible historical and institutional confounders. Column (1) utilizes a sub-sample of former colonies only and colonizer identity dummies for France, Great Britain, Portugal, Spain, and Others (excluded variable). See Bertocchi and Canova (2002) and Klerman et al. (2011) for discussions of the economic effects of colonizer

Table 3. Robustness Analysis: Institutions

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Colonizer identity	Rule of law	Quality of institutions	Civil liberties	Democracy	Proportional representation	Pathogen stress
Common Law LT	**0.99**** (0.46)	**0.51***** (0.17)	**0.53***** (0.17)	**0.57***** (0.18)	**0.34*** (0.18)	**0.52**** (0.24)	**0.51**** (0.22)
Rule of law		0.56 (0.40)					
Quality of institutions			0.99*** (0.24)				
Civil liberties				0.02** (0.01)			
Democracy					0.02 (0.02)		
Proportional representation						-0.42 (0.26)	
Historical pathogen stress							-0.23 (0.23)
Colonizer identity	Yes	-	-	-	-	-	-
Baseline controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Countries	116	175	175	175	156	102	115
Observations	183	284	284	284	265	149	182

Notes: The table presents Cox proportional hazard model estimates. Baseline controls are political rights, corruption control, landlocked, distance to coast, climate vulnerability, population size, log per capita income, and its squared term. Column (4) drops corruption control and political rights. Columns (5) and (6) drop political rights. The Efron method for ties is used. Robust standard errors in parenthesis. *, ** and *** indicate significance at the 10%, 5% and 1% levels, respectively.

identity on outcomes. The rule of law may influence the degree to which legal traditions affect policymaking, and column (2) accounts for the rule of law using WGI (2021) data. Next, column (3) includes an index of the quality of institutions. The index is an average of six sub-components from WGI (2021): voice and accountability, political stability, government effectiveness, regulatory quality, rule of law, and corruption control. Column (4) controls for the degree of civil liberties

(Freedom House, 2023), and column (5) includes the Polity IV democracy measure from CSP (2015). To avoid duplicating measures, columns (3)-(5) drop corruption control and political rights from the baseline model where applicable.

Column (6) uses a dummy for proportional electoral rule systems in the sub-sample of democracies only.[14] Building on Acemoglu et al.'s (2001) use of the disease environments as an instrument for institutional quality, column (7) includes a measure of historical pathogen stress in a sub-sample of former colonies only. Common law legal tradition remains positive and significant across all specifications in Table 3. Among the controls, greater quality of institutions and civil liberties are associated with speedier ratification.

4.2.2 Political economy factors

Tables 4 and 5 examine whether our results hold up to the inclusion of multiple political economy variables. Table 4 includes measures of industry and environmental lobbying. The literature reports that while environmental lobbying raises the probability of ratification, industry lobbying has little effect (Fredriksson et al., 2007; Sauquet, 2014; Bellelli et al., 2023a). Moreover, corruption strengthens the influence of the environmental lobby. Column (1) includes a measure of the relative size of manufacturing in GDP, which reflects the political pressure from polluting sectors (c.f. Fredriksson et al., 2004; Yamagata, 2013, 2017). Columns (2) and (3) employ measures of coal reserves and crude oil endowments, respectively. Column (4) uses total fossil fuel rent as a percentage of GDP. Column (5) measures the strength of environmental lobbying represented by the number of environmental NGOs with membership in the International Union for the Conservation of Nature (IUCN). Columns (6)-(9) include combinations of the industry and environmental lobbying measures, and their interactions with corruption control.

The lobbying variables show a mixed pattern. Manufacturing share of GDP (columns (1) and (6)) and fuel rent (columns (4) and (9)) have negative and significant direct associations with

[14] The sub-sample is restricted to countries with non-negative Polity IV scores (CSP, 2015).

Table 4. Robustness Check: Robustness Analysis: Political Economy I

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Manufacturing share of GDP	Coal endowment	Oil endowment	Fuel rents	IUCN	Lobbying and corruption control			
						Manufacturing share of GDP	Coal endowments	Oil endowments	Fuel rents
Common Law	**0.57*** **	**0.52*** **	**0.56*** **	**0.51*** **	**0.53*** **	**0.60*** **	**0.49*** **	**0.51*** **	**0.50*** **
LT	**(0.17)**	**(0.17)**	**(0.17)**	**(0.17)**	**(0.17)**	**(0.17)**	**(0.17)**	**(0.17)**	**(0.17)**
Manuf. share of GDP	-0.02*					-0.02*			
	(0.01)					(0.01)			
Coal endowment		-0.00					-0.00		
		(0.00)					(0.00)		
Crude oil endowments			-0.01					-0.01*	
			(0.00)					(0.00)	
Fuel rents				-0.05***					-0.04**
				(0.02)					(0.02)
IUCN					0.00	0.01	0.01	0.01	0.01
					(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Corruption control	0.45***	0.44***	0.45***	0.41**	0.43**	0.92***	0.55***	0.51***	0.45**
	(0.16)	(0.17)	(0.17)	(0.16)	(0.17)	(0.27)	(0.19)	(0.19)	(0.19)
Manuf. share of GDP × corr. cntrl.						-0.01			
						(0.01)			
Coal endowment × corruption control							0.00		
							(0.00)		
Crude oil endowm. × corr. control								0.01***	
								(0.00)	
Fuel rent × corruption control									0.01
									(0.01)
IUCN × corruption control						-0.02**	-0.02**	-0.02*	-0.01
						(0.01)	(0.01)	(0.01)	(0.01)
Baseline controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Countries	175	174	172	175	175	175	174	172	175
Observations	284	282	280	284	284	284	282	280	284

Notes: The table presents Cox proportional hazard model estimates. The Efron method for ties is used. Baseline controls are political rights, landlocked, distance to coast, climate vulnerability, population size, log per capita income, and its squared term. Robust standard errors in parenthesis. *, ** and *** indicate significance at the 10%, 5% and 1% levels, respectively.

PA ratification, but corruption control does not influence these political pressures (the interaction terms are insignificant). However, column (8) suggests that crude oil endowment has a negative association with PA ratification, and the strength of this association is reduced by greater corruption control. The direct effect of environmental lobbying (IUCN) is consistently insignificant, but the interactions with corruption control are negative and significant in columns (6)-(8). This indicates that stronger environmental lobbying is associated with a reduced probability of PA ratification, reinforced by a higher level of corruption control. Analogously, environmental lobbying is relatively more successful in more corrupt countries, consistent with Fredriksson et al. (2007) and Bellelli et al. (2023a). One possible explanation is that environmental lobbying met fiercer political resistance where corruption is relatively low, such that their efforts backfired. The IUCN measure may also suffer from endogeneity, where with more lobby groups forming where lobbying in favor of ratification is facing greater resistance, e.g. Common law legal tradition has a positive and significant association with the probability of PA ratification in all columns of Table 4.

Table 5 includes several additional political economy factors. Column (1) controls for the average years of schooling, which may be related to how informed the population is about climate change. This may influence, e.g., voting behavior. Column (2) uses a measure of the combined political power of leftist and centrist parties and column (3) accounts for union density within the workforce (La Porta et al., 2008). Column (4) employs a measure of government fractionalization, which attempts to mirror the ability of the government to push major legislation through legislative bodies. Column (5) uses a Herfindahl index of government seats, which similarly reflects the power of the government coalition parties within the legislature. Finally, column (6) includes a measure of the government majority's electoral vote margin, where the sample is restricted to democracies only (non-negative Polity IV scores). The common law legal tradition dummy has a positive and significant association with the probability of ratification in all columns of Table 5. None of the political economy factors is significant, except years of schooling which however is negative.

Table 5. Robustness Analysis: Political Economy II

	(1)	(2)	(3)	(4)	(5)	(6)
	Schooling	Power of the left	Union density	Government fractionalization	Herfindahl index	Margin govt majority
Common Law LT	**0.44****	**0.51****	**0.64****	**0.48****	**0.47****	**0.74*****
	(0.17)	**(0.21)**	**(0.27)**	**(0.19)**	**(0.19)**	**(0.24)**
Avg. years of schooling	-0.13*					
	(0.07)					
Power of the left		0.15				
		(0.25)				
Union density			0.01			
			(0.01)			
Government fractionalization				0.11		
				(0.31)		
Govt. Herfindahl index					-0.10	
					(0.31)	
Margin govt majority						0.43
						(0.89)
Baseline controls	Yes	Yes	Yes	Yes	Yes	Yes
Countries	138	134	83	161	161	103
Observations	216	212	106	267	267	151

Notes: The table presents Cox proportional hazard model estimates. The Efron method for ties is used. Baseline controls are political rights, corruption control, landlocked, distance to coast, climate vulnerability, population size, log per capita income, and its squared term. Robust standard errors in parenthesis. *, ** and *** indicate significance at the 10%, 5% and 1% levels, respectively.

4.2.3 Legal tradition and cultural differences

One possible criticism advanced in the literature is that legal tradition may proxy for inherent cultural differences that influence present-day legal rules and outcomes. Table 6 controls for several dimensions of culture (e.g., La Porta et al., 2008; Vu, 2023): % Catholics in the population (column (1)); Hofstede (1984) six cultural dimensions (power distance, individualism, masculinity, uncertainty avoidance, long-term orientation, and indulgence) (column (2)); and generalized trust (column (3)). Common law legal tradition has a positive and significant coefficient in all three columns, suggesting that legal tradition is not simply a proxy for culture. In contrast, none of the cultural variables is significant, except indulgence.

Table 6. Robustness Analysis: Culture

	(1) % Catholics	(2) Hofstede's cultural dimensions	(3) Generalized trust
Common Law LT	**0.60*** **	**0.62***	**0.60****
	(0.18)	**(0.35)**	**(0.29)**
% Catholics	0.00		
	(0.00)		
Power distance		0.00	
		(0.01)	
Individualism		-0.01	
		(0.01)	
Masculinity		0.00	
		(0.01)	
Uncertainty avoidance		-0.00	
		(0.01)	
Long-term orientation		-0.01	
		(0.01)	
Indulgence		-0.01*	
		(0.01)	
Generalized trust			-0.59
			(1.17)
Baseline controls	Yes	Yes	Yes
Countries	175	91	56
Observations	284	126	103

Notes: The table presents Cox proportional hazard model estimates. The Efron method is used for ties. Baseline controls are political rights, corruption control, landlocked, distance to coast, climate vulnerability, population size, log per capita income and its squared term. Robust standard errors in parenthesis. *, **, and *** indicate significance at the 10%, 5% and 1% levels, respectively.

4.2.4 Alternative data and samples

Table 7 checks the sensitivity of our baseline estimates to alternative data and samples. Column (1) uses the legal origin classification by La Porta et al. (2008). Column (2) uses Klerman et al. (2011) classification of legal traditions into British common law (common Law), civil law, mixed law (more than one legal system has been used historically), and other law. Civil law is the excluded category in column (2). Europe has historically been strongly committed to emission reduction relative to other regions of the world (da Graça Carvalho, 2012; Oberthür and Groen, 2018), and countries on this continent may drive our results. Column (3) excludes all European countries from the baseline sample. Column (4) includes only the 116 former colonies in our sample, which are more likely to have received their legal traditions involuntarily

and more exogenously (La Porta et al., 2008; Fredriksson and Wollscheid, 2015). Column (5) drops the countries that ratified the PA on April 22, 2016, the first day the PA became open for ratification. Our main result holds across all specifications in Table 7.

Table 7. Robustness Analysis: Alternative Data and Samples

	(1)	(2)	(3)	(4)	(5)
	Legal tradition classification: La Porta et al. (2008)	Legal tradition classification: Klerman et al. (2011)	Europe excluded	Former colonies only	Drop first ratifiers
Common Law LT	**0.51*** (0.17)**	**0.41* (0.21)**	**0.51*** (0.18)**	**0.54** (0.22)**	**0.40** (0.18)**
Mixed Law LT		0.62** (0.24)			
Other Law LT		0.23 (0.22)			
Baseline controls	Yes	Yes	Yes	Yes	Yes
Countries	173	170	136	116	166
Observations	282	272	227	183	275

Notes: The Cox proportional hazard estimation model is used in the estimations. The Efron method is used for ties. Baseline controls are political rights, corruption control, landlocked, distance to coast, climate vulnerability, population size, log per capita income and its squared term. Robust standard errors in parenthesis. *, ** and *** indicate significance at the 10%, 5% and 1% levels, respectively.

Table A5 in the appendix provides a further robustness check. Eq. (1) is re-estimated using two fully parametric models, the Weibull and Gompertz estimators, respectively. Furthermore, we use a stratified proportional hazard model allowing the baseline hazards to differ between (i) Annex 1 and non-Annex 1 countries; and (ii) OECD and non-OECD countries, respectively. (i) is based on the Kyoto Protocol which divided countries into groups with and without binding obligations, which may have affected subsequent PA ratification behavior. All four Common Law LT dummy estimates are significant with coefficients like the baseline specification.

4.2.5 The influence of neighbors and major blocs

Table 8 provides further robustness analysis. Column (1) adds continent-fixed effects to ensure that the baseline estimate is not spuriously driven by unobserved time-invariant region-

specific characteristics. Next, columns (2), (3), and (4) control for the influence of major blocs of countries, in particular the G7, the G20, and the EU, respectively.[15] These blocs of countries may potentially influence the ratification decisions of other countries. Column (5) considers the influence of neighboring countries using as a measure the share of regional neighbors which has already ratified, similar to von Stein (2008).

Table 8. Robustness Analysis: Major Blocs and Regional Neighbors

	(1)	(2)	(3)	(4)	(5)
	Continent FE	G7 countries	G20 countries	EU countries	Regional ratification
Common Law LT	**0.50**** **(0.21)**	**0.53***** **(0.17)**	**0.53***** **(0.18)**	**0.54***** **(0.18)**	**0.59***** **(0.19)**
G7 countries		0.10 (0.32)			
G20 countries			-0.01 (0.31)		
EU countries				0.05 (0.24)	
Regional ratification					-6.59*** (0.57)
Continent FE	Yes	-	-	-	-
Baseline controls	Yes	Yes	Yes	Yes	Yes
Countries	175	175	175	175	175
Observations	284	284	284	284	284

Notes: The Cox proportional hazard estimation model is used in the estimations. The Efron method for ties is used. Baseline controls include political rights, corruption control, landlocked, distance to coast, climate vulnerability, population size, log per capita income, and its squared term. Continent dummies include the Americas, Asia, Europe, and Oceania; Africa is the omitted group. Robust standard errors in parenthesis. *, ** and *** indicate significance at the 10%, 5% and 1% levels, respectively.

The common law legal tradition estimates remain positive and significant. While the G7, G20, and EU countries have no additional effect on the probability of ratification, regional neighbors appear to have a negative impact on PA ratification. This suggests that free-riding or a race-to-the-the-bottom in environmental regulations may be relevant problems within regions, in line with the findings of von Stein (2008) but in contrast to Sauquet (2014). As discussed by

[15] The European Union and African Union are dropped from the G20 sample.

Wagner (2016), if the relative payoff to cooperation decreases with the number of treaty members (here, neighboring treaty members), ratification is a strategic substitute.

4.3 Alternative cut-off dates for ratification

Table 9 analyzes whether ratification behavior differs at various milestones. A particularly important milestone was October 5, 2016, when the threshold of at least 55 countries representing a minimum of 55% of total emissions was reached, and the PA could enter into force. The countries that ratified the PA by this date contributed to the agreement entering into force when it mattered the most. Column (1) defines ratification success as ratification occurring on or before October 5, 2016.

Furthermore, the time to ratification varies quite substantially across countries, and columns (2)-(5) use this variation. The average delay among the 173 countries that ratified the PA during the sample period is 320 days and the median time is 196 days. The first and third quartiles of delay are 152 and 364 days, respectively. We use these as cut-offs. Finally, column (6) uses China's and the United States' (first occasion) ratification date September 3, 2016, as a cut-off. These are significant polluters, and this date is potentially an important milestone.

Table 9. Alternative Ratification Cut-off Dates

	(1)	(2)	(3)	(4)	(5)	(6)
	55/55%	152 days (25%)	196 days (Median)	324 days (Mean)	389 days (75%)	US and China Ratification
Common Law LT	**1.14*** (0.30)**	**1.23*** (0.48)**	**0.60** (0.24)**	**0.62*** (0.20)**	**0.56*** (0.19)**	**1.41*** (0.53)**
Baseline controls	Yes	Yes	Yes	Yes	Yes	Yes
Countries	175	175	175	175	175	175
Observations	284	284	284	284	284	284

Notes: The Cox proportional hazard estimation model is used in estimations. The Efron method is used for ties. Baseline controls are political rights, corruption control, landlocked, distance to coast, climate vulnerability, population size, log per capita income, and its squared term. Robust standard errors are reported in parenthesis. *, ** and *** indicate significance at the 10%, 5% and 1% levels, respectively.

Common law legal tradition is significant in all six columns of Table 9 indicating that our result is not sensitive to the cut-off date. However, the coefficient size declines in columns (3)-(5)

compared to columns (1)-(2) and (6). This suggests that legal tradition played a larger role in the early stages of the ratification process, and in particular until the two largest emitters had ratified.

4.5 Do NDCs matter for ratification?

Table 10 studies the role of the NDC pledges in countries' ratification decisions. The NDCs were country-specific pledges where individual countries outlined their post-2020 plans. They were made before ratifications occurred, and despite their nonbinding design, they may have affected the timing of ratification decisions. The NDC pledges include emission-cut commitments, climate adaptations, and related funding (UNFCCC, 2018; Tolliver et al., 2020).

The NDC pledges are likely to be endogenously determined by similar variables as the ratification decision (including legal traditions), which prevents us from including an NDC measure in the main hazard analysis. Tolliver et al. (2020) constructed an NDC regulatory index consisting of 11 categories of climate commitments. The country scores are based on pledged commitments, and a normalized index score is provided for 49 countries.[16]

Column (1) in Table 10 presents OLS estimates using the baseline model from column (3), Table 2, but with the NDC index stringency as the dependent variable. Column 2 adds environmental and industry lobbying measures along with interactions with corruption control. Columns (3)-(7) replicate Table 7 in order to provide further robustness analysis. We find no evidence that common law legal tradition has a significant association with the NDC index. This indicates that the nonbinding NDC emissions cut pledges do not drive the results reported in the previous tables. Political rights and environmental lobbying may have positive associations with NDC stringency, however. We should keep in mind the low number of observations when we interpret these suggestive results, however.

[16] The eleven categories are: mitigation contribution type; single or multi-year mitigation target; long-term mitigation target; GHG scope; non-GHG scope; percentage of national emissions covered; GHG reduction target type; breadth of covered economic sectors; conditionality; transparency and progress traceability; use of international market mechanisms. See Table A3 in Tolliver et al. (2020) for further details.

Table 10. Legal Traditions and the NDC index: OLS

	(1) Main specification	(2) Lobby groups	(3) Legal tradition classification: La Porta et al. (2008)	(4) Legal tradition classification: Klerman et al. (2011)	(5) Excluding Europe	(6) Former colonies only	(7) Drop first ratifiers
Common Law LT	**-0.44**	**-0.15**	**-0.44**	**-0.21**	**-0.66**	**-0.92**	**-0.31**
	(0.40)	**(0.42)**	**(0.40)**	**(0.46)**	**(0.54)**	**(0.69)**	**(0.39)**
Mixed Law LT				-1.43**			
				(0.56)			
Other Laws LT				-0.66			
				(0.41)			
Political rights	0.05*	0.02	0.05*	0.04	0.04	0.05	0.05*
	(0.03)	(0.02)	(0.03)	(0.03)	(0.03)	(0.06)	(0.03)
Corruption control	0.32	0.85	0.32	0.47	0.68	0.55	0.40
	(0.37)	(0.58)	(0.37)	(0.35)	(0.55)	(0.66)	(0.37)
Log per capita income	4.15	4.32	4.15	8.42	4.85	1.45	5.07
	(7.00)	(7.53)	(7.00)	(7.05)	(12.33)	(19.10)	(7.05)
Log per capita income squared	-0.20	-0.23	-0.20	-0.42	-0.25	-0.07	-0.25
	(0.35)	(0.37)	(0.35)	(0.36)	(0.63)	(0.97)	(0.35)
Environmental lobbying		0.05*		0.04			
		(0.03)		(0.03)			
Environmental lobbying × corr. control		-0.03					
		(0.02)					
Industry lobbying		-0.19					
		(0.18)					
Industry lobbying × corr. control		-0.03					
		(0.16)					
Geo. controls & pop. size	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Climate vuln.	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.49	0.59	0.49	0.54	0.41	0.36	0.48
Observations	49	49	49	49	28	24	48

Notes: The table presents OLS estimates. Geographic controls are landlocked and distance to the coast. Robust standard errors are reported in parenthesis. *, ** and *** indicate significance at the 10%, 5% and 1% levels, respectively.

5. Conclusion

This paper studies the role of common law and civil law legal traditions in the ratification of international environmental agreements. We analyze the Paris Agreement in which the nonbinding emissions cuts pledges are an important feature. Our estimates provide robust support for the hypothesis, emerging from the literature on international law, that common law legal tradition countries ratify the Paris Agreement earlier than civil law countries. This is due to

common law's preference for, and civil law's aversion to, nonbinding obligations within international agreements. The analysis may help observers and policymakers better understand and predict the level of cooperation on future multilateral environmental agreements and inform policy design.

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Appendix

Table A1. Definition of variables and data sources

Variable	Description	Source
	Baseline estimation	
Common Law LT	A dummy variable equal to 1 if the legal tradition is common law, 0 if civil law.	Nunn and Puga (2012)
Political rights	Assessment of the political rights of individuals by measuring the electoral process, political pluralism, participation, and the functioning of the government. Higher values indicate greater political rights.	Freedom House (2023)
Corruption control	Perceptions of the extent to which public power is exercised for private gain, including petty and grand forms of corruption, and capture of the state by elites and private interests. Higher values indicate greater control of corruption.	WGI (2021)
Per capita income (log)	2015 data based on purchasing power parity measured in constant 2017 international dollars.	World Bank (2023)
Landlocked	A dummy variable equal to 1 if a country is fully enclosed by land, 0 otherwise.	Gallup et al. (1999); CIA (2023)
Distance to coast	Average distance to nearest ice-free coast (1000 km).	Nunn and Puga (2012)
Population size	Total population in millions.	World Bank (2023)
Climate vulnerability	Index that quantifies the impacts of extreme weather events in terms of fatalities and economic losses. Average of 1993-2012, lower values indicate greater climate risk.	Germanwatch (2014)
	Other variables	
Historical pathogen stress	Proxies the historical prevalence of pathogens. Average prevalence of the following seven diseases: leishmanias, schistosomes, trypanosomes, malaria, typhus, filariae, and dengue.	Murray and Schaller (2010)
Colonizer identity dummies	Dummy variables for France, Great Britain, Portugal, Spain, and Others (excluded variable).	
Rule of law	Captures perceptions of the extent to which agents have confidence in and obey the rules. The focus is on the quality of contract enforcement, property rights, the police, the courts, and also the likelihood of crime and violence. Higher values indicate greater confidence and obedience towards the rule of law. The years are 2016-2021.	WGI (2021)
Quality of Institutions	A composite index constructed as the average value of six WGI measures of institutions for 2016-2021: voice and accountability, political stability, government effectiveness, regulatory quality, rule of law, and control of corruption.	WGI (2021)
Civil liberties	Assesses liberties in the following sub-categories: freedom of expression and belief, associational and organizational rights, rule of law, personal autonomy, and individual rights. Higher values indicate greater liberties. Years are 2016-2021.	Freedom House (2023)
Democracy	Captures the political regime authority spectrum on a 21-point scale ranging from -10 (hereditary monarchy) to +10 (consolidated democracy). A composite average for 1975-2015.	CSP (2015)
Proportional representation	Proportional representation in 2015. A binary variable equal to 1 if candidates are elected based on the percent of votes received by their party and/or the system uses "proportional representation", and 0 otherwise.	Cruz et al. (2016)
Manufacturing share of GDP	Manufacturing value added as a percentage of GDP in 2015.	World Bank (2023)
Coal endowment	Coal reserves in 2015 in million short tons.	EIA (2015)
Oil endowment	Crude oil (including lease condensate) reserves in 2015 in billion barrels.	EIA (2015)
Fuel rent	Total fossil fuels rent as a percentage of GDP over 2016-2021. Total natural resources rents are the sum of oil rents, natural gas rents, coal rents (hard and soft), mineral rents, and forest rents.	World Bank (2023)
Environmental lobbying	Number of environmental NGO memberships in the International Union for the Conservation of Nature in 2017.	IUCN (2017)

Average years of schooling	Average years of total schooling.	Barro and Lee (2013)
Power of the left	The proportion of years between 1975-2015 when the chief executive in the office was leftist or centrist.	Cruz et al. (2016)
Union density	Percentage of the total workforce affiliated with labor unions over the study period.	Cruz et al. (2016)
Government fractionalization	The probability that two deputies picked at random from among the government parties will be of different parties in 2015.	Cruz et al. (2016)
Government Herfindahl index	The sum of squared seat shares of all government parties in 2015.	Cruz et al. (2016)
Margin of government majority	The fraction of seats held by the government, calculated as the number of government seats over the total seats (government seats, opposition seats, plus non-aligned seats) in 2015.	Cruz et al. (2016)
% Catholic	Catholics as share of the population in 2010.	Pew (2011)
Power distance	The extent to which the less powerful members of society expect and accept that power is distributed unequally. Takes values between 0 and 100.	Hofstede (1984)
Individualism	The degree of interdependence a society maintains among its members. Takes values between 0 and 100.	Hofstede (1984)
Masculinity	Societal orientation towards competition, achievement/success (defined by winners and the best in the field) vs. emphasis on caring for others and quality of life. Takes values between 0 and 100.	Hofstede (1984)
Uncertainty avoidance	The extent to which a society deals with the fact that the future can never be known. Takes values between 0 and 100.	Hofstede (1984)
Long-term orientation	How societies priorities following two existential goals: maintaining links with its own past; dealing with the challenges of the present and future. Takes values between 0 and 100.	Hofstede (1984)
Indulgence	The extent to which people try to control their desires and impulses, based on the way they were raised: indulgence vs. restrain. Takes values between 0 and 100.	Hofstede (1984)
Generalized trust	The country-level average of the answers to the following question: "Generally speaking, would you say that most people can be trusted or that you can't be too careful in dealing with people?", 1 if yes, and 0 otherwise. WVS wave 6 data: 2010-2014.	Inglehart et al. (2018)
Regional ratification	The share of neighbors with a common border which has already ratified.	
NDC index	Index with 11 categories of climate commitments: mitigation contribution type, single or multi-year mitigation target, long-term mitigation target, GHG scope, non-GHG scope, percentage of national emission covered, GHG reduction target type, breadth of covered economic sectors, conditionality, transparency and progress traceability, and use of international market mechanisms. Answers are scored based on the relative strength of the underlying policy. Normalized scores are summed to find a final index score between 0 and 10.	Tolliver et al. (2020)

Table A2. Ratifying and Non-ratifying Countries by Legal Tradition

Ratifying Countries				
Common Legal Traditions (58)		Civil Legal Traditions (115)		
Antigua and Barbuda	Saudi Arabia	Afghanistan	Estonia	Morocco
Australia	Sierra Leone	Albania	Ethiopia	Mozambique
Bahamas	Singapore	Algeria	Finland	Myanmar
Bahrain	Solomon Islands	Angola	France	Netherlands
Bangladesh	South Africa	Argentina	Gabon	Nicaragua
Barbados	Sri Lanka	Armenia	Georgia	Niger
Belize	Sudan	Austria	Germany	Norway
Bhutan	Swaziland	Azerbaijan	Greece	Oman
Botswana	Tanzania	Belarus	Guatemala	Panama
Brunei Darussalam	Thailand	Belgium	Guinea	Paraguay
Canada	Tonga	Benin	Guinea-Bissau	Peru
Cyprus	Trinidad and Tobago	Bolivia	Haiti	Philippines
Dominica	Uganda	Bosnia and Herzegovina	Honduras	Poland
Fiji	United Arab Emirates	Brazil	Hungary	Portugal
Gambia	United Kingdom	Bulgaria	Iceland	Qatar
Ghana	United States	Burkina Faso	Indonesia	Romania
Grenada	Vanuatu	Burundi	Iraq	Russian Federation
Guyana	Zambia	Cambodia	Italy	Rwanda
India	Zimbabwe	Cameroon	Japan	Sao Tome and Principe
Ireland		Cape Verde	Jordan	Senegal
Israel		Central African Republic	Kazakhstan	Serbia
Jamaica		Chad	South Korea	Seychelles
Kenya		Chile	Kuwait	Slovakia
Kiribati		China	Kyrgyzstan	Slovenia
Lesotho		Colombia	Laos	Spain
Liberia		Comoros	Latvia	Suriname
Malawi		Congo, Democratic Republic of the	Lebanon	Sweden
Malaysia		Congo, Republic of the	Lithuania	Switzerland
Maldives		Costa Rica	Luxembourg	Tajikistan
Namibia		Cote d'Ivoire	Macedonia	Togo
Nepal		Croatia	Madagascar	Tunisia
New Zealand		Czech Republic	Mali	Turkey
Nigeria		Denmark	Malta	Turkmenistan
Pakistan		Djibouti	Mauritania	Ukraine
Papua New Guinea		Dominican Republic	Mauritius	Uruguay
Saint Kitts and Nevis		Ecuador	Mexico	Uzbekistan
Saint Lucia		Egypt	Moldova	Viet Nam
Saint Vincent and the Grenadines		El Salvador	Mongolia	
Samoa		Equatorial Guinea	Montenegro	
Non-ratifying countries				
Common Legal Traditions (0)		Civil Legal Traditions (2)		
		Iran	Libya	

Notes: Legal traditions classification by Nunn and Puga (2012).

Table A3. Legal Traditions and PA Ratification: time-invariant version of control variables

	(1)		(2)		(3)	
			Geographic, climate, and population controls		Baseline specification: adding income controls	
	Coefficient (std. error)	H.R.	Coefficient (std. error)	H.R.	Coefficient (std. error)	H.R.
Common Law LT	**0.65*** (0.16)**	**1.91**	**0.66*** (0.17)**	**1.93**	**0.57*** (0.17)**	**1.76**
Political rights	0.01 (0.01)	1.01	0.01 (0.01)	1.01	0.00 (0.01)	1.00
Corruption control	0.24** (0.10)	1.27	0.25** (0.11)	1.29	0.50*** (0.17)	1.64
Per capita income (log)					1.28 (1.23)	3.6
Squared per capita income (log)					-0.08 (0.07)	0.92
Geo. controls and population size	No		Yes		Yes	
Climate vulnerability	No		Yes		Yes	
Proportional Hazard Tests	0.48 [0.92]		2.40 [0.93]		5.76 [0.76]	
Log-likelihood	-714.60		-712.22		-709.96	
Countries	175		175		175	
Observations	284		284		284	

Notes: The table presents Cox proportional hazard model estimates and hazard ratios (H.R.). Eq. (1) is re-estimated using a time-invariant version (i.e., political rights and corruption control in the year 2015) of control variables. Geographic controls are landlocked dummy and distance to the coast. The Efron method is used for ties. Robust standard errors in parenthesis. *, ** and *** indicate significance at the 10%, 5% and 1% level, respectively. The global proportional hazards test (with p-values in parenthesis) is reported (Grambsch and Therneau, 1994).

Table A4. Descriptive statistics for variables used in the robustness analysis

Variable	Observations	Mean	Std. Dev.	Min	Max
Pathogen stress	279	0.18	0.60	-1.18	1.20
Rule of law	284	-0.23	0.93	-1.86	2.04
Quality of institutions	284	-0.23	0.86	-1.90	1.86
Civil liberties	284	32.79	16.13	3.00	60.00
Democracy	265	1.10	5.98	-10.00	10.00
Proportional representation	252	0.64	0.48	0.00	1.00
Manufacturing output as a share of GDP	284	28.82	13.81	7.51	70.55
Coal endowment	282	6287.98	29516.87	0	254896
Oil endowment	280	13.24	38.53	0	265.79
Fuel rent	284	7.74	10.20	0.00	61.03
Environmental lobbying	284	4.55	7.30	0.00	62.00
Trade openness	262	86.02	45.94	1.38	360.47
Average years of schooling	216	8.50	2.82	1.95	13.25
Power of the left	212	0.65	0.37	0.00	1.00
Union density	106	20.05	15.36	1.83	90.50
Government fractionalization	267	0.22	0.28	0.00	0.86
Government Herfindahl index	267	0.78	0.27	0.15	1.00
Margin of government majority	267	0.64	0.20	0.03	1.00
Share of catholic population	284	24.64	28.22	0.01	100.20
Power distance	179	68.76	19.39	11.00	100.00
Individualism	179	36.61	19.40	6.00	91.00
Masculinity	179	45.25	16.29	5.00	100.00
Uncertainty avoidance	179	68.68	21.06	8.00	100.00
Long-term orientation	136	44.73	23.53	3.53	100.00
Indulgence	137	44.12	22.95	0.00	97.32
Generalized trust	103	0.21	0.15	0.03	0.67
NDC index	49	6.36	1.47	1.60	8.67

Table A5. Alternative empirical approaches

	(1)	(2)	(3)	(4)
	Parametric regression models		Stratified Cox proportional hazard model: Kyoto Annex 1	Stratified Cox proportional hazard model: OECD
	Weibull distribution	Gompertz distribution		
Common Law LT	**0.49*** **	**0.45*** **	**0.50*** **	**0.46*** **
	(0.15)	**(0.14)**	**(0.17)**	**(0.17)**
Political rights	0.01	0.01	0.01	0.01
	(0.01)	(0.01)	(0.01)	(0.01)
Corruption control	0.44***	0.41***	0.45***	0.46***
	(0.16)	(0.15)	(0.17)	(0.18)
Log per capita income	0.74	0.71	0.45	0.27
	(1.22)	(1.10)	(1.36)	(1.26)
Squared log per capita income	-0.05	-0.05	-0.03	-0.02
	(0.07)	(0.06)	(0.08)	(0.07)
Geographic controls, and population size	Yes	Yes	Yes	Yes
Climate vulnerability	Yes	Yes	Yes	Yes
Countries	175	175	175	175
Observations	284	284	284	284

Notes: Columns (1) and (2) use fully parametric models (Weibull and Gompertz, respectively). Column (3) uses a stratified proportional hazard model where the baseline hazard differs between Annex 1 and non-Annex 1 countries as classified by the Kyoto Protocol. Column (4) reports a stratified proportional hazard model for OECD and non-OECD members. Geographic controls include dummies for being a landlocked country and distance to coast. *, ** and *** indicate significance at the 10%, 5% and 1% levels, respectively.