Appendix for "Religious Tides: The Time-Variant Effect of Religion on Morality Policies"

Supplemental Online material

Technical documentation of the article "Religious Tides: The Time-Variant Effect of Religion on Morality Policies" published at *Regulation & Governance*.

Description of the dataset

Outcome variable: permissiveness

Figure 1 shows the comparison between an index based on a simple aggregation assuming equal distance between categories and a model-based index based on a Partial Credit Model.
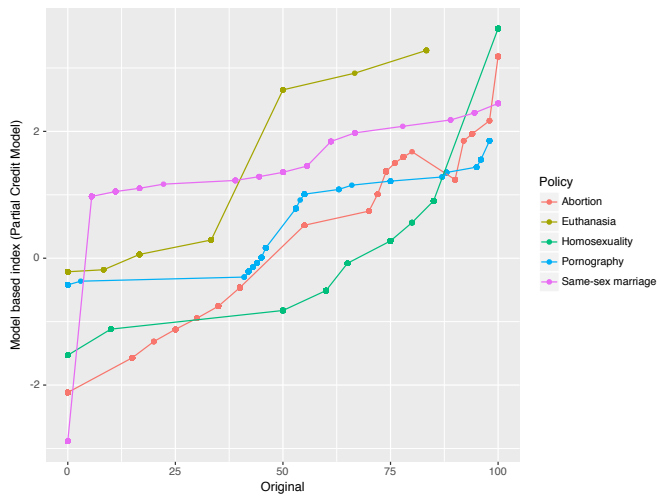

Figure 1: Correspondence between the ordinal categories and the values from the Partial Credit Model.

Figure 2 shows the time trend of the median, the mean and the standard deviation of the permissiveness for every policy.
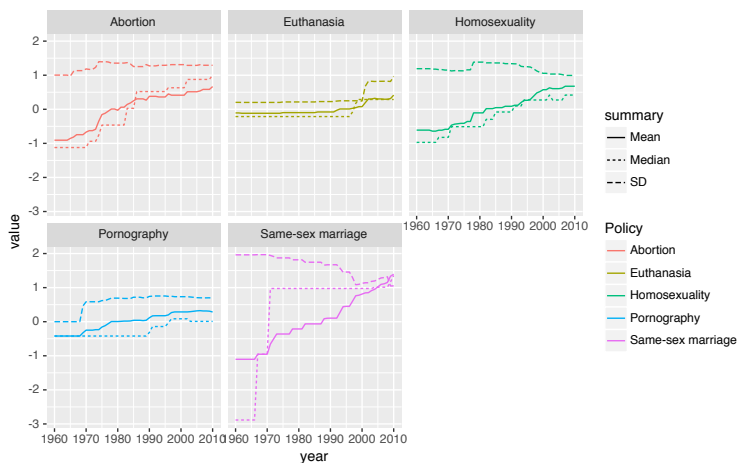

Figure 2: Time trend of the median of permissiveness for every policy.

Figure 3 shows the overall distribution of permissiveness for every policy.
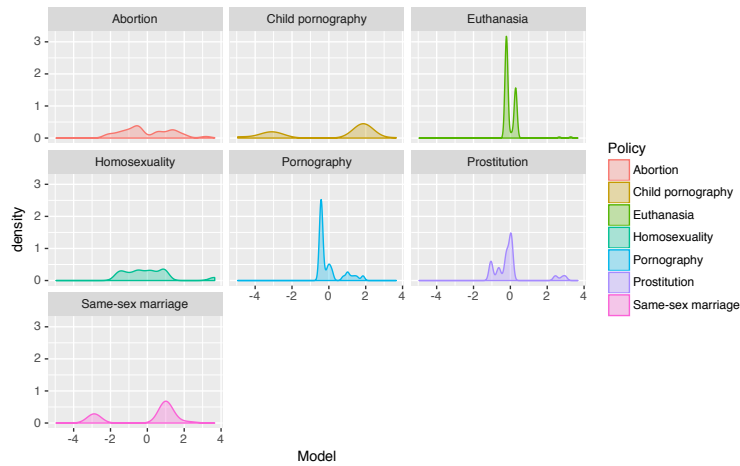
Figure 3: Distribution of permissiveness for every policy.

Covariates for Religious opposition

Figure 4 shows the temporal evolution of the religious opposition for every topic and for all countries.
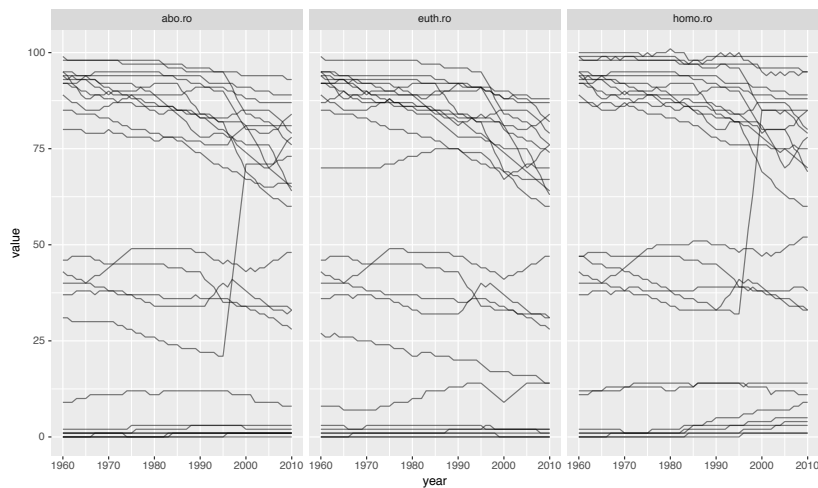

Figure 4: Time evolution of the religious opposition for the three topics, by country.

Covariates for common exposure

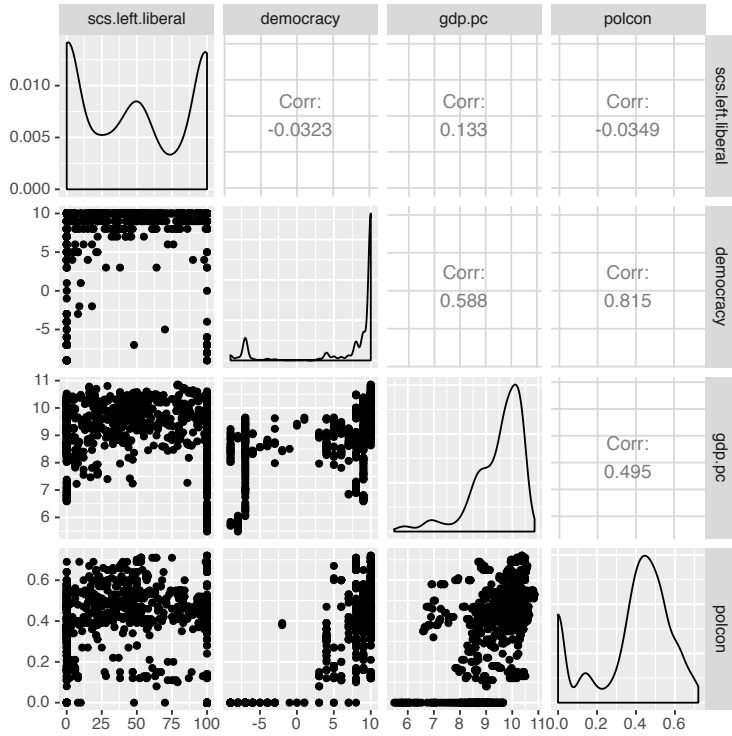Figure 5 shows the descriptive statistics for control covariates.

Figure 5: Descriptive statistics for covariate variables.

Results

This section contains results that are not shown in the main text, but contain valuable information about parameters of the model.

Parameters for covariate variables

Figure 6 shows the parameters of covariates for common exposure (β).

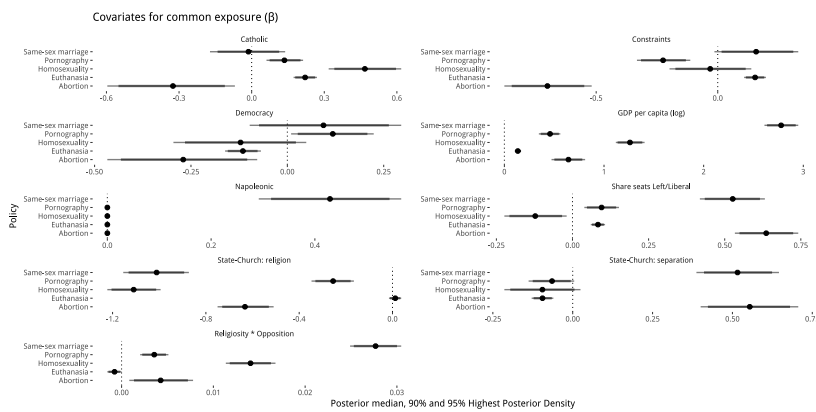Figure 6: Parameters for the covariate variables of common exposure (β).

Figure 7 shows the parameters of the covariate for interdependence (γ).

Error parameters

Figure 8 shows the time trend of the error components by policies (standard deviations of the policies).

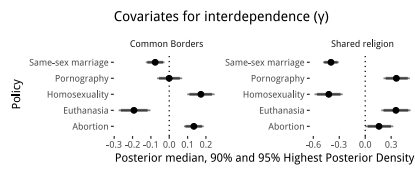Figure 9 shows the year-to-year variation of the state-space model for θ.

Covariates for interdependence (γ)

Figure 7: Parameters for the covariate variable of interdependence (γ).

Time trend for annual variation (σ)
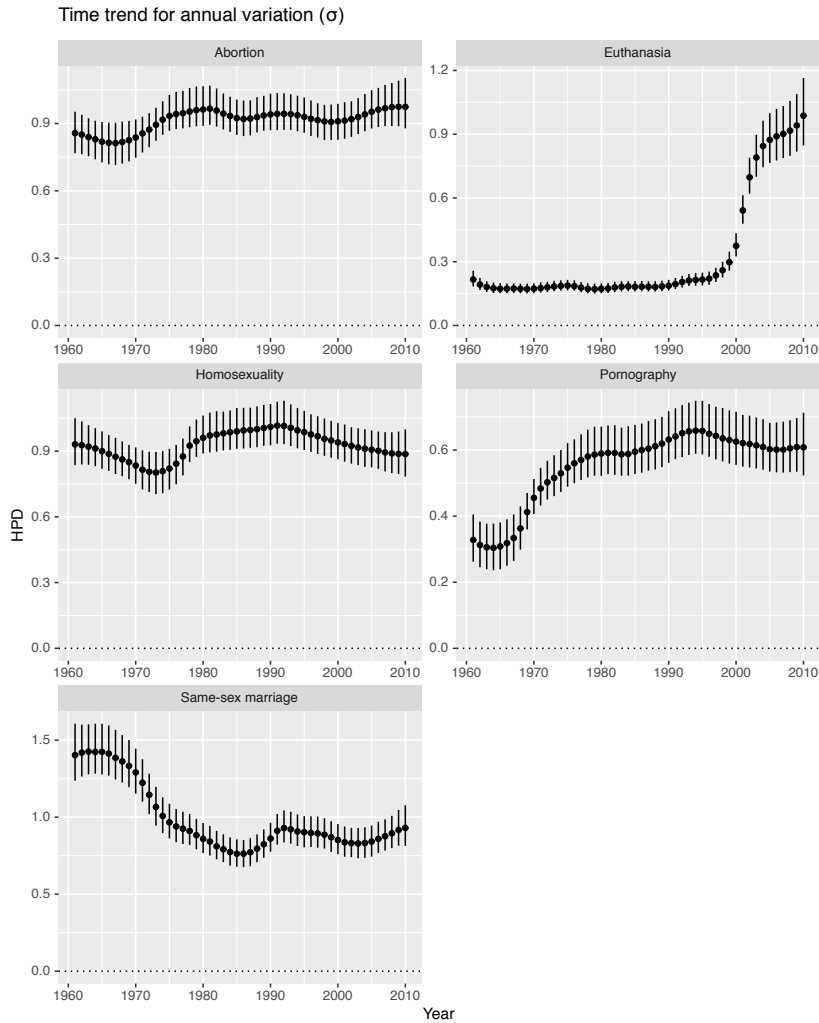
Figure 8: Posterior distribution of the error components by policies and year (σ)

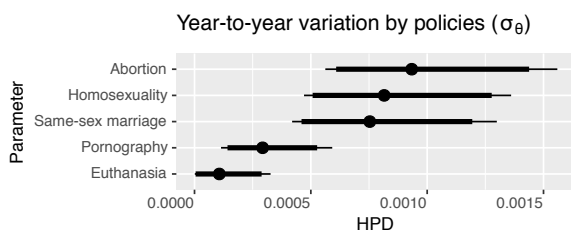## Year-to-year variation by policies (σ_θ)

Figure 9: Posterior distribution of the year-by-year variation of the state-space model for θ.

Model fit

This section presents the residual standard deviation by policy.

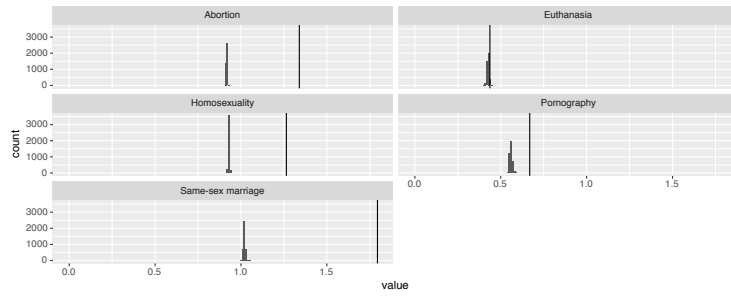Figure 10 shows the distributions of the residual standard deviation.

Figure 10: Residual standard deviations.

Robustness

This section presents the main results of the model running only with Western democracies, against the full sample used in the article.

Figure 11 shows the temporal trend of the religios effects for the model running only with the subsample of Western countries. This Figure must be compared to Figure 2 in the main text. Recall that the trend of the bottle-neck effect is present.
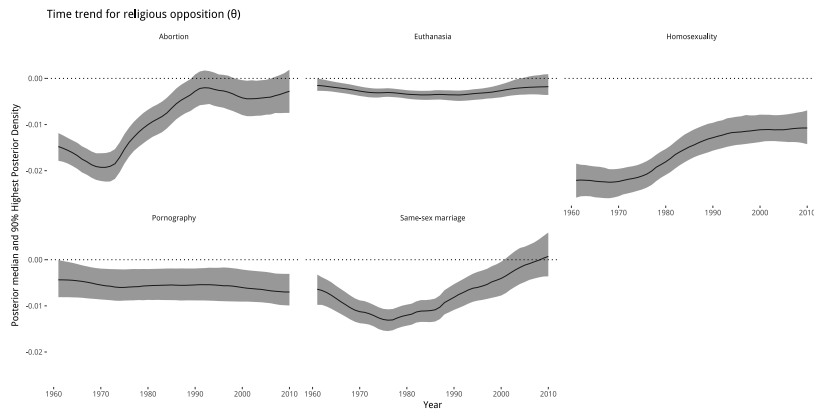

Figure 11: Posterior distribution of the θ parameters that account for the effect of religious opposition on the level of restrictiveness - permissiveness of each policy. Sample with only Western countries.

Figure 12 shows the posterior distribution of the hyperparameters accounting for the control variables for the model running only with the subsample of Western countries. This Figure must be compared to Figure 5 in the main text.
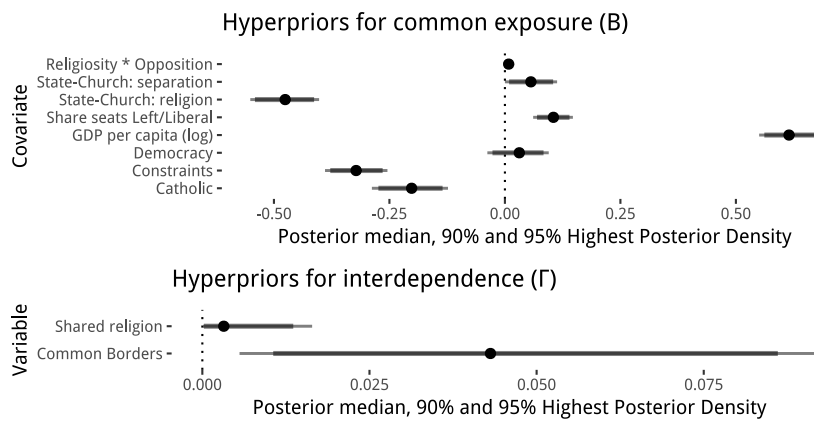

Figure 12: Posterior distribution of the B and Γ parameters that account for the control variables. Sample with only Western countries.

Code

The JAGS code for the model is the following.

```
model {
  ##### # Explanatory model
  for (p in 1:nP) {
    for (c in 1:nC) {
      for (y in 2:nY) {
        Y[y,c,p] ~ dnorm(mu[y,c,p], tau[y,c,p])
        mu[y,c,p] <-
              alpha[p]
            + theta[y,p] * X[y-1,c,p]
            + beta[1,p] * C[y-1,c,1] # Catholic
            + beta[2,p] * C[y-1,c,2] # Polcon
            + beta[3,p] * C[y-1,c,3] # Democracy
            + beta[4,p] * C[y-1,c,4] # GDP pc
            + beta[5,p] * C[y-1,c,5] # Napoleonic
            + beta[6,p] * C[y-1,c,6] # Share seats
            + beta[7,p] * C[y-1,c,7] # State-Church: religion
            + beta[8,p] * C[y-1,c,8] # State-Church: separation
            + beta[9,p] * C[y-1,c,9] * X[y-1,c,p] # Religiosity * Religion
            + gamma[1,p] * (M.borders.std[c,] %*% Y[y-1,,p])
            + gamma[2,p] * (M.religion.std[c,] %*% Y[y-1,,p])
        tau[y,c,p] <- pow(sigma[y,c,p], -2)
        sigma[y,c,p] <- exp(lambda[p] + delta[p] * C[y,c,1] + rho[p] * sigma[y-1,c,p])
        resid[y,c,p] <- Y[y,c,p] - mu[y,c,p]
      }
      mu[1,c,p] ~ dnorm(Y.mean.p[p], Y.sd.p[p]^-2)
      sigma[1,c,p] <- exp(lambda[p] + delta[p] * C[1,c,1])
      resid[1,c,p] <- 2
    }
    resid.mean[p] <- mean(resid[2:nY,1:26,p])
    resid.sd[p] <- sd(resid[2:nY,1:26,p])

    ###### Error structure
    lambda[p] ~ dnorm(0, 2^-2)
    delta[p] ~ dnorm(0, 2^-2)
    rho[p] ~ dnorm(0, 1^-2)T(-1, 1)
    Rho[p] ~ dnorm(0, 1)T(-1,1)
    tau.rho[p] <- pow(sigma.rho[p], -2)
    sigma.rho[p] ~ dunif(0, 1)

    ###### # Priors for constant rate
    alpha[p] ~ dnorm(0, 2^-2)

    ###### # Priors for religious oposition
    for (t in 2:nY) {
      theta[t,p] ~ dnorm(theta[t-1,p], tau.theta[p])
      #theta[t,p] ~ dnorm(0, 1^-2)
    }
    theta[1,p] ~ dnorm(0, 1^-2)
    tau.theta[p] <- pow(sigma.theta[p], -2)
    sigma.theta[p] ~ dunif(0, 0.01)

    ###### # Priors for control variables
    beta[1,p] <- Beta.unadj[1] + nu.beta[1,p]
    beta[2,p] <- Beta.unadj[2] + nu.beta[2,p]
    beta[3,p] <- Beta.unadj[3] + nu.beta[3,p]
    beta[4,p] <- Beta.unadj[4] + nu.beta[4,p]
    beta[6,p] <- Beta.unadj[6] + nu.beta[6,p]
    beta[7,p] <- Beta.unadj[7] + nu.beta[7,p]
    beta[8,p] <- Beta.unadj[8] + nu.beta[8,p]
    beta[9,p] <- Beta.unadj[9] + nu.beta[9,p]

    # Priors for spatial variables
    for (l in 1:2) {
      gamma[l,p] <- Gamma.unadj[l] + nu.gamma[l,p]
    }
  }
  # Napoleonic only in SSM
  beta[5,1] <- 0
  beta[5,2] <- 0
  beta[5,3] <- 0
  beta[5,4] <- 0
  beta[5,5] ~ dnorm(0, 1^-2)

  ##### # Hyperpriors for control variables
  for (b in 1:nCv) {
    Beta[b] <- Beta.unadj[b] + mean(nu.beta[b,])
    Beta.unadj[b] ~ dnorm(0, 2^-2)
    for (p in 1:nP) {
      nu.beta.unadj[b,p] ~ dnorm(mu.nu.beta[b], tau.beta[b])
      nu.beta[b,p] <- nu.beta.unadj[b,p] - mean(nu.beta.unadj[b,])
```

```
81        }
82        mu.nu.beta[b] ~ dnorm(0, 2^-2)
83        tau.beta[b] ~ dt(0, pow(1, -2), 1)T(0,)
84        sigma.beta[b] <- 1 / sqrt(tau.beta[b])
85      }
86
87      ###### # Hyperpriors for spatial variables
88      for (g in 1:2) {
89        Gamma[g] <- Gamma.unadj[g] + mean(nu.gamma[g,])
90        Gamma.unadj[g] ~ dnorm(0, 2^-2)T(0,)
91        for (p in 1:nP) {
92          nu.gamma.unadj[g,p] ~ dnorm(mu.nu.gamma[g], tau.gamma[g])
93          nu.gamma[g,p] <- nu.gamma.unadj[g,p] - mean(nu.gamma.unadj[g,])
94        }
95        mu.nu.gamma[g] ~ dnorm(0, 2^-2)
96        tau.gamma[g] ~ dt(0, pow(1, -2), 1)T(0,)
97        sigma.gamma[g] <- 1 / sqrt(tau.gamma[g])
98      }
99
100     #############################
101     # Missing values
102     for (c in 1:nC) {
103       for (y in 1:nY) {
104         C[y,c,2] ~ dnorm(-0.5, pow(0.5, -2))   # polcon
105         C[y,c,4] ~ dnorm(-0.5, pow(0.5, -2))   # gdp pc
106       }
107     }
108     # Chile for pornography
109     Y[1,4,4] ~ dnorm(Y.mean.p[4], Y.sd.p[4]^-2)
110
111     # Japan for pornography
112     Y[1,15,4] ~ dnorm(Y.mean.p[4], Y.sd.p[4]^-2)
113
114     # Fake countries for counterfactuals
115     for (c in 27:28) {
116       for (p in 1:nP) {
117         Y[1,c,p] ~ dnorm(Y.mean.p[p], Y.sd.p[p]^-2)
118       }
119     }
120   }
```

Categories

This section provides the detailed list of categories used for every policy, along with the paradigms and concrete specifications of every regulation. It includes material for abortion (Table 1), euthanasia (Table 2), pornography (Table 3), same-sex marriage (Table 4) and homosexuality (Table 5).

Category	Paradigm	Specifications
1	Total prohibition	
2	Medical indication, life	time restricted
3		unrestricted
4	Medical indication, health	time restricted
5		unrestricted
6	Criminological or eugenic indication	time restricted
7		unrestricted
8	Criminological and eugenic indication	time restricted
9		unrestricted
91	Social indication	short (>=12 weeks)
11		long (<12 weeks)
12	Choice model, short	short (>=12 weeks)
13	Combination choice model short +	Plus 1 indication long
14		Plus 2 indications long
15		Plus 3 indications long
16		Plus 4 indications long
17		Plus 5 indications long
18	Choice model, long	long (<12 weeks)
19	Combination choice model long +	Plus 1 indications long
20		Plus 2 indications long
21		Plus 3 indications long
22		Plus 4 indications long
23		Plus 5 indications long
24	Unrestricted	

Table 1: Abortion. Categories, paradigms and specifications.

Category	Paradigm	Specifications
1	Total prohibition	
2	1 type of euthanasia allowed	terminally ill
3		gravely ill
4		ill
5		no medical conditions
6	2 types of euthanasia allowed	terminally ill
7		gravely ill
8		ill
9		no medical conditions
10	3 types of euthanasia allowed	terminally ill
11		gravely ill
12		ill
13		no medical conditions

Table 2: Euthanasia. Categories, paradigms and specifications.

Category	Paradigm	Specifications
1	Total Prohibition	
2	Only adult pornography allowed, high age limit (age >=18)	0 Types
3		1 Type
4		2 Types
5		3 Types
6		4 Types
7		5 Types
8		6 Types
9		7 Types
10		8 Types
11		9 Types
12	Only adult pornography allowed, low age limit (age <18)	0 Types
13		1 Type
14		2 Types
15		3 Types
16		4 Types
17		5 Types
18		6 Types
19		7 Types
20		8 Types
21		9 Types
22	Adult and Animal OR Violent Pornography allowed, highest age limit of any type >=18	0 Types
23		1 Type
24		2 Types
25		3 Types
26		4 Types
27		5 Types
28		6 Types
29		7 Types
30		8 Types
31		9 Types
32	Adult and Animal OR Violent Pornography allowed, highest age limit of any type < 18	0 Types
33		1 Type
34		2 Types
35		3 Types
36		4 Types
37		5 Types
38		6 Types
39		7 Types
40		8 Types
41		9 Types
42	Adult and Animal AND Violent Porn allowed, highest age limit of any type >=18	0 Types
43		1 Type
44		2 Types
45		3 Types
46		4 Types
47		5 Types
48		6 Types
49		7 Types
50		8 Types
51		9 Types
52	Adult and Animal AND Violent Porn allowed, , highest age limit of any type <18	0 Types
53		1 Type
54		2 Types
55		3 Types
56		4 Types
57		5 Types
58		6 Types
59		7 Types
60		8 Types
61		9 Types
62	All Porn and all distribution legal	

Table 3: Pornography. Categories, paradigms and specifications. Specifications refer to legality of different types of distribution channels: 1. Trade: Import/Export, 2. Distribution via electronic networks / Internet, 3. Distribution via public TV and radio broadcasting, 4. Distribution via satellite or cable TV (pay TV), 5. Distribution via print media, 6. Distribution via videos, sex shops, and adult cinemas, 7. Zoning requirements, 8. Advertisement, 9. Hours of operation.

Category	Paradigm	Specifications
1	Total prohibition	
2	Nonregistration	Nonequalization
3		Equalization in one law sector
4		Equalization in two law sectors
5		Equalization in three law sectors
6		Equalization in four law sectors
7		Equalization
8	Registration model	Nonequalization
9		Equalization in one law sector
10		Equalization in two law sectors
11		Equalization in three law sectors
12		Equalization in four law sectors
13		Equalization
14	Gay marriage	Nonequalization
15		Equalization in one law sector
16		Equalization in two law sectors
17		Equalization in three law sectors
18		Equalization in four law sectors
19		Equalization

Table 4: Same-sex marriage. Categories, paradigms and specifications. Specifications refer to equalization in social, inheritance, tax, adoption, and ART law.

Category	Paradigm	Specifications
1	Prohibition of all practices (total)	
2	Prohibition of at least one practice (partial)	
3		High for all practices (≥ 20)
4		High (≥ 20), but not for all practices
5		Medium for all practices (≥ 17)
6	All practices allowed with age restrictions	Medium (≥ 17), but not for all practices
7		Low for all practices ($=16$)
8		Low ($=16$), but for not all practices
9		Very low (≥ 14) for all practices
10		Very low (≥ 14), but with no age restrictions for one/some practices
11	No restrictions (age restrictions only for individuals <14)	

Table 5: Homosexuality. Categories, paradigms and specifications. Specifications refer to age restrictions: the age for age restrictions indicates the minimum age of the younger person in sexual activities to indicate whether the sexual activities between two persons is legal (i.e., the age of consent).