In Times of Natural Disasters: An Empirical Study of the Impact on LGBTQ+ Populations

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Motivation

- In recent years, there has been a surge in disasters, resulting in unpredictable human casualties and significant economic losses.
- The rise in natural disasters due to climate change exacerbates existing inequalities, disproportionately affecting those who are socially and economically marginalized.
- LGBTQ+ communities are among the most vulnerable and disadvantaged groups within society, facing numerous challenges throughout their lives, including exclusion, gender-based violence, discrimination, harassment, and social isolation.

Topic

- Studying the impact of natural disasters on public perceptions regarding LGBTQ values and rights and investigating whether such events foster greater acceptance or deepen prejudice toward LGBTQ individuals.

- Do countries react differently within Schengen and non-Schengen areas? Focusing on the distinction between Schengen and non-Schengen countries to explore how differences in cross-border cooperation and mobility shape public responses to natural disasters.

- Understanding these differences is crucial for designing policies for minority groups that account for varying levels of public support and institutional capacity across member states.

Related Literature & Contribution

- **Natural disasters, inequality, and marginalization for LGBTQ+ individuals**
  - Gorman-Murray et al., (2018) ; Matthijsen, (2018).
- **Natural disasters and mental health for LGBTQ+ individuals.**
  - Shaw, (2020) ; Clayton et al., (2017) ; Schlanger, (2017) .
- **Disaster response policies for LGBTQ+ individuals**
  - Seglah and Blanchard, (2021); Eriksen, (2014).
- To my knowledge, this study is the first to explore how natural disaster events influence individuals' attitudes toward LGBTQ+ community, focusing on specific rights and values.

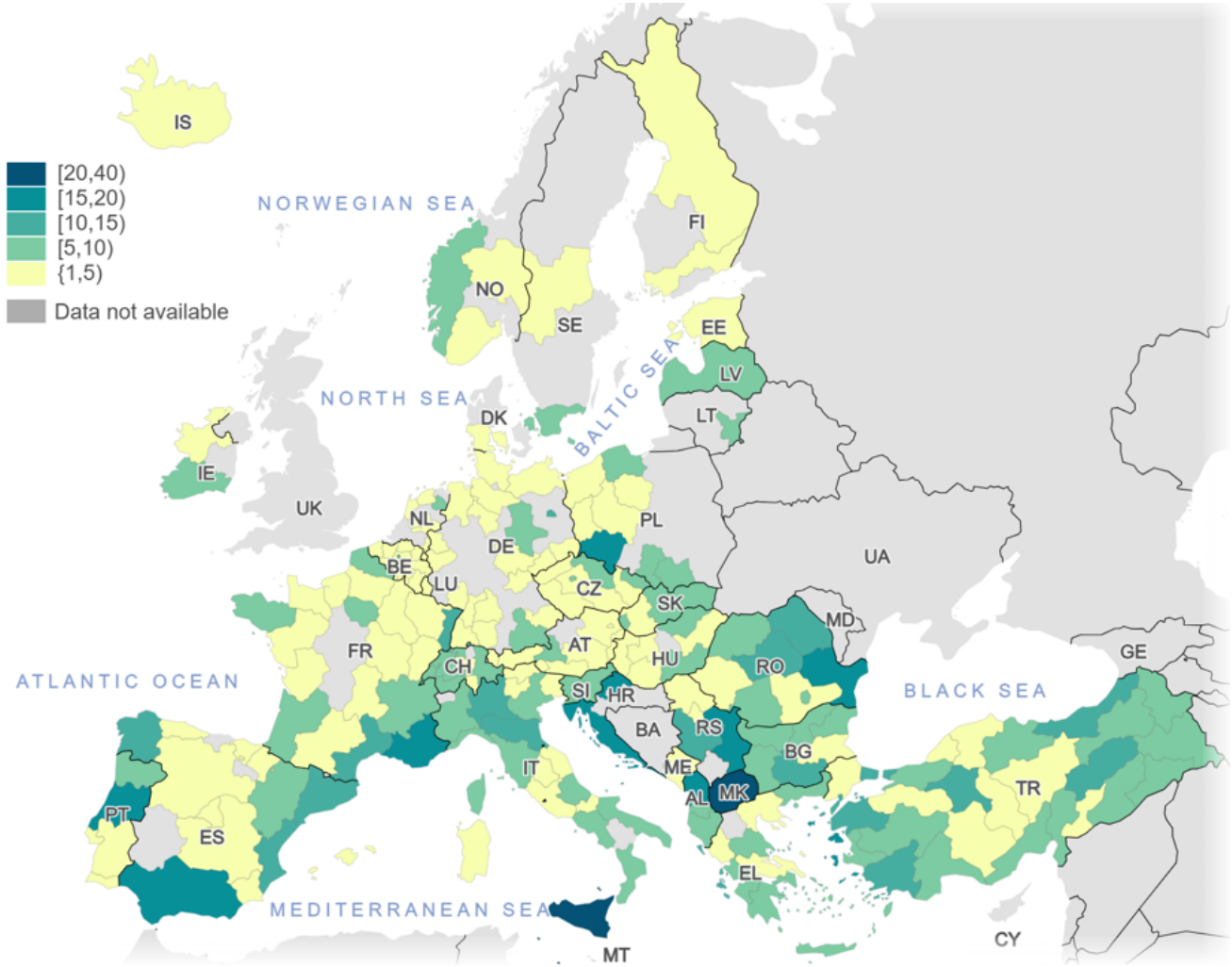
Data-Distasters

- Natural disaster data are derived from EM-DAT, while LGBTQ+ values data come from the European Social Survey (ESS).
- EM-DAT includes various disaster events, such as floods, storms, droughts, earthquakes, and wildfires. To be included in the EM-DAT database, a disaster must meet at least one of the following criteria: (1) 10 or more people reported killed; (2) 100 or more people reported affected; (3) declaration of a state of emergency; or (4) a call for international assistance.
- Constructing a disaster shock variable at the Nuts 2 regional level, assigning each individual based on the shock experience associated with the region in which they reside. This variable is binary, taking the value of 1 once an individual has experienced a disaster shock and 0 before exposure.

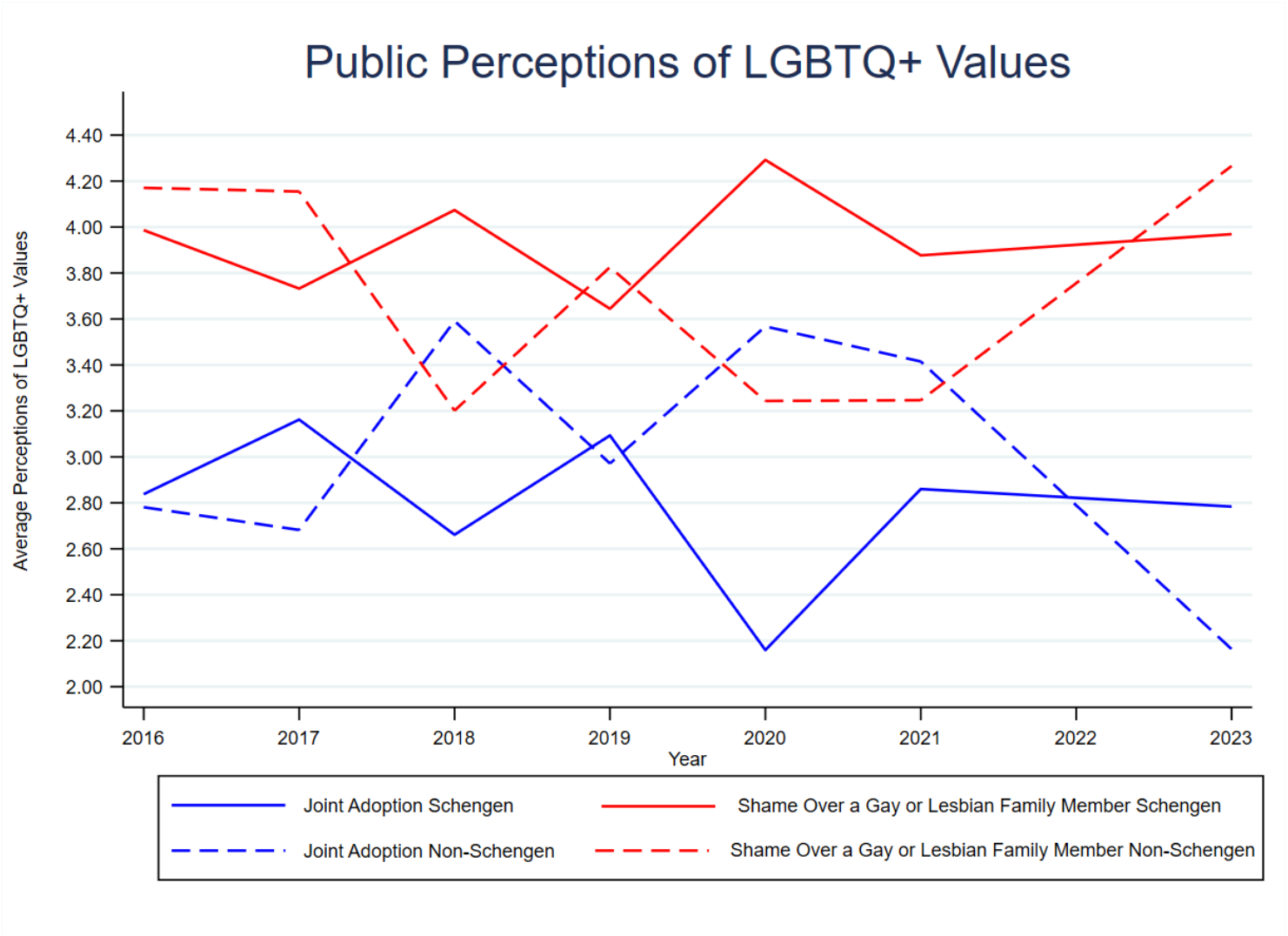
Data-LGBTQ+ Values

- LGBTQ+ values include measures on:
  - Gays and lesbians are free to live their lives as they wish, with a scale ranging from 1 (indicating 'Strongly Agree') to 5 (indicating 'Strongly Disagree').
  - The right of gay and lesbian couples to adopt children, with a scale ranging from 1 (indicating 'Strongly Agree') to 5 (indicating 'Strongly Disagree').
  - Feelings of shame if a close family member is gay or lesbian, with 1 indicating 'Strongly Agree' and 5 indicating 'Strongly Disagree.
- To ensure that individuals were asked about their perceptions after natural disaster shocks, these variables were introduced with a one-year lag.
- The final dataset combines data on natural disasters and LGBTQ+ measures, with 323,620 responses from Schengen and non-Schengen regions across ESS rounds 1 to 11.

Spatial Distribution of Experiencing Natural Disasters



Public Perceptions towards LGBTQ+ Values in Schengen and Non-Schengen Areas



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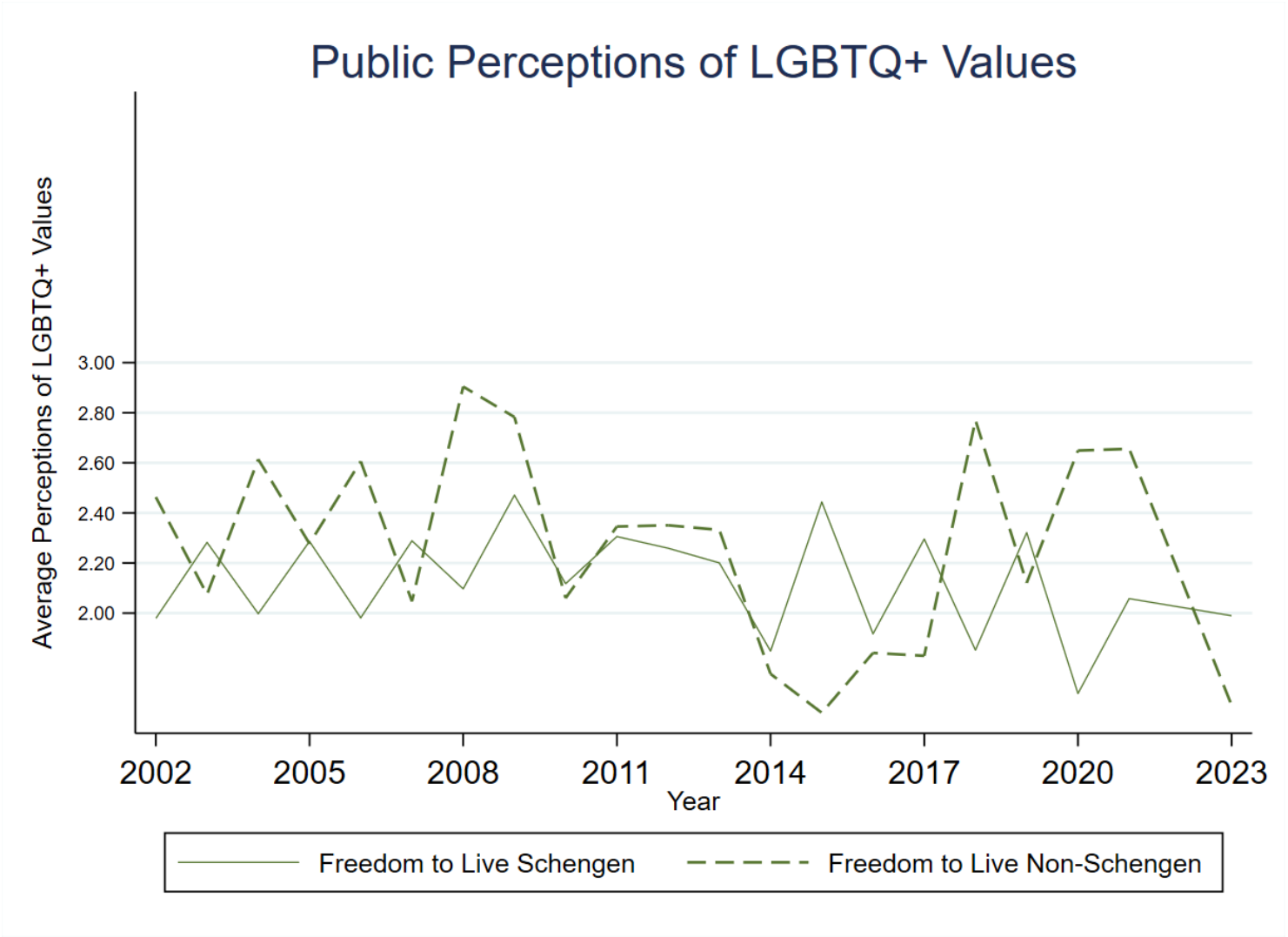

Public Perceptions of LGBTQ+ Values
Average Perceptions of LGBTQ+ Values
3.00
2.80
2.60
2.40
2.20
2.00
2002
2005
2008
2011
2014
2017
2020
2023
Year
Freedom to Live Schengen
Freedom to Live Non-Schengen

Selected Countries

Country	Schengen Membership
Albania	No
Austria	Yes
Belgium	Yes
Bulgaria	No
Croatia	Yes
Cyprus	No
Czech Republic	Yes
Denmark	Yes
Estonia	Yes
Finland	Yes
France	Yes
Germany	Yes
Greece	Yes
Hungary	Yes
Iceland	Yes
Ireland	No
Italy	Yes
Latvia	Yes
Lithuania	Yes
Luxembourg	Yes
North Macedonia	No
Netherlands	Yes
Norway	Yes
Poland	Yes
Portugal	Yes
Romania	No
Slovakia	Yes
Slovenia	Yes
Spain	Yes
Sweden	Yes
Switzerland	Yes

Descriptive Statistics

Table 1: Descriptive Statistics

	Obs.	Mean	SD	Min	Max
LGBTQ+ Values					
Gays and lesbians free to live life as they wish	323.620	2.18	1.18	1	5
Gay and lesbian couples right to adopt children	118.379	2.89	1.45	1	5
Ashamed if close family member gay or lesbian	118.379	3.86	1.25	1	5
Natural Disaster					
Disaster Shock	323.620	0.52	0.49	0	1
Demographic Variables					
Schengen	323.620	0.79	0.40	0	1
Age	323.620	49.7	17.9	18	114
Gender	323.620	0.53	0.49	0	1
Education	323.620	13.1	7.47	2	28
Marital status	323.620	7.09	2.61	1	12
Household members	323.620	2.64	1.36	0	19
Denomination	323.620	1.70	1.10	1	8
Religious Identification	323.620	4.73	3.05	0	10
Born in country	323.620	1.08	0.28	1	2

Notes – Sources: EM-DAT and European Social Survey (ESS). The table presents descriptive statistics for LGBTQ+ perceptions, including: (i) gays and lesbians free to live life as they wish, (ii) the right of gay and lesbian couples to adopt children, and (iii) feelings of shame if a close family member is gay or lesbian. It also includes descriptive statistics for the Disaster Shock variable, based on whether individuals have experienced a natural disaster shock, as well as demographic characteristics such as Schengen membership, age, gender, education (measured by the International Standard Classification of Education, ISCED), marital status, household composition, whether born in the country, religiosity, and denomination belonging.

Method

- Using a staggered triple difference approach
  - Staggered treatment adoption to examine how natural disasters influence public perceptions toward LGBTQ+ individuals.
- Treatment group: regions that have experienced a shock and belong to the Schengen Area
- Control group: regions that have experienced a shock but do not belong to Schengen Area.

Benchmark Specification

$$
\begin{aligned}
y_{irs} = \alpha_0 &+ \alpha_1 \text{Disaster Shock}_{irs} + \alpha_2 \text{Schengen}_{rs} \\
&+ \alpha_3 \text{Disaster Shock}_{irs} \times \text{Schengen}_{rs} \\
&+ \eta X_i + \phi_r + \lambda_s + \epsilon_{irs}
\end{aligned}
$$

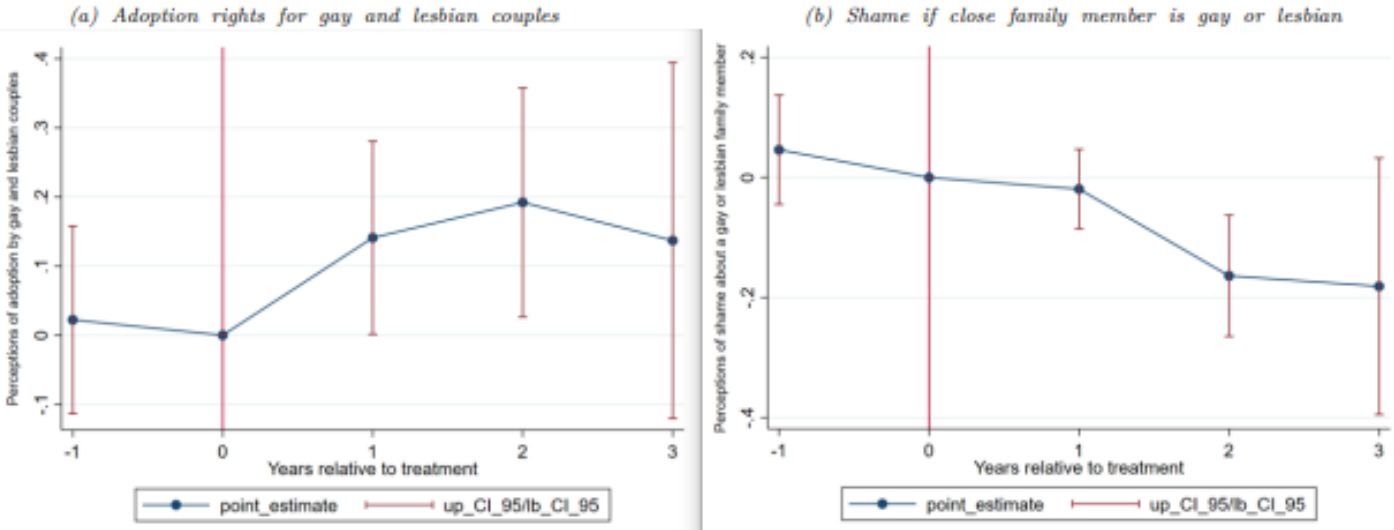
- y_{irs}: denotes the individuals' attitudes toward LGBTQ+ of individual i, residing in region r and participating in the European Social Survey (ESS) in round s.
- $DisasterShock_{irs}$ equals 1 following a disaster shock for individual i residing in region r in round s, and 0 before the exposure.
- $Schengen_{rs}$: equals 1 if the region r belongs to the Schengen Area in round s.
- α_3: captures the main treatment effect.
- X_i: individual controls (age, gender, education, marital status, number of household members, country of birth, denomination, religiosity).
- ϕ_r and λ_s: Nuts 2 and Round fixed effects.
- ϵ_{irs}: Error term - Standard errors are clustered at the Nuts 2 level.

Method (cont.)

- Treatment effects at different time points, with multiple periods and heterogeneous effects, often lead to biased estimates. (Borusyak and Jaravel, 2017; Athey and Imbens, 2018; Goodman-Bacon, 2018; de Chaisemartin and D'Haultfoeuille, 2020; Imai and Kim, 2020; Sun and Abraham, 2020).

- To overcome this, I resort to the event study estimator by Chaisemartin and D'Haultfoeuille (2020, 2021), which exploits variation in shock timing and the point at which regions began to belong to the Schengen Area, and is robust to treatments switching on and off (Wing et al., 2024).

Event Study: Effects of Natural Disasters on Same-Sex Adoption Rights and Attitudes Toward Gay or Lesbian Family Members in the Schengen Area

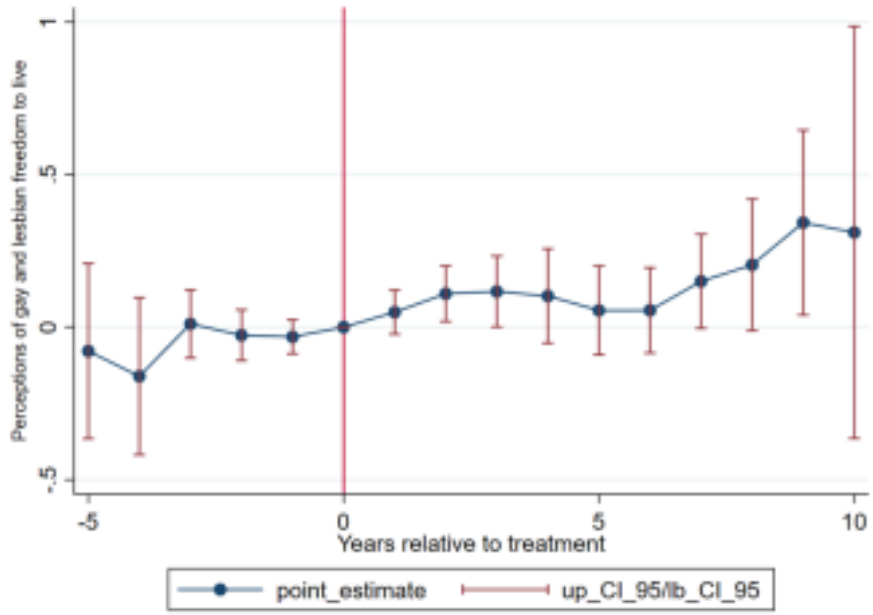


Notes: This figure shows pre-shock trends and post-treatment effects for the treated and control groups, focusing on attitudes toward gay and lesbian couples' right to adopt children and feelings of shame if a close family member is gay or lesbian in the Schengen Area: a) Post - Average Cumulative Total Effect: 0.152 (0.06), statistically significant at the 5% level, with the average number of time periods over which a treatment's effect is accumulated = 1.79; b) Post - Average Cumulative Total Effect: -0.068 (0.03), statistically significant at the 5% level, with the average number of time periods over which a treatment's effect is accumulated = 1.79).

- On average, individuals in the Schengen Area show reduced support:
  - (i) a 15 percentage point decrease in the adoption rights of gay and lesbian couples.
  - (ii) a 7 percentage point increase in feelings of shame toward a close family member who is gay or lesbian.

Event Study: Effects of Natural Disasters on Gays and Lesbians Free to Live Life as They Wish in the Schengen Area

(c) Gays and lesbians free to live life as they wish



Notes: This figure shows the pre-shock trends and post-treatment effects for both the treated and control groups, focusing on attitudes toward whether gays and lesbians are free to live as they wish in the Schengen Area. c) Post - Average Cumulative Total Effect: 0.111 (0.05), statistically significant at the 10% level, with the average number of time periods over which a treatment's effect is accumulated = 4.11

- On average, individuals in the Schengen Area show reduced support:
  (i) an 11 percentage point decrease in the view that gays and lesbians should not be free to live as they wish.

Economic Mechansisms

- Individuals facing vulnerability and hardship, including financial instability and limited resources after a disaster, may prioritize personal safety and stability, marginalizing societal issues.

  (i) Trade

  (ii) Commercial Service Imports

  (iii) Exports of Goods and Services

  (iv) Foreign Direct Investment

  (v) Gross Savings

Findings

- Higher trade flows are associated with more negative effects on both the right of gay and lesbian couples to adopt children and on feelings of shame regarding a close family member's sexual orientation.
  ▸ Trade

- A rise in imports of commercial services reflects less conservative attitudes toward LGBTQ+ adoption rights and reduced feelings of shame regarding a close family member's sexual orientation.
  ▸ Commercial Service Imports

- Increased exports of goods and services are linked to less negative views on adoption rights for LGBTQ+ couples and reduced feelings of shame when a close family member is gay or lesbian.
  ▸ Exports of Goods and Services

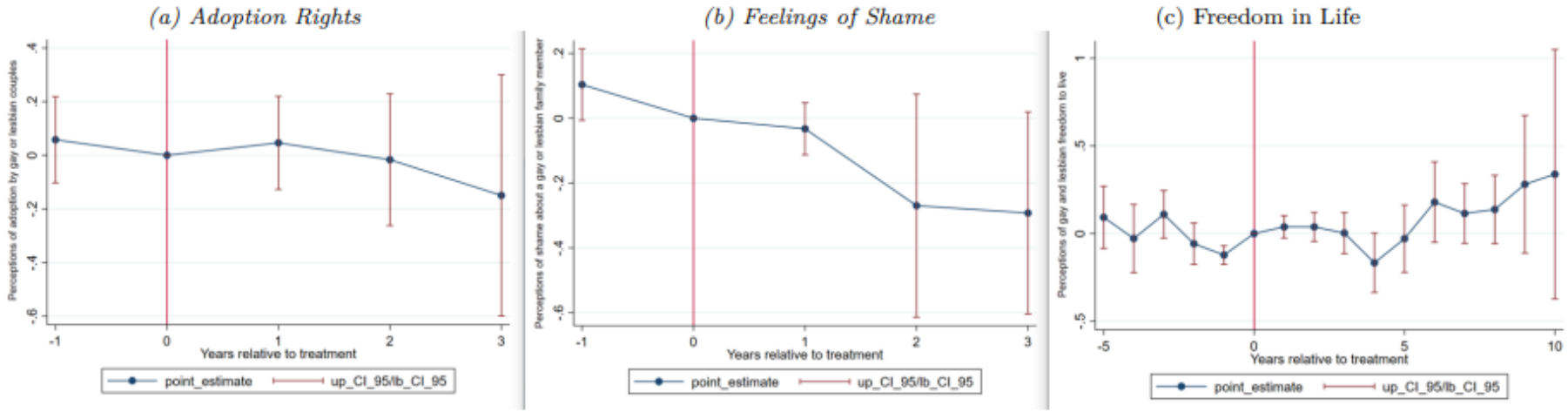
Cont.

- Higher foreign direct investment inflows present more negative attitudes toward LGBTQ+ adoption rights but slightly less negative views on the belief that gays and lesbians should be free to live their lives as they wish. ▸ Foreign Direct Investment

- A rise in gross savings indicates a less negative impact on LGBTQ+ adoption rights and reduced feelings of shame when a close family member is gay or lesbian. ▸ Gross Savings

Falsification Tests: Eurozone vs Non-Eurozone Countries

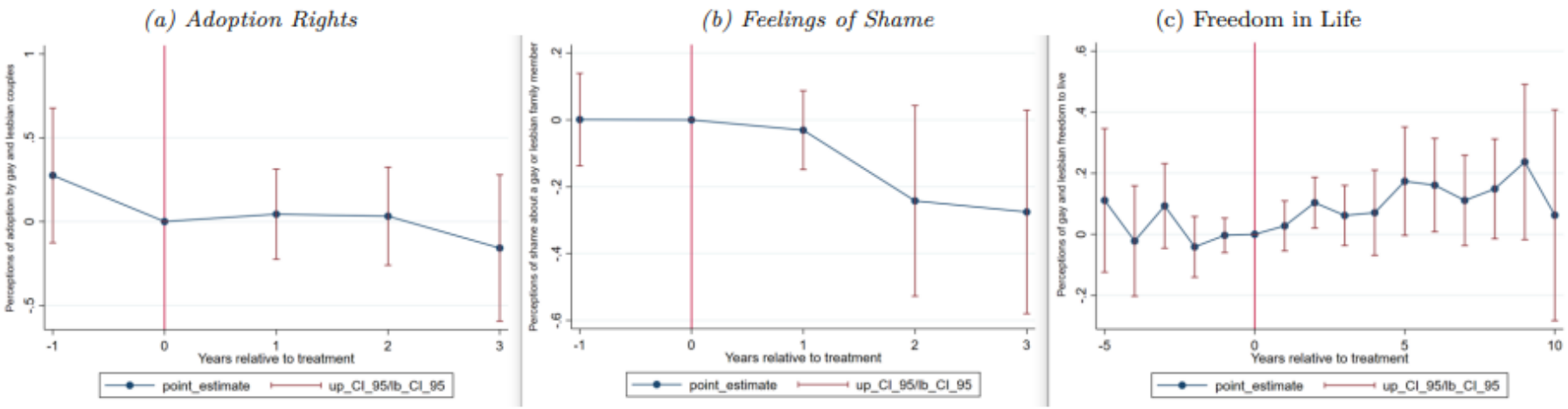
(i) The Eurozone shows no significant results.



Notes: This figure shows pre-shock trends and post-treatment effects for the treated and control groups, focusing on attitudes toward the right of gay and lesbian couples to adopt children, feelings of shame if a close family member is gay or lesbian, and whether gays and lesbians are free to live as they wish in the Eurozone. a) Post - Average Cumulative Total Effect: -0.005 (0.11), not statistically significant; b) Post - Average Cumulative Total Effect: -0.133 (0.07), not statistically significant; (c) Post - Average Cumulative Total Effect: 0.03 (0.05), not statistically significant.

Falsification Tests: European Union vs Non-European Union Countries

(ii) The European Union has a partially significant impact.

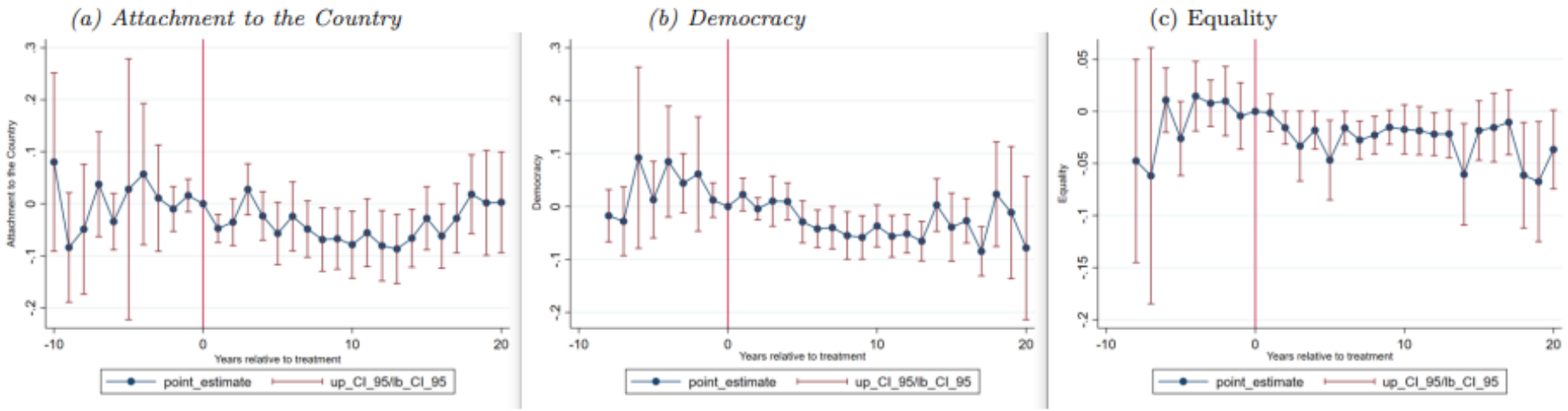


Notes: This figure shows pre-shock trends and post-treatment effects for the treated and control groups, focusing on attitudes toward the right of gay and lesbian couples to adopt children, feelings of shame if a close family member is gay or lesbian, and whether gays and lesbians are free to live as they wish in the European Union: a) Post - Average Cumulative Total Effect: -0.009 (0.15), not statistically significant; b) Post - Average Cumulative Total Effect: -0.152 (0.09), not statistically significant; c) Post - Average Cumulative Total Effect: 0.09 (0.05), statistically significant at the 10% level.

Effects of the Schengen Area

- The Schengen framework allows for free movement across borders: it disrupts individuals' sense of national identity, increases fears of external threats, and marginalizes societal values.
- I use data from the Eurobarometer survey to further support national identity loss and more pronounced negative shifts in societal values within the Schengen Area.
  - Attachment to the country: How attached do you feel to our country? Scale: 1 = Very attached, 4 = Not at all attached.
  - Which values are most important to you personally? Democracy. Scale: 0 = No, 1 = Yes.
  - Which values are most important to you personally? Equality. Scale: 0 = No, 1 = Yes.

Investigating County Attachment and Social Values



Notes: This figure shows pre-shock trends and post-treatment effects for the treated and control groups, focusing on attitudes toward the right of gay and lesbian couples to adopt children, feelings of shame if a close family member is gay or lesbian, and whether gays and lesbians are free to live as they wish in the European Union: a) Post - Average Cumulative Total Effect: -0.049 (0.02), statistically significant at the 5% level, with the average number of time periods over which the treatment effect is accumulated = 7.91; b) Post - Average Cumulative Total Effect: -0.040 (0.01), statistically significant at the 1% level, with the average number of time periods over which the treatment effect is accumulated = 7.37; c) Post - Average Cumulative Total Effect: -0.020 (0.00), statistically significant at the 1% level, with the average number of time periods over which the treatment effect is accumulated = 7.37.

- On average, individuals in the Schengen Area show:
  - (i) a 5 percentage point increase in attachment to the country.
  - (ii) a 4 percentage point reduction in support for the value of democracy
  - (ii) a 2 percentage point reduction in support for the value of equality.

Future Plans and Research

- Using alternative disaster measures, such as total affected, injuries, and the number of homeless, to control for robustness.
- Analyzing the types of disasters and determine which may have a greater impact on attitudes toward LGBTQ+ individuals.

Conclusions

- Natural disasters in Schengen regions are associated with more conservative attitudes toward LGBTQ+ values, particularly regarding adoption rights, feelings of shame toward a close family member who is gay or lesbian, and the belief that gays and lesbians should not be free to live as they wish, compared to non-Schengen regions.

- Economic mechanisms can mitigate the conservative negative effects of disasters. Individuals may prioritize personal stabilization and safety, marginalizing broader societal issues and rights.

- Disaster-affected individuals in the Schengen Area feel more attached to the country while downplaying crucial principles of society, including values of democracy and equality.

- Examining the Eurozone and European Union frameworks, I reveal only partially significant results on LGBTQ+ values following a disaster shock in EU countries.

Thank you for your time

Trade

	(1) Gay and Lesbian Couples' Adoption Rights	(2) Shame Over Family Member's Orientation	(3) Gays and Lesbian Freedom to Live
Disaster Shock	7.099***	-1.381***	-0.033
	(21.51)	(-4.88)	(-0.44)
Schengen	6.811***	-1.757***	-0.118
	(14.49)	(-4.67)	(-1.12)
Trade	0.027***	-0.002***	-0.001*
	(34.21)	(-5.12)	(-1.81)
Disaster Shock x Schengen	-7.200***	1.439***	-0.063
	(-19.64)	(5.01)	(-0.55)
Disaster Shock x Trade	-0.033***	0.005***	0.000
	(-21.80)	(4.26)	(1.54)
Trade x Schengen	-0.030***	0.007**	0.001*
	(-8.40)	(2.56)	(1.80)
Disaster Shock x Schengen x Trade	0.034***	-0.005***	0.000
	(19.32)	(-3.93)	(0.13)
Sample	81.875	81.026	222.364
Controls	Yes	Yes	Yes
Nuts2 FE	Yes	Yes	Yes
ESS Round FE	Yes	Yes	Yes

Notes: Coefficients for all dummy variables are not reported. This table presents the combined effect of natural disaster shocks, Schengen membership, and trade, where trade impacts are measured by the ability to import fewer goods and services at constant prices, on LGBTQ+ values. The model controls for individual characteristics such as age, gender, marital status, occupation, education, denomination, religiosity, and country of birth, and includes Nuts-2 and ESS round fixed effects. Standard errors, clustered at the Nuts-2 region level, are shown in parentheses. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Commercial Service Imports

	(1) Gay and Lesbian Couples' Adoption Rights	(2) Shame Over Family Member's Orientation	(3) Gays and Lesbian Freedom to Live
Disaster Shock	-4.651***	0.553***	0.035
	(-28.47)	(4.56)	(.068)
Schengen	-4.807***	0.392***	0.075**
	(-24.52)	(2.94)	(2.03)
Commercial Service Imports	-0.021***	0.002***	-0.000
	(-35.59)	(5.60)	(-0.02)
Disaster Shock x Schengen	4.789***	-0.566***	-0.030
	(23.78)	(-4.07)	(-0.54)
Disaster Shock x Commercial Service Imports	0.019***	-0.003***	0.000
	(29.51)	(-6.23)	(0.07)
Commercial Service Imports x Schengen	0.019***	-0.002***	-0.000
	(16.08)	(-3.25)	(-0.03)
Disaster Shock x Schengen X Commercial Service Imports	-0.020***	0.002***	-0.000
	(-19.63)	(3.99)	(-0.03)
Sample	81.875	81.026	218.866
Controls	Yes	Yes	Yes
Nuts2 FE	Yes	Yes	Yes
ESS Round FE	Yes	Yes	Yes

Notes: Coefficients for all dummy variables are not reported. This table represents the combined effect of natural disaster shocks, Schengen membership, and commercial service imports on LGBTQ+ values. Commercial service imports are measured as the total value of services provided by non-residents to residents, excluding imports of government services not included elsewhere, and expressed in current prices. The model controls for individual characteristics such as age, gender, marital status, occupation, education, denomination, religiosity, and country of birth, and includes Nuts-2 and ESS round fixed effects. Standard errors, clustered at the Nuts-2 region level, are shown in parentheses. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Exports of Goods and Services

	(1) Gay and Lesbian Couples' Adoption Rights	(2) Shame Over Family Member's Orientation	(3) Gays and Lesbian Freedom to Live
Disaster Shock	-2.200***	0.344***	0.050
	(-16.88)	(3.44)	(0.83)
Schengen	-2.392***	0.131	0.094**
	(-14.37)	(1.15)	(2.08)
Exports of Goods and Services	-0.005***	0.000***	0.000
	(-36.06)	(6.24)	(0.65)
Disaster Shock x Schengen	2.381***	-0.317**	-0.048
	(13.54)	(-2.58)	(-0.74)
Disaster Shock x Exports of Goods and Services	0.005***	-0.001***	-0.000
	(19.72)	(-5.98)	(-0.55)
Exports of Goods and Services x Schengen	0.005***	-0.000***	-0.000
	(17.42)	(-3.02)	(-0.79)
Disaster Shock x Eurozone x Exports of Goods and Services	-0.005***	0.001***	0.000
	(-15.83)	(4.05)	(0.61)
Sample	81.875	81.026	218.866
Controls	Yes	Yes	Yes
Nuts2 FE	Yes	Yes	Yes
ESS Round FE	Yes	Yes	Yes

Notes: Coefficients for all dummy variables are not reported. This table presents the combined effect of natural disaster shocks, Schengen membership, and exports of goods and services in current U.S. dollars, including ownership transfers from residents to non-residents, regardless of physical movement, as well as services provided by residents to non-residents, on LGBTQ+ values. The model controls for individual characteristics such as age, gender, marital status, occupation, education, denomination, religiosity, and country of birth, and includes Nuts-2 and ESS round fixed effects. Standard errors, clustered at the Nuts-2 region level, are shown in parentheses. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Foreign Direct Investment

	(1) Gay and Lesbian Couples' Adoption Rights	(2) Shame Over Family Member's Orientation	(3) Gays and Lesbian Freedom to Live
Disaster Shock	0.029	0-.234***	0.006
	(1.05)	(-15.61)	(0.15)
Schengen	-0.044	-0.385***	0.048
	(-0.53)	(-7.38)	(1.42)
Foreign Direct Investment	0.013***	-0.001***	-0.003***
	(33.62)	(-4.75)	(-3.40)
Disaster Shock x Schengen	0.068	0.216***	-0.003
	(0.99)	(5.87)	(-0.07)
Disaster Shock x Foreign Direct Investment	-0.010***	.0001*	0.002***
	(-10.72)	(1.85)	(2.80)
Foreign Direct Investment x Schengen	-0.012***	0.002**	0.003***
	(-10.30)	(2.54)	(2.99)
Disaster Shock x Foreign Direct Investment x Schengen	0.010***	-0.000	-0.003**
	(5.28)	(-0.45)	(-2.07)
Sample	81.875	81.026	218.866
Controls	Yes	Yes	Yes
Nuts2 FE	Yes	Yes	Yes
ESS Round FE	Yes	Yes	Yes

Notes: Coefficients for all dummy variables are not reported. This table presents the combined effect of natural disaster shocks, Schengen membership, and foreign direct investment net inflows measured as a percentage of GDP on LGBTQ+ values. The model controls for individual characteristics such as age, gender, marital status, occupation, education, denomination, religiosity, and country of birth, and includes Nuts-2 and ESS round fixed effects. Standard errors, clustered at the Nuts-2 region level, are shown in parentheses. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Gross Savings

	(1) Gay and Lesbian Couples' Adoption Rights	(2) Shame Over Family Member's Orientation	(3) Gays and Lesbian Freedom to Live
Disaster Shock	-7.061***	0.997*	0.116
	(-9.08)	(1.68)	(0.86)
Schengen	-8.142***	0.707**	-0.003
	(-14.02)	(2.45)	(-0.04)
Gross Savings	-0.231***	0.020***	0.000
	(-32.15)	(4.07)	(0.13)
Disaster Shock x Schengen	7.2552***	-0.977	0.148
	(8.35)	(-1.60)	(1.00)
Disaster Shock x Gross Savings	0.200***	-0.034**	-0.003
	(9.26)	(-2.09)	(-0.68)
Gross Savings x Schengen	0.242***	-0.029***	0.003
	(12.75)	(-3.39)	(1.19)
Disaster Shock x Gross Savings x Schengen	-0.205***	0.033*	-0.007
	(-8.03)	(1.93)	(-1.48)
Sample	81.875	81.026	218.866
Controls	Yes	Yes	Yes
Nuts2 FE	Yes	Yes	Yes
ESS Round FE	Yes	Yes	Yes

Notes: Coefficients for all dummy variables are not reported. This table presents the combined effect of natural disaster shocks, Schengen membership, and gross savings measured as a percentage of GDP on LGBTQ+ values. The model controls for individual characteristics such as age, gender, marital status, occupation, education, denomination, religiosity, and country of birth, and includes Nuts-2 and ESS round fixed effects. Standard errors, clustered at the Nuts-2 region level, are shown in parentheses. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.