

# Supplementary Information for “Ideology in European Mass Publics, 1981-2016”

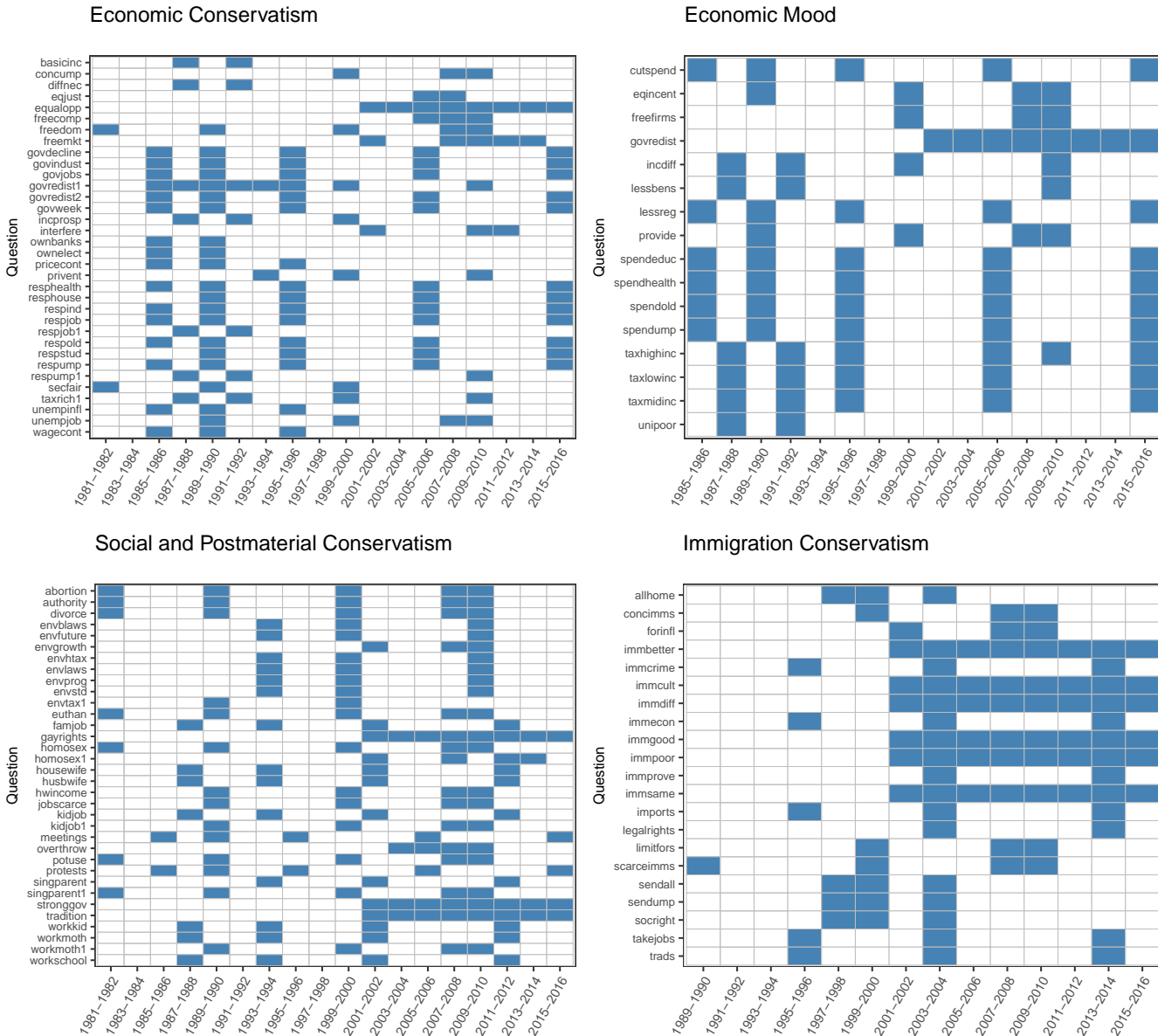
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# 1. Availability of Data by Survey Question and Country

Figure S1 shows the availability of the survey questions in our data on each domain by biennium. It illustrates the sparseness of the raw survey data. For example, no individual survey question is available in every period.

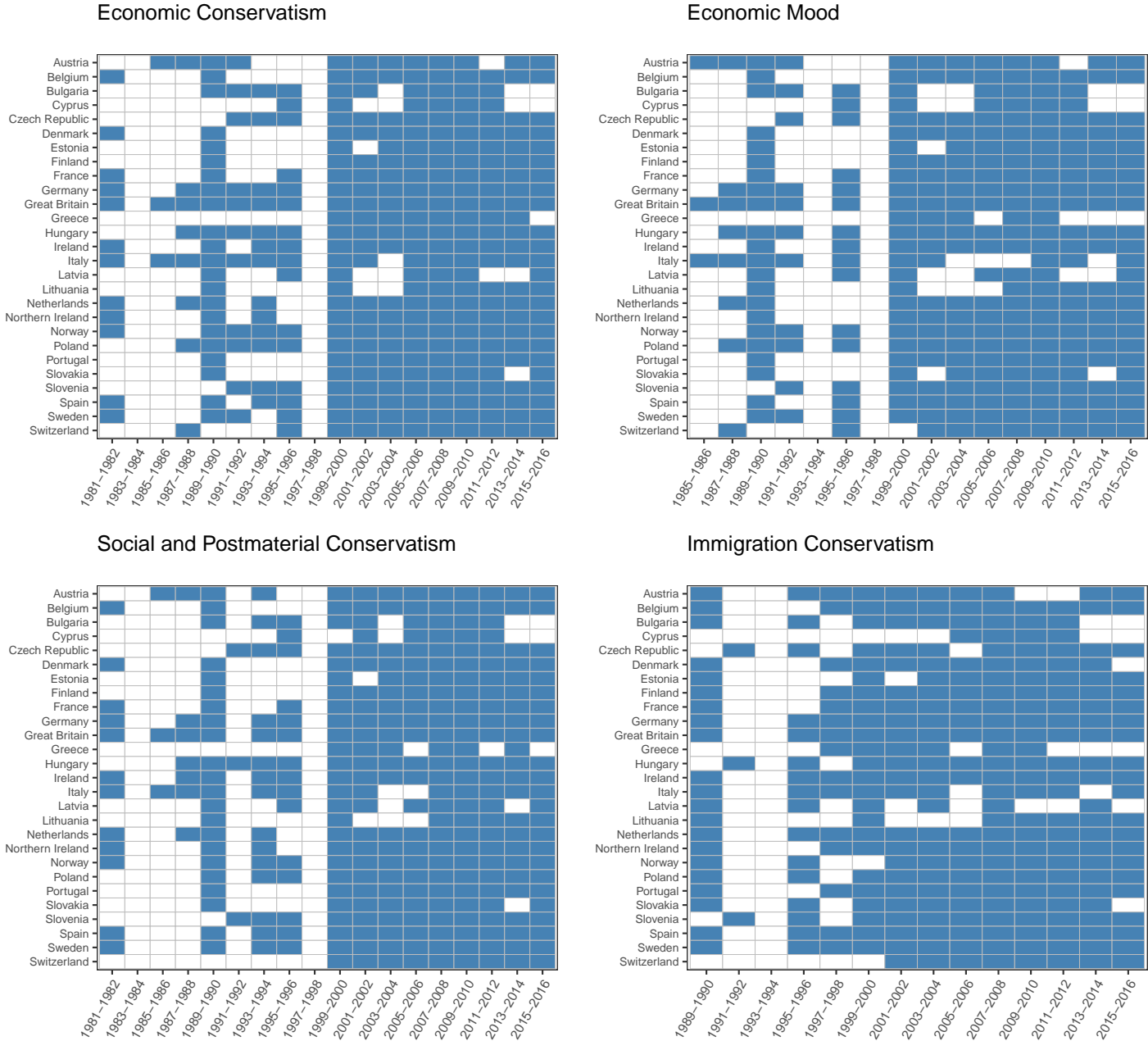
Figure S1: Coverage of Questions in the three datasets



**Note:** Each square represents the appearance of a given question in a given biennium in the relevant ideological dimension. See the Appendix for full details of each question.

Figure S2 shows the coverage of countries in our data on each domain across time. It shows the sparseness of the survey data both cross-sectionally across countries and longitudinally within countries.

**Figure S2: Coverage of Countries in the three datasets**



**Note:** Each square represents the appearance of a given country in a given biennium in the relevant ideological dimension

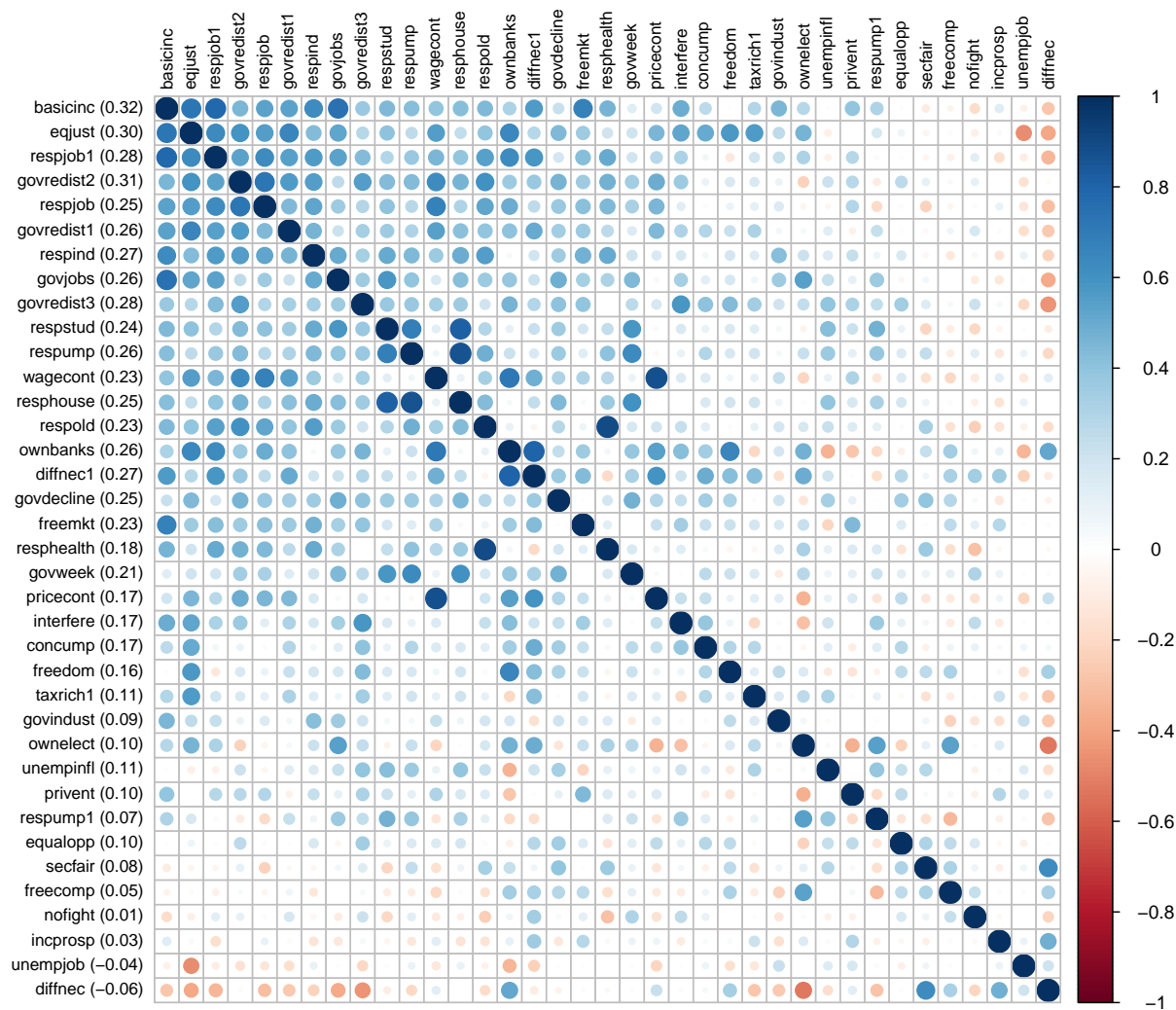
## 2. Inter-Item Correlations and Scree Plots

Our approach is “non-exploratory” in the sense that the dimensionality of the model and issue categorization of survey questions are based on ex ante substantive assumptions rather than inductive statistical evidence. Underlying our analysis, however, are the implicit assumptions that public opinion is correlated within each of our substantive domains (economic conservatism, economic mood, social, and immigration), and that latent conservatism is approximately unidimensional within domain. In this appendix, we present evidence in support of each of these assumptions.

First, we examine the inter-item correlations between the items used to generate each conservatism scale (Figures S3–S6). Due to the prevalence of missing responses, we first summarized the raw data by averaging each question within group-biennia (defining groups as age  $\times$  gender  $\times$  country), centering these averages within year (to eliminate time effects), and then averaging across biennia within groups. The variance in the transformed dataset is therefore purely cross-sectional. We then calculated the pairwise correlation matrix of the question averages. In general, we find that survey questions within a given domain are highly correlated

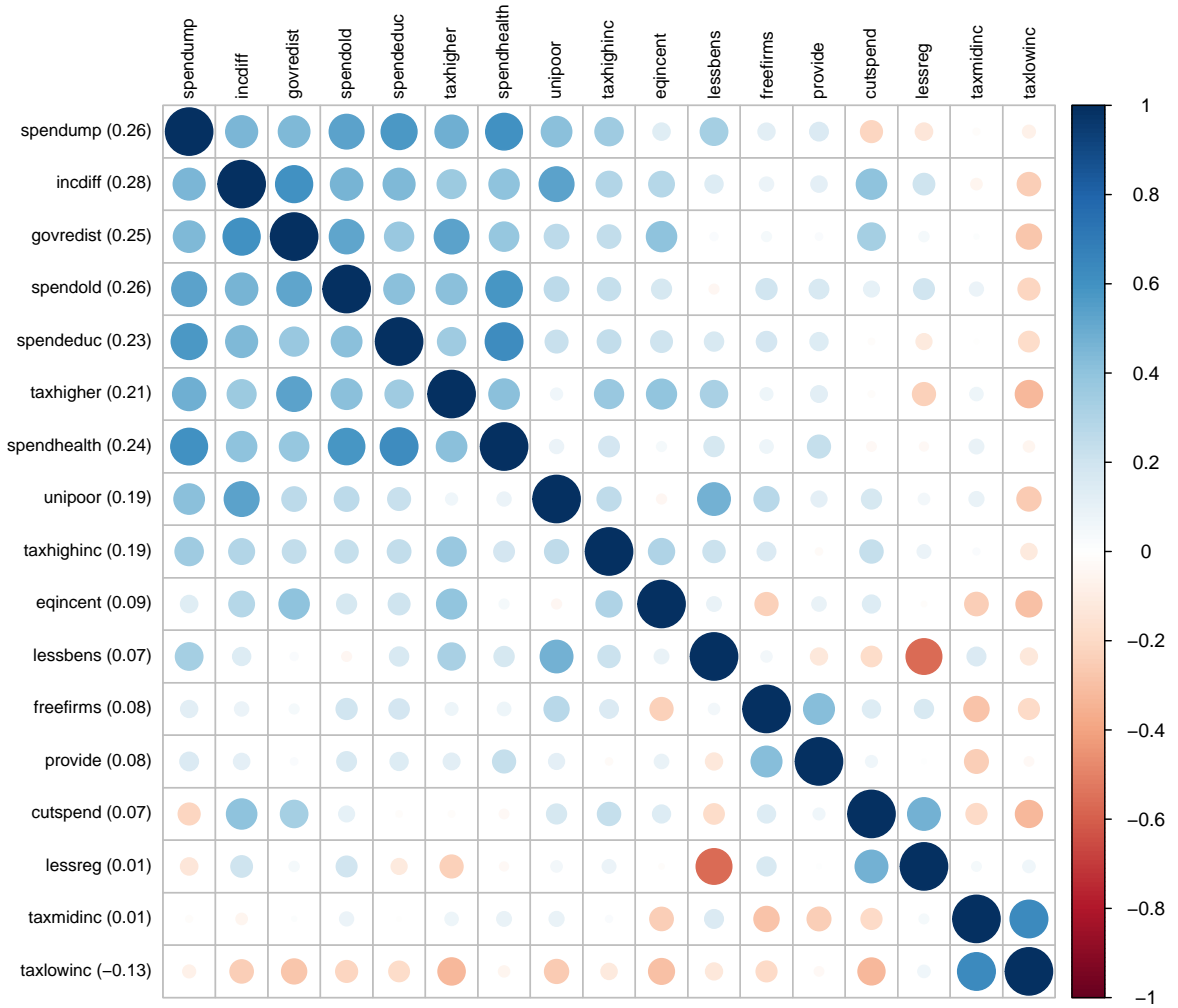
To assess the dimensional structure within each domain, we calculated the eigenvalues of the correlation matrix just described. The scree plots in Figure S6 plot each eigenvalue’s proportion of the total variance, alongside the eigenvalues of 20 randomly simulated datasets with the same sample size and missingness pattern. Each scree plot exhibits an “elbow” after the first dimension, which explains at least twice as much variance as the second dimension. This suggests that a single latent dimension summarizes the bulk of systematic variation within issue domains. A single dimension does not capture all domain-specific variation, however, as indicated by the fact that in every domain at least 3 eigenvalues are higher than the distribution of randomly simulated eigenvalues. Indeed, as the correlation plots—particularly Figures S3 and S4—suggest, each domain contains a few questions that, though substantively related to the domain’s content, display little covariation with other questions. Nevertheless, the scree plots do support our contention that unidimensionality within domains is a reasonable approximation.

Figure S3: Inter-Item Correlations for the Economic Conservatism Scale



**Note:** Numbers in parentheses on the *y*-axis indicate the variable's average correlation with other variables.

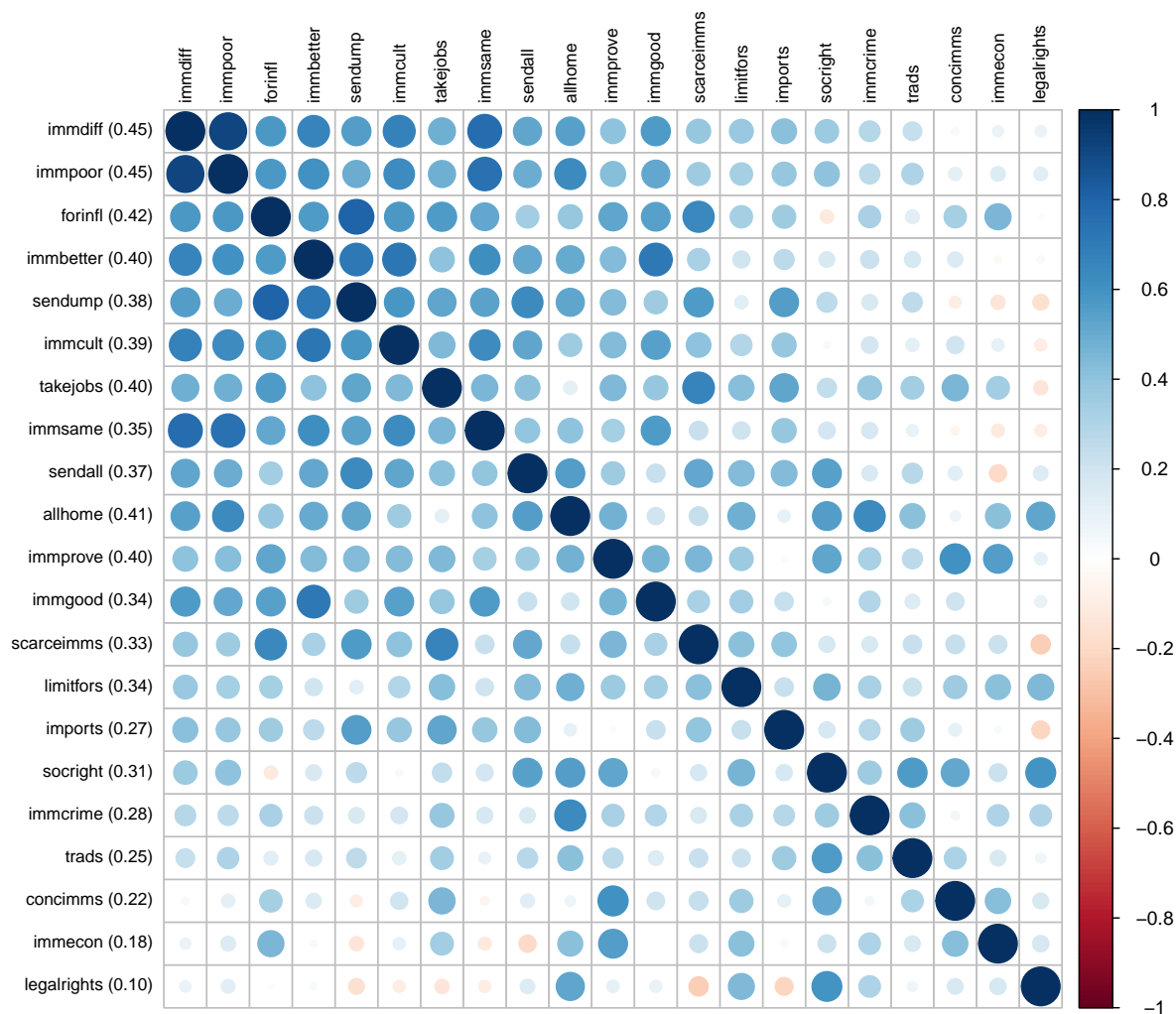
Figure S4: Inter-Item Correlations for the Economic Mood Scale



**Note:** Numbers in parentheses on the *y*-axis indicate the variable's average correlation with other variables.



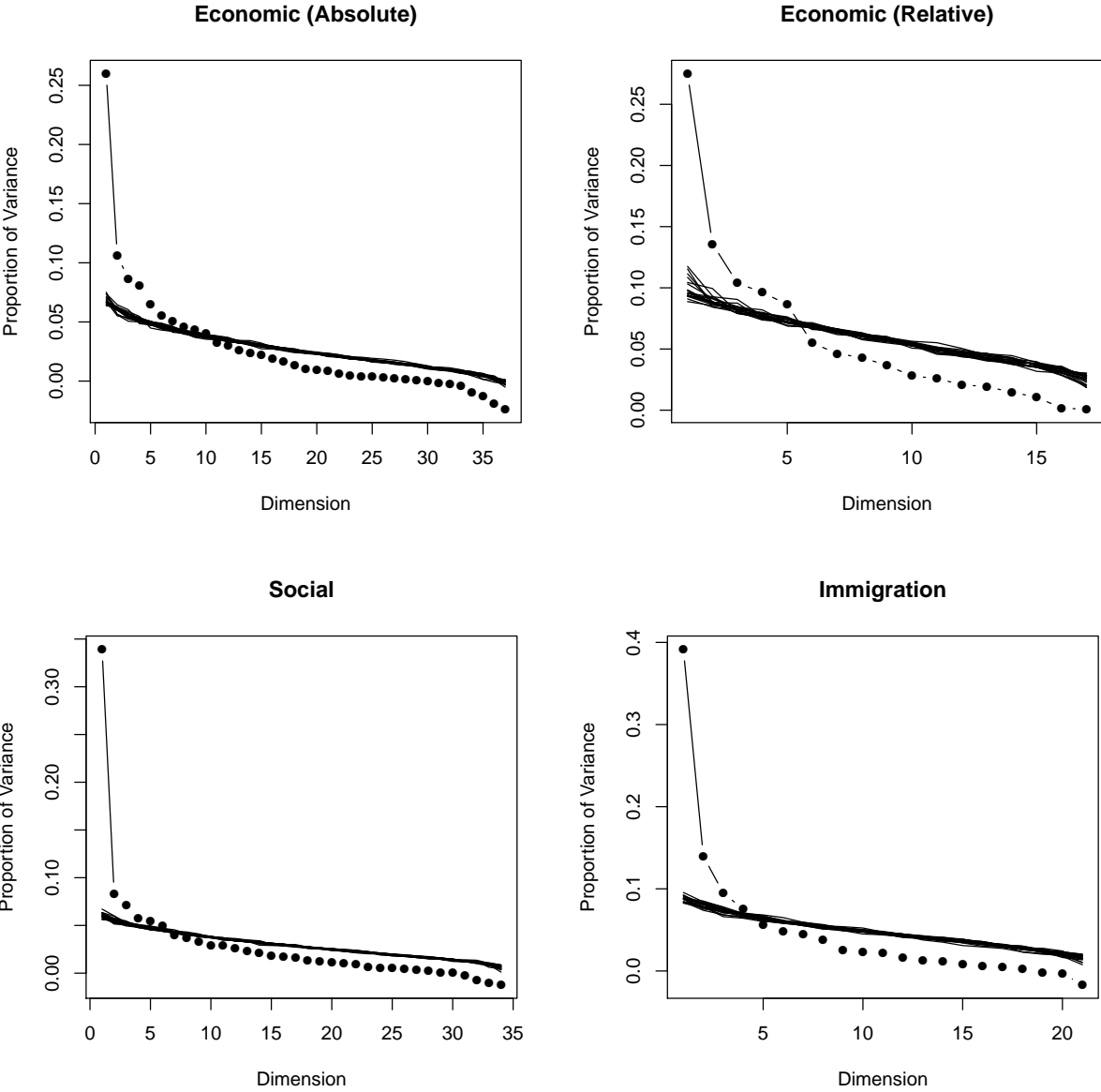
Figure S5: Inter-Item Correlations for the Immigration Issues Scale



**Note:** Numbers in parentheses on the *y*-axis indicate the variable's average correlation with other variables.



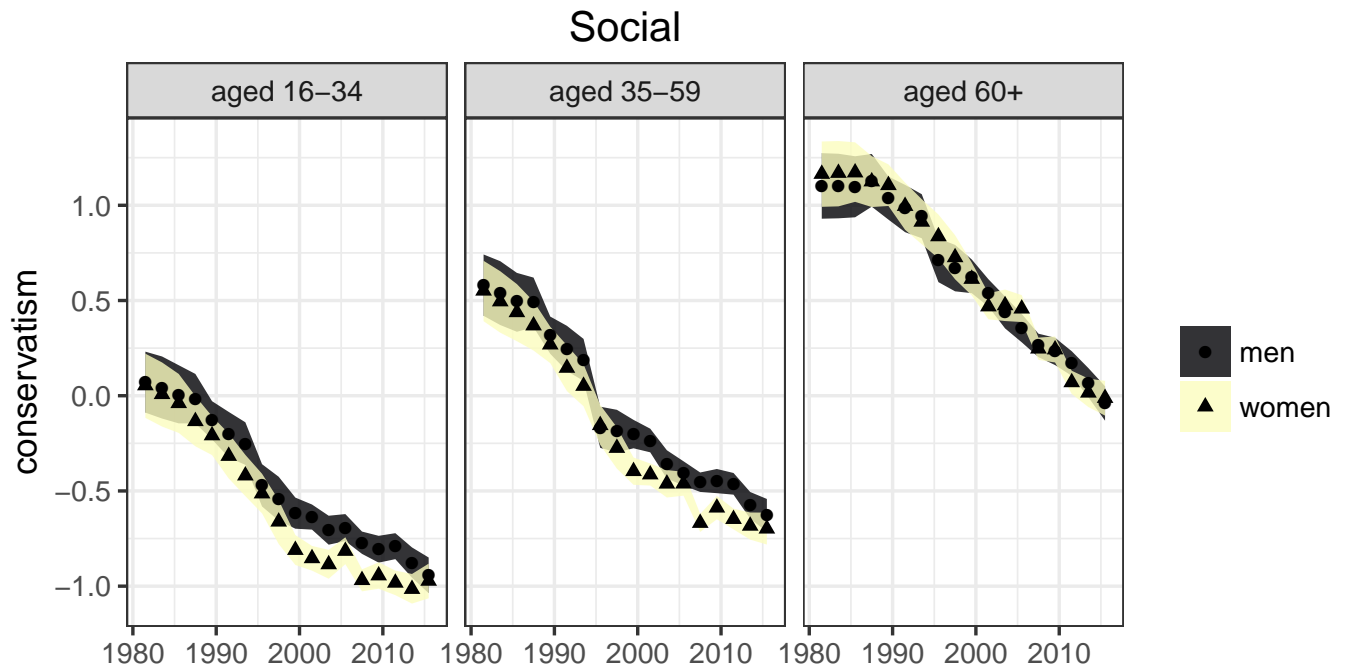
Figure S7: Scree plots for the four survey datasets. Black lines represent the eigenvalues of 20 randomly simulated datasets.



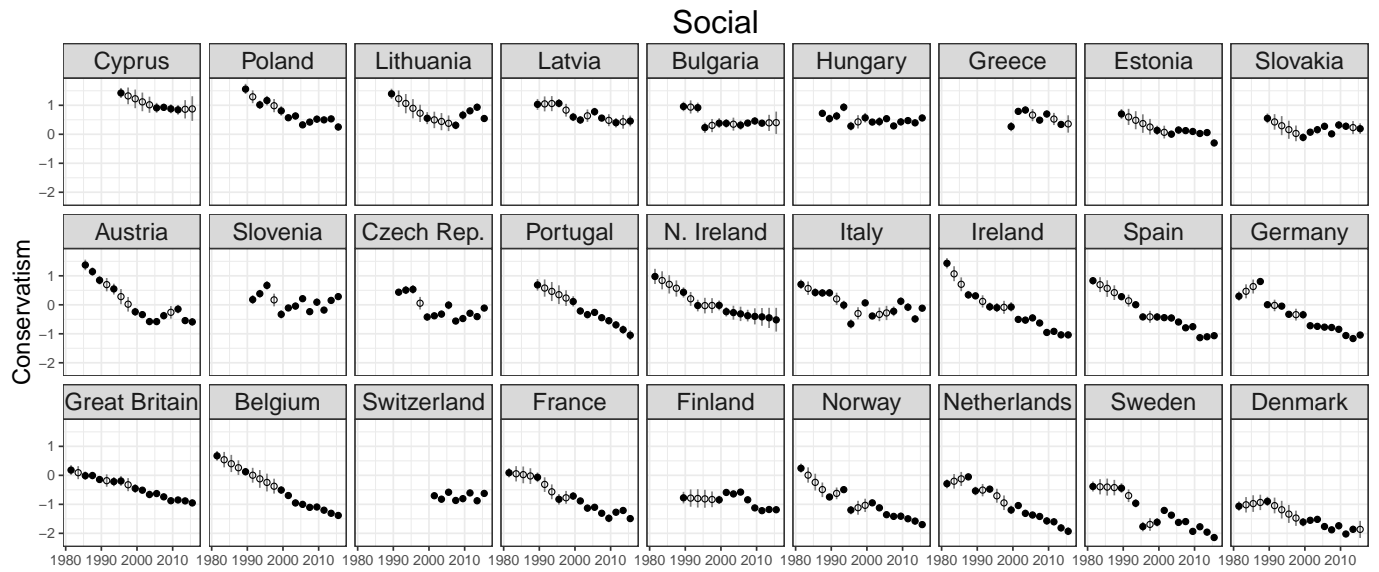
### 3. Results for the Social Domain Excluding Environmental Issues

Although environmental issues have often been seen as part of a second, ‘postmaterial’ dimension (Inglehart 1995), not all authors agree (e.g., Kriesi et al. (2006)). Thus some readers may wonder whether their inclusion drives our results. To check this, we re-estimated our models without environmental issues in the social scale and found that our results were virtually identical. The main results are shown below in Figures S8 and S9, which are the same as the social issues sections of Figures 1 and 3 in the paper except that environmental issues are removed. As in Figure 2, in Figure S9 the countries are ordered from most to least conservative on average. Section 2 above also shows that the environmental items are in fact positively correlated with the other social issues items.

Figure S8: Trends in Mass Conservatism by Gender, Age Group and Dimension (Excluding Environmental Issues from the Social/Postmaterial Scale)



**Figure S9: Social Conservatism Within Countries Over Time (Excluding Environmental Issues from the Social/Postmaterial Scale)**



## 4. Full Regression Results for the Welfare Generosity Model (Figure 9)

Here we show the full regression results that are reported in Figure 8 of the paper. The models explain welfare generosity using our economic conservatism measure as well as previous proxies for ideology (left-right placement and median voter positions). All models focus on variation within countries only: there are two-way fixed effects controlling for both country and biennium. Due to the small number of clusters, P values were calculated using the wild bootstrap method (Esarey 2016), clustering by country. The outcome variable is the net replacement rate. A score of 100% on this metric implies an extremely generous welfare system that replaces all lost income when unemployed, and a score of 0% a system that replaces none at all.

For each measure, we conducted two sets of analysis. The first consisted of two-way fixed-effects regression for each of the three measures in turn, containing all possible observations. The sample sizes and coverage differ across these regressions, mainly because median-voter scores are often missing and are only available up to 2004, forcing us to drop almost 70% of country-biennia for that measure.<sup>1</sup> The second analysis also consisted of three regressions, this time with a dataset consisting only of complete observations, so that the samples were identical in each case.

As explained in the paper, the results show that only our measure of economic conservatism is negatively related to welfare generosity, as theories of policy responsiveness would predict. In the model with all available data, a one-unit rise in economic conservatism (which equals 1.2 standard deviations) is estimated to lead to a fall of 3 percentage points in the net replacement rate. Paradoxically, the coefficients for left-right placement imply that as countries become more conservative, welfare generosity rises.

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1. The median voter positions come from an update to the original Kim-Fording dataset produced by De Neve (2011). They are available only in country-biennia when elections were held, and even in this updated data set, they are also only available up to 2004.

**Table S1: Regression Models Explaining Proxies for European Countries' Ideological Positions with our Domain-Specific Measures**

	<i>Sample:</i>											
	All Available Data				Balanced Dataset							
	(1)		(2)		(3)		(4)		(5)		(6)	
	Coef.	P-Value	Coef.	P-Value	Coef.	P-Value	Coef.	P-Value	Coef.	P-Value	Coef.	P-Value
Left-Right Placement	11.93	0.13					19.61	0.077				
Median Voter Position			0.0033	0.94					-0.055	0.47		
Economic Mood			-3.03	0.037							-2.71	0.027
Observations	207		103		245		66		66		66	

*Notes:* All models include country and period fixed effects  
P values calculated using the Wild bootstrap method, clustered by country

## 5. Full Regression Results for the Relationships between Our Models and other Proxies for Ideology

On the next page, we show the full regression results that are reported on page 37-38 of the main paper, describing the relationships between other proxies for ideology and our measures of domain-specific conservatism. Models 1-5 use left-right self-placement as the dependent variable and models 6-10 use the median voter position. In all models the unit of analysis is the country-biennium, and standard errors are clustered by country. Models 1-4 and 5-8 contain only one of the measures as an independent variable; models 5 and 10 contain all four and are referred to as ‘multivariate’ in the paper.

As described in the paper, our domain-specific conservatism measures correlate at best modestly with the previous proxy measures. The left-right scale runs from 0-10, meaning that, for example, a 1-unit rise in economic conservatism (which equals 1.25 standard deviations) is associated with at most an increase of 0.126 (0.34 of a standard deviation) along the 11-point left-right self-placement scale. Likewise, a 1-unit rise in immigration conservatism (x standard deviations) is associated with at most an increase of 5.524 (0.45 of a standard deviation) in the median voter position, whose scale runs from -33.4 to 34.6. As shown by the  $R^2$  statistics, in the multivariate models our measures of ideology explain less than one-fifth of the variation in the proxy measures.

**Table S2: Regression Models Explaining Proxies for European Countries' Ideological Positions with our Domain-Specific Measures**

	<i>Dependent variable:</i>									
	Left-Right Placement					Median Voter Position				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Economic Conservatism	0.085 (0.071)				0.126* (0.065)	2.812* (1.447)				1.827 (1.536)
Economic Mood		-0.011 (0.050)			0.016 (0.063)		-0.299 (1.567)			3.111 (1.955)
Social Issues			0.146** (0.067)		0.195** (0.082)			3.313** (1.666)		0.744 (3.049)
Immigration Issues				0.078 (0.048)	-0.005 (0.063)				3.742*** (1.309)	5.524*** (1.772)
Constant	5.322*** (0.061)	5.323*** (0.061)	5.371*** (0.064)	5.325*** (0.060)	5.377*** (0.058)	0.065 (1.378)	0.698 (1.517)	-0.144 (1.259)	0.915 (1.445)	-0.122 (1.406)
Observations	304	304	304	280	280	139	122	139	102	102
R <sup>2</sup>	0.033	0.001	0.083	0.030	0.173	0.033	0.0004	0.036	0.068	0.132

*Note:* \* p<0.1; \*\* p<0.05; \*\*\* p<0.01. Standard errors are clustered by country.

## 6. User Guide for Extending Our Estimates of Policy Ideology in Europe

This guide helps users to access and interpret our measures. We also offer guidance on how to modify or extend the measures, including estimating ideology for different numbers (or types) of dimensions and potential extensions to other demographic subgroups, countries and future surveys.

### 6.1. Accessing our Measures of Ideology by Country and Period

The scales by country and two-year period are available for download from [website] in csv format. They are available as both post-stratified national totals (as shown in, for example, Figure 2 of the paper) and for the individual demographic subgroups (six gender-age groups per country-period, as shown in Figure 1 of the paper).

### 6.2. Interpretation of the Scales

Here we offer a few notes on how to interpret our scales for use in substantive applications

#### 6.2.1. The role of the original survey data

It is worth emphasizing that, as with any scaling method, our eventual measures are mainly determined by the underlying data. Tables 1-3 in the main paper, as well as Section 5.1 (Convergent Validation) show that the raw survey data exhibit the same temporal and cross-country patterns as our scales. For instance, our finding that Northern European countries – including Scandinavian countries – are more economically conservative than Southern European countries is a clear feature of the original survey data and is not ‘imposed by the model.’ Of course, our choice of grouping the data into three dimensions affected the results that we found. But once the questions were grouped, our scales accurately reflected the data that comprises each one.

Hence our findings, or those of anyone choosing to modify or extend our analysis, can only ever be as ‘good’ or as ‘accurate’ as the survey data itself. There are a number of potential limitations that could affect the cross-country or over-time comparability of all cross-national survey data or measures derived from it, including our scales and previous measures of European ideology such as those derived from the Eurobarometer’s question asking respondents to place themselves on a left-right scale. These limitations include: differences in sampling procedures or survey response patterns that lead to measured cross-country or over-time differences in opinion in the absence of genuine differences; differential item functioning, such that different people in different countries or periods interpret the same questions differently;<sup>2</sup> or differential influence from the ‘status quo’ across countries (see 2.3 below).

#### 6.2.2. Interpreting Economic Mood vs. Conservatism

As discussed in the main paper, it is important to be cautious when interpreting cross-country differences in our economic mood measure. Whilst our economic conservatism measure should be comparable in an absolute sense, the mood measure is only interpretable relative to the status quo within a country. Because relative preferences depend on the policy status quo, two individuals from countries with different policies may well differ in their relative preferences even if they share the same absolute preferences. This means that, for instance, the fact that Swedes are amongst the most conservative in Europe in terms of mood does not necessarily mean that the average Swede would opt for less redistribution or government spending in an

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2. Although, as explained in the paper, we think that the questions making up our surveys are likely to be much less subject to differential item functioning than questions asking for self-described left-right positions



absolute sense than citizens of other countries. It merely means that the average Swede currently wants cuts to Swedish government spending more than citizens of other countries want cuts in their own governments' spending. This is very likely, of course, to reflect the fact that Swedish government spending is relatively very high. For substantive applications, therefore, it would make sense to focus on within-country variation in mood, perhaps using two-way fixed effects as we do in Figure 9 of the paper.

### 6.3. Modifying or Extending our Measures: Considerations

Because our estimates were produced with publicly-available software, it is logistically quite easy for future users to modify or extend our measures for their own applications. However, the availability of data – both survey data and demographic data for post-stratification – does impose certain constraints. Our replication archive will contain more specific guidance about how to implement our measurement model and places in the code where specific analytical decisions we made can be altered. Here, we offer some more general guidance on modifications or extensions of our work, particularly the role played by data availability.

#### 6.3.1. Producing estimates for different ideological domains, or modifying our existing domains

As we explain in the paper, our choice of a three-dimensional structure is based on an ex-ante classification that is consistent with the literature on European politics, rather than data-driven criteria for selecting the 'correct' number of latent dimensions. While our analysis of inter-item correlations in the Supplementary Information provides an additional statistical justification for our choices, we certainly do not view our paper as the final word on the dimensionality of European politics. Other analysts may wish to make different choices, and here we explain the issues that arise in doing so.

Logistically, it is very easy to add or delete variables from our existing scales. Our code takes all of the individual cross-national surveys and amalgamates them into a single large dataset. From there, this single dataset is broken down into dimension-specific datasets (e.g. economic issues). One need only change 2-3 lines of our code in order to reassign a variable from one dimension to another, or exclude a variable altogether. Adding in a new variable from one of the surveys requires only a little more work: the additional step of extracting it from the original datasets and potentially re-coding it such that higher values indicate more conservative opinions.

In principle one could easily estimate ideology across fewer dimensions than we do. The single large dataset that we create could be used to produce a uni-dimensional measure of ideology, although we think that our results show that such an enterprise would be inappropriate given the very different cross-national and over-time patterns across dimensions. A more reasonable enterprise might be to combine the immigration and social domains into a single second dimension, given that the cross-country patterns are similar across both domains (even though over-time patterns are very different). Again, this can be achieved with a single line of our code.

It is more difficult, but by no means impossible, to produce estimates for a wider set of dimensions. The constraint that arises is the potential sparse availability of data. In our scales, survey data are available for virtually every two-year period across a reasonably large set of countries. One reason for this is that the scales amalgamate a relatively diverse set of questions. For instance, the 'social issues' scale includes questions on gender equality, gay rights, abortion, euthanasia, marijuana legalization, environmental issues and civil liberties. This is in line with standard definitions of the 'socio-cultural axis' (see e.g. Inglehart 1995). It could be more challenging to estimate a scale for a single issue like abortion or gay rights simply because questions on those issues have been asked less often. We emphasize that such an enterprise is by no means impossible. We merely mean that the results would be based on less data and more imputation than is the case with our scales.

Indeed, one more general issue with an enterprise of this type is that there is a lag between a set of issues becoming politically salient and their inclusion in cross-national opinion surveys over time and countries. The fact that we are only able to estimate our immigration scale from 1989 is telling in its own right. It simply wasn't asked about in cross-national surveys before then. A contemporary example would be authoritarian values. Questions on authoritarianism have not been asked with much frequency in the past, making it impossible to estimate an 'authoritarian' scale with our method at present. Assuming that such questions do begin to be asked more often from now on, it might soon be possible to do so.

### **6.3.2. Producing estimates with different demographic subgroups**

With our approach, in principle there are two reasons to estimate ideology at the sub-group level. One is that an appropriate choice of subgroups can help to more accurately estimate aggregate opinion. When the groups themselves hold different opinions (e.g., opinions on social issues clearly differ by age group), estimating ideological positions for each subgroup first and then combining them with post-stratification should yield better estimates of national ideology. The second reason could be that, rather than being interested in aggregate ideology, the ideological positions of sub-groups are of interest directly. For instance, one might wish to investigate gender differences in ideology. In such a case, there is no need to carry out the post-stratification step.

The distinction between these two cases matters because the latter case requires less data. Extending our measures to other sub-groups would only require choosing groups that are measured consistently across all of the surveys in our data, or at least across a sufficiently large subset of them. Besides age and gender (which we use) education would be an obvious candidate for further sub-group analysis. Virtually every survey measures whether or not respondents have a degree, or have completed secondary education. Other possibilities include employees of the public and private sectors, trade union and non-union members, or urban and rural dwellers. These demographic variables are recorded in many of the surveys.

When using further demographic subgroups as a building block in estimating overall national ideology, one must also post-stratify the subgroup estimates, which imposes constraints on feasibility. It requires demographic data on the proportion of the population of each country in each cell defined by the subgroups. In our case, we needed data on the population shares of women aged 16-34, men aged 16-34, women aged 35-59, men aged 35-59, women aged 60+ and men aged 60+. This data is readily available from censuses and population surveys and is collated across Europe back to the 1960s by Eurostat. However, consistent data on the population shares of men and women of different ages with certain educational qualifications is *not* readily available, which would make it challenging to use education as a grouping variable. That is why we did not use education in our analysis, because our ultimate interest was in national ideologies rather than those of sub-groups.

A final consideration when it comes to estimation for further subgroups is computing time. In our experience, increasing the number of subgroups being estimated leads to substantial increases in computing time. While we managed to estimate our models with six subgroups within a reasonable timeframe, even adding one more grouping variable such as whether respondents have a degree would double the number of subgroups from six to twelve. This is likely to lead the models to require substantially more computational time.

## 7. Details of Surveys and Survey Items Included in the Models

*Key to datasets:* ISSP = International Survey Program; ROG = “Role of Government” survey modules; INEQ = “Social Inequality” survey modules; ENV = “Environment” survey modules; NI = “National Identity” survey modules; F+G = “Family and Gender” survey modules; ESS = European Social Survey; EVS = European Values Survey; EB IMM = Eurobarometer special surveys on immigration; EB VAL = Eurobarometer special surveys on social values; EB POV = Eurobarometer special surveys on poverty and social exclusion; PEW = Pew Global Attitudes Survey

**Note on Replication:** Due to data license requirements, we cannot share the raw data for replication. However, our code deposited with Dataverse allows anyone to reproduce our results once they have signed a data user agreement and downloaded the original data files. Therefore a full replication would first require downloading the exact datasets (including version number) shown in Table S3 below. Datasets with a GESIS code are available for download from the GESIS service at <https://www.gesis.org/>. The European Social Survey and the Pew Global Attitudes Surveys are available at <https://www.europeansocialsurvey.org/> and <http://www.pewglobal.org/>.

**Table S3: Datasets Used**

Dataset	Year	GESIS Code	Version	DOI
ISSP ROG	1985	ZA1490	1.0.0	10.4232/1.1490
ISSP ROG	1990	ZA1950	1.0.0	10.4232/1.1950
ISSP ROG	1996	ZA2900	1.0.0	10.4232/1.2900
ISSP ROG	2006	ZA4700	1.0.0	10.4232/1.4700
ISSP ROG	2016	ZA6900	1.0.0	10.4232/1.12994
ISSP INEQ	1987	ZA1680	1.0.0	10.4232/1.1680
ISSP INEQ	1992	ZA2310	1.0.0	10.4232/1.2310
ISSP INEQ	1999	ZA3430	1.0.0	10.4232/1.3430
ISSP INEQ	2009	ZA5400	3.0.0	10.4232/1.11506
ISSP ENV	1993	ZA2450	1.0.0	10.4232/1.2450
ISSP ENV	2000	ZA3440	1.0.0	10.4232/1.3440
ISSP ENV	2010	ZA5500	2.0.0	10.4232/1.11418
ISSP NI	1995	ZA2880	1.0.0	10.4232/1.2880
ISSP NI	2003	ZA3910	2.0.0	10.4232/1.10077
ISSP NI	2013	ZA5950	2.0.0	10.4232/1.12312
ISSP F+G	1988	ZA1700	1.0.0	10.4232/1.1700
ISSP F+G	1994	ZA2620	1.0.0	10.4232/1.2620
ISSP F+G	2002	ZA3880	1.1.0	10.4232/1.11564

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Table 1 – Continued from previous page

Dataset	Year	GESIS Code	Version	DOI
ISSP F+G	2012	ZA5900	2.0.0	10.4232/1.12022
EVS	Combined	ZA4804	2.0.0	10.4232/1.11005
EB POV (72.1)	2009	ZA4975	3.0.0	10.4232/1.11136
EB POV (74.1)	2010	ZA5237	4.2.0	10.4232/1.11625
EB VAL (66.1)	2006	ZA4526	1.0.1	10.4232/1.10980
EB VAL (69.2)	2008	ZA4744	5.0.0	10.4232/1.11755
EB VAL (71.3)	2009	ZA4973	3.0.0	10.4232/1.11135
EB IMM (47.1)	1997	ZA2936	1.0.1	10.4232/1.10926
EB IMM (53.0)	2000	ZA3296	1.0.1	10.4232/1.10935
EB IMM (59.2)	2003	ZA3905	1.0.1	10.4232/1.10956
ESS	2002		6.3	
ESS	2004		3.3	
ESS	2006		3.4	
ESS	2008		4.2	
ESS	2010		3.1	
ESS	2012		2.3	
ESS	2014		2.1	
ESS	2016		2.0	
PEW	2002 (Summer)			
PEW	2007 (Spring)			
PEW	2009 (Spring)			
PEW	2009 (Fall)			
PEW	2010 (Spring)			
PEW	2011 (Spring)			
PEW	2012 (Spring)			
PEW	2013 (Spring)			
PEW	2014 (Spring)			

Table S4: Variables included in the Economic Conservatism Scale

Variable Name	Survey	Years Covered	Question Wording	Response Options
govredist1	ISSP ROG, ISSP INEQ., ISSP ENV	1985, 1990, 1992, 1993, 1996, 1999, 2000, 2009, 2010	What is your opinion of the following statement: "it is the responsibility of the government to reduce differences in income between those with high incomes and those with low incomes"	5-point 1 = agree strongly, 5 = disagree strongly
wagecont	ISSP ROG	1985, 1990, 1996	"Here are some things the government might do for the economy. Please show which actions you are in favor of and which you are against" ... control of wages by law	5-point 1 = strongly favor, 5 = strongly against
pricecont	ISSP ROG	1985, 1990, 1996	[as above] ... control of prices by law	5-point 1 = strongly favor, 5 = strongly against
govjobs	ISSP ROG	1985, 1990, 1996, 2006	[as above] ... financing of projects to create new jobs	5-point 1 = strongly favor, 5 = strongly against
govindust	ISSP ROG	1985, 1990, 1996, 2006	[as above] ... support for industry to develop new products and technology	5-point 1 = strongly favor, 5 = strongly against
govdecline	ISSP ROG	1985, 1990, 1996, 2006, 2016	[as above] ... support for declining industries to protect jobs	5-point 1 = strongly favor, 5 = strongly against
govweek	ISSP ROG	1985, 1990, 1996, 2006, 2016	[as above] ... reducing the working week to create more jobs	5-point 1 = strongly favor, 5 = strongly against
unempinfl	ISSP ROG	1985, 1990, 1996	If the government had to choose between keeping down inflation or keeping down unemployment, to which do you think it should give the highest priority?	2-point 1 = strongly favor, 5 = strongly against
ownelect	ISSP ROG	1985, 1990, 1996	What do you think should be the government's role in each of these industries and services should be? ... Electricity	1 = Own it 2 = control prices and profits, don't own 3 = neither
ownbanks	ISSP ROG	1985, 1990, 1996	[as above] ... Banking and Insurance	As above
respjob	ISSP ROG	1985, 1990, 1996, 2006, 2016	On the whole, do you think it should or should not be the responsibility of the government to ... provide a job for everyone who wants one	4-point 1 = definitely should be 4 = definitely should not be
resphealth	ISSP ROG	1985, 1990, 1996,	[as above] ... provide healthcare for the sick	As above

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Table 2 – Continued from previous page

Variable Name	Survey	Years Covered	Question Wording	Response Options
respold	ISSP ROG	2006, 2016 1985, 1990, 1996,	[as above] ... provide a decent standard of living for the old	As above
respind	ISSP ROG	2006, 2016 1985, 1990, 1996,	[as above] ... provide industry with the help it needs to grow	As above
respump	ISSP ROG	2006, 2016 1985, 1990, 1996,	[as above] ... provide a decent standard of living for the unemployed	As above
govredist2	ISSP ROG	2006, 2016 1985, 1990, 1996,	[as above] ... reduce income differences between the rich and poor	As above
respstud	ISSP ROG	2006, 2016 1990, 1996,	[as above] ... give financial help to university students from low-income families	As above
resphouse	ISSP ROG	2006, 2016 1990, 1996,	[as above] ... provide decent housing for those who can't afford it	As above
equalopp	ESS	2002, 04, 06, 08, 10, 12, 14, 16	"It is important that every person in the world should be treated equally, and everyone should have equal opportunities in life."	6-point top 3 responses indicate disagreement
unempjob	EVS	1990, 1999-00, 2008-10	[as above] 1 = people who are unemployed should have the right to refuse a job they do not want ... 10 = people who are unemployed should have to take any job available or lose their unemployment benefits	10-point
secfair	EVS	1981-2, 1990 1999-00	"Imagine two secretaries, of the same age, doing practically the same job. In your opinion is it fair or not fair that one secretary is paid more than, the other if she is quicker, more efficient and more reliable at her job?"	2-point 1 = unfair, 2 = fair
freedom	EVS	1981-2, 1990	What is more important, freedom or equality?	3-point
concupm	EVS	1999-00, 2008-10 1990, 1999-00,	To what extent do you feel concerned about the living conditions of the unemployed?	1 = equality, 3 = freedom 5-point
diffnec	ISSP INEQ	2008-10 1987, 1992,	In order to get people to work hard, do you think large differences in pay are necessary?	1 = very much, 5 = not at all 4-point
incprosp	ISSP INEQ	2009 1987, 1992,	Do you agree or disagree with these	1 = definitely not, 4 = absolutely 5-point

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Table 2 – *Continued from previous page*

Variable Name	Survey	Years Covered	Question Wording	Response Options
unipoor	ISSP INEQ	1987, 1992	statements . . . “large differences in income are necessary for a country’s prosperity” Please show how much you agree or disagree with these statements . . . “the government should provide more chances for children from poor families to go to university” [as above] . . . “the government should provide a job for everyone who wants one” [as above] . . . “the government should provide a decent standard of living for the unemployed” [as above] . . . “the government should provide everyone with a guaranteed basic income” Do you think that people with high incomes should pay a larger share of their income in taxes than those with low incomes, the same share or a smaller share?	1 = strongly disagree, 5 = strongly agree 5-point 1 = strongly agree, 5 = strongly disagree
respjob1	ISSP INEQ	1987, 1992	[as above] . . . “the government should provide a job for everyone who wants one”	5-point
respump1	ISSP INEQ	1987, 1992	[as above] . . . “the government should provide a decent standard of living for the unemployed”	1 = strongly agree, 5 = strongly disagree 5-point
basicinc	ISSP INEQ	1987, 1992	[as above] . . . “the government should provide everyone with a guaranteed basic income”	1 = strongly agree, 5 = strongly disagree 5-point
taxrich1	ISSP INEQ	1987, 1992, 1999, 2009	Do you think that people with high incomes should pay a larger share of their income in taxes than those with low incomes, the same share or a smaller share?	1 = much larger share 5 = much smaller share
privent	ISSP ENV	1993, 2000, 2010	How much do you agree or disagree with the following statements . . . “private enterprise is the best way to solve my country’s problems”	5-point
freecomp	EB VAL	2006, 2008, 2009	For each of the following propositions, tell me if you agree or disagree . . . “Free competition is the best guarantee for economic prosperity “	1 = strongly disagree, 5 = strongly agree 4-point
eqjust	EB VAL	2006, 2008, 2009	[as above] . . . “We need more equality and justice even if this means less freedom for the individual”	1 = totally disagree, 4 = totally agree 4-point
govredist3	EB POV	2009, 2010	For each of the following propositions, tell me if you agree or disagree . . . “the government should ensure that the wealth of the country is redistributed in a fair way to all citizens”	1 = totally disagree, 4 = totally agree 4-point
nofight	EB POV	2002, 2010	[as above] “There is no point in trying to fight poverty, it will always exist”	4-point
diffinec1	EB POV	2009, 2010	[as above] “Income inequalities are necessary for economic development ” some are poor	1 = totally disagree, 4 = totally agree

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Table 2 – Continued from previous page

Variable Name	Survey	Years Covered	Question Wording	Response Options
freemkt	PEW	2002, 07, 08, 09	Most people are better off in a free market economy, even though some people are rich and some are poor	4-point 1 = completely disagree, 4 = completely agree
interfere	PEW	2002, 09, 11, 12	what's more important in (survey country) society – that everyone be free to pursue their life's goals life's goals without interference from the state, or that the state play an active role in society so as to guarantee that nobody is in need?	4-point 1 = option 2, 2 = option 1

Table S5: Variables included in the Economic Mood Scale

Variable Name	Survey	Years Covered	Question Wording	Response Options
cutspend	ISSP ROG	1985, 1990, 1996, 2006, 2016	In favour or oppose cuts in government spending	5-point 1 = strongly against, 5 = strongly in favor
lessreg	ISSP ROG	1985, 1990, 1996, 2006, 2016	In favour or oppose less government regulations of business	5-point 1 = strongly against, 5 = strongly in favor
spendhealth	ISSP ROG	1985, 1990, 1996, 2006, 2016	Listed below are various areas of government spending. Please show whether you would like to see more or less government spending in each area. Remember that if you say “much more”, it might require a tax increase to pay for it ... “Health”	5-point 1 = spend much more, 5 = spend much less

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Table 3 – Continued from previous page

Variable Name	Survey	Years Covered	Question Wording	Response Options
spendeduc	ISSP ROG	1985, 1990, 1996, 2006, 2016	[as above] “Education”	5-point 1 = spend much more, 5 = spend much less
spendold	ISSP ROG	1985, 1990, 1996, 2006, 2016	[as above] “Old Age Pensions”	5-point 1 = spend much more, 5 = spend much less
spendump	ISSP ROG	1985, 1990, 1996, 2006, 2016	[as above] “Unemployment Benefits”	5-point 1 = spend much more, 5 = spend much less
taxhighinc	ISSP ROG, INEQ	1987, 1992, 1996, 2006, 2016	Taxes for those with high incomes are too high or too low	5-point 1 = much too low, 5 = much too high
taxmidinc	ISSP ROG, INEQ	1987, 1992, 1996, 2006, 2016	Taxes for those with middle incomes are too high or too low	5-point 1 = much too low, 5 = much too high
taxlowinc	ISSP ROG, INEQ	1987, 1992, 1996, 2006, 2016	Taxes for those with low incomes are too high or too low	5-point 1 = much too low, 5 = much too high
incdiff	ISSP INEQ	1987, 1992, 1999, 2009	Differences in income in my country are too large	5-point 1 = Strongly Agree, 5 = Strongly Disagree
incdiff	ISSP INEQ	1987, 1992, 2009	The government should spend less on benefits for the poor	5-point 1 = Strongly Disagree, 5 = Strongly Agree
unipoor	ISSP INEQ	1987, 1992	The government should provide more chances for children from poor families to go to university	5-point 1 = strongly agree, 5 = strongly disagree
govredist	ESS	2002, 04, 06, 08, 10, 12, 14, 16, 16	The government should take measures to reduce differences in income levels	5-point 1 = agree strongly, 5 = disagree strongly
taxhigher	EB POV	2009, 2010	People who are well-off should pay higher taxes so the government has more means to fight poverty”	4-point 1 = totally agree, 4 = totally disagree
eqincnt	EVS	1990, 1999-00, 2008-10	“How would you place your views” on this scale? 1 = incomes should be made more equal, 10 = we need larger income differences as incentives	10-point

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Table 3 – Continued from previous page

Variable Name	Survey	Years Covered	Question Wording	Response Options
freefirms	EVS	1999-00, 2008-10	[as above] 1 = the state should control firms more effectively ...10 = the state should give more freedom to firms to provide for themselves	10-point
provide	EVS	1990, 1999-00, 2008-10	[as above] 1 = the government should take more responsibility to ensure that everyone is provided for, 10= people should take more responsibility for providing for themselves	10-point

Table S6: Variables included in the Social and Postmaterial Issues Model

Variable Name	Survey	Years Covered	Question Wording	Response Options
meetings	ISSP ROG	1990, 1996, 2006, 2016	There are many ways people or organisations can protest against a government action they strongly oppose. Please show which you think should be allowed and which should not be allowed: “Organizing public meetings to protest against the government”	4-point 1 = definitely, 4 = definitely not
protests	ISSP ROG	1990, 1996, 2006, 2016	[as above] “Organising protest marches and demonstrations”	4-point 1 = definitely, 4 = definitely not
kidjob	ISSP F+G,	1988, 1994, 2002, 2012,	To what extent do you agree or disagree...? “A pre-school child is likely to suffer if his or her mother works”	5-point 1 = strongly disagree, 5 = strongly agree
workmoth	ISSP F+G	1988, 1994, 2002, 2012	[as above] “A working mother can establish just as warm and secure a	5-point 1 = strongly agree, 5 = strongly disagree

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Table 4 – Continued from previous page

Variable Name	Survey	Years Covered	Question Wording	Response Options
famjob	ISSP F+G	1988, 1994, 2002, 2012	relationship with her children as a mother who does not work” [as above] “All in all, family life suffers when the woman has a full-time job”	5-point 1 = strongly disagree, 5 = strongly agree
housewife	ISSP F+G	1988, 1994, 2002, 2012	[as above] “Being a housewife is just as fulfilling as working for pay”	5-point 1 = strongly disagree, 5 = strongly agree
husbwife	ISSP F+G	1988, 1994, 2002, 2012	[as above] “A man’s job is to earn money a woman’s job is to look after the home and family”	5-point 1 = strongly disagree, 5 = strongly agree
singparent	ISSP F+G	1988, 1994, 2002, 2012	[as above] “One parent can bring up a child as well as two parents together”	5-point 1 = strongly agree, 5 = strongly disagree
workkid	ISSP F+G	1988, 1994, 2002, 2012	Do you think that women should work work outside the home full-time, part-time or not at all under the following circumstances? “When there is a child under school age”	3-point 1 = work full-time, 3 = stay at home
workschool	ISSP F+G	1988, 1994, 2002, 2012	[as above] “After the youngest child starts school”	3-point 1 = work full-time, 3 = stay at home
envfuture	ISSP ENV	1993, 1990, 2010	How much do you agree or disagree with each of these statements... “we worry too much about the future of the environment and not enough about prices and jobs today”	5-point 1 = strongly disagree, 5 = strongly agree
envprog	ISSP ENV	1993, 1990, 2010	[as above] “People worry too much about human progress harming the environment”	5-point 1 = strongly disagree, 5 = strongly agree
envhtax	ISSP ENV	1993, 1990, 2010	How willing would you be to pay much higher taxes in order to protect the environment?	5-point 1 = very willing, 5 = very unwilling
envstd	ISSP ENV	1993, 1990, 2010	How willing would you be to accept cuts in your standard of living in order to protect the environment?	5-point 1 = very willing, 5 = very unwilling

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Table 4 – *Continued from previous page*

Variable Name	Survey	Years Covered	Question Wording	Response Options
envlaws	ISSP ENV	1993, 1990, 2010	If you had to choose, which of the following would be closest to your views? “government should let ordinary people decide for themselves how to protect the environment, even if it means they don’t always do the right thing”, or “government should pass laws to make ordinary people protect the environment , even if it interferes with people’s rights to make their own decisions”	2-point 1 = second statement, 2 = first statement
envblaws	ISSP ENV	1993, 1990, 2010	[As above - substitute “businesses” for “ordinary people”]	2-point 1 = second statement, 2 = first statement
kidjob1	EV5	1990, 1999-00, 2008-10	To what extent do you agree or disagree...? “A pre-school child is likely to suffer if his or her mother works”	4-point 1 = strongly disagree, 4 = strongly agree
envtax1	EV5	1990, 1999-00, 2008-10	I am now going to read out some statements about the environment. For each one read out, can you tell me whether you agree strongly, agree, disagree or strongly disagree? “I would agree to an increase in taxes if the extra money is used to prevent environmental pollution”	3-point 1 = strongly agree, 4 = strongly disagree
authority	EV5	1981-2, 1990 1999-00, 2008-10	Here is a list of various changes in our way of life that might take place in the near future. Please tell me for each one, if it were to happen whether you think it would be a good thing, a bad thing, or don’t you mind?	3-point 1 = good thing, 3 = bad thing
jobscarce	EV5	1990, 1999-00, 2008-10	Do you disagree or agree with the following statements: “When jobs are	3-point 1 = disagree, 3 = agree

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Table 4 – *Continued from previous page*

Variable Name	Survey	Years Covered	Question Wording	Response Options
singparent1	EV5	1981-2, 1990 1999-00, 008-10	scarce, men have more right to a job than women” [as above] “If someone says a child needs a home with both a father and a mother to grow up happily, would you tend to agree or disagree?”	3-point 1 = disagree, 3 = agree
workmoth1	EV5	1990, 1999-00, 2008-10	People talk about the changing roles of men and women today. For each of the following statements I read out, can you tell me how much you agree with each: “A working mother can establish just as warm and secure a relationship with her children as a mother who does not work”	4-point 1 = agree strongly, 4=disagree strongly
hwincome	EV5	1990, 1999-00, 2008-10	[as above] “Both the husband and wife should contribute to household income	4-point 1 = agree strongly, 4=disagree strongly
homosex	EV5	1981-2, 1990 1999-00, 2008-10	“Please tell me for each of the following statements whether you think it can always be justified, never be justified, or something in between: “homosexuality”	10-point 1 = always justified, 10=never justified
abortion	EV5	as above	[as above] “Abortion”	as above
divorce	EV5	as above	[as above] “Divorce”	as above
euthan	EV5	as above	[as above] “Euthanasia (terminating the life of the incurably sick)”	as above
potuse	EV5	as above	[as above] “Taking the drug marijuana or hashish”	as above
tradition	ESS	2002, 04, 06, 08, 10, 12, 14, 16	“It is important to try to follow the customs handed down by religion or family”	6-point top 3 responses indicate agreement
natenvt	ESS	2002, 04, 06, 08, 10, 12, 14, 16	“It is important to look after nature and the environment”	6-point top 3 responses indicate disagreement
stronggov	ESS	2002, 04, 06, 08, 10, 12, 14, 16	“It is important that the government is strong and ensures safety”	6-point top 3 responses indicate disagreement

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Variable Name	Survey	Years Covered	Question Wording	Response Options
gayrights	ESS	2002, 04, 06, 08, 10, 12, 14, 16	“To what extent do you agree or disagree that gay men and lesbians should be free to live their life as they wish?”	5-point 1=agree strongly, 5=disagree strongly
overthrow	ESS	2002, 04, 06, 08, 10	“To what extent do you agree or disagree that political parties that wish to overthrow democracy should be banned?”	5-point 1=disagree strongly, 5=agree strongly
homosexl	PÉW	2002, 07, 11, 13,	“Homosexuality is a way of life that should be accepted by society”	2-point 1=agree, 2=disagree
envgrowth	PÉW	2002, 07, 08, 09, 10	“Protecting the environment should be given priority, even if it causes slower growth and some loss of jobs”	4-point 1=completely agree, 4=completely disagree

Table S7: **Variables included in the Immigration Model**

Variable Name	Survey	Years Covered	Question Wording	Response Options
trads	ISSP NI	1995, 2003, 2013	How much do you agree or disagree with the following statements? “It is impossible for people who do not share this country’s customs and traditions to become fully [nationality]”	5-point 1=disagree strongly, 5=agree strongly
immcrime	ISSP NI	1995, 2003, 2013	[as above] “Immigrants increase crime rates”	5-point 1=disagree strongly, 5=agree strongly
immecon	ISSP NI	1995, 2003, 2013	[as above] “Immigrants are generally good for this country’s economy”	5-point 1=agree strongly, 5=disagree strongly
takejobs	ISSP NI	1995, 2003, 2013	[as above] “Immigrants take jobs away from people who were born in	5-point 1=agree strongly, 5=disagree strongly

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Table 5 – Continued from previous page

Variable Name	Survey	Years Covered	Question Wording	Response Options
immprove	ISSP NI	2003, 2013	this country.” [as above] “Immigrants improve this society by bringing in new ideas and cultures?”	5-point 1=agree strongly, 5=disagree strongly
legalrights	ISSP NI	2003, 2013	[as above] “Legal immigrants to this country who are not citizens should have the same rights as citizens”	5-point 1=agree strongly, 5=disagree strongly
imports	ISSP NI	1995, 2003, 2013	[as above] “We should limit the import of foreign products in order to protect the national economy?”	5-point 1=disagree strongly, 5=agree strongly
immgood	ESS	2002, 04, 06, 08, 10,12,14,16	Is it generally good or bad for the country’s economy that people come to live here from other countries?	11-point 1=good, 11=bad
immcult	ESS	2002, 04, 06, 08, 10,12,14,16	Is the country’s cultural life generally undermined or enriched by immigrants coming to live here?	11-point 1=enriched, 11=undetermined
immbetter	ESS	2002, 04, 06, 08, 10,12,14,16	Is the country a better or worse place to live as a result of immigrants coming to live here?	11-point 1=enriched, 11=undetermined
immsame	ESS	2002, 04, 06, 08, 10,12,14,16	To what extent do you think this country should allow people of the same race or ethnic group as most of the country to come and live here?	4-point top 3 signal agreement
immdiff	ESS	2002, 04, 06, 08, 10,12,14,16	[as above] ... different race or ethnic group?	4-point top 3 signal agreement
immpoor	ESS	2002, 04, 06, 08, 10,12,14,16	[as above] ... people from the poorer countries outside Europe?	4-point top 3 signal agreement

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Table 5 – Continued from previous page

Variable Name	Survey	Years Covered	Question Wording	Response Options
scarceimm	EVS	1990, 1999-00, 2008-10	'When jobs are scarce, employers should give priority to native people over immigrants'	3-point 1=disagree, 3=agree
concernimm	EVS	1999-00, 2008-10	To what extent do you feel concerned about the living conditions of immigrants in your country?	5-point 1=very much, 5=not at all
limitfors	EVS	1999-00, 2008-10	'Which one of the following do you think the government should do about people from less developed countries coming here to work?'	4-point top 2: prohibit/place limits
forinfi	PEW	2002, 07, 09, 12	'Our way of life needs to be protected against foreign influence'	4-point 1=completely disagree, 4=completely agree
socright	EB IMM	1997, 2000, 2003	'Legally established immigrants from outside the European Union should have the same social rights as citizens.'	2-point 0=agree, 1=disagree
sendump	EB IMM	1997, 2000, 2003	'Legally established immigrants from outside the European Union should be sent back to their country of origin if they are unemployed.'	2-point 0=disagree, 1=agree
sendall	EB IMM	1997, 2000, 2003	'Legally established immigrants from outside the European Union should all be sent back to their country of origin'	2-point 0=disagree, 1=agree
allhome	EB IMM	1997, 2000, 2003	'All illegal immigrants should be sent back to their country of origin without exception'	2-point 0=disagree, 1=agree



## 8. Exposition of the Ordinal DGIRT Model

### 8.1. Individual-Level Model

We assume that subject  $i$ 's latent preference on question  $q$ ,  $y_{iq}^*$ , is governed by the stochastic utility model

$$y_{iq}^* = \beta_q \theta_i + \epsilon_{iq}, \quad (1)$$

where  $\theta_i$  is  $i$ 's domain-specific conservatism,  $\beta_q$  is question  $q$ 's "discrimination," and  $\epsilon_{iq} \sim N(0, \sigma_q^2)$  is an iid utility shock. For ordinal question  $q$ , the categorical response  $y_{iq} = k \in \{1 \dots K_q\}$  is observed if  $\alpha_{q,k-1} < y_{iq}^* \leq \alpha_{qk}$ , where  $\alpha_{q,k-1}$  is the "threshold" for response option  $k$  to question  $q$ . The probability that  $i$  selects response option  $k$  is

$$\begin{aligned} \pi_{iqk} &= \Pr(y_{iq} = k \mid \theta_i, \beta_q, \boldsymbol{\alpha}_q) \\ &= \Pr(k-1 < y_{iq} \leq k) \\ &= \Pr(\alpha_{q,k-1} < y_{iq}^* \leq \alpha_{qk}) \\ &= \Pr(\alpha_{q,k-1} < \beta_q \theta_i + \epsilon_{iq} \leq \alpha_{qk}) \\ &= \Pr(\alpha_{q,k-1} - \beta_q \theta_i < \epsilon_{iq} \leq \alpha_{qk} - \beta_q \theta_i) \\ &= \Pr\left(\frac{\alpha_{q,k-1} - \beta_q \theta_i}{\sigma_q} < \frac{\epsilon_{iq}}{\sigma_q} \leq \frac{\alpha_{qk} - \beta_q \theta_i}{\sigma_q}\right) \\ &= \Phi\left(\frac{\alpha_{qk} - \beta_q \theta_i}{\sigma_q}\right) - \Phi\left(\frac{\alpha_{q,k-1} - \beta_q \theta_i}{\sigma_q}\right) \quad \left(\frac{\epsilon_{iq}}{\sigma_q} \sim N(0, 1)\right) \\ &= \left[1 - \Phi\left(-\frac{\alpha_{qk} - \beta_q \theta_i}{\sigma_q}\right)\right] - \left[1 - \Phi\left(-\frac{\alpha_{q,k-1} - \beta_q \theta_i}{\sigma_q}\right)\right] \\ &= \left[1 - \Phi\left(\frac{\beta_q \theta_i - \alpha_{qk}}{\sigma_q}\right)\right] - \left[1 - \Phi\left(\frac{\beta_q \theta_i - \alpha_{q,k-1}}{\sigma_q}\right)\right] \\ &= \Phi\left(\frac{\beta_q \theta_i - \alpha_{q,k-1}}{\sigma_q}\right) - \Phi\left(\frac{\beta_q \theta_i - \alpha_{qk}}{\sigma_q}\right). \end{aligned} \quad (2)$$

Equation (2) is the probit version of the (individual-level) ordinal IRT model.

### 8.2. Group-Level Model

Suppose the quantity of interest is not individual-level conservatism  $\theta_i$ , but rather the average conservatism  $\bar{\theta}_g$  of population groups  $g \in \{1 \dots G\}$ . If conservatism is distributed within groups as

$$\theta_{i[g]} \sim N(\bar{\theta}_g, \sigma_{\bar{\theta}}^2), \quad (3)$$

then the distribution of latent preferences is

$$y_{i[g]q}^* \sim N(\beta_q \bar{\theta}_g, \sigma_q^2 + \sigma_{\bar{\theta}}^2) \quad (4)$$

and the probability that a randomly sampled member  $i[g]$  of group  $g$  selects response option  $k$  to item  $q$  is

$$\begin{aligned} \Pr(y_{i[g]q} = k \mid \bar{\theta}_g, \beta_q, \boldsymbol{\alpha}_q, \sigma_\theta^2) &= \Pr(\alpha_{q,k-1} < y_{i[g]q}^* \leq \alpha_{qk}) \\ &= \Phi\left(\frac{\beta_q \bar{\theta}_g - \alpha_{q,k-1}}{\sqrt{\sigma_q^2 + \beta_q^2 \sigma_\theta^2}}\right) - \Phi\left(\frac{\beta_q \bar{\theta}_g - \alpha_{q,k}}{\sqrt{\sigma_q^2 + \beta_q^2 \sigma_\theta^2}}\right) \\ &= \pi_{gqk}. \end{aligned} \tag{5}$$

Equation (5) is the probit version of the *group-level* ordinal IRT model.

### 8.3. Sampling Model

Let  $s_{gqk} = \sum_{i \in g} \mathbf{1}_{y_{iq}=k}$  denote the number of respondents in group  $g$  who selected category  $k$  in response to question  $q$ . If (conditional on  $\pi_{gqk}$ ) responses are iid sampled within groups, these totals follow the multinomial distribution

$$\mathbf{s}_{gq} \sim \text{Multinomial}(\boldsymbol{\pi}_{gq}), \tag{6}$$

where  $\mathbf{s}_{gq} = (s_{gq1}, \dots, s_{gqK_q})$  and  $\boldsymbol{\pi}_{gq} = (\pi_{gq1}, \dots, \pi_{gqK_q})$ . The assumption of iid sampling will be violated if respondents' sampling probabilities are not equal and/or there are multiple responses per respondent (which would introduce dependence among responses; for details see Fox, Mulder, and Sinharay 2017, 1002). As noted by Caughey and Warshaw (2015), both problems can be addressed by weighting the responses  $y_{iq}$  and using the weighted sum  $s_{gqk}^* = \sum_{i \in g} w_i \times \mathbf{1}_{y_{iq}=k}$ . In brief, each subject  $i$  is assigned a weight  $w_i$  that is inversely proportional to the product of  $i$ 's (estimated) sampling probability and the number of questions  $i$  answered. The effect of the latter is to decrease the effective sample size for the estimates of  $\bar{\theta}_g$  in proportion to the number of duplicated respondents. Unless responses of a given person are perfectly correlated, the latter correction is conservative in the sense that it overstates the uncertainty surrounding estimates of  $\bar{\theta}_g$ . Finally, following Ghitzza and Gelman (2013), we also divide  $s_{gqk}^*$  by a design effect (weakly greater than 1) to account for the added variability induced by within-group variation in weights.

### 8.4. Dynamic Model

We allow groups' conservatism to differ across time periods  $t \in 1 \dots T$ , and we model the evolution of  $\bar{\theta}_{gt}$  using a local-level transition model,

$$\bar{\theta}_{gt} \sim \text{N}(\bar{\theta}_{g,t-1}, \sigma_{\bar{\theta}}^2), \tag{7}$$

where the transition variance  $\sigma_{\bar{\theta}}^2$  is a parameter to be estimated. The model in (7) thus serves as a dynamic prior for  $\bar{\theta}_{gt}$ , smoothing or (in the limit) imputing estimates in periods with little or no survey data.

### 8.5. Priors

Aside from  $\bar{\theta}_{gt} \forall t > 1$ , all unbounded parameters are assigned a  $\text{N}(0, 1)$  prior. The standard deviations  $\sigma_{\bar{\theta}}$  and  $\sigma_\theta$  are assigned half-Cauchy(0, 1) priors with positive support.

### 8.6. Identification

We impose the following (standard) identification restrictions on the stochastic utility model,

- $\sigma_q = 1 \forall q$

- $\alpha_{q0} = -\infty \forall q$
- $\alpha_{qK_q} = +\infty \forall q$ ,

as well as the following (standard) restrictions on the IRT model,

- $\beta_q > 0 \forall q$
- $\sum_g \sum_t \bar{\theta}_{gt} = 0$
- $\text{Var}(\bar{\theta}_{gt}) = 1$ .

The last two restrictions are achieved by normalizing  $\bar{\theta}_{gt}$  to be mean-zero and unit-variance within each Monte Carlo iteration.

## 8.7. Likelihood

Substituting  $\pi_{tgqk}$  for  $\pi_{gqk}$  and  $s_{tgqk}^*$  for  $s_{gqk}$ , the likelihood of the multinomial sampling model in (6) is

$$L(\boldsymbol{\pi} \mid \mathbf{s}^*) = \prod_{t=1}^T \prod_{g=1}^G \prod_{q=1}^Q C_{tgq} \prod_{k=1}^{K_q} (\pi_{tgqk})^{s_{tgqk}^*}, \quad (8)$$

where the multinomial coefficient  $C_{tgq} = (\sum_k s_{tgqk})! / \prod_k (s_{tgqk}!)$  is a constant that can be ignored for the purposes of estimation. After dropping  $C_{tgq}$ , substituting in (5), and imposing the identification restriction  $\sigma_q = 1 \forall q$ , we obtain the likelihood for the full model:

$$L(\boldsymbol{\beta}, \boldsymbol{\alpha}, \bar{\boldsymbol{\theta}}, \sigma_\theta^2 \mid \mathbf{s}^*) = \underbrace{\prod_{t=1}^T \prod_{g=1}^G \prod_{q=1}^Q \prod_{k=1}^{K_q} \left[ \Phi \left( \frac{\beta_q \bar{\theta}_{tg} - \alpha_{q,k-1}}{\sqrt{1 + \beta_q^2 \sigma_\theta^2}} \right) - \Phi \left( \frac{\beta_q \bar{\theta}_{tg} - \alpha_{q,k}}{\sqrt{1 + \beta_q^2 \sigma_\theta^2}} \right) \right]}_{\text{ordinal group-level IRT model}}^{s_{tgqk}^*}. \quad (9)$$

This likelihood, in conjunction with the priors and identification restrictions described above, characterizes the ordinal dynamic group-level IRT model used in the paper.

## 9. Stan Code for the Ordinal DGIRT Model

```

functions {
  real p2l_real (real x) { // converts scalar from probit to logit scale
    real y;
    y = 0.07056 * pow(x, 3) + 1.5976 * x;
    return y;
  }
  vector p2l_vector (vector x) { // converts vector from probit to logit scale
    vector[num_elements(x)] y;
    for (i in 1:num_elements(x)) {
      y[i] = 0.07056 * pow(x[i], 3) + 1.5976 * x[i];
    }
    return y;
  }
}

```

```

data {
  int<lower=1> T;           // number of years
  int<lower=1> G;           // number of covariate groups
  int<lower=1> Q;           // number of items/questions
  int<lower=1> D;           // number of latent dimensions
  int<lower=1> K;           // max number of answer options
  real<lower=0> SSSS[T, G, Q, K]; // number of responses (possibly non-integer)
  real beta_sign[Q, D];    // sign restrictions on betas
  int unused_cut[Q, (K-1)]; // indicates categories with no responses
  int<lower=0, upper=1> evolving_alpha;
  int<lower=0> N_nonzero;
}
parameters {
  real raw_bar_theta_N01[T, G, D]; // group means (pre-normalized, N(0,1) scale)
  ordered[K-1] raw_alpha[T, Q];    // thresholds (difficulty)
  real beta_free[D, Q];            // discrimination (unconstrained)
  real<upper=0> beta_neg[D, Q];     // discrimination (negative)
  real<lower=0> beta_pos[D, Q];     // discrimination (positive)
  vector<lower=0>[D] sd_theta_N01;  // standard normal
  vector<lower=0>[D] sd_theta_IG;   // inverse-gamma
  vector<lower=0>[D] sd_theta_evolve_N01; // standard normal
  vector<lower=0>[D] sd_theta_evolve_IG; // inverse-gamma
  real<lower=0> sd_alpha_evolve_N01; // standard normal
  real<lower=0> sd_alpha_evolve_IG; // inverse-gamma
}
transformed parameters {
  // Declarations
  real raw_bar_theta[T, G, D]; // group means (pre-normalized)
  real bar_theta[T, G, D];     // group means (normalized)
  matrix[Q, D] beta;           // discrimination
  ordered[K-1] alpha[T, Q];    // thresholds (difficulty)
  vector[D] sd_theta;          // within-group SD of theta
  vector[D] sd_theta_evolve;   // transition SD of theta
  real sd_alpha_evolve;        // transition SD of alpha
  cov_matrix[D] Sigma_theta;   // diagonal matrix of within-group variances
  vector[D] mean_raw_bar_theta;
  vector[D] sd_raw_bar_theta;
  // Assignments
  sd_theta = sd_theta_N01 .* sqrt(sd_theta_IG); // sd_theta ~ cauchy(0, 1);
  sd_theta_evolve = sd_theta_evolve_N01 .* sqrt(sd_theta_evolve_IG); // ditto
  sd_alpha_evolve = sd_alpha_evolve_N01 * sqrt(sd_alpha_evolve_IG); // ditto
  Sigma_theta = diag_matrix(sd_theta .* sd_theta);
  for (t in 1:T) {
    if (t == 1) {
      for (g in 1:G) {
        for (d in 1:D) {
          raw_bar_theta[t, g, d] = raw_bar_theta_N01[t, g, d];
        }
      }
    }
    for (q in 1:Q) {
      vector[K-1] alpha_prior_mean;
      alpha_prior_mean =
        rep_vector(100, K-1) .* to_vector(used_cut[q, 1:(K-1)]);
    }
  }
}

```

```

    alpha[t, q] =
      alpha_prior_mean + raw_alpha[t, q]; // alpha[1] ~ N(0/100, 1)
  }
}
if (t > 1) {
  for (g in 1:G) {
    for (d in 1:D) {
      // implies raw_bar_theta[t] ~ N(raw_bar_theta[t-1], sd_theta_evolve)
      raw_bar_theta[t, g, d] = raw_bar_theta[t-1, g, d]
        + sd_theta_evolve[d] * raw_bar_theta_N01[t, g, d];
    }
  }
  for (q in 1:Q) {
    for (k in 1:(K-1)) {
      if (evolving_alpha == 0) {
        alpha[t, q][k] = alpha[1, q][k]; // copy first period
      }
      if (evolving_alpha == 1) {
        // implies alpha[t,q] ~ N(alpha[t-1, q][k], sd_alpha_evolve)
        alpha[t, q][k] =
          alpha[t-1, q][k] + sd_alpha_evolve * raw_alpha[t, q][k];
      }
    }
  }
}
}
// Identify location and scale
for (d in 1:D) {
  mean_raw_bar_theta[d] = mean(to_matrix(raw_bar_theta[1:T, 1:G, d]));
  sd_raw_bar_theta[d] = sd(to_matrix(raw_bar_theta[1:T, 1:G, d]));
  for (t in 1:T) {
    for (g in 1:G) {
      bar_theta[t, g, d] = (raw_bar_theta[t, g, d] - mean_raw_bar_theta[d])
        ./ sd_raw_bar_theta[d];
    }
  }
}
// Identify polarity
for (q in 1:Q) {
  for (d in 1:D) {
    if (beta_sign[q, d] == 0) {
      beta[q, d] = beta_free[d, q];
    }
    if (beta_sign[q, d] < 0) {
      beta[q, d] = beta_neg[d, q];
    }
    if (beta_sign[q, d] > 0) {
      beta[q, d] = beta_pos[d, q];
    }
  }
}
}
}
model {

```

```

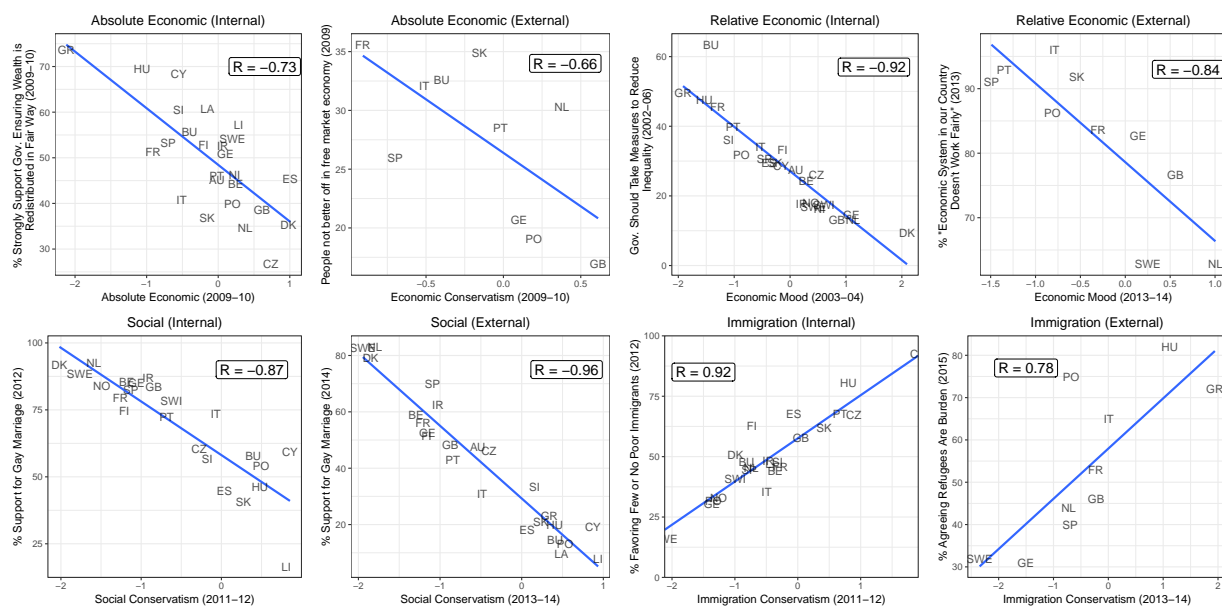
vector[N_nonzero] SSSS_summands; // to store log-likelihood for summation
int SSSS_pos = 0;
// Priors
for (t in 1:T) {
  for (q in 1:Q) {
    raw_alpha[t, q][1:(K-1)] ~ normal(0, 1);
  }
}
to_array_1d(raw_bar_theta_N01[1:T, 1:G, 1:D]) ~ normal(0, 1);
to_array_1d(beta_free[1:D, 1:Q]) ~ normal(0, 10);
to_array_1d(beta_neg[1:D, 1:Q]) ~ normal(0, 10);
to_array_1d(beta_pos[1:D, 1:Q]) ~ normal(0, 10);
sd_theta_N01 ~ normal(0, 1); // sd_theta ~ cauchy(0, 1);
sd_theta_IG ~ inv_gamma(0.5, 0.5); // ditto
sd_theta_evolve_N01 ~ normal(0, 1); // ditto
sd_theta_evolve_IG ~ inv_gamma(0.5, 0.5); // ditto
sd_alpha_evolve_N01 ~ normal(0, 1); // ditto
sd_alpha_evolve_IG ~ inv_gamma(0.5, 0.5); // ditto
// Likelihood
for (t in 1:T) {
  for (q in 1:Q) {
    real z_denom;
    vector[K-1] cut;
    z_denom =
      sqrt(1 + quad_form(Sigma_theta[1:D, 1:D], to_vector(beta[q][1:D])));
    cut = p2l_vector(alpha[t, q][1:(K-1)] / z_denom);
    for (g in 1:G) {
      for (k in 1:K) {
        if (SSSS[t, g, q, k] > 0) {
          real eta;
          SSSS_pos += 1;
          eta = p2l_real(beta[q][1:D] * to_vector(bar_theta[t, g, 1:D])
            / z_denom);
          SSSS_summands[SSSS_pos] =
            SSSS[t, g, q, k] * ordered_logistic_lpmf(k | eta, cut);
        }
      }
    }
  }
}
target += sum(SSSS_summands);
}
generated quantities {
  vector[D] sd_theta_std = sd_theta[1:D] ./ sd_raw_bar_theta;
  vector[D] sd_theta_evolve_std = sd_theta_evolve[1:D] ./ sd_raw_bar_theta;
}

```

## 10. Additional Details on Convergent Validation

We began our validation analysis in the main text with convergent validation, demonstrating that our measures are strongly correlated with alternative indicators of domain-specific policy preferences. Specifically, we compare our conservatism estimates with responses to highly ideological survey questions in each domain. Figure S10 (Figure 6 in the main text) shows the correlation of our estimates on each domain with one “internal” issue question that is included in the data used to estimate our conservatism scores and one “external” issue question that does not contribute to our estimates.<sup>3</sup> All of these comparisons show a strong correlation between our ideology estimates and specific issue questions on each domain. The upper-left panels show that our estimates of economic conservatism in 2009–10 have a correlation of 0.73 with a redistribution question from the 2009–10 Eurobarometer that we include in our dataset and a 0.66 correlation with a question about support for a free market economy from the 2009 TransAtlantic Trends Survey that we did not include. The upper-right panels show that our estimates of economic mood have a correlation of 0.92 with a redistribution question from the 2002–06 ESS that we include in our dataset and a nearly equally strong correlation (0.78) with a question on economic fairness in the respondent’s country from the 2013 TransAtlantic Trends Survey that we did not include. The lower-left panel shows that our social estimates have correlations of 0.87 with an internal question about support for gay rights from the 2012 ESS, and 0.96 with an external question about gay rights in the 2014 European Election Study that we did not include. Finally, the lower-right panel indicates that our estimates have correlations of 0.92 with an internal question on immigration from the 2012 ESS, and 0.78 with an external question about whether immigrants are a burden in Pew’s 2014 Global Attitudes survey that we did not include.

Figure S10: Correlations between domain-specific conservatism and individual issue questions. The left column validates the scale against “internal” issue questions included in the data used to estimate the corresponding conservatism scores, whereas the right column validates against “external” questions not included in the original data.



3. The “external” questions were in all cases not included in our scales because they were asked in only a single year. In certain cases, such as the European Election Study, it may be possible to incorporate the question in future if is repeated across waves.

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