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Between-person methods provide limited insight about within-person belief systems

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Abstract

Belief systems are individual-level phenomena that describe the interrelationships of the political attitudes of a person. However, the modal study of the structure of political ideologies and beliefs uses cross-sectional survey data to estimate what is central to the belief system or the dimensionality of the belief system, aggregating across many people. Cross-sectional data, however, are ill-suited to the task of studying individual-level phenomena because they contain an unobservable mixture of within-person and between-person variation. In this project, we use longitudinal datasets from the Netherlands (representative) and the United States (convenience), spanning between 6 months and 10 years, to we ask whether between-subjects methods can help us understand the within-person structure of belief systems. First, we use Bayesian STARTS models (Lüdtke et al., 2018) to assess what type of variance cross-sectional studies are likely tapping into. We find that variability in measures of ideology and political beliefs is primarily due to stable between-person differences, with relatively smaller amounts variation due to within-person differences. Second, we estimate between-person, within-person, and cross-sectional correlations between all items in our study and find that between-person correlations are larger and in some cases differ in their direction from within-person correlations. Furthermore, cross-sectional correlations are most similar to between-person correlations. Taken together, these findings indicate that the modal study may help describe differences between people, but is ill-suited to tell us about the structure of individuals' belief systems. New methods are necessary for a complete understanding of political attitudes that clarify both between- and within-person processes.

Keywords: Ideology, Belief Systems, Attitudes, Longitudinal Data, Within-person variability

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American society is characterized by substantial ideological polarization (e.g., Dunlap, McCright, & Yarosh, 2016; Iyengar et al., 2019; Finkel et al., 2020; McCarty, Poole, & Rosenthal, 2006). The experience and study of this polarization has led researchers to focus on the factors that are related to individual differences in political beliefs. We strive to understand why some people identify as conservatives and others identify as liberals, we want to know why some people are racists and others are anti-racists, and we work to find out why some people hold democratic principles dear whereas others embrace authoritarianism. In the modal study, the associations between psychological traits, political attitudes, and / or political identities are assessed in cross-sectional studies and make comparisons between people. This focus is valuable for understanding when and why people are different (or similar). One well-known limitation to the modal approach is that cross-sectional studies cannot answer questions about causality, leading to scholars listing longitudinal studies and experimental methods as future directions to many studies.

Here we consider a related, but less acknowledged limitation for the study of ideology and political beliefs: Cross-sectional studies cannot separately identify the associations between variables that are due to between-person differences from those that are due to within-person differences. This means that any of the relationships we observe in cross-sectional studies between political beliefs (e.g., when estimating belief system structure) and other constructs (e.g., perceived threat) may be due to differences between people, differences within people, or a combination of both (Morgan & Wisneski, 2017). For example, the cross-sectional finding that ideology is structured among one or a few continuums (Ashton et al., 2005; Everett, 2013; Layman & Carsey, 2002; Pan & Xu, 2018; Saucier, 2000) does not reveal whether these

ideological structures merely provide a meaningful way to distinguish between people or whether individuals use these ideological structures to organize their own belief systems. In this work, we consider the implications of this limitation to cross-sectional studies for our understanding of the structure of belief systems. Belief systems are a person's inter-connections of political attitudes and identities (Brandt & Sleegers, 2021; Homer-Dixon et al., 2013). That is, belief systems describe how political attitudes and identities are related to one another within a person. In this project, we ask does the modal study of the structure of political beliefs help us understand the ways that beliefs systems are structured within people?

The current project takes two inter-related approaches to answering this question. First, we assess what kind of variance is captured by the typical measurement approach in studies of ideology and political beliefs. Do commonly used cross-sectional measures of political beliefs capture stable beliefs or do they capture more malleable within-person changes in beliefs? This question is a critical one: If cross-sectional measures primarily reflect stable political beliefs then (as we describe more fully below), these measures are limited in the insights they provide us about within-person associations.

Second, we compare and contrast the results from cross-sectional studies to an approach that isolates between-person associations from within-person associations. Specifically, we estimate cross-sectional, between-person, and within-person correlations between several different measures of political beliefs and identities. Correlations form the building block of nearly all studies of political belief system structure. Therefore, if we find that cross-sectional correlations are more similar to between-person correlations, it would suggest that typical studies of belief system structure are unable to estimate belief system structure within people. This would be a meaningful problem; belief systems and the associations that make them up are

within-person constructs that individuals use to make sense of their social and political world (e.g., Brandt & Sleegers, 2021; Homer-Dixon et al., 2013).

In short, cross-sectional studies cannot separate between- from within-person associations, so we use an approach that decomposes variability. As we describe below, we find that measures of ideology and political beliefs primarily reflect stable traits. Furthermore, we find that cross-sectional associations most closely resemble between-person associations rather than within-person associations. This suggests that current measures of ideology and political beliefs are adequate for describing between-person differences in ideology (i.e., that they help us understand how individuals differ from one another), but that they are inadequate for answering a key psychological question: what is the structure of belief systems within people?

A Widespread Approach in the Study of Ideology and Political Beliefs

Political ideology and other political beliefs have received substantial scholarly attention during the last fifty years (Converse, 1964; Knight, 2006), and especially over the last two decades (Jost, Federico, & Napier, 2009; Kinder & Kalmoe, 2017). Despite disagreement about the specific content and structure of ideology, it is typically defined as a framework that organizes or “constrains” individuals’ social and political attitudes (Gerring, 1997). In other words, ideology is a developed and chronically accessible knowledge structure or schema that people use to process and organize socially and politically relevant information (e.g., Conover & Feldman, 1984; Larson, 1994). Scholarship on ideology and political beliefs tackles a wide range of questions, including psychological differences between people who adopt different ideologies in terms of their sensitivity to negative stimuli and threat, acceptance of misinformation and conspiracy, moral values, prejudice, attributions, cognitive process, brain structure, and more. In this paper, we focus on a tradition of work – starting with Converse (1964) – that estimates the

structure of belief systems. This work is foundational to the study of ideology – it seeks to answer the question of how ideology, as a particularly well-structured belief system, exists in individuals' minds. The arguments we advance here directly applies to this body of work, but also to any study assessing the cross-sectional relationship between two or more variables relevant to ideology and political beliefs. Indeed, the most general form of our argument applies to nearly any psychological construct.

Work on the structure of belief systems aims to understand how people's belief systems are organized. There are two prominent lines of research. One line of research assesses the dimensionality of ideology (for a review see Johnston & Ollerenshaw, 2020). Studies in this line of research use factor analysis to (a) identify if and how items form different dimensions (Ashton et al., 2005; Everett, 2013; Layman & Carsey, 2002; Pan & Xu, 2018; Saucier, 2000), (b) examine how items from different measures are correlated (Azevedo et al., 2019; Layman & Caarsey, 2002; Malka, Lelkes, & Soto, 2019), (c) test factors that increase or decrease the relationship between the dimensions (e.g., elite cues, attention to politics, societal structure; Malka et al, 2019; Layman & Caarsey, 2002), and (d) test predictors of the dimensions (Brandt et al., 2021; Malka et al., 2014). Although there is debate, a growing consensus is that more than one dimension is required to capture belief systems across people. A second line of research aims to identify the central component (or components) of political belief systems. This work adopts a range of analytic techniques, but in the end aims to understand what types of political beliefs, identities, or values are most closely associated with relevant outcomes (e.g., voting) or predictive of other beliefs, identities, or values in the belief system (Barker & Tinnick, 2006; Boutyline & Vaisey, 2017; Brandt, Sibley, & Osborne, 2019; Converse, 1964; Fishman & Davis, in press; Kinder & Kalmoe, 2017). Those issues, identities, or values most closely related to

other components of the belief system are typically the most central to the belief system and are seen as being responsible for holding the belief system together. Although there is debate, a growing consensus at this time suggests that political identities (e.g., party identification) are the most central component of belief systems (Boutyline & Vaisey, 2017; Brandt, Sibley, & Osborne, 2019; Fishman & Davis, in press).

Across these two lines of belief system structure research, the basis for nearly all analyses are cross-sectional correlations between ideological positions, political beliefs, values, predictors, and outcomes.¹ This is true when considering the factor analytic techniques used to uncover dimensions of belief systems (e.g., Everett, 2013) or the newer network analytic techniques used to identify central components of belief systems (e.g., Brandt, Sibley, & Osborne, 2019). The initial input for both of these techniques are cross-sectional correlations between a variety of politically-relevant attitudes and identities. Cross-sectional correlations are thus the building blocks of research on belief system structure. In this manuscript, we are testing if these building blocks are the right materials for the job.

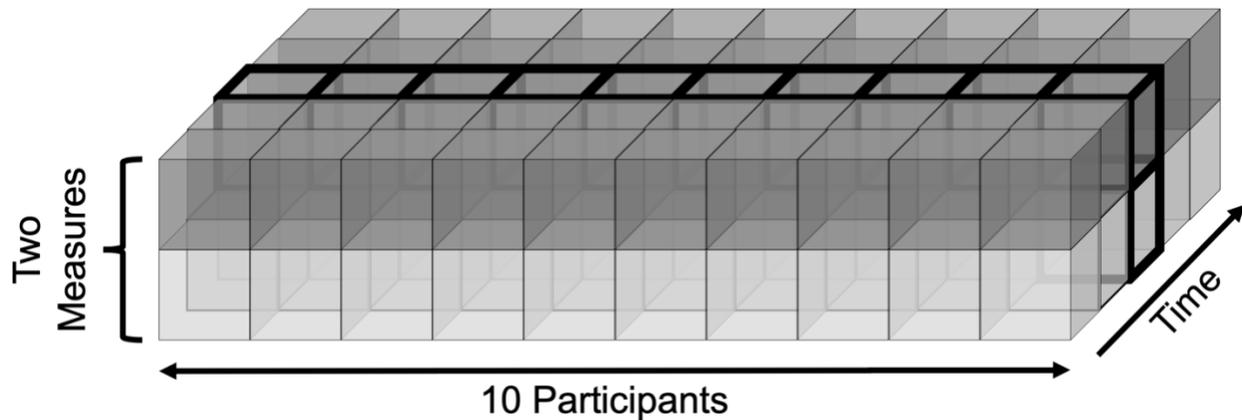
What Do Cross-Sectional Studies Show Us?

Cross-sectional studies of belief system structure may not tell us what we want to know about belief system structure because they do not necessarily tell us how politically relevant attitudes and identities are associated and organized within people. Consider a simple, hypothetical study that tests the correlation between two political policies: support for free trade and support for abortion rights. In this hypothetical study, we recruit a random sample of participants, measure their positions on these two policies, calculate the correlation between the

¹ In some analyses assessing so-called belief system constraint, the correlations are themselves the key item of interest with higher correlations in a sample indicating higher levels of constraint (e.g., Converse, 1964; Kalmoe, 2020).

two measures, and find that the two positions are positively correlated. Such a cross-sectional design is a snapshot of where participants collectively stand on support for free trade and support for abortion rights at a particular moment in time. But consider Figure 1 which illustrates 10 participants from our hypothetical study. Each participant is represented by a column in the figure. The two measures are represented by the two rows. Because our study consists of one time-point, our study is represented by the boxes with the thick border (3rd row from the front) where each of the 10 participants complete two measures. This figure conceptualizes the typical cross-sectional study. However, these participants could have also been measured at earlier or later timepoints (rows closer to the front or the back) where their positions may be similar or may be different (either in extremity or direction) from the timepoint we observed. In the typical cross-sectional study, we are not only capturing the participants in relation to the other participants (i.e. between-person comparison, comparing columns in Figure 1), but also in relation to themselves (i.e. within-person comparisons, comparing boxes within a column that are closer to the front or the back). And so the cross-sectional snapshot is just capturing one particular configuration of the two attitudes. It cannot tell us if that configuration is due to correlated between-person differences, correlated within-person changes, or a combination of both.

Figure 1. Hypothetical study. Row with the thicker borders represents the hypothetical study described in the text. Each column of data is a participant. Each row of data is a measure. Each layer (from front to back) is a different moment of time.



This is a general point and it applies to cross-sectional measurement of psychological constructs: all data exists in a multi-dimensional space. The insight that between-person and within-person levels of analysis are different is already incorporated into the field when it comes to data with a multilevel structure (e.g., measures nested within people, people within groups). The goal of such discussions is to help analysts estimate effects for the level of analysis they care about (e.g., within vs. between person; see Enders & Tofighi, 2007). Nonetheless, even if data are not multilevel data – that is, even if the data is cross-sectional in design and we do not have multiple measures from each individual in the sample – the data still exist in multilevel space. A substantial challenge is that the multilevel space is unobserved in a cross-sectional design. It is the dark matter of cross-sectional analyses because it exists, cannot be observed from the collected data, but nonetheless impacts what we observe. In other words, the typical cross-sectional study of belief system structure cannot estimate which part of the associations are due to between-person associations, within-person associations, or a mix of the two (for discussions of this issue in the statistical literature, see Epskamp, Waldorp, Möttus, & Borsboom, 2018; Hamaker, 2012).

Our hypothetical example illustrates a broad point about measurement of psychological constructs more generally, but also highlights a specific and fundamental problem with much of

the work on ideology and political beliefs. Much of the work uses cross-sectional analyses (correlations, partial correlations, regression models, factor analyses) to draw conclusions about the structure of belief systems – a within-person construct. For example, recent empirical work on belief system networks uses cross-sectional partial correlations to estimate what is central to belief systems (Brandt et al., 2019), suggesting that political identities are particularly central. However, it is ambiguous whether the estimated belief system reflects a meaningful way to distinguish *between* people, or if it reflects belief systems *within* individual people.² Cross-sectional designs are also used to assess other questions in political psychology, such what types of motivations are associated with ideology (e.g., Jost et al., 2007), or how different moral values are correlated with ideology (e.g., Graham, Haidt, & Nosek, 2009). All of this work represents just a snapshot of these constructs at one particular moment in time, leaving it unclear the extent the associations are between-person associations, within-person associations, or both (see Morgan & Wisneski, 2017). If the analyses using cross-sectional data are primarily capturing between-person associations, they cannot assess how ideology and political beliefs operate as individual-level constructs. Instead, these analyses may be capturing the between-person differences and divisions within a society, rather than the within-person structure of belief systems (Martin, 2000).

The Stakes

The questions we pose above are not merely methodological ones, but have important implications for our understanding of ideological belief systems. Cross-sectional studies do not

² Indeed, this ambiguity lead one of the same authors to warn against such methods for estimating the parameters of belief system networks for theoretical modeling purposes (Brandt & Sleegers, 2021).

cleanly distinguish between within-person and between-person associations. Moreover, studies that are able to distinguish between between-person and within-person associations show that there are differences between conclusions from analyses that focus on the between-person and within-person levels. It is important to note (although it often goes unrecognized) that between-person comparisons do not cleanly map onto within-person processes. That is, there is a lack of generalizability from between- to within-level statistical inferences. This has been demonstrated in many domains outside of political ideology (e.g., Fisher et al., 2018; Hamaker, 2012; Masselink et al., 2018; Nelemans et al., 2020). For example, between and within-person correlations differ within the same data-sets assessing psychopathological symptoms and affect (Fisher et al., 2018). Between-level processes map onto within-person phenomena only when certain criteria are met, and in psychology it is rare that they do (Hamaker, 2012; Molenaar, 2004; Molenaar & Campbell, 2009). Given the centrality of correlations to inferential statistics, including those used to assess the structure of belief systems, this means that between-person inferences will typically fail to generalize to within-person processes (for further examples see Cervone, 2005; Mischel, 1973; Molenaar et al., 1997; Molenaar et al., 2003). The results of aggregate-level analyses summarize the pattern of responses at the aggregate-level, but do not describe associations as they exist within people. These findings have profound implications for the insights that cross-sectional studies yield (or do not yield) about within-person phenomena more generally, but also about the ways that ideological belief systems operate within individuals specifically.

Taken together, the above findings suggest that if cross-sectional studies of belief systems capture between-person associations, then they cannot be cleanly applied to understand within-person belief structures. Consider the example above regarding support for free trade and

support for abortion rights. In an analysis using between-person comparisons in 2021, these two policies might end up in the same “liberal” cluster. That is, people who tend to support free trade also tend to support abortion rights. However, this would not necessarily mean that changes in opinion on free trade would be correlated with changes in opinion on abortion. Beyond this hypothetical example, one recent study suggests there are likely differences between conclusions from analyses at the between-person and within-person level when it comes to political ideology. Using methods that can tease apart between-person and within-person associations (i.e. a random effects cross-lagged panel model, Hamaker, Kuiper, & Grasman, 2015), Osborne and Sibley (2020) found that ideology and openness to experience were correlated at the between-person level but not at the within-person level. This finding might, however, just be specific to one particular personality trait or only applicable to personality traits in general. In the current study, we take a next step by comparing and contrasting between-person, within-person and cross-sectional associations between various measures of ideology and political beliefs. If there are marked differences depending on the level of analysis in these associations, it would suggest that similar differences would arise for less obvious associations (e.g., between perceived threat and ideology).

The Current Study

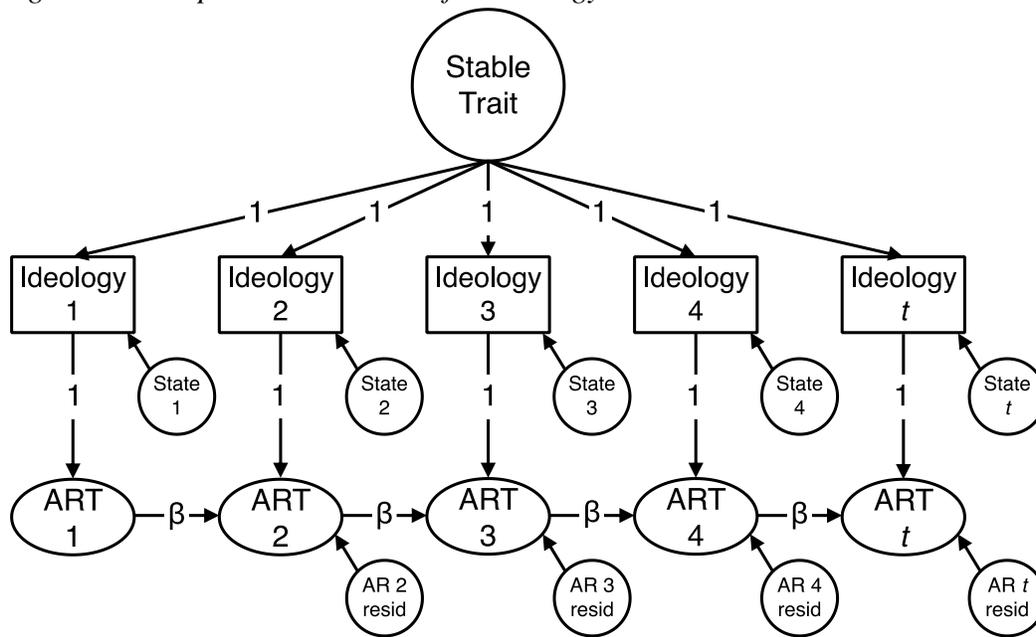
The work we present here proceeds in two, interrelated steps. First, we assess what kind of variance is captured by cross-sectional studies, the typical measurement approach in studies of ideology and political beliefs. This descriptive information about the stability of political beliefs is necessary because it clarifies whether cross-sectional relationships between measures of political beliefs will primarily represent between-person or within-person associations. For example, if measures of political beliefs are primarily stable, then cross-sectional correlations

between different measures of political beliefs are more likely to represent between-person associations. Second, we assess the similarity and differences between results from cross-sectional studies compared to an approach that isolates between-person associations from within-person associations. This will help us understand the extent the typical cross-sectional analyses can be used to make inferences about the structure of belief systems within individuals.

To answer these two questions, we use three longitudinal datasets from the United States and the Netherlands that cover different time intervals (6 months, 1 year, 10 years). For all three datasets, we first estimate a STARTS model (Kenny & Zautra, 1995, 2001; Lüdtke et al., 2018) for each of the politically relevant items we are investigating to identify the sources of variance (items include ideology, partisanship, policy attitudes). The STARTS model (see Figure 2) is a statistical tool for modeling individual differences across time and identifying different sources of variation, including stable trait (ST) variation, autoregressive trait (ART) variation, and state (S) variation. Stable trait variation is due to between-person processes that are stable over the course of the study. State variation is due to within-person processes that vary from time point to point (including both substantive changes and measurement error). Autoregressive trait variation represents changes in a person's attitudes, but in a way where the attitude remains relatively stable at a new level. The β parameter is an index of the stability of the ART component (see Figure 2). If β is high, it suggests the time varying factors of the ART component are relatively stable over the time interval (e.g., the 1 year between measurement occasions). However, if β is relatively low, it suggests that the time varying factors of the ART component are less stable over the time interval.³

³ One way to think about the components of the STARTS models is how those components might appear in a correlation matrix where each entry in the matrix is the same measure of ideology measured at different time points. If stable trait variance is dominant then there will be equal correlations between the measure at different time points

Figure 2. Example STARTS model for Ideology



The idea is that if measures of ideology and political beliefs are primarily due to stable trait variation or autoregressive trait variation with high degrees of stability, it would suggest that cross-sectional studies are primarily tapping into relatively stable between-person processes.

This helps us anticipate whether cross-sectional associations will be more or less similar to between-person associations. If cross-sectional associations are similar to between-person associations, then cross-sectional associations do not reveal the structure of individuals' belief systems and new approaches are needed (although the studies could be useful for assessing other questions). However, if there is substantial state variation or if the autoregression trait variation

regardless of the lag between time points. Autoregression trait variance appears as declining correlations between the measure at different time points with increasing lag between the time points. State variance increases as wave to wave correlation decrease (even over short lags). It is unlikely that any one of these patterns will characterize any given measure. The STARTS model helps parse the data to determine the amount of variance is due to each of these components.

is not stable, it would suggest that cross-sectional studies are primarily tapping into within-person processes.

There are, indeed, reasons to suspect that cross-sectional assessments of ideology and political beliefs will primarily reflect between-person associations. Kiley and Vaisey (2020) directly assessed stability and found that in the United States political attitudes are primarily stable overtime, with relatively few changes. Their models relied on data from the United States with three timepoints, which allowed them to estimate the extent political attitudes are due to settled dispositions or active updating models of attitude formation and change. Their estimate of settled dispositions maps onto the stable trait component of the STARTS model, both of which identify the extent a particular political attitude is consistent across the course of the study. Their estimate of active updating maps onto the autoregression trait component of the STARTS model. Because they were limited to three waves, the work by Kiley and Vaisey is not able to separately estimate state variation using the STARTS model (4-waves is the minimum number of waves necessary to identify a STARTS model, Lüdtke et al., 2018). Our work extends these findings by including data from the Netherlands and, more importantly, including data with more than three time-points to estimate additional variance components using the STARTS model.

After assessing the type of variance that likely contributes to measures of ideology and political beliefs, we compare (a) cross-sectional relationships between ideology and political beliefs, as well as between-person relationships between ideology and political beliefs to (b) within-person relationships between ideology and political beliefs. That is, rather than assessing how relationships might differ between politically-relevant beliefs and personality traits (like Osborne & Sibley, 2020), we look at how these relationships might differ for constructs that are typically closely related (i.e. different types of political beliefs). Cross-sectional correlations are

the dominant ingredient for analyses of belief system structure whether using network analyses (e.g., Boutyline & Vaisey, 2017; Brandt, Sibley, & Osborne, 2019) or factor analysis (Ashton et al., 2005; Saucier, 2000). If the correlations are different at the two levels of analysis, it suggests that the within-person structure of belief systems differs across individuals and is different from the belief system as estimated at the between-person level. It would also suggest that studies of belief system structure are not able to tell us about within-person belief systems. Notably, for these analyses we use the exact same data and participants which means that differences between the estimate cannot be attributed to different methodologies or participant characteristics.

Because the datasets are the same for each research question, we first describe the three datasets. Then, we describe the analysis strategy and results for the first research question before repeating the process for the second research question.

Data

Participants and Procedures

To answer our research questions, we use three different samples. The sample we refer to as Netherlands 10 Year – or NL10Y – makes use of the first 10 years (2007-2017) of the LISS (Longitudinal Internet Studies for the Social sciences) panel administered by CentERdata (Tilburg University, The Netherlands; Scherpenzeel & Das, 2010). The LISS panel is a representative sample of Dutch people who participate in monthly Internet surveys. The panel is based on a true probability sample of households drawn from the population register. Households that could not otherwise participate are provided with a computer and internet connection. We make use of the panel's yearly survey of political attitudes. Participants complete a survey consisting of questions about their political attitudes, values, and behaviors. We selected items that most closely represent people's political ideology or political attitudes, the focus of our

investigation. The measures we include are listed in Table S1. For the first research question, we included the 1669 participants who had complete data for at least one measure across all 10 years. For the second research question, we included the 14823 people who completed at least two measures for at least one time point.

The sample we call Netherlands 6 Months – or NL6M – is a novel survey designed to examine the dynamics of ideology over the course of 6 months (September 2019 – February 2020). NL6M was administered by CenterData (Tilburg University, The Netherlands) and also used the LISS panel and follows the same participants for 6 months. Over this period, participants complete two surveys per month (24 waves in total). Each survey is open for approximately two weeks. Participants can complete the survey at any point during the two week period. A random sample of 1670 LISS panel members were selected for the study and the surveys were made available to them (M age = 51.6, SD age = 18.5; 803 men, 867 women). Each wave had a response rate between 69.5% and 82.4% (i.e. approximately 1200 participants per wave). Each survey consists of questions about participants' political attitudes, values, and behaviors. We selected items that most closely represent people's political ideology or political attitudes. Many of the measures are the same as NL10Y, with a few additions. The measures we include are listed in Table S1. For the first research question, we included the 557 participants who had complete data for at least one measure across all 12 waves. For the second research question, we included the 1670 people who completed at least two measures from at least one time point.⁴

⁴ Data for both NL10Y and NL6M are available from <https://www.lissdata.nl>. Replication code and the remaining data are at https://osf.io/htc8a/?view_only=706994829edd4c2292072938383d7e30

The sample we call United States 1 Year – or US1Y – is a novel survey designed to examine the dynamics of ideology over the course of 1 year (May 2019 – April 2020; Brandt, Turner-Zwinkels, & Kubin, 2021). This sample was collected using Prolific, a service that connects researchers recruiting participants with people who are willing to complete studies. Participants from the United States (starting $N = 552$; M age = 34.7, SD age = 12.4, 271 men, 278 women, 2 not listed, 1 missing) completed a survey every two weeks for a year (26 waves in total). Each survey was open for one week and participants could complete the survey any time during that one week period. Our average response rate across the waves was 75%, $SD = 8\%$, Range [63%, 93%]. The survey consisted of items assessing their political attitudes, values, and behaviors. We again selected items that most closely represent people’s political ideology or political attitudes, the focus of our investigation. The measures we include are listed in Table S2. For the first research question, we include the 285 participants who had complete data for at least one measure across the first 13 waves. We limited analyses to this subsample because of problems with convergence using all of the waves. For the second research question, we included the 552 people who completed at least two measures at one time point or more.⁵

Notably, the measures we focus on include a variety of ideologically- and politically-relevant beliefs to help us generalize across a larger variety of issues and domains. Our measures include both political identities and political issues. For example, both partisan and ideological identities are often considered to be particularly important to people (e.g., Huddy et al., 2015) and central to belief systems (e.g., Boutyline & Vaisey, 2017; Brandt, Sibley, & Osborne, 2019),

⁵ A preregistration of the US1Y method is here:
https://osf.io/7h5ds/?view_only=f677ae53a73c492d9bd5c2c49d5a6262.

and so may have different psychological properties than specific political issues. We also include different types of political identities. Some suggest that ideological identities (e.g., liberalism / conservatism) are less important than partisan identities (e.g., Democrat / Republican; e.g., Kinder & Kalmoe, 2017) and so assessing both kinds of identity is important. In US1Y we included a measures of both liberal-conservative ideological (When it comes to politics, do you think of yourself as a liberal, conservative, moderate, or haven't you thought much about this?) and partisan identification (Do you think of yourself as a Republican, a Democrat, an Independent, or haven't you thought much about this?). In the two Dutch samples, we asked about left-right ideological identification (In politics, a distinction is often made between "the left" and "the right". Where would you place yourself on the scale below, where 0 means left and 10 means right?), traditional-progressive ideological identification (When it comes to politics, do you think of yourself as more traditional, more progressive, or haven't you thought much about this?), and sympathy for a number of different Dutch political parties (How sympathetic do you think the following political parties are?).

We also included different types of political issues, including items assessing both so-called cultural issues and economic issues (cf. Carmines & Stimson, 1980; Johnston & Ollerenshaw, 2020). For example, in US1Y we asked about participants' attitudes about abortion, gay adoption, economic stimulus, and spending on healthcare (among other topics). In the Dutch samples, we asked about participants' attitudes about immigration, euthanasia, the European Union, and inequality (among other topics). In short, by including different types of items we are able generalize our findings across different facets of ideological and political beliefs.

Research Question #1: What are the Sources of Variation?

Analytic Approach

STARTS models are structural equation models for longitudinal data. They are specified to estimate the variance attributable to each component of the model for a single measure. Although STARTS models can be implemented in most SEM software using standard maximum likelihood estimation, in practice these models do not reliably converge in SEM due to their complexity (Anusic, Lucas, & Donnellan, 2012; Kenny & Zautra, 2001). A Bayesian STARTS model has been developed (Lüdtke, Robitzsch, & Wagner, 2018) and used (Mund, Lüdtke, & Neyer, 2020; Wagner, Lüdtke, & Robitzsch, 2019) which reliably converges and accurately estimates variance components under a large number of situations. We implement this Bayesian STARTS model using the R package STARTS (Robitzsch & Luedtke, 2019).

A key choice in any Bayesian analysis is the choice of priors. We selected priors for the three STARTS components ((S)table (T)rait, (A)uto(r)egressive (T)rait, and (S)tate components), and the β parameter (i.e., the stability of the ART component). Lüdtke et al (2018) recommends weakly informative priors with estimates of .33 variance explained for each of the three STARTS components and .5 for the B path parameter as default priors. We use these default priors, which are also similar to the STARTS estimates for studies of life satisfaction (Lucas & Donnellan, 2007). To explore if our estimates of the STARTS parameters are robust to choice of prior, we created two additional priors. For an audience that assumes that political beliefs may be more like a personality trait, we used priors of .80 stable trait variance, .18 autoregression trait variance, and .02 state variance (based on the estimates for extraversion in Prenoveau et al., 2011). For an audience that assumes that political beliefs may be more state like, with beliefs of much of the population representing relatively unformed “door step opinions” that are easily

swayed, we used priors of .10 stable trait variance, .10 autoregression trait variance, and .80 state variance. These priors are the conceptual reverse of the extraversion-inspired priors.

For each item in each sample, we first select participants who have complete data on the item across all waves under study. This results in different sample sizes for each item in each sample (mean N's for each item are NL10Y = 1333.8, NL6M = 554.0, US1Y = 313.9; range of N's for each item are NL10Y = [1090, 1531], NL6M = [553, 557], US1Y = [309, 317]). Then, we standardized the item by its standard deviation to make model parameters more easily interpretable. For each sample, for each standardized item, for each prior we estimate a STARTS model (NL1Y = 45, NL6M = 60, US1Y = 48 models in total). For the sake of presentation, we discuss the default prior, but present all three so that the reader can make up their own minds (in practice the conclusions are similar across priors).

We followed the recommendations of Lüdtke et al (2018) when assessing the convergence of our models. These recommendations include two criteria. First, that effective sample size must be greater than 400. Second, the potential scale reduction factor must be within .1 of 1. If either of these conditions were not met, we increased the number of iterations and re-estimated the model. These two criteria help indicate whether the model converged successfully and provides accurate estimates of the model parameters. All models had a burn-in phase of at least 5,000 iterations and a minimum of 100,000 iterations. The fit statistics of all of the models and all of the priors are in Table S3, Table S4, and Table S5.

Results

Parameters estimates for all of the variance components and the β parameter when using the default priors are in Figure 3, Figure 4, and Figure 5 (results using other prior distributions are in Figure S1 to Figure S6). The y-axis of each figure are the individual items from each of the

samples. The x-axis is the parameter estimate and 95% credible interval; the variance components are on the left of the figure and the β parameter is on the right. The density plots in both panels of the figures are the posterior distributions. The three STARTS components ((S)table (T)rait, (A)uto(r)egressive (T)rait, and (S)tate components) represent the proportion of variance explained by each component (the sum of the components = 1). The β parameter is the stability of the ART component and can range from 0 to 1 (like any standardized regression coefficient). The amount of variance explained by the stable trait component tells us how much variation in political attitudes and beliefs is due to between-person processes. The amount of variance explained by the state components tells us how much variation in political attitudes and beliefs is due to within-person processes (with the state component representing both wave-to-wave changes and measurement error). The autoregression trait reflect within-person changes; however, because it can be very stable may be thought to represent both within-person and between-person variation.

Figure 3. STARTS components for NL10Y (10-year timespan) for the default priors. Density curves are of the posterior distribution. Error bars are 95% credibility intervals.

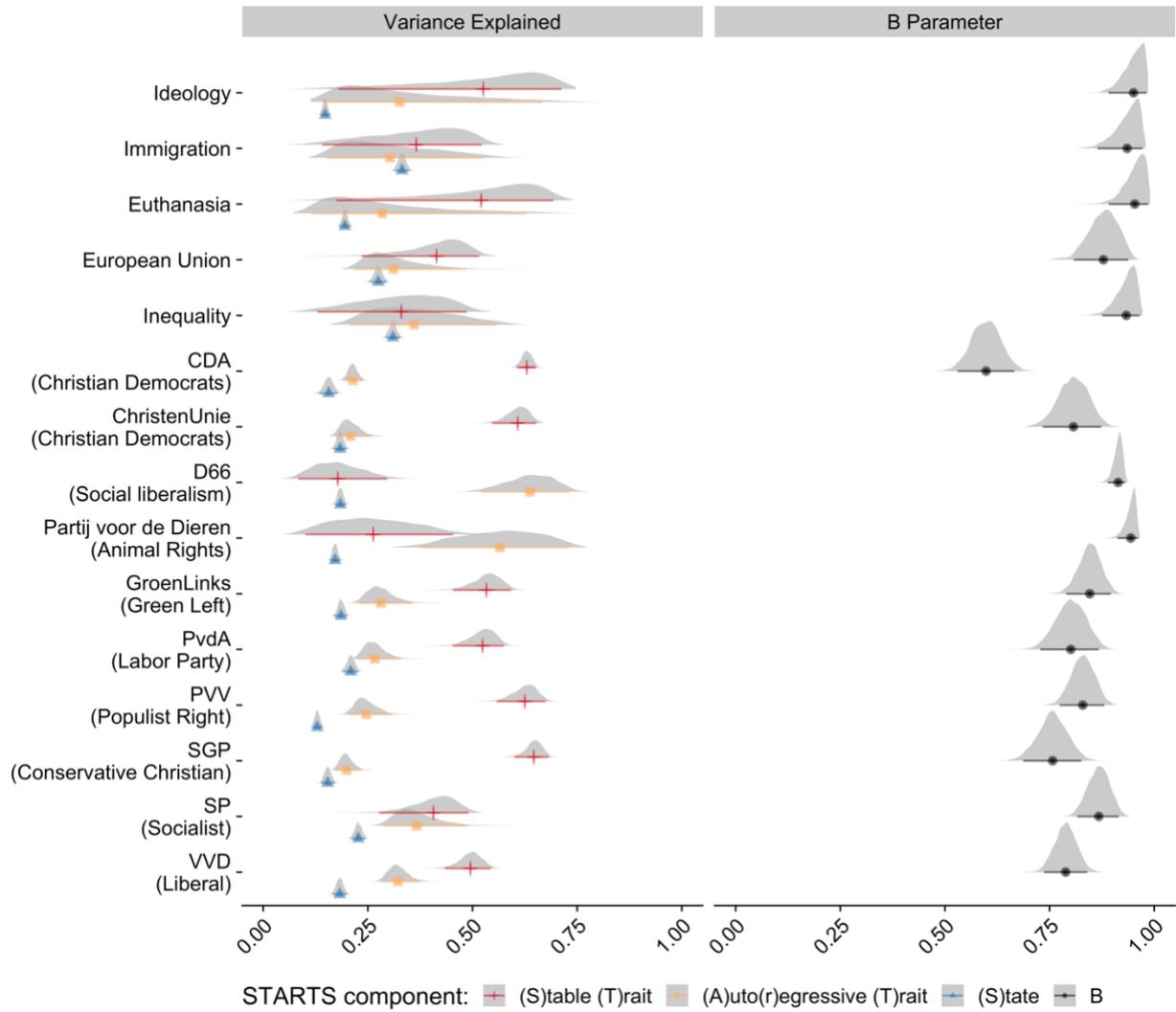


Figure 4. STARTS components for NL6M (6-month timespan) for the default priors. Density curves are of the posterior distribution. Error bars are 95% credibility intervals.

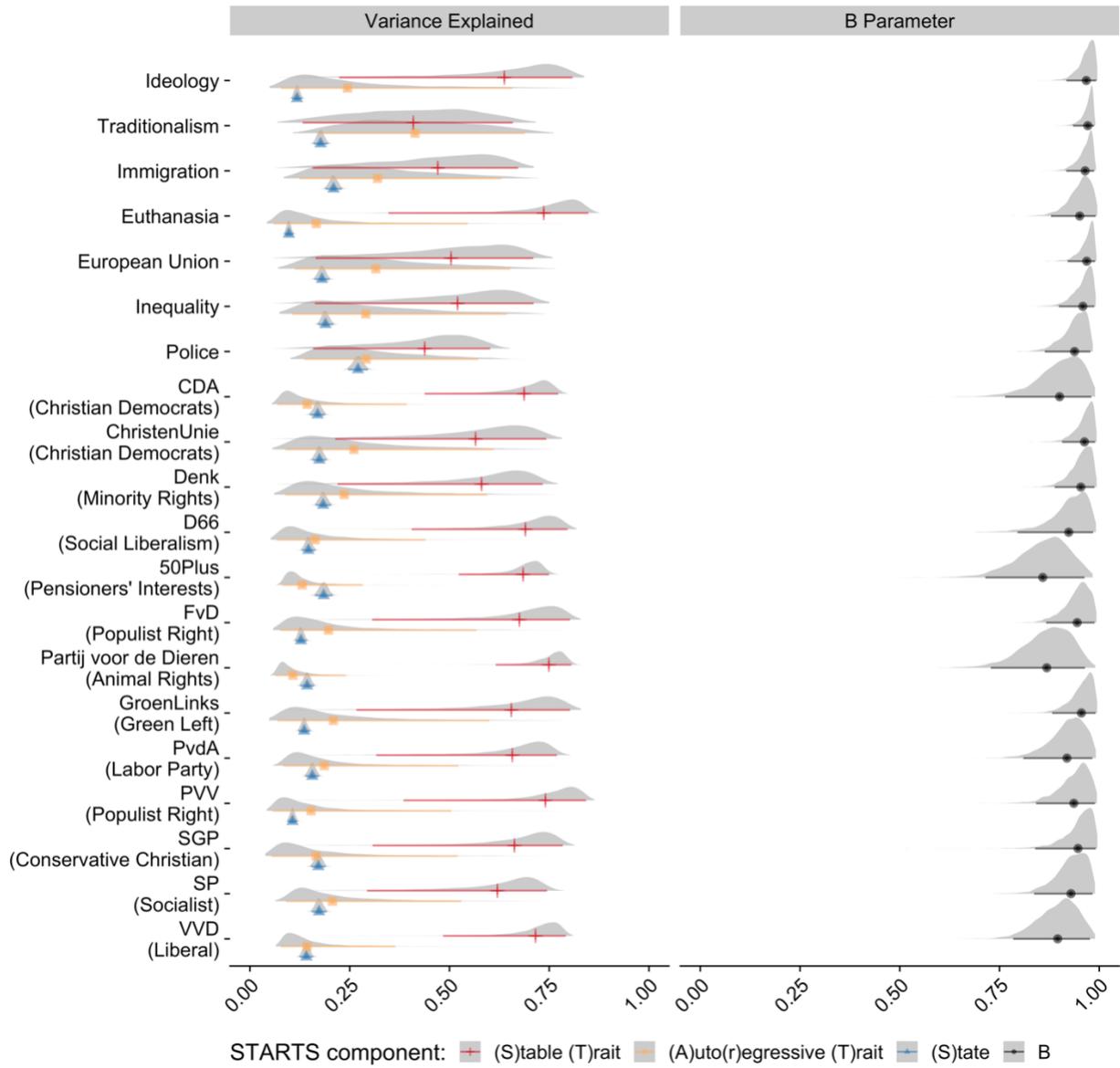
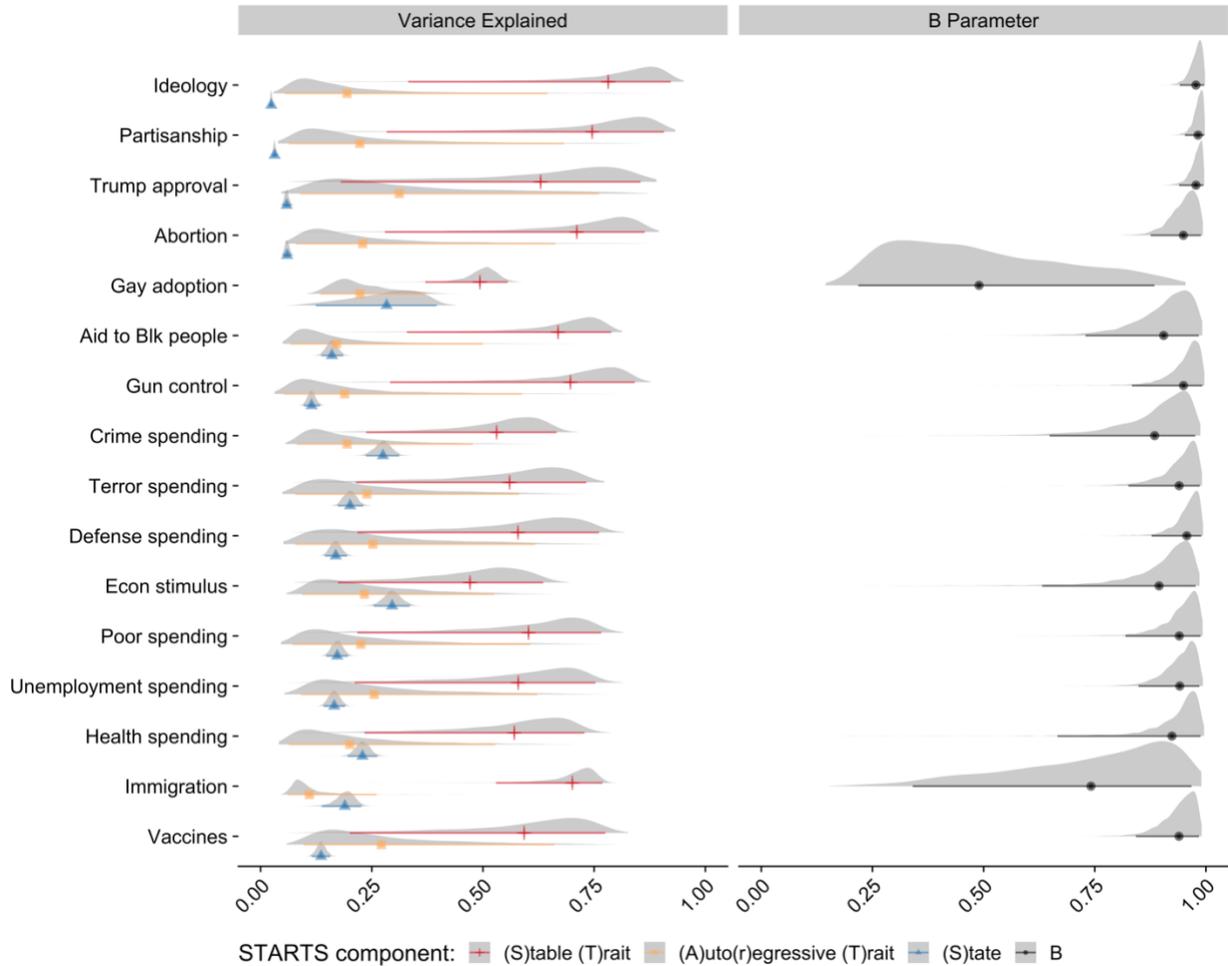


Figure 5. *STARTS* components for the first 13 waves of US1Y (6-month timespan) for the default priors. Density curves are of the posterior distribution. Error bars are 95% credibility intervals.



We first examine how much variance is accounted for by between-person processes, that is, the stable trait variance. We focus on the results using the default priors. Figure 3, Figure 4, and Figure 5 show that across all samples, the items' variance is mostly explained by the stable trait component. The estimate for the stable trait component is consistently higher than the autoregression trait or state components. There are a few exceptions in NL10Y: Three items (Inequality, D66, Partij voor de Dieren) in NL10Y have stable trait estimates lower or equal to the autoregressive trait and state estimates (see Figure 3). No items in NL6M (Figure 4) nor US1Y (Figure 5) have stable trait estimates lower or equal to the autoregressive trait and state

estimates, suggesting that stable traits account for the most variance across all items in these two samples.

Across all of the items, stable traits explained an average of 47% of the variance in NL10Y, 62% of the variance in NL6M, and 62% of the variance in US1Y (see Table 1) – indicating that a majority (or close) of the variance in these political attitudes and beliefs is due to stable traits and between-person processes. In some cases, stable traits explain as much as 78% of the variance (Ideology in US1Y, Figure 5), but in other cases stable traits explain as little as 18% of the variance (D66 in NL10Y, Figure 3). The higher stable trait variance found in the samples with the shorter time-period is to be expected because traits are less likely to change over shorter time periods. Although some of the precise estimates change with different priors, the pattern of results does not (compare Figure 3, Figure 4, and Figure 5 with Figure S1 to Figure S6). In sum, analyses indicate that stable traits typically explain the largest proportion of variance in items—affirming the importance of between person differences in ideology and beliefs and indicating that cross-sectional analyses are primarily mapping onto these processes.

Table 1. Mean, maximum, and minimum parameter estimate across items in each sample

	<i>M</i> Estimate	Max Estimate	Min Estimate
Sample: NL10Y			
(S)tate	0.20	0.33	0.13
(A)uto(r)egressive (T)rait	0.33	0.64	0.20
(S)table (T)rait	0.47	0.65	0.18
B	0.85	0.95	0.60
Sample: NL6M			
(S)tate	0.16	0.27	0.10
(A)uto(r)egressive (T)rait	0.22	0.41	0.11
(S)table (T)rait	0.62	0.75	0.41
B	0.94	0.97	0.86
Sample: US1Y			
(S)tate	0.16	0.30	0.02
(A)uto(r)egressive (T)rait	0.22	0.31	0.11

(S)table (T)rait	0.62	0.78	0.47
B	0.90	0.98	0.49

Note: Estimates are from the models using default priors

Additional variance is explained by both autoregressive trait variance and state variance. The autoregression trait variance is related to within-person changes. A high β parameter indicates how stable these changes are. We found that across all items, autoregressive trait variance explained an average of 33% of the variance in NL10Y, 22% of the variance in NL6M, and 22% of the variance in US1Y (see Table 1). In some cases, autoregressive traits explain as much as 64% of the variance (D66 in NL10Y, Figure 3) or as little as 11% of the variance (Partij voor de Dieren in NL6M, Figure 4).⁶ The β parameter indexes how stable changes due to autoregressive trait variance are. In general, changes are quite stable. The average β across items is .85 in NL10Y, .94 in NL6M, and .90 in US1Y (Table 1). Some estimates approach 1, such as party identification and ideology in US1Y (Figure 4). However, other estimates are more modest. The high average β across items indicates that the changes associated with autoregressive trait variance are stable. Even variation associated with change (autoregression trait variation) is associated with stable change.

The state variance represents wave-to-wave changes that could be due to both within-person processes and/or measurement error. Across all of the items, state variance explained an average of 20% of the variance in NL10Y, 16% of the variance in NL6M, and 16% of the variance in US1Y (see Table 1). In some cases, states explain as much as 33% of the variance

⁶ This source of variance can be affected by time varying changes in the environment, which helps to explain why some of the political parties in NL10Y, which cover a 10 year span, have higher autoregressive trait variance. For example, the D66 party rose and fell in salience across the span of the study (e.g., after an unexpectedly good showing in the 2014 municipal elections), which may have influenced people's support/opposition for the party and increased the estimate of autoregression trait variance.

(Immigration in NL10Y, Figure 2) or as little as 2% of the variance (Ideology in US1Y, Figure 4). This finding indicates that although political beliefs may be stable between person constructs, many of the items also vary to some degree within person over time. This is largely consistent with Kiley and Vaisey's (2020) findings using different methods, fewer time points, and data from the United States.

Research Question #2: Do Conclusions Differ at Different Levels of Analysis?

Analytic Approach

Now that we've confirmed that cross-sectional measures of ideological and political beliefs primarily tap into stable constructs, we next assess the similarity and differences between results obtained from the approach used by the modal cross-sectional study assessing the correlations between ideology and political beliefs compared to the results obtained from our approach aimed at isolating between-person associations from within-person associations. Given that much of the variance in ideology and political beliefs appears to be due to stable traits and longer-lasting autoregressive trait variance (due to the high β parameter), we should expect that cross-sectional correlations will be most similar to between-person correlations and that within-person correlations will be substantially different from both between-person correlations and cross-sectional correlations. We focus on comparisons of correlations estimated at the two levels of analysis because correlations are the underpinning of more advanced analyses (e.g. multiple regression, factor analysis) and have been used to estimate belief system structure (e.g., Boutyline & Vaisey, 2017; Brandt et al., 2019; Converse, 1964; Kalmoe, 2020). If we find differences in this basic statistic, it therefore follows that there will be differences with more advanced methods. We used all available data from each of the datasets for these analyses.

We constructed correlations at the between-level and the within-level using the `statsBy` function from the `psych` package (Revelle, 2020). This function decomposes an observed correlation into the pooled correlation within-persons and the correlation of the means between-persons (weighted by observations per person; see Pedazur, 1997). Conceptually, this function estimates within-person correlations for all pairs of items for each participant and then averages those within-person correlations. Similarly, this function calculates the means for each item for each person and then calculates the correlations between those means. To compare these correlations with the typical cross-sectional correlations, we calculated the correlation between all pairs of items at each wave and then averaged these cross-sectional correlations. Notably, the within-person, between-person, and cross-sectional correlations are all estimated using the same participants who completed the same survey conducted at the same time. This means that the only difference between the correlations is what they are estimating and not other aspects of the design.

Results

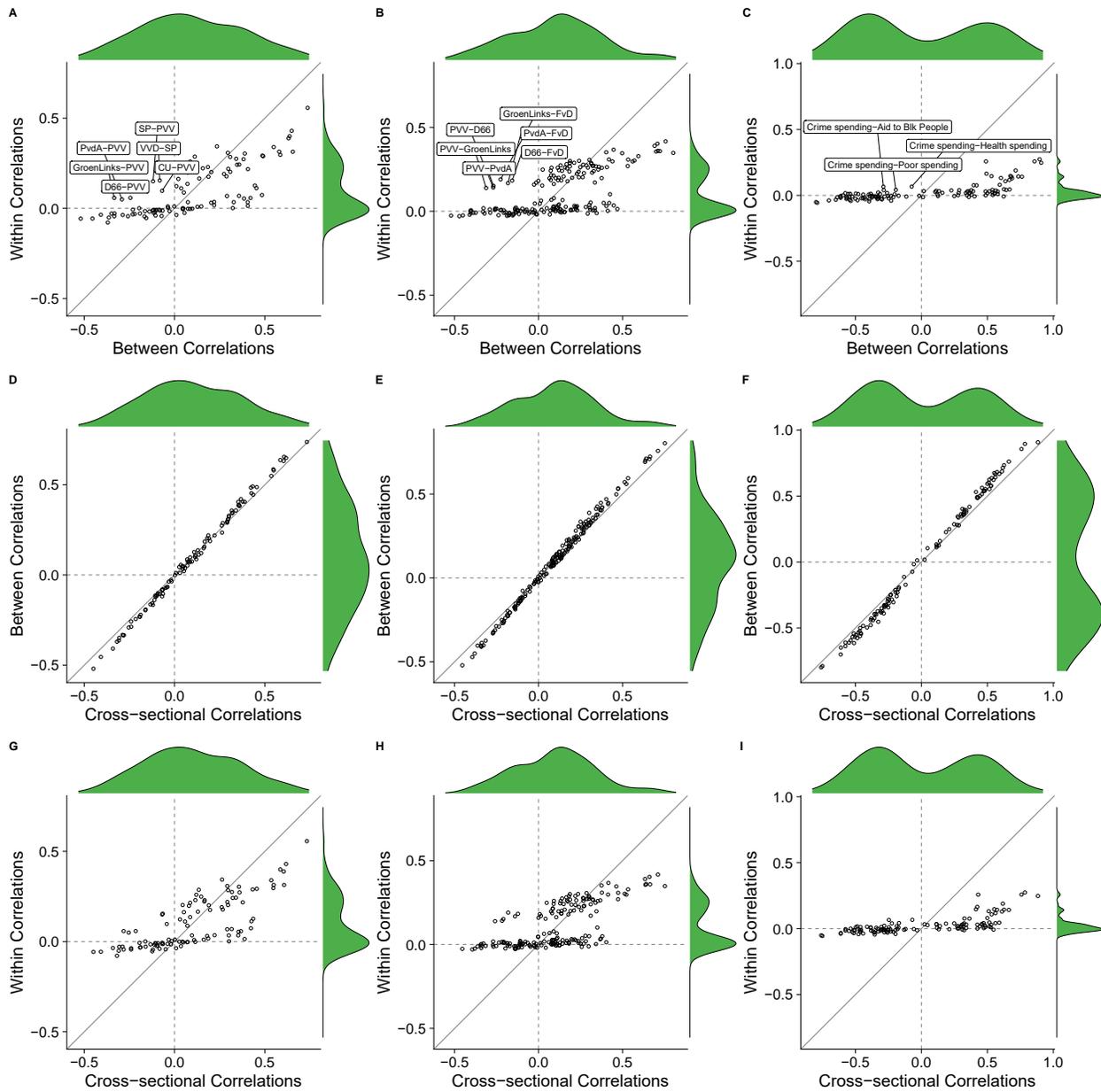
Comparing Between-Person and Within-Person Correlations

The comparison of the correlations estimated between-person and within-person can be found in Figure 6 for all three samples (between-person and within-person correlation matrices are in Table S6 to Table S11). In panels A, B, and C of the figure (top-row), the x-axis represents the between-person correlation and the y-axis represents the within-person correlation. Each dot in each panel is a separate correlation between two items in each of our three surveys. The distribution of correlations is shown with density plots on the top and right-side of each panel. Although some correlations are similar at both the within-subject and between-subject level of analysis (i.e. those falling near the diagonal), other differences are quite substantial. In all three

samples, the absolute value of the correlations were larger when estimated between-persons (NL10Y M = .24, NL10Y SD = .18, NL6M M = .24, NL6M SD = .17, US1Y M = .45, US1Y SD = .19) than when estimated within-persons (NL10Y M = .12, NL10Y SD = .12, NL6M M = .11, NL6M SD = .12, US1Y M = .04, US1Y SD = .06), NL10Y $t(104) = 8.37, p < .001$; NL6M $t(189) = 10.34, p < .001$; US1Y $t(119) = 20.64, p < .001$.⁷

Figure 6. Comparison between between-person correlation and within-person correlations (top row), cross-sectional correlations and between-person correlations (middle row), and cross-sectional correlations and within-person correlations (bottom row) for NL10Y (first column), NL6M (second column), and US1Y (third column).

⁷ Correlations were transformed using Fisher Z's prior to t-tests.



A related issue that can arise when moving from between-person to within-person correlations is that the direction of the estimates differ at different levels of analysis. Although a majority of the correlations are in the same direction at both levels of analysis (see top right and bottom left quadrants in Figure 6; same direction n NL10Y = 87, NL6M = 148, US1Y = 97), a nontrivial amount differ in direction in each sample (opposite direction n NL10Y = 18, NL6M =

42, US1Y = 23). In each panel, a few of these opposite direction correlations are labeled. In both of the datasets from the Netherlands, we see that support for several parties are typically negative correlated when assessed between-person and are positively correlated when assessed within-person. In US1Y, we see that spending on crime is negatively correlated with items assessing aid for Black people, healthcare spending, or aid to the poor when assessed at the between-person level, but spending on crime is positively related to these three issues when assessed within-person. These US1Y “opposite direction associations” show the typical “conservative policies are correlated with conservative policies” that one comes to expect when analyzing public opinion data using typical methods. However, within-persons we find that support for a conservative policy (spending on crime) is positively correlated with three different liberal policies.

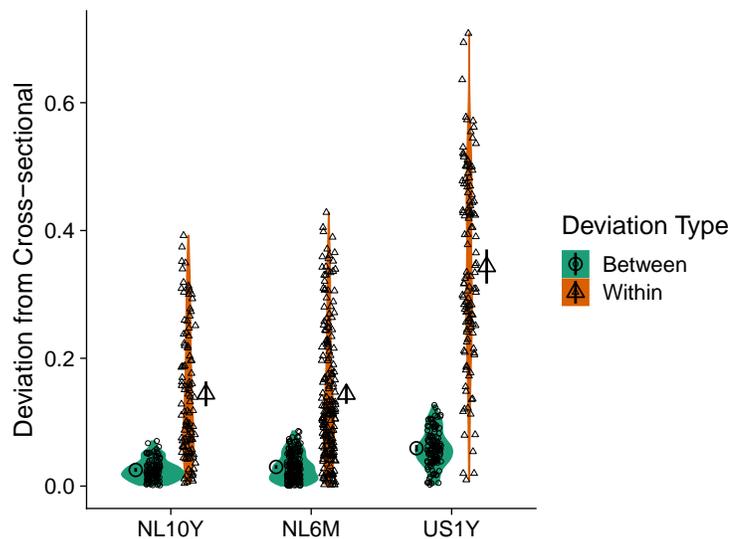
We find that the conclusions drawn from a between-person analysis differ from the conclusions drawn from a within-person analysis. Although these analyses are not particularly complicated, correlations are the foundations of higher level statistics (e.g., factor analysis). These differences between levels of analysis will thus result in differences in more complicated analyses. Taken together, our analyses indicate that between-person analyses are not a substitute for within-person analyses when studying political attitudes and beliefs.

Comparing Cross-Sectional Correlations to Between-Person and Within-Person Correlations

Given that much of the literature focuses on cross-sectional correlations, a related question is how well cross-sectional correlations of these same items map onto the between-person and within-person correlations? The STARTS models estimated above showed that a majority of the variance in the items were due to stable traits, which means that between-person correlations will be most similar to cross-sectional correlations. We plot the association between

cross-sectional correlations (x-axis) and between-person correlations (y-axis) in panels D, E, and F of Figure 6. We similarly plot the association between cross-sectional correlations (x-axis) and within-person correlations (y-axis) in panels G, H, and I of Figure 6. As is evident, the cross-sectional associations are more similar to the between-person correlations than the within-person correlations. This is further confirmed when we compare the size of the absolute deviations from the cross-sectional correlations in Figure 7. In all three surveys, within-person correlations were significantly more deviant from cross-sectional correlations than the between-person correlations, NL10Y $t(104) = 13.05, p < .001$; NL6M $t(189) = 16.84, p < .001$; US1Y $t(119) = 20.46, p < .001$. In short, between-person correlations are different from within-person correlations and cross-sectional correlations are most similar to between-person correlations. An important implication of this finding is that cross-sectional correlations that make up the modal study in political psychology and the study of ideology cannot assess ideology as an individual level construct.

Figure 7. Absolute difference between cross-sectional correlation and either between-person (circles) or within-person (triangles) correlations. Each of the small shapes indicates a different pair of items. The green and orange density plots represent the distribution. The larger shapes on the outside of the density plots are the estimated means and 95% confidence intervals. Note that some of the confidence intervals are smaller than the shapes.



General Discussion

Political attitudes and beliefs are typically conceptualized as individual-level phenomenon, but many of the methods used to study political attitudes and beliefs, including their structure, rely on cross-sectional studies. This is a problem for the study of political attitudes and beliefs because cross-sectional analyses – in our case correlations – contain an unobserved mixture of between-person and within-person variance. To get a sense of what type of variance is likely to be captured in cross-sectional analyses, we use STARTS models (Kenny & Zautra, 1995; Lüdtke et al., 2018). Our findings showed that variance in measures of ideology and political beliefs were primarily due to stable trait and stable autoregressive trait variance (see also Kiley & Vaisey, 2020). Consistent with this finding, when we compare cross-sectional, within-person, and between-person correlations we found that cross-sectional correlations are most similar to between-person correlations, whereas both between-person and cross-sectional correlations are substantially different from within-person correlations. If political attitudes and beliefs are individual-level phenomenon as theorized (Brandt & Sleegers, 2021; Homer-Dixon et al., 2013; Morgan & Wisneski, 2017), the takeaway from our work here is that the methods do not always match the theory. Although cross-sectional designs and between-person analyses help us understand differences between people (how people differ from one another), they do not help us understand fundamentally important phenomena – such as the structure of ideology within people.

The idea that the conclusions and estimates of between-person analyses do not always (or even mostly) map onto the conclusions and estimates of within-person analyses has been made before (e.g., Fisher et al., 2018; Masselink et al., 2018; Molennar, 2004; Nelemans et al., 2020)

and likely applies to a variety of psychological constructs. The importance of this insight, however, has not diffused to the study of political ideology and beliefs in specific, nor to the field of social and political psychology more generally. Correlations, a basic statistic, were different when calculated with between-person compared to within-person analyses. These differences were substantial despite the fact that both analyses included the same people completing the same questionnaire. That is, these differences are due to fundamental differences between levels of analysis and not to differences in the composition of our samples, nor the method of administering the questionnaire. These findings showed that although many of the items were correlated as would be expected from past work when using between-person and cross-sectional analyses, the size and sometimes the direction of the correlations were different when using within-person analyses. These findings suggest that typical studies of belief system structure that use cross-sectional correlations (e.g., as the basis of factor analysis, partial correlations, e.g., Ashton et al., 2005; Boutyline & Vaisey, 2017; Brandt et al., 2019; Converse, 1964; Kalmoe, 2020) will not represent belief system structure at the within-person level. Thus, work that has focused on cross-sectional analyses shed only limited light on the psychology of *individuals'* belief systems and key questions about the structure of belief systems have gone unanswered.

Empirical Implications & Future Directions

Although our paper documents problems with the modal study, we want our paper to be a call to action! Cross-sectional analyses do not fully capture a theoretical level of analysis in which social and political psychologists are deeply interested. These analyses do not help us fully answer the questions like how do belief systems and ideology operate for individual persons. The solution to this problem is to design, fund, and publish studies that address within-

person processes. For example, this might include intensive-longitudinal studies that probe people's political attitudes and psychological states many different times to allow conclusions based on the within-person level of analysis. These types of studies have been used to assess the within person dynamics of other psychological constructs, such as personality (Beck & Jackson, 2020; Fleeson, 2001), and may find a use in political psychology too. Perhaps assessments at higher frequencies than those we used or items that asked about "In the past hour..." or "In the past week, how well does 'liberal' describe you" (adapted from Fleeson's, 2001 measures of state personality) would generate more within-person variation. Less intensive designs, such as longitudinal studies with 3 or more waves, can be sufficient for estimating average within-person associations (see Osborne & Sibley, 2020 for an example; see Usami, Murayama, & Hamaker, 2019 for possible models; see Zmigrod, in press for related suggestions about longitudinal models for the study of ideology).

Other methods are also possible. For example, well designed experiments can speak to within-person processes. Although not immediately obvious, between-subject experiments tap into (average) within-person processes because the randomization helps answer the counterfactual question of what would happen to Person A if Person A was in Condition 1 instead of Condition 2. Within-subject political psychology experiments can further take advantage of recent advances in the modeling of such studies to help understand the extent of within-subject variation and the predictors of that variation (Bolger et al. 2019; Whitset & Shoda, 2014). Other methods less often used in political or social psychology, such as N = 1 longitudinal studies, may also hold promise for unlocking the within-person side of political attitudes and beliefs.

Notably, the measures we assessed were relatively stable and there was a relatively close correspondence between the cross-sectional correlations and the between-person correlations. This is useful information because it suggests that the one-item measures we use have relatively good reliability (i.e. they are stable overtime). It is also useful information because cross-sectional correlations between political attitudes are not entirely ambiguous. It could be the case that it is a mix of within-person and between-person associations to such an extent that any cross-sectional correlation was near uninterpretable. Instead, we find that they are likely to correspond with between-person correlations. This is a problem for making inferences about belief system structure and other within-person processes, but it is much less of a problem for making inferences about between-person processes. The action item for scholars of ideology and political beliefs is to be clear what level of analysis their theory and empirical findings are expected to apply to. If the theory is about between-person processes, cross-sectional correlations may be useful approximations in the domain of political attitudes.

Theoretical Implications and Future Directions

Existing work suggests that political ideology and beliefs are relatively stable (Kiley & Vaisey, 2020), implying that there is relatively little wholesale change in beliefs (especially for adults; see also Rekker et al., 2015). We also find that political ideology and beliefs are relatively stable. Notably, whether the studies covered 6 months or 10 years, there was substantial stability. Nonetheless, there were changes across time. Some of this change was stable change; for example, our estimates of autoregressive trait variation indicated that changes in belief systems over time were stable (i.e. the change persists as indicated by the B parameter). Some of the change, however, was less stable. Our estimates yielded meaningful state variation, that is, changes from time point to time point. This reflects both genuine fluctuations, but also

measurement error. A clear direction for future theoretical and empirical work is to identify those social and psychological factors that contribute to the long term stability, as well as the changes in political ideology and beliefs over time. For example, it seems plausible that relatively stable life circumstances (e.g., SES) and biological factors (e.g., genetics) likely contribute to the stability of political ideology and beliefs. It is less clear which factors contribute to short term changes and how we can determine what types of factors merely lead to short term changes and those that will lead to longer term changes.

Our work also showed that there are clear differences in correlations estimated between-participants and those estimated within-participants. Prior work has used correlations and partial correlations of cross-sectional data to make inferences about the structure of people's belief systems (Boutyline & Vaisey, 2017; Brandt et al., 2019; Kalmoe, 2020). Our analyses show that this prior work is fundamentally limited because it cannot accurately assess the links between the various beliefs in people's belief systems. Consider people's ideological identification, a measure that has been identified as particularly central to the belief system in the United States (Boutyline & Vaisey, 2017). The between-person correlations (those most similar to the prior research) between ideological identification and the other measures in US1Y range from $|.279|$ to $|.908|$ with an average $|r|$ of $.575$. The within-person correlations, however tell a different story. The within-person correlations between ideological identification and the other measures in US1Y range from $|.000|$ to $|.248|$ with an average $|r|$ of $.040$. Moreover, the within-person correlations we report are the average across participants; there is additional variation in the size of these correlations between people (i.e. see analysis in supplemental materials). Theories and methods that take this idiographic variation in belief system structure are necessary for our theories of political ideology and belief systems in general.

Strength and Limitations

Our study made use of longitudinal data from multiple countries that is more extensive than typical data used to study these issues. Although our data from the United States used an opt-in internet sample which is not representative of any population (see Kalmoe, 2020), our data from the Netherlands were representative samples. Similarly, although our data covered a range of time frames, from two weeks between surveys to one year between surveys, the precise time frames necessary to detect different types of changes in political ideology and beliefs may be different. For example, if there are brief, but meaningful, changes in political ideology from moment to moment, our data would not be able to pick this up. Similarly, if the most substantial changes in political beliefs occurs for people who are not yet adults or over timeframes longer than a decade, our models would not detect these changes.

A big picture contribution of our research is that it can also help us think about the ways that we study other psychological constructs. These insights are not just applicable to ideology. Our findings suggest that we must take care whenever we use cross-sectional and between-person methods to avoid making within-person claims. This is not only a vitally important insight when studying political belief systems, but is important to a variety of other psychological variables in which people may be tempted to treat between-person differences as evidence for individual-level processes.

Conclusions

People's political ideologies and beliefs operate at the individual level, but are typically studied at the aggregate level. Our analyses show that measures of ideology and political beliefs are relatively stable, which leads cross-sectional analyses to better approximate between-person associations than within-person associations. This is not a problem when describing differences

between people, but is when it comes to describing ideology at the individual level: ideology and political belief systems are, after all, individual-level constructs. We suggest that the field needs to study how ideology and political beliefs work within people in addition to studying how ideology and political beliefs vary between people. Without addressing individuals' ideology and political beliefs, we miss and will continue to miss an important part of our psychological experience of our political world.

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