Spillover effects across values*

Fabien Petit†[1]

[1]University of Sussex, SPRU

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Abstract

This paper argues that a change in a singular value, such as *conservatism*, leads to changes in other values, such as *individualism*. The agent identifies with a social group based on shared values. Whenever an event occurs in her life, bringing new information, this may change one of her values. When this change occurs in a value central to her social identity, her values are no longer consistent with those of the group. As a result, she identifies with a new group and changes all her values to align with those of the new group, including those initially unaffected by the change. By changing values initially unaffected, life events generate spillover effects across values. Using cohort data, I show that these spillover effects account for a third of value changes when life-changing events, such as parenthood, sickness and unemployment, occur.

Keywords: Values dynamics; Social identity; Cognitive dissonance; Spillover effects.

JEL Classification: A13, D63, D91, Z10.

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†Email: fabien.petit@sussex.ac.uk. Website: fabienpetit.com.

1 Introduction

Values, such as conservatism and individualism, are beliefs about what is important to individuals.[1] Social identity, which is the self-perception of being a member of a social group, is shaped by individuals' values that are shared with those of the group.[2] Understanding the joint dynamics of values and social identity is key to social sciences since they characterize the economic and political preferences which are at the root of individuals' decisions, such as consumption, labor supply or voting.[3]

This paper argues that a change in a singular value, such as *conservatism*, leads to changes in other values, such as *individualism*. Individuals, being inherently social, identify with groups based on shared values within groups. Whenever a life event occurs, it brings new information that can generate a shock to a particular value, say conservatism. This shock may prompt the agent to identify with a new group, as the shocked value becomes too distant from that of her previous group. Once identifying with that new group, the agent aims to be consistent with the other group's values (e.g. individualism), thus, she changes all her values toward those of that new group. Although the latter values were not initially subject to the shock, they changed owing to the existence of spillover effects across values. These spillover effects stem from the agent's aspiration to uphold consistency with the values held by the group to which they now belong.

Based on social psychology, I develop a model where the dynamics of values are disciplined by two anchoring forces: *time consistency* and *group consistency*. The former indicates that one prefers her today's values to be close to her yesterday's values, that is, that values be consistent over time. This induces rigidity shaping how values adjust over time. The latter relates to the proximity of values held within the group with which the agent identifies, hence, one prefers values to be consistent with those of her group. Both consistencies are based on the concept of cognitive dissonance introduced by Festinger (1957) as individuals seek to avoid the psychological burden of having values that are dissonant with either their past self or their group.

I start by presenting a benchmark model in which there is only one value, say conservatism versus progressivism, and two groups composed of, on the one hand, *rightists*, and on the other, *leftists*; where the former is more conservative than the latter.

[1] Values differ from personality traits. Personality traits describe how individuals behave across time and situations, while values refer to what they consider important. See Schwartz (2012) for a discussion on how values relate to attitudes, beliefs, traits, and norms.

[2] See Hogg (2012) for a review of the social identity theory.

[3] See Khamis et al. (2012) for the role of social identity in explaining consumption behavior; see Oh (2021) for the link between identity and labor supply decision; and Greene (1999), Greene (2004), Ben-Bassat and Dahan (2012) for the role of social identity in explaining voting behavior.

When the agent's identity is exogenous and the agent cannot identify with another group, the agent converges toward the average value of her group. The speed of convergence depends positively on the relative weight of the group consistency (with respect to the time consistency). The more costly for the agent to hold values that are different from those of the group, the faster the convergence.

With endogenous identity, meaning that the agent can choose her identity, she identifies with the group that is the closest to her value on the one-dimensional space. The frontier between identifying with one group or the other is determined by the midpoint of the distance between both groups, that is, the value for which the agent is indifferent between both groups. In the absence of shock, she converges toward the average value of the closest group.

Some life-changing events can change an agent's identity. A life-changing event is a shock that brings new information (Levitt et al. 2004). Depending on the direction of the shock, it can drive the agent's conservatism beyond the midpoint of the distance. Thus, the agent now prefers to identify with the other group. For instance, suppose an agent with progressive values who identify with leftists. This agent has a girl as a first child—this is a life-changing event that I use later in the empirical analysis. Provided that this information shock is sufficiently large, her progressivism turns into conservatism meaning that her value goes beyond the midpoint. As a result, the agent now identifies with rightists and will converge toward the average conservatism within the latter group.

I extend the model by adding a second value, say individualism versus collectivism, with still two groups composed of rightists and leftists; where the former is more individualist than the latter.[4] Suppose the same agent with progressive and also collectivist values who identify with leftists. This agent experiences the same life-changing event as before (i.e. having a girl as her first child) which generates an information shock that increases her conservatism, however, leaving unaffected her collectivism. Provided that the information shock is sufficiently large, she now identifies with rightists. Yet, she will also change her collectivism into individualism to be consistent with the values of her new group. That is the spillover effect across values.

To test the existence of spillover effects, I use data from two British cohort studies for which I can measure their values and observe their political voting behavior in their twenties, thirties, forties and fifties.[5] In addition, these data also provide a full history from which

[4]The intensity of the inter-dependence between values is exogenous to the agent and reflects the mapping of values in the society; see Roccas and Sagiv (2010) for the importance of the cultural context.

[5]The National Child Development Study (NCDS58) is a cohort of individuals born in England, Scotland and Wales during the same week in March 1958; the British Cohort Study (BCS70) is composed of those born during the same week in April 1970. These cohort data have been extensively used in income and social mobility-related work in Economics and Sociology; see, for instance, Blanden et al. (2007), Goldthorpe and Jackson (2007), García-Peñalosa et al. (2023), among others.

life-changing events can be considered as information shock on values.

Measuring the values of individuals is challenging. Using a principal component analysis, I show that the variation in the answers to a large set of statements about attitudes can be summarized by two dimensions: *conservatism* versus *progressivism*, and *collectivism* versus *individualism*.[6]

I use the political vote of individuals at the General Election to proxy their social identity. The mapping of the average voters is consistent with the two-dimensional value space across cohorts and periods. For instance, voters of the Conservative Party tend to hold more conservative and individualist values, whereas Labour Party voters hold more progressive and collectivist values.

I consider three life-changing events as information shocks on values: i) to have a girl as a first child (conditional on having a baby, hence, instead of a boy), ii) to have ever had cancer, and iii) to have ever been unemployed. I use the two first life events in my instrumental variable (IV) setting to show the existence of spillover effects, while the third one provides some insights into how values and social identity correlate with the experience of unemployment in the empirical framework.[7]

I provide empirical evidence of the existence of spillover effects using an IV setting. In this setting, I assume that both life events bring no information shock on collectivism but only on conservatism.[8] I proceed in two steps.

First, I show that individuals who become more conservative because of an exogenous life-changing event also become more individualist. I estimate the relationship using a 2SLS approach. In the first stage, I predict conservatism based on whether the life event occurred or not, conditional on the level of conservatism in the previous period, as well as gender, education, with cohort and period fixed effects. In the second stage, I regress collectivism on the predicted conservatism, conditional on the level of collectivism in the previous period, and the same set of control variables.

Second, I show that the change in values (due to both exogenous life-changing events) also translates into a change in political voting behavior in the next General Election, thus,

[6]These two dimensions coincide with the motivational types of values introduced by Schwartz (1992, 2012). In Schwartz's terms, the first dimension captures conservation versus openness to change, that is, the preference for stability, security, tradition, and conformity versus the openness to new experiences related to self-direction and stimulation; while the second dimension reflects self-transcendence versus self-enhancement, that is, values associated to care for and concern about others such as universalism and benevolence versus the self-interest and ambition linked to achievement and power.

[7]Both first ones are exogenous, meaning that individuals' values do not affect their likelihood to occur, and non-reversible, meaning that one cannot reverse the life event once it has occurred. The third one, to have ever been unemployed, is likely to be endogenous to values.

[8]Since this assumption may be violated for many life events, I consider another setting with a weaker assumption later in the paper.

showing the relevance of the social identity mechanism as affected individuals identify with a new group. I estimate the probability to vote for one party or another following the change in conservatism that is due to life-changing events. I use the predicted conservatism, obtained from the first-stage regression, in a multinomial logistic regression where the outcome variable is the vote at the next General Election, conditional on the vote at the previous election and the same set of control variables.

I then turn to a Simultaneous Equations Model (SEM) which provides less restrictive assumptions for identification. In this setting, both values are jointly determined and also determined by their own previous values. The identification assumption is that one value is not directly affected by the lag of the other value, which is less restrictive and consistent with the theoretical framework. Based on the SEM, I can estimate and decompose the change in values due to the information shock (direct effect) and the change owing to spillover effects across values (indirect effect).

This paper provides three results that are specific to life-changing events. First, having a girl (instead of a boy) as a first child increases conservatism while leaving collectivism unchanged. Political voting behavior also changes consistently as those who experience this life-changing event tend to be more likely to vote for right-wing (e.g. Conservative Party) instead of left-wing political parties (e.g. Labour Party or Green Party) during the following General Elections. The effect goes in the same direction for mothers and fathers, although more pronounced for mothers. Looking at the heterogeneity by the level of education reveals that tertiary-educated parents who have a girl as their first child become more progressive. This indicates that they want more gender equality for their daughters compared to primary- and secondary-educated parents who become more conservative as they value more authority in society since they are worried about their daughters being more exposed.

Second, having ever had cancer increases both conservatism and collectivism and increases the probability to vote for right-wing (e.g. Conservative Party or UKIP) versus left-wing political parties (e.g. Labour Party or Green Party) during the following General Elections. As one expects to rely more on others either financially or socially, they become more social focus meaning that they increase their values in preferring to live within a community and reinforcing the stability, tradition, and conformity to that community.

Third, to have ever been unemployed is associated with higher progressivism and collectivism. Although I cannot estimate the causal effect of experiencing on values, I quantify the magnitude of the bias that would be introduced by the endogeneity of values. This bias can reduce the magnitude, however, not the direction of the change. By splitting according to the current employment status (either currently employed or unemployed), I find no differences which indicate that this life-changing event has a permanent effect on values.

This paper yields two main general results that relate to the dynamics of values. On the one hand, I show that spillover effects across values do exist and that life-changing events affect all values at the same time because of them. Whenever a life-changing event generates an information shock that is sufficiently large, such as those mentioned above, it may change the positioning of the agent about this singular value. When this latter value is important enough to the social identity of the agent, the agent may identify with a new group and therefore change all other values toward those of that new group.

On the other hand, I show that spillover effects are non-reciprocal, meaning that, for instance, an increase in conservatism generates a *negative* spillover effect on collectivism; but an increase in collectivism generates a *positive* spillover effect on conservatism. I also show that this spiral pattern in the dynamics between values can be rationalized by the dynamic underpinnings of value changes from the social psychology literature (Schwartz 2012). Therefore, identifying which value is directly affected by life-changing events is key to understanding the direction of these spillovers.

This paper is the first to show the existence of spillover effects across values by considering the multi-dimensionality of values that characterizes social identity as a cluster of values. Prior work analyses the dynamics of values but focuses on the evolution of a single value (Piketty 1995, Mayda 2006, Fernández 2007, Alesina et al. 2018, i.a.). I contribute to this literature by showing that neglecting the inter-dependence between values—i.e. assuming that values are independent—underestimates to which extent life experiences affect individuals because this omits the role of social identity, hence, the spillover effects.

This paper adds to the literature on the formation and dynamics of values. Prior work highlights several mechanisms such as the inter-generational transmission (Bisin and Verdier 2001, 2011, Montgomery 2010, Hiller and Baudin 2016, Alan et al. 2017, i.a.) along with the role of cultural values (Ichino and Maggi 2000, Fernández et al. 2004, Guiso et al. 2006, Fernández 2007, Giuliano 2007, Chen 2013, Alesina and Giuliano 2014) and norms (Fehr and Falk 2002, Bardi and Schwartz 2003, Tabellini 2008) to explain how people form their values. Recent work focuses on the development of values during childhood (Fehr et al. 2013, Doepke and Zilibotti 2017, Bašić et al. 2020). I contribute to this literature by providing an additional mechanism based on cognitive dissonance and endogenous social identity.

My work is also related to the literature on the consequences of cognitive dissonance in economics (Akerlof and Dickens 1982, Konow 2000, Bénabou and Tirole 2006). Prior work uses the concept of cognitive dissonance—introduced by Festinger (1957) and McGuire (1960)—to explain the belief-behavior relationship. I, instead, consider its effects on the between-values relationship; either to avoid dissonance with the previous self (Eyster 2002, Yariv 2002) or to avoid dissonance with the values of the group.

My approach is also inspired by the literature on identity in economics (Akerlof and Kranton 2005, 2010, Bénabou and Tirole 2011, Kranton 2016). Prior work shows the effect of group membership on individual behavior (Charness et al. 2007, Sutter 2009). I link changes in values, hence spillover effects, to changes in endogenous social identity. Thus, individuals decide with which group they prefer to identify by comparing their values with the ones held in these groups. In the empirical part, I build my identification strategy of changes in social identity using political identity (Greene (1999), Greene (2004), Shayo 2009, Bonomi et al. 2021).

My work also builds an additional bridge between the social psychology literature and that in economics. Psychological determinants of economic behaviors have been mostly introduced through personality traits (Borghans et al. 2008, Almlund et al. 2011, Ferguson et al. 2011, Becker et al. 2012, Flinn et al. 2018, Todd and Zhang 2020). The *big-five* personality traits are quite stable over the lifecycle and therefore can hardly explain changes in individuals' decision-making process (Terracciano et al. 2006, 2010, Cobb-Clark and Schurer 2012). Thus, I introduce motivational types of values *à la* Schwartz (1992, 2012) as novel determinants of economic behaviors, which are more volatile than personality traits because of the impact of life experiences (Lönnqvist et al. 2011, Daniel et al. 2021). Yet, personality traits and values are related as they look at the same object, individuals, from different perspectives which are therefore complementary (Caprara et al. 2009, Fischer and Boer 2015, Parks-Leduc et al. 2015).

Lastly, my results on the consequences of life-changing events relate to three additional literatures. First, to the literature on the impact of children's gender on their parents' views. Washington (2008) finds that congressmen become more progressive in their voting after having a daughter. I, instead, find that having a girl as a first child makes parents more conservative. I show that both results can be reconciled as I find that tertiary-educated parents become indeed more progressive after having a girl. This suggests that Washington (2008) captures the effect of having a daughter at the top of the distribution since congressmen tend to be highly educated; whereas I capture the average effect. Grinza et al. (2017) argue that, when entering into parenthood, women shift toward more conservative views.[9] I provide additional evidence to this literature by showing that the effect is all the more important when they have a daughter and that changes in values are larger for mothers than for fathers.

Second, my work also relates to the literature on the impact of cancer on employment. Peteet (2000) discusses the relationship between cancer and the meaning of work, in a context

[9]Similarly, Bolzendahl and Myers (2004) and Cunningham et al. (2005) find that entry into parenthood reduces the support for egalitarian roles for women and men in families.

where the loss of occupational identity becomes a source of anxiety and depression. Moran et al. (2011) show that cancer survivors have lower employment rates and work fewer hours than other similarly aged adults which can be due to consequences on life purpose and limitations in the ability to work (Short et al. 2005, 2008a,b, Bradley et al. 2002, 2005, i.a.). I add to this literature by providing an underlying mechanism through which cancer has consequences for employment, hence, through changes in values.

Third, my results relate to the literature on unemployment scarring as they open another potential explanation for this phenomenon. Unemployment is known to have consequences on well-being and health (Clark and Oswald 1994, Knabe et al. 2010, Nordt et al. 2015). Scarring emphasizes the depreciation of human capital and firm-specific skills as the main driver of future employment (Arulampalam et al. 2001, Clark et al. 2001, Gregg and Tominey 2005). I show that having ever been unemployed decreases individualism, thus, if the likelihood to find a job is an increasing function of individualist values, then my framework would provide a novel mechanism in which past unemployment could affect future employment through changes in values.

The remainder of the paper proceeds as follows. Section 2 presents the theoretical framework and emphasizes the role of consistency in explaining the dynamics of values and the existence of spillover effects. Section 3 describes the cohort data, derives values from attitudes, shows the mapping of political parties on the two-dimensional value space, and presents the life events that are used as information shocks in the empirical part. Section 4 shows the presence of spillover effects using instrumental variable regressions. Section 5 presents the simultaneous equations model to identify spillover effects when the information shock affects both values simultaneously, and then discusses the dynamics between values in light of the social psychology literature. Section 6 concludes.

2 Theoretical framework

In this section, I develop a model to illustrate the role of dependent values when looking at the trade-off between time consistency and group consistency. I proceed in two steps. First, I describe a model in which there is a single value and show the consequences of an information shock which is the result of a life-changing event. Then, I extend the model to two values that are correlated across groups. I discuss the differences with respect to the single-value model. Lastly, I state the predictions of the model.

2.1 Single-value model

Consider an agent represented by one value, say conservatism versus progressivism. Let $a_t \in \mathbb{R}$ be the degree of conservatism of the agent at time t. By convention, we set the average in the reference population to zero, that is, the norm.[10] Thus, $a_t > 0$ (< 0) means that the agent has more conservative (progressive) values.

The agent identifies with a social group $s \in \{1, 2\}$ composed of either conservatists (i.e. $s = 1$) or progressivists (i.e. $s = 2$).[11] The average conservatism in both groups are, respectively, $\bar{a}_1 < 0$ and $\bar{a}_2 > 0$. I assume the population is sufficiently large to ensure the *anonymity* of the agent, meaning that any change in the agent's conservatism does not change $\bar{a}_1 < 0$ nor $\bar{a}_2 > 0$.

In any period t, the agent solves the following maximization program in order to determine her conservatism and social identity:

$$\max_{a_t, s_t} U_t(a_t, s_t) = -\eta_a \frac{[a_t - a_{t-1}]^2}{2} - \phi_a \frac{[a_t - \bar{a}(s_t)]^2}{2}, \tag{1}$$

where $\bar{a}(s_t) = \{\bar{a}_1, \bar{a}_2\}$ is the average value a within her group and $(\eta_a, \phi_a) \in (\mathbb{R}^\star_+)^2$ are parameters that account for the relative importance of the time and group consistency.[12]

The agent seeks to minimize two psychological costs, namely, the *time inconsistency* and the *group dissonance*. The former psychological cost means that the agent prefers when her today's value is consistent with her yesterday's value.[13] The latter psychological cost suggests that the agent prefers to hold a value close to the norm of the group with which she identifies.[14]

The optimal conservatism (given the social identity) satisfies both the time and group consistencies, hence, it is equal to the weighted average between the agent's conservatism

[10] The reference population can be defined at several levels such as the city, the region, the country, or more broadly, the shared culture. See Roccas and Sagiv (2010) for the importance of the cultural context in the value-behavior relation. See, also, Bisin and Verdier (2011) for a survey on the economics of cultural transmission and Rapport (2014) for a survey on cultural heterogeneity in cultural anthropology.

[11] Although I only consider two social groups, the model can be extended to n groups; see Appendix A for more details on the extension with more than two groups.

[12] These parameters are assumed to be homogeneous within the population, although they might differ across groups of individuals. More extensively, the emergence of heterogeneity in the relative importance of each component would be an interesting point that I leave for future research.

[13] The literature on social psychology shows that individuals tend to resist changing their attitudes, beliefs, and values through mental processes such as cognitive inertia, or belief perseverance, providing empirical evidence of such a component in agent's utility; see Kunda (1990) for a review of biased information processing through which people maintain their beliefs.

[14] The consistency with the group—to avoid group dissonance—refers to the concept of conformity warp in the social economics literature, meaning that individuals are warped away from their optimal behavior because they have to conform to the norm; see Burke and Peyton Young (2011) for a survey on the role of social norms and individual behaviors in the presence of norms.

in the previous period and the average conservatism in her group. It corresponds to the first-order condition that solves the maximization program (1), namely,

$$a_t(s_t) = \frac{\eta_a a_{t-1} + \phi_a \bar{a}(s_t)}{\eta_a + \phi_a}. \tag{2}$$

Thus, her optimal conservatism depends on the group to which the agent decides to identify.

Suppose that identity is exogenous and that the agent cannot identify with another group. Let her initial conservatism be a_0 and the average conservatism in her group be $\bar{a}$. The dynamics of the agent's conservatism a_t is derived from Equation (2) and corresponds to

$$a_t = \bar{a} + \left(\frac{\eta_a}{\eta_a + \phi_a}\right)^t (a_0 - \bar{a}). \tag{3}$$

It is straightforward to show that she converges toward the average of the group, i.e. $\lim_{t\to+\infty} a_t = \bar{a}$, at a rate of convergence

$$\mu \equiv \lim_{t\to+\infty} \frac{|a_{t+1} - \bar{a}|}{|a_t - \bar{a}|} = \frac{\eta_a}{\eta_a + \phi_a} < 1.$$

Thus, leading to Proposition 1. Proof in Appendix A.

Proposition 1 (Value convergence) *For any individual in group s, $\lim_{t\to+\infty} a_t = \bar{a}(s)$ and the speed of convergence depends positively on the relative weight of the group consistency (with respect to the time consistency), i.e. $\partial\mu/\partial(\phi_a/\eta_a) > 0$.*

Let us allow the agent to freely choose her identity.[15] She compares both indirect utilities to determine which group she prefers. The agent weakly prefers her group to the other as long as her indirect utility in this group is greater or equal to the one she would get in the other. Using the utility function from the maximization problem defined in Equation (1) along with the optimal conservatism from Equation (2), I obtain

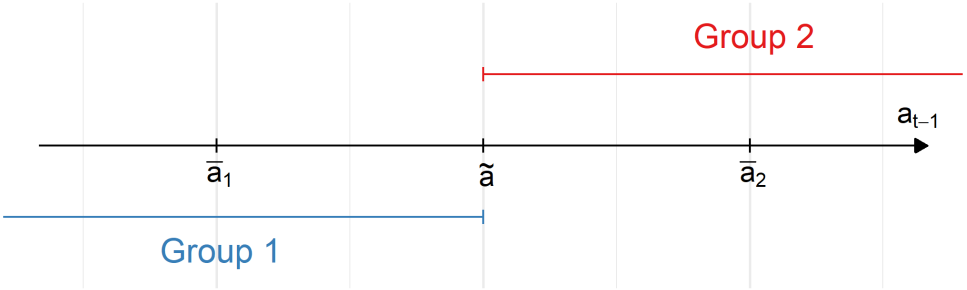
$$U_t(2) - U_t(1) = -\gamma_a \left([\bar{a}_2 - a_{t-1}]^2 - [a_{t-1} - \bar{a}_1]^2 \right), \tag{4}$$

where $\gamma_a \equiv \frac{\eta_a \phi_a}{2(\eta_a + \phi_a)} > 0$.

Let $\tilde{a}$ be the *indifference value* which is defined as the threshold value in $t-1$ such that the agent is indifferent between both identities in period t, i.e. $U_t(2) - U_t(1) = 0$. Using Equation (4), the indifference value is $\tilde{a} = \hat{a}$, where $\hat{a} \equiv (\bar{a}_1 + \bar{a}_2)/2$ is the *midpoint value*. The midpoint value refers to the middle of the distance between both average values and

[15] I do not consider any uncertainty in the ability to identify with a group or any direct cost. Nonetheless, the group consistency corresponds to the psychological, hence indirect, cost of changing group.

Figure 1: Indifference values and social identity in the single-value model



Notes: This figure presents the indifference value $\tilde{a}_{t-1}$ which is defined as the threshold value a in $t-1$ such that the agent is indifferent between both groups. In the single-value model, it corresponds to the midpoint value $\hat{a}$, which is the middle of the distance between the average values in both groups. When the value a in previous period is lower (resp. greater) than the indifference value, the agent prefers to identify with the group 1 (resp. 2).

represents the frontier between both groups. The anonymity of the agent ensures that the frontier is exogenous.

Figure 1 illustrates the indifference value and social identity. In the single-value model, as long as the value in the previous period a_{t-1} is lower (greater) than the midpoint value $\hat{a}$, the agent prefers to belong to group 1 (2). In the absence of shocks on her conservatism, the agent converges toward a steady-state conservatism that corresponds to the average conservatism within her group, and the dynamics are given by Equation (3). What happens when there is a shock?

If an information shock, such as a life event as we consider later in the paper, is sufficiently large, the agent identifies with the other group.[16] Suppose the agent identifies with group 1 in period $t-1$, that is, the agent identifies with the progressivists, and there is shock $\Delta a_{t-1} > 0$ at the end of that period such that her conservatism becomes $a'_{t-1} \equiv a_{t-1} + \Delta a_{t-1}$. As the shock drives her conservatism beyond the midpoint, i.e. $a'_{t-1} > \tilde{a}$, the agent prefers now to identify with group 2, that is, the group of conservatists.

This leads to Proposition 2. For any agent, it always exists an information shock such that she prefers to identify with the other group. Proof in Appendix A.

Proposition 2 (Shock existence) *For any individual,* $\exists \Delta a_{t-1}$ *such that* $|\Delta a_{t-1}| > |\tilde{a}_{t-1} - a_{t-1}|$ *and* $U_t(s_t) > U_t(s_{t-1})$ *with* $s_t \neq s_{t-1}$.

To summarize, the single-value model delivers two results. First, any individual converges to the average value within her group in the long run. The length of time to convergence

[16] Based on constructivist psychology, a shock on values consists of an event that brings new information to the agent through an experience (Levitt et al. 2004). This challenges the agent by questioning her sense of independence, her emotions, and her self-awareness, hence, all her perceptions of the meaning of life (i.e. values).

depends on two components: the rate of convergence and the distance with the group-average value. On the one hand, the greater the ratio η_a/ϕ_a, the more costly the psychological cost of the time inconsistency with respect to the group dissonance, hence, the faster the convergence. On the other hand, the further the current value is from the group-average value, the longer the convergence.

Second, it is always possible to find a shock such that an individual starts to identify with the other group. The shock requires two conditions to be satisfied: its direction has to be toward the other-group average value and the magnitude has to be sufficiently large. The magnitude depends on the distance between both groups in terms of value and the current value of the individual. The larger the distance, the greater has to be the shock. When the current value is in a steady state, the magnitude corresponds to the midpoint distance. Otherwise, the closer the agent is to the midpoint value, the smaller has to be the shock.

2.2 Two-value model

To highlight the differences in dynamics when there are two values instead of one, consider an agent represented by two values. Let $a_t \in \mathbb{R}$ be conservatism which is opposed to progressivism, as in the single-value model, and $b_t \in \mathbb{R}$ be collectivism which is opposed to individualism. Consider the same additively-separable structure for the utility function which now also includes collectivism. The maximization program of the agent becomes:

$$\begin{aligned}\max_{a_t,b_t,s_t} U_t(a_t,b_t,s_t) = &-\eta_a\frac{\left[a_t-a_{t-1}\right]^2}{2}-\phi_a\frac{\left[a_t-\bar{a}(s_t)\right]^2}{2}\\ &-\eta_b\frac{\left[b_t-b_{t-1}\right]^2}{2}-\phi_b\frac{\left[b_t-\bar{b}(s_t)\right]^2}{2},\end{aligned} \tag{5}$$

where $\bar{a}(s_t) = \{\bar{a}_1, \bar{a}_2\}$ is the average conservatism in the group, $\bar{b}(s_t) = \{\bar{b}_1, \bar{b}_2\}$ is the average collectivism in the group and $(\eta_a, \phi_a, \eta_b, \phi_b) \in (\mathbb{R}^\star_+)^4$ are parameters that account for the relative importance of each utility components.

The agent seeks to avoid the same psychological costs as before, namely, time inconsistency and group dissonance, but on two values instead of one. The optimal values (conditional on the group) are identical to the single-value model and correspond to the weighted average between the past value and the average value within the group:

$$a_t(s_t) = \frac{\eta_a a_{t-1} + \phi_a \bar{a}(s_t)}{\eta_a + \phi_a}, \qquad \text{and} \qquad b_t(s_t) = \frac{\eta_b b_{t-1} + \phi_b \bar{b}(s_t)}{\eta_b + \phi_b}.$$

Thus, the dynamics of values are also identical to Equation (3) and Proposition 1 holds.

So far, nothing changes with respect to the single-value model although we have added one value.

The difference arises from the inter-dependence between both values. There exist two groups, 1 and 2, in which the average values are respectively $(\bar{a}_1, \bar{b}_1)$ and $(\bar{a}_2, \bar{b}_2)$. Since values are standardized in the population, it implies that $\bar{a}_1$ and $\bar{a}_2$ have opposite signs and that $\bar{b}_1$ and $\bar{b}_2$ as well. By convention, I set the average value a in both groups such that $\bar{a}_1 < 0 < \bar{a}_2$. This implies that the first group is more progressivist than the second group which is more conservatist.

The inter-dependence between both values is captured by the sign of $\bar{b}_2$ (or equivalently by the sign of $\bar{b}_1$). If $\bar{b}_2 > 0$, then both conservatism and collectivism are positively correlated in the population. Reciprocally, this implies that progressivism and individualism are as well correlated in the population. Otherwise, if $\bar{b}_2 < 0$, then conservatism and collectivism are negatively correlated in the population, meaning that conservatists tend to be individualists as well, whereas progressivists tend to be collectivists. The correlation of values across groups affects the indifference values that are key in the decision of the agent to identify with one group or the other.

Let $(\tilde{a}, \tilde{b})$ be the indifference values such that the agent is indifferent between both groups, i.e. $U_t(2) - U_t(1) = 0$. Solving this equation leads to the relationship between both indifference values, namely,

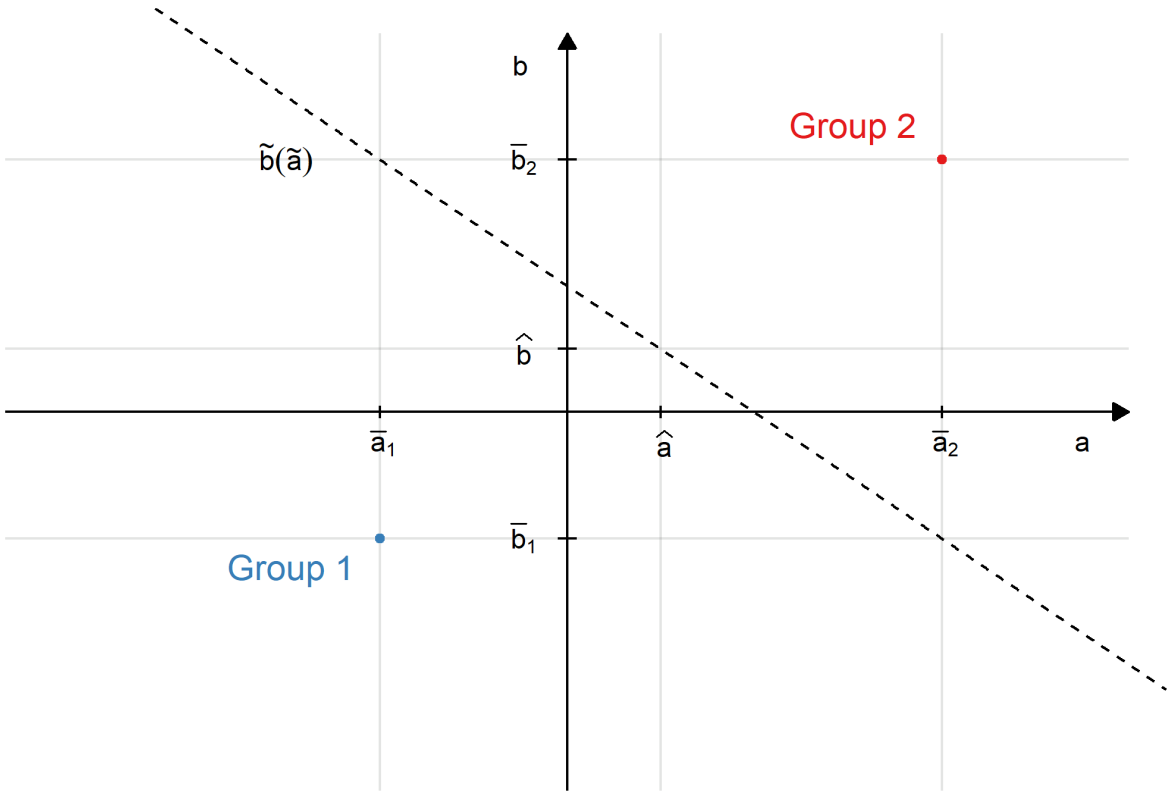
$$\tilde{a} = \hat{a} - \frac{1}{\gamma} \frac{\bar{b}_2 - \bar{b}_1}{\bar{a}_2 - \bar{a}_1} \left(\tilde{b} - \hat{b} \right), \tag{6}$$

where $\gamma \equiv \gamma_a / \gamma_b > 0$ and $\bar{a}_2 - \bar{a}_1 > 0$ by definition. When both values are orthogonal, i.e. $\bar{b}_2 - \bar{b}_1 = 0$, the indifference value corresponds to the one of the single-value model, i.e. the midpoint value $\tilde{a} = \hat{a}$.

Figure 2 presents the relation between both indifference values from Equation (6) on the two-dimensional space. For simplicity, we set that both values are positively correlated across groups, so that $\bar{b}_2 - \bar{b}_1 > 0$. The results are symmetrical when both values are negatively correlated. The dashed line represents the set of values for which the agent is indifferent between identifying with one group or the other. Any agent on the left-hand (right-hand) side of this dashed line prefers to identify with group 1 (group 2) and will converge toward the group-average value in the long run.

The interdependence between values introduces a distortion to the indifference value that depends on the polarization of both groups in the two-dimensional space. To illustrate this, suppose the agent belongs to the group 1 and she is in her steady state such that $a_{t-1} = \bar{a}_1$ and $b_{t-1} = \bar{b}_1$. There is an information shock on her value a at the end of the period $t - 1$

Figure 2: Indifference values and social identity in the two-value model



Notes: This figure presents the pairs of values (i.e. the dashed line) for which the agent is indifferent between identifying with both groups. The x-axis corresponds to conservatism and the y-axis to collectivism. Pairs $(\bar{a}_1, \bar{b}_1)$ and $(\bar{a}_2, \bar{b}_2)$ correspond, respectively, to the average values within group 1 and 2. Any agent on the left-hand (right-hand) side of the dashed line identifies with group 1 (2).

such that $a'_{t-1} = \bar{a}_1 + \Delta a_{t-1}$. In period t, the agent has to choose whether she wants to keep identifying with her group or change to the other group. Her optimal values depend on this choice. If she decides to identify with her current group, her indirect utility is

$$U_t(1) = -\gamma_a \left(\Delta a_{t-1}\right)^2. \tag{7}$$

Otherwise, she identifies with the other group and gets the following indirect utility:

$$U_t(2) = -\gamma_a \left[\bar{a}_2 - \bar{a}_1 - \Delta a_{t-1}\right]^2 - \gamma_b \left[\bar{b}_2 - \bar{b}_1\right]^2. \tag{8}$$

The agent decides to change her group *if and only if* the information shock drives her value a'_{t-1} beyond the indifference threshold $\tilde{a}$. In this example, the indifference threshold

is derived from Equations (7) and (8) and corresponds to

$$\tilde{a} = \hat{a} + \frac{1}{2\gamma} \frac{\left(\bar{b}_2 - \bar{b}_1\right)^2}{\bar{a}_2 - \bar{a}_1}. \tag{9}$$

The conservatism which makes the agent indifferent between both groups depends on the degree of interdependency which reflects the polarization between groups in collectivism relative to the polarization in conservatism. Equation (9) presents the indifference value $\tilde{a}$ as a distorted version of the midpoint value from the single-value model. This distortion emerges from the degree of inter-dependence between values. The greater $\bar{b}_2 - \bar{b}_1$ with respect to $\bar{a}_2 - \bar{a}_1$, the larger the distortion.

Proposition 2 holds when there is an additional inter-dependent value such as collectivism, meaning that it is always possible to find a shock sufficiently large such that the agent prefers to identify with the other group.

Yet, this additional inter-dependent value introduces Proposition 3. Proof in Appendix A.

Proposition 3 (Value relevance) *If a value poorly discriminates groups with respect to the other value, then this value is less relevant in the individual's choice of social identity.*

When the gap in average collectivism between groups is large in absolute terms, i.e. $\left|\bar{b}_2 - \bar{b}_1\right| \gg \bar{a}_2 - \bar{a}_1$, it indicates that the polarization between both groups in collectivism is more important with respect to the polarization in terms of conservatism. Thus, conservatism is less relevant to the agent's identity than collectivism. Only a very large shock on conservatism can make the agent identify with the other group. This is due to the fact that the group dissonance with respect to collectivism generates a psychological cost that can hardly be offset by any other consideration than keeping up with the current group—except with a large information shock.

2.3 Predictions of the model

The theoretical framework provides several predictions about the dynamics of inter-dependent values and social identity.

Proposition 1 indicates that any agent converges in values toward the values of her group in the absence of information shocks.

Proposition 2 predicts that, for any agent, it is always possible to find an information shock such that the agent identifies with the other group. The corollary implies that there exist small shocks for which the agent is only affected in the short run as she does not change

group. Both previous predictions hold when the agent is characterized by two values that are correlated across groups, hence, inter-dependent.

Proposition 3 predicts that values that discriminate the most between groups are those that are the most relevant in the choice of the individual regarding her social identity.

The theoretical framework also raises an important issue about considering only one value at a time. The consistency trade-off in the agent's identity depends on the degree of inter-dependence between values across groups. As a result, neglecting this inter-dependence leads to underestimating the role of the group in values dynamics. Thus, the greater the correlation of values across groups, the larger the shock be for the agent to identify with a new group.

Lastly, I derive Proposition 4 which gives the main result of the theoretical framework about the existence of spillover effects across values.

Proposition 4 (Spillover effect) *If* $\bar{v_1} - \bar{v_2} \neq 0 \ \forall v = \{a, b\}$*, then, for any individual,* $\exists \Delta a_{t-1}$ *such that* $|\Delta a_{t-1}| > |\tilde{a}_{t-1} - a_{t-1}|$ *and* $U_t(s_t) > U_t(s_{t-1})$ *with* $s_t \neq s_{t-1}$ *which implies that* $\lim_{t \to +\infty} v_t = \bar{v}(s_t) \ \forall v$.

The interpretation of the proposition is as follows. If two values are inter-dependent, then for any agent, it always exists an information shock on one value, say conservatism, that is sufficiently large so that the agent reaches a higher level of utility by identifying with the other group in the next period, hence, both values converge toward the average value in that new group in the long run.

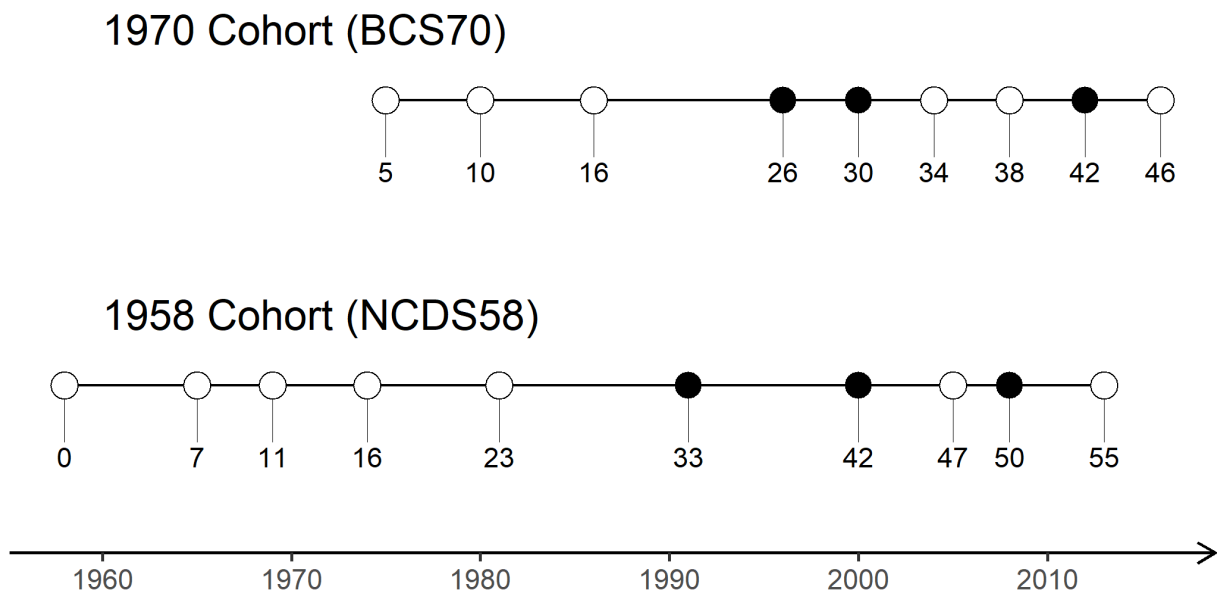
When an information shock, due to a life-changing event for instance, on conservatism is sufficiently large, the individual identifies with another group, thus, she changes both of her values. Although the other value, say collectivism, was not initially affected by the shock, the life-changing event has also changed this value indirectly through the spillover effect. I turn to empirical analysis in order to test the existence of spillover effects across values.

3 Data

To study the dynamics of values and identity, I consider life-changing events in individuals' life as information shocks that will affect values, such as conservatism and collectivism, as well as their social identity. Cohort data are ideal in my setting as they have information on life events, values, and identity.

In this section, I start by presenting the data from two British cohorts and explain how I derive values such as conservatism and collectivism from attitudes. Then, I show how

Figure 3: Timing of interviews



Notes: This figure presents the timing of interviews for the NCDS58 and BCS70 cohorts. Circles correspond to interviews and numbers under them indicate the age of cohort members during this interview. Full circles correspond to interviews for which attitudes can be derived. The horizontal arrow at the bottom of the figure represents the years.

these values are consistent with political voting behavior and present the three life events I consider in the analysis. Lastly, I describe variables and provide their summary statistics.

3.1 Sample

I use two mature British cohort studies: the National Child Development Study (NCDS58) is a cohort of individuals born during the same week in March 1958; the British Cohort Study (BCS70) is composed of those born during the same week in April 1970.[17] Cohort members were born in England, Scotland and Wales.

Both cohorts participated in several interviews at different ages. Figure 3 presents the ages at which they have been interviewed and the corresponding years. The full circles on the figure indicate interviews from which values can be derived, thus I will focus on those years for the remaining of the paper. I define four periods according to the decade in which individuals belong, i.e. their twenties, thirties, forties, or fifties. For the BCS70 cohort, I refer to period 1 for the interview at the age of 26, period 2 for the one at 30, and period 3

[17]These cohort data have been extensively used in income and social mobility-related work in Economics and Sociology; see, for instance, Blanden et al. (2007), Goldthorpe and Jackson (2007), García-Peñalosa et al. (2023), among others.

Table 1: Number of individuals and response rates by periods

	BCS	NCDS
Initial	19,006 (100%)	17,885 (100%)
Period 1	9,003 (47.4%)	
Period 2	11,261 (59.2%)	11,469 (64.1%)
Period 3	9,841 (51.8%)	11,419 (63.8%)
Period 4		9,790 (54.7%)
All	6,115 (32.2%)	8,107 (45.3%)

Notes: Response rates between parentheses. The last row corresponds to the number of cohort members who have been interviewed at all periods.

for the one at 42. For the NCDS58 cohort, periods start at period 2 for the interview at the age of 33, then period 3 corresponds to the one at 42, and period 4 refers to the one at 50.

One of the main issues with cohort studies is attrition. Cohort members do not participate at every interview and therefore some individuals are either missing at some interviews or lost definitely at some point. Table 1 presents the response rates by periods. Period 2 is the period with the greater response rate, i.e. 64.1% for the NCDS58 cohort and 59.2% for the BCS70 one. This latter interview, when BCS70 cohort members are 30, has been conducted at the same time as the Period 3 interview for the NCDS58 cohort, when they are 42, so in the year 2000; see Figure 3.

3.2 Conservatism and Collectivism

From these interviews, I derive values from individuals' answers to statements about their attitudes.[18] At each interview, cohort members answer to statements using a 5-level scale (strongly disagree / disagree / neither agree nor disagree / agree / strongly agree). I attribute them a score for each statement between -2 and 2 according to the answer.

These statements cover five attitudes (in alphabetical order): Authority (A), Inequality Aversion (IA), Morale (MOR), Political Cynicism (PC) and Work-Ethic (WE).[19] Some examples of statements from these attitudes are the following:[20]

[18] In social psychology, an attitude toward an object—such as a statement—corresponds to emotions, beliefs, and behaviors toward this particular object.

[19] I focus on these five attitudes since they are available in all interviews for both cohorts. The number of available statements depends on the cohort and the period. They do not necessarily share the same set of statements, except when the BCS70 cohort is 30 and the NCDS58 cohort is 42 because interviews were performed using the same questionnaires in 2000; see Table B.1 in Appendix B for more details on the number of available statements at each interview.

[20] The full list of statements is reported in Tables B.2 to B.4 in Appendix B.

(A2) *For some crimes the death penalty is the most appropriate sentence*;

(IA6) *Government should redistribute income from the better off to those who are less well off?*;

(MOR3) *Couples who have children should not separate*;

(PC1) *None of the political parties would do anything to benefit me*;

(WE1) *Having almost any job is better than being unemployed.*

For each individual, I derive her standardized score for each of the five attitudes in every period. I proceed in two steps. First, I compute the average score within each attitude category (A, IA, MOR, PC, WE) for each individual at each period. Thus, each individual has a score for each attitude in each period. Second, I standardize these scores at the cohort and period levels. This standardization allows me to account for macro events that would shift the whole distribution of attitudes. As a result, each individual belongs to a cohort and has, for each period, a standardized score in each attitude that is relative to the norm in her cohort in a given period.

I derive conservatism and collectivism from these attitude scores using a Principal Component Analysis (PCA). PCA increases the interpretability of vectors while minimizing information loss. By focusing on the two first components, which are orthogonal by the construction of the PCA, I can interpret them as the two main values that discriminate and, therefore, characterize individuals in their attitudes.

The other principal components act as residuals to some extent. Although they might be incorporated into the analysis, Proposition 3 states that a value needs to be sufficiently discriminatory between groups in order to be relevant for social identity. The two first principal components capture more than 50% of the explained variance in attitudes (see Figure 4), which makes the discriminatory power of the other principal components less relevant.

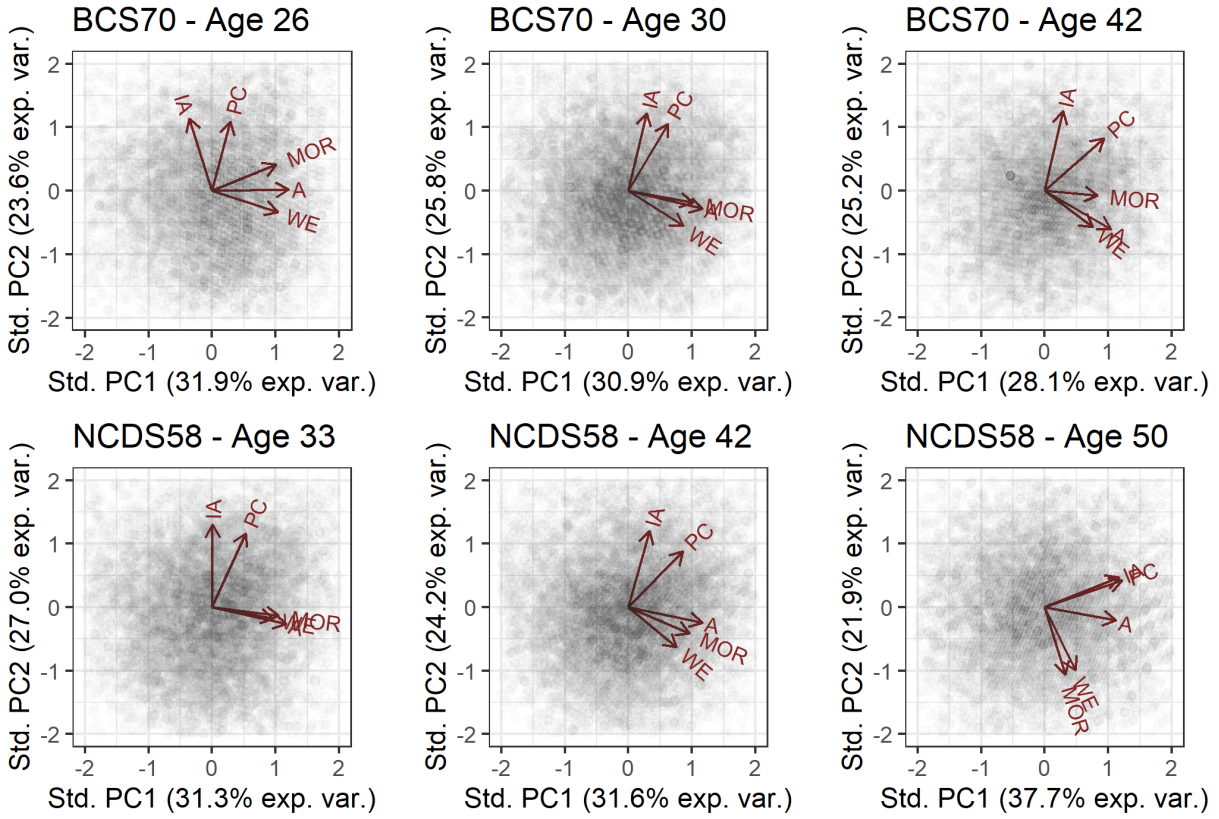
I perform PCA at the cohort and period levels. Figure 4 presents the eigenvectors of the two first principal components. Links between attitudes are fairly stable across cohorts and periods. These principal components explain more than 50% of the variance in attitudes.

I interpret both dimensions as conservatism, as opposed to progressivism, and collectivism, as opposed to individualism.[21]

Focusing on the first principal component (PC1), the x-axis directions of vectors high-

[21]Both dimensions are derived from the two-dimensional structure of universal motivational types of values, as introduced by Schwartz (1992, 2012)—see Figure C.1 in Appendix C. In Schwartz (1992), both dimensions are respectively named conservation (versus openness-to-change) and self-transcendence (versus self-enhancement).

Figure 4: Eigenvectors of the two first principal components



Notes: This figure presents the eigenvectors of the two first principal components. Each panel corresponds to a cohort and its age at the time of the interview. The x-axis (Std. PC1) indicates the first principal component and the y-axis (Std. PC2) indicates the second first principal component. Each faded point corresponds to a cohort member in the two-dimensional space. Details on the eigenvectors are available in Tables C.1 and C.2, respectively for the BCS70 and NCDS58 cohorts. Attitudes are Authority (A), Inequality Aversion (IA), Morale (MOR), Political Cynicism (PC) and Work Ethic (WE).

light attitudes that characterize *conservatism* which is the preference for stability, security, tradition, and conformity. In the data, they reflect a taste for attitudes about Authority (A), Morale (MOR), and Work Ethic (WE). Thus, the dimension that discriminates the most between individuals is *conservatism* (versus *progressivism*).

The second principal component (PC2) is orthogonal to the previous dimension of values at the cohort-period level. Focusing on the y-axis directions of vectors, they indicate attitudes that characterize *collectivism* which refers to the care and concern for others, reflecting universalism and benevolence. In the data, this value is associated with attitudes toward Inequality Aversion (IA), Political Cynicism (PC) and Work Ethic (WE). Therefore, the second discriminatory dimension between individuals is *collectivism* (versus *individualism*).

Cohort members have a Conservatism score ($Cons$) and a Collectivism score ($Coll$) in each period. These scores are derived with a projection of both principal components based

on attitudes for all individuals in each period. By construction, both scores are standardized at the cohort-period level and *orthogonal* due to the PCA.

The orthogonality between conservatism and collectivism that is obtained by construction implies that one score cannot explain the other. Thus, any spillover effect can only occur through an intermediate, i.e. the group identity later, and not directly.

3.3 Groups mapping using political vote

In my theoretical framework, the agent belongs to a social group and the spillover effect occurs once the agent identifies with another group. Defining groups is therefore crucial to understand spillover effects as we expect individuals to change groups along with their values.

So far, a group can be interpreted as composed of peers with whom the agent identifies in terms of values. One can think about those peers as close people such as relatives, neighbors, or colleagues; since we tend to share values with them. Nonetheless, most of the time, individuals cannot freely break off all ties with those latter as there may be direct costs. These direct costs thwart the identification of changes in group membership as they introduce noise through bonds. Thus, I cannot rely on peers to define groups.

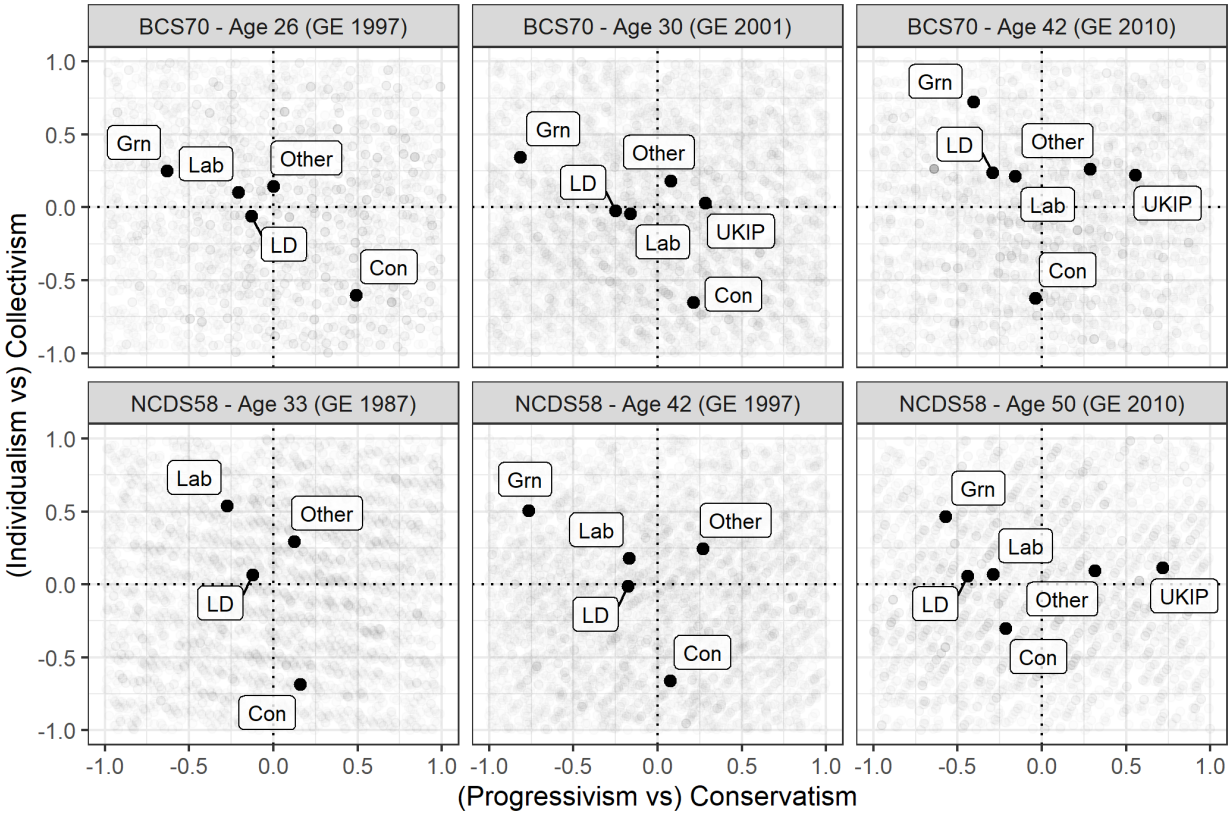
An alternative proxy for social identity is the political voting behavior as the latter is often determined by the former (see Bonomi et al. 2021, Gethin et al. 2021). There is no direct cost in voting for one party or another at the general election, conditional on voting. In addition, political parties reflect part of individuals' values in the sense that the agent decides to identify with one party with respect to others when voting.

Figure 5 presents a mapping of values of the average voters for each main political party in the UK at the closest general election (GE); see Table D.1 in Appendix D for the vote shares in both cohorts. This figure presents several results regarding the link between voting behavior and values for these cohorts as well as the positioning of the voter base of UK political parties.

The bottom-left panel represents the mapping of values in the 1987 General Election for which only the NCDS58 cohort voted at age 33. Positioning of the two main UK political parties is consistent: Labour voters are progressive and collectivist, whereas Conservative voters are conservative and individualist. The Liberal Democrats provide an in-between the Labour and Conservative parties.[22] Other encompasses all other parties, blank votes, and abstentions.

[22]Note that the Liberal Democrats party only appeared in 1988 as the merge of the SDP–Liberal Alliance that was running into general elections in 1987. For ease of exposition, I refer to the SDP–Liberal Alliance in 1987 as the Liberal Democrats.

Figure 5: Average values according to political vote



Notes: This figure presents the mapping of average scores in conservatism and collectivism according to political voting in General Elections (GE). Political parties are (in alphabetical order): Conservative (Con), Green (Grn), Labour (Lab), Liberal Democrat (LD), and UK Independence Party (UKIP). Other encompasses all other parties, blank votes and abstentions.

The top-left and bottom-mid panels correspond to the 1997 General Election. The Green Party emerged and attracted voters with progressive and collective values. The overall structure of values and voting is stable across cohorts.

The top-mid panel shows the rise of the far-right party UKIP for the 2001 General Election. As the formation of political parties is endogenous, it is unsurprising that it emerged in an area where there was no political supply before and close to the Other group that encompasses other small parties and abstentions.

Both right panels depict the political mapping for the 2010 General Election. The average political voters of the BCS70 cohort are more spread along the collectivism axis, while those in the older cohort are rather spread on the conservatism axis. This difference may also reflect differences in the relevance of values between generations, with the conservatism dimension being more relevant to the Boomer generation (represented here by the NCDS58) while the collectivism dimension is more relevant to the X Generation (represented here by

the BCS70).

The positioning of political parties relative to each other is consistent over time and across cohorts on the two-dimensional values' space. Thus, I consider the political vote of individuals as a relevant proxy of their social identity in the remaining of the empirical analysis. This proxy helps understand how individuals start to identify with other groups after life-changing events.

3.4 Life-changing events

We are interested in life-changing events that generate information shocks on conservatism ($Cons$) or collectivism ($Coll$) in order to show whether there exist spillover effects or not. The ideal setting to obtain causality would be an exogenous non-reversible life-changing event that generates an information shock on only one value, say conservatism, leaving collectivism unaffected directly.

The life events that I consider to test the existence of spillover effects across values require two properties: *exogeneity* and *non-reversibility*. On the one hand, the life event has to be exogenous so that values in the previous period do not influence the likelihood that the life event occurs. On the other hand, the life event has to be non-reversible. Otherwise, the probability to reverse the event is likely to be endogenous which would bias the estimate of individual's values at the time of interviews.[23]

In this regard, I focus on two life events that satisfy both properties, namely, *to have ever had cancer* and *to have a girl as a first child conditional on having a baby*.

The former life event is exogenous in the sense that conservatism and collectivism do not affect the probability to have cancer—excluding individuals with lung cancer as smoking behavior might be related to values. It is also non-reversible as I compare individuals who have *ever* had cancer with respect to those who never had one. I set the focus on the information shock related to the fact that people have known they have cancer, not on the illness *per se* as someone might have one without knowing it or might recover from it.[24]

[23]Note that life events that provide temporary shocks are also interesting to study. Especially if a temporary shock leads to a change in social identity. In the absence of reverse shock, both time and group consistencies would prevent the individual to come back to her previous group's values. Thus, a sufficiently large temporary shock can have long-run consequences on individuals' values.

[24]Note that for the older cohort at age 50, there may be a bias when considering the effect of this life event on values. As people turn 50, they expect that their health condition will deteriorate in the coming years, thus, they may anticipate such a life event and change their values beforehand. This potential mechanism would bias my estimate toward zero as the control group—those who did not get cancer yet—anticipate and shift their values in the same direction as those who have been treated. Therefore, for this cohort at that age, my approach is likely to provide a lower bound estimate of the effect of having ever had cancer on values.

For the latter life event, I consider a sub-sample that only contains individuals who have at least one baby, hence, I compare those who had a girl as a first child with those who got a boy. Thus, the life event is exogenous to values because the probabilities of child's sex at birth are fifty-fifty, considering that sex-selective abortion is very rare in the UK.[25] Once the baby is born, the life event is non-reversible because it has occurred and remains forever. I do not also consider adopted children because the sex may be decided by parents and therefore linked to values and preferences (Dahl and Moretti 2008). I also exclude stillborn babies because the socialization of parents with the baby does not occur.[26]

I only focus on the first child as fertility decisions for following children might be linked to the sex of the eldest child and values, e.g. a preference for diversity in children's birth sex. Moreover, some parents may have a boy as their first child and a girl thereafter. Some changes in values may be specific to having a girl even though she is not the first baby. Thus, this is likely to produce a lower-bound estimate and also to reduce the statistical power of effects of this life event on values.

Lastly, I also study the role of unemployment on values as it is a sizeable information shock in individuals' life. Nonetheless, I cannot use it as a life event to show the existence of spillover effects among values because it does not satisfy both properties, First, individuals change their activity status quite often and, therefore, the effect of unemployment on values is all the time affected by these changes in status. Second, the likelihood to be unemployed is clearly endogenous to values such as conservatism and collectivism. For instance, one might argue that individuals with high work ethic, hence high conservatism and high individualism, have a lower probability to be unemployed as they are less likely to quit their job with respect to people with low work ethic.

This life-changing event is considered in the analysis to give some insights into how values and group identity correlate with unemployment in the empirical framework. However, any result related to this life event has to be taken with a grain of salt as I cannot claim any causal effect.

3.5 Variables and summary statistics

To summarize, I use three life-changing events and socio-economic variables about individuals from two British cohort studies.

[25] Dubuc and Coleman (2007) argue that sex-selective abortion occurs among mothers born in India and living in Great Britain. They show that sex ratios at birth have always been one point lower for Asian groups in England and Wales before 1990. Although this issue raises several social and economic concerns, it does not statistically affect my results as they represent a minority in the data.

[26] Note that this tragic life event could also be considered as a potential life event that would deeply affect values.

For life events, I focus on three of them: to have had a girl as a first child, to have ever had cancer, and to have ever been unemployed. $GirlFirst$ is a dummy variable that equals one if the sex of the first child is female, and zero if it is a male. $GotCancer$ is also a dummy variable that equals one if the individual has ever had cancer by the time of the interview. $BeenUnemp$ is a dummy variable that equals one if the individual has ever been unemployed for at least one month by the time of the interview.[27]

I consider several socio-economic characteristics as control variables. Among them, I use the sex at birth of cohort members and their level of education based on the highest academic qualification they obtained. $Female$ is a dummy variable that equals one if the cohort member is born as a female. I regroup education levels into three categories that characterize primary, secondary, and tertiary education levels ($Educ$). Both control variables are important determinants of values such as conservatism and collectivism as well as their dynamics with respect to life-changing events.

Table 2 presents the descriptive statistics for the NCDS58 and BCS70 cohorts. Both cohorts contain respectively 30,552 and 27,906 observations. Each cohort is observed during three periods which correspond to three decades with roughly a third of our observations in each decade. About half of the sample is female. The younger cohort tends to be more educated than the older cohort with 20% of observations in the NCDS58 cohort having tertiary education, while 29% do so in the BCS70 cohort.

The table also provides summary statistics on the share of cohort members for whom the life-changing events occurred. Girl First is conditional on having a baby, hence, they are more NA values in the BCS70 cohort meaning that there are more observations that do not satisfy the condition of having a baby. This is due to several reasons. First, the interview ages for the BCS70 cohort are 26, 30 and 42, hence, much younger than for the NCDS58 cohort (i.e. age 33, 42, 50). Thus, they are more likely not to have a baby yet in the first interviews. Second, fertility has declined between both cohorts. Of those who had a baby, about half have a girl and the other half had a boy.

Having ever had cancer is hopefully a rare life event with only 3% of observations in the NCDS58 cohort concerned and 1% in the BCS70. This gap is also explained by the difference in interview ages. Lastly, to have ever been unemployed happened to 34% (21%) of observations in NCDS58 (BCS70) cohort.

[27] Activity status is derived from the full activity histories to the nearest month since cohort members are 16 years old. These data are available for all cohort members until the last interview they have participated in. When individuals were missing in previous interviews, interviewers asked them about their activities during the period until then.

Table 2: Summary statistics

	NCDS58 - N = 30,552					BCS70 - N = 27,906				
Variable	Mean	SD	Min	Max	NA	Mean	SD	Min	Max	NA
Period 1 - Twenties						0.31	0.46	0	1	0
Period 2 - Thirties	0.35	0.48	0	1	0	0.40	0.49	0	1	0
Period 3 - Forties	0.37	0.48	0	1	0	0.29	0.45	0	1	0
Period 4 - Fifties	0.28	0.45	0	1	0					
Female	0.51	0.50	0	1	0	0.53	0.50	0	1	0
Education - Primary	0.62	0.49	0	1	0	0.52	0.50	0	1	0
Education - Secondary	0.19	0.39	0	1	0	0.19	0.39	0	1	0
Education - Tertiary	0.20	0.40	0	1	0	0.29	0.46	0	1	0
Girl First	0.49	0.50	0	1	7199	0.48	0.50	0	1	14789
Got Cancer	0.03	0.16	0	1	0	0.01	0.12	0	1	0
Been Unemployed	0.34	0.48	0	1	0	0.21	0.41	0	1	0

Notes: This table presents the descriptive statistics of variables used in the study. Values and attitudes are not displayed in this table as they are standardized. Period variables correspond to dummy variables to indicate the decade in which individuals are at the time of the interview. Female is a dummy that equals one if the sex at birth of the cohort member is female. Education variables are dummy variables for primary, secondary and tertiary education. GirlFirst is a dummy variable that equals one if the sex of the first child is female, and zero if it is a male. GotCancer is also a dummy variable that equals one if the individual has ever had cancer by the time of the interview. BeenUnemp is a dummy variable that equals one if the individual has ever been unemployed for at least one month by the time of the interview

4 Empirical evidence

In this section, I provide empirical evidence of spillover effects across values. First, I look at the effect of both exogenous life events, which characterize the information shocks, on conservatism and collectivism but independently. Second, I look at the change in social identity, proxied by political voting behavior, following the occurrence of life-changing events. Third, I consider an instrumental variable (IV) setting to show the existence of spillover effects and the group membership mechanism.

4.1 Effect of life events on values

I estimate *independently* with OLS the effect of the life event $z \in Z = \{GotCancer, GirlFirst, BeenUnemp\}$ on value $v \in V = \{Cons, Coll\}$ for an individual i in period t with the following equation:

$$v_{it} = \alpha + \beta \times z_{it} + \eta \times v_{i,t-1} + X_i\delta + u_{it} \tag{10}$$

Table 3: Effect of life events on values

	Linear regression - OLS					
	GirlFirst		GotCancer		BeenUnemp	
	(Cons)	(Coll)	(Cons)	(Coll)	(Cons)	(Coll)
Life event	0.03**	0.00	0.09***	0.02	0.02*	0.18***
	(0.01)	(0.01)	(0.03)	(0.03)	(0.01)	(0.01)
Value_{t-1}	0.54***	0.49***	0.56***	0.50***	0.56***	0.49***
	(0.01)	(0.01)	(0.00)	(0.00)	(0.00)	(0.00)
R^2	0.37	0.26	0.39	0.27	0.39	0.27
Adj. R^2	0.37	0.26	0.39	0.27	0.39	0.27
Num. obs.	23354	23354	32885	32885	32885	32885

Notes: $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$. Standard errors between parentheses. Control variables include gender, education (primary, secondary, tertiary), cohort fixed effects and period fixed effects. Male in the NCDS cohort in his forties with primary education as the reference group. GirlFirst, GotCancer, and BeenUnemp are the life events. In GirlFirst regressions, parents who have had a boy as a first child are the reference group. In GotCancer regressions, individuals who never had a cancer are the reference group. In BeenUnemp, individuals who have never been unemployed are the reference group. Table E.1 in the appendix presents all the coefficients.

where X are control variables including gender, education, along with period and cohort fixed effects.

The coefficients of interest are β and η. The former coefficient indicates the gap in conservatism (or collectivism) between individuals for whom the life event occurred compared to those for whom it did not. The later coefficient measures the time consistency of individuals as today's values for an individual are likely to be close to those of yesterday. Table 3 summarizes both coefficients (see Table E.1 in Appendix E for all the coefficients).

For both life events, having a girl as a first child and having ever had cancer, the coefficients are positive and significant in both (Cons) columns; while they are not significant in (Coll) ones. Parents who have had a girl as a first child, instead of a boy, tend to hold more conservative values, about 0.03 standard deviation, without any statistical difference in their collectivism. Individuals who have ever had cancer seem to be more conservative, by 0.09 standard deviation, although they do not differ from others in terms of collectivism versus individualism. For having ever been unemployed, the associated coefficients are both significant and positive. Individuals who have ever been unemployed tend to be more conservative and collectivist, by respectively 0.02 and 0.18 standard deviations.

Coefficients associated with the lag of the value lie around 0.55 standard deviation for conservatism and around 0.49 standard deviation for collectivism. This pattern indicates that conservative values are more correlated over periods than collectivist values. In terms of the

theoretical framework, it provides evidence that time consistency may be more important for conservatism with respect to collectivism. This is consistent with the fact that conservatism is the first principal component, hence, the more relevant to individuals' social identity.

4.2 Change in values and social identity

Individuals affected by life-changing events tend to hold different values. As they change their values, are they also more likely to identify with different groups? To answer this question, I look at their likelihood to vote for one political party or another during the General Elections after a change in conservatism and collectivism.

Let p_s be the probability to vote for a political party $s \in \{Con, Grn, Lab, LD, UKIP\}$. I consider the *Other* category (with probability p_O), which encompasses all other parties, blank votes, and abstentions, as the referent group. Thus, I estimate the probability to vote for these political parties in a multinomial logistic regression:

$$\log\left(\frac{p_s}{p_O}\right) = \pi_s + \phi_{1s}\Delta Cons_t + \phi_{2s}\Delta Coll_t + \eta_{1s}Cons_{t-1} + \eta_{2s}Coll_{t-1} + \gamma_s X, \qquad (11)$$

where $\Delta v_t \equiv v_t - v_{t-1}$ are the changes in conservatism and collectivism, which are conditional on individuals' values in previous period, i.e. $Cons_{t-1}$ and $Coll_{t-1}$, and also conditional on the political party for which the individual voted at the previous general election. The latter variable is included in control variables X along with gender, education, cohort and period fixed effects.

Table 4 summarizes the coefficients. These coefficients provide the log odds of voting for the political party (s) relative to the baseline outcome (voting for *Other*). The signs of those coefficients have to be compared with the relative position of political parties with respect to Other category, as depicted in Figure 5.

To derive the effect of values' changes on the odds of voting for one party with respect to another one, we take the exponential of the difference between both coefficients. For instance, a one-standard-deviation increase in conservatism raises the odds to vote for the Conservatives with respect to the Labour party by 12%, but it also reduces the odds to vote for the Conservatives with respect to UKIP by 27%. Similarly, a one-standard-deviation increase in collectivism raises the odds to vote for the Labour party with respect to its historical rival by 26%.[28]

Changes in values are associated with changes in the likelihood to vote for the political

[28]These coefficients are obtained by taking the exponential of the difference between both associated coefficients, respectively, $\exp(-0.06 - (-0.17)) = 1.12$, $\exp(-0.06 - 0.26) = 0.73$ and $\exp(-0.14 - (-0.37)) = 1.26$.

Table 4: Effect of values change on the group membership

	Multinomial logit - Dep. var.: Vote				
	(Con)	(Grn)	(Lab)	(LD)	(UKIP)
ΔCons_t	-0.06^{***}	-0.19^{***}	-0.17^{***}	-0.10^{***}	0.26^{***}
	(0.02)	(0.06)	(0.02)	(0.02)	(0.05)
ΔColl_t	-0.37^{***}	0.17^{***}	-0.14^{***}	-0.06^{**}	-0.01
	(0.02)	(0.06)	(0.02)	(0.02)	(0.05)
Cons_{t-1}	-0.03	-0.39^{***}	-0.23^{***}	-0.23^{***}	0.23^{***}
	(0.02)	(0.05)	(0.02)	(0.02)	(0.05)
Coll_{t-1}	-0.69^{***}	0.21^{***}	-0.05^{***}	-0.08^{***}	-0.03
	(0.02)	(0.06)	(0.02)	(0.02)	(0.06)
Vote_{t-1}	2.25^{***}	3.26^{***}	2.69^{***}	2.20^{***}	3.07^{***}
	(0.05)	(0.23)	(0.06)	(0.04)	(0.42)
Num. obs.	32885	32885	32885	32885	32885

Notes: $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$. Standard errors between parentheses. Control variables include gender, education (primary, secondary, tertiary), cohort fixed effects and period fixed effects. Male in the NCDS cohort in his forties with primary education as the reference group. The baseline outcome of the multinomial logistic regression is the vote for Other (encompassing all other parties, blank votes, and abstentions). Vote_{t-1} corresponds to the effect of having voted for the same party in the previous period.

parties, hence, with changes in the probability to identify with a new group. An increase in conservative values is associated with a rise in the probability to vote for right-wing and far-right parties, while an increase in collectivist values relates to individuals being more likely to vote for left-wing parties.

4.3 Spillover effects

To test the existence of spillover effects, the ideal setting would be an exogenous and non-reversible life-changing event that *directly* affects one value but not the other. Thus, if spillover effects exist one would observe a change in the latter value that is due to change in the former one. Yet, we cannot rule out the fact that the life-changing event may affect the later value.

In the motive of being as close as possible from this ideal setting, I assume that information shocks from the exogenous life event does not directly affect collectivism, i.e. $z \perp Coll$. This assumption builds upon the results presented in Section 4.1 where there is no significant association between the occurrence of both life events and collectivism. Later in the paper, I will consider a weaker assumption and show similar results in a Simultaneous Equation Model setting.

Table 5: IV Estimate of the spillover effect

	IV regression - 2SLS			
	GirlFirst		GotCancer	
	(Cons)	(Coll)	(Cons)	(Coll)
Life event	0.03^{**}		0.09^{***}	
	(0.01)		(0.03)	
$\widehat{\text{Cons}}_t$		-0.32^{***}		-0.34^{***}
		(0.01)		(0.01)
Value_{t-1}	0.54^{***}	0.48^{***}	0.56^{***}	0.49^{***}
	(0.01)	(0.01)	(0.00)	(0.00)
R^2	0.37	0.30	0.39	0.31
Adj. R^2	0.37	0.30	0.39	0.31
Num. obs.	23354	23354	32885	32885

Notes: $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$. Standard errors between parentheses. Control variables include gender, education (primary, secondary, tertiary), cohort fixed effects and period fixed effects. Male in the NCDS cohort in his forties with primary education as the reference group. GirlFirst and GotCancer are the life events. In GirlFirst regressions, parents who have had a boy as a first child are the reference group. In GotCancer regressions, individuals who never had a cancer are the reference group. Table E.2 in the appendix presents all the coefficients.

Under this identification assumption, I estimate IV regressions using two-stage least squares (2SLS). In a first stage, I instrument conservatism $Cons_t$ with z conditional on $Cons_{t-1}$. In a second stage, I regress $Coll_t$ on the predicted $Cons_t$ conditional on $Coll_{t-1}$. The IV setting can be written as:

$$Cons_{it} = \alpha_1 + \beta_1 \times z_{it} + \eta_1 \times Cons_{i,t-1} + X_i\delta_1 + u_{1it}, \tag{12}$$

$$Coll_{it} = \alpha_2 + \beta_2 \times \widehat{Cons}_{it} + \eta_2 \times Coll_{i,t-1} + X_i\delta_2 + u_{2it}, \tag{13}$$

where $\widehat{Cons}$ are the predicted $Cons$ and X are control variables including gender, education, along with period and cohort fixed effects. Table 5 summarizes the coefficients for the IV regressions (see Table E.2 in Appendix E for all the coefficients).

In both first-stage regressions, the information shock on conservatism due to the life event is positive and significant. To have a girl instead of a boy as a first child increases conservatism by 0.03 standard deviation, while to have ever had cancer raises conservatism by 0.09 standard deviation.

In both second-stage regressions, the spillover effect is negative and significant. For the first life event, a one-standard-deviation increase in conservatism decreases collectivism by

0.32 standard deviation; while an increase of the same magnitude for the second life event also reduces collectivism by 0.34 standard deviation. As the values associated with collectivism decrease, it means that those related to individualism increase.

Both exogenous and irreversible life-changing events show that the change in conservatism spill over collectivism. In my theoretical framework, I argue that this spillover effect is driven by a change in the social identity. To test this mechanism, I estimate a second-stage IV multinomial logistic regression to estimate the probability to vote for a political party where the first stage is given by Equation 12. Thus, the second stage is the following:

$$\log\left(\frac{p_s}{p_O}\right) = \pi'_s + \beta_s \times \widehat{Cons}_{it} + \gamma_s X, \tag{14}$$

where $\widehat{Cons}$ are the predicted $Cons$ from the first-stage IV regression, and X are control variables including the vote in the previous general election, gender, education, cohort and period fixed effects.

Table 6 summarizes the coefficients for the second-stage IV multinomial logistic regression (see Tables E.3 and E.4 in Appendix E for all the coefficients for both life events). The top panel corresponds to the estimate of the relative probability to vote for each political party when the conservative values are instrumented with the $GirlFirst$ life event, whereas the bottom panel refers to the same estimate when the conservative values are instrumented with the $GotCancer$ life event.

Coefficients are fairly similar across both life events indicating that they have similar effects on the probability to vote for one political party or another. A notable exception is the $\widehat{Cons}$ in the Conservatives column (Con) that is positive but not significant in the column (Con) for the first life event, while it is significant for the second life event.

Changes in voting behavior due to changes in values instrumented by life-changing events are consistent with the positioning of political parties in the two-dimensional value space depicted in Figure 5 which provides empirical evidence of the group membership as the underlying mechanism in explaining the existence of spillover effects.

To summarize, both exogenous and irreversible life-changing events show that spillover effects account for a third of the information shock. They also indicate that an increase in conservatism generates a increase in individualism (i.e. a decrease in collectivism). Changes in voting behavior following the life-changing are consistent with the positioning of political parties in the two-dimensional value space which gives support to the group membership mechanism. Nonetheless, the identification relies on the assumption that the information shock, associated with the life event, does not directly affect collectivism, i.e. $Coll \perp z$. This assumption is likely to be too restrictive, even for those life events. In the next section, we

Table 6: IV Estimate of the group membership

	IV regression - GirlFirst - Multinomial logit - Dep. var.: Vote				
	(Con)	(Grn)	(Lab)	(LD)	(UKIP)
$\widehat{\text{Cons}}_t$	0.01	-0.85^{***}	-0.27^{***}	-0.34^{***}	0.18^{*}
	(0.03)	(0.10)	(0.03)	(0.04)	(0.09)
Vote_{t-1}	2.56^{***}	3.75^{***}	2.73^{***}	2.19^{***}	3.25^{***}
	(0.05)	(0.31)	(0.08)	(0.05)	(0.49)
Num. obs.	23354	23354	23354	23354	23354
	IV regression - GotCancer - Multinomial logit - Dep. var.: Vote				
	(Con)	(Grn)	(Lab)	(LD)	(UKIP)
$\widehat{\text{Cons}}_t$	0.08^{***}	-0.67^{***}	-0.24^{***}	-0.32^{***}	0.19^{**}
	(0.03)	(0.07)	(0.02)	(0.03)	(0.07)
Vote_{t-1}	2.56^{***}	3.31^{***}	2.71^{***}	2.21^{***}	3.06^{***}
	(0.04)	(0.23)	(0.06)	(0.04)	(0.42)
Num. obs.	32885	32885	32885	32885	32885

Notes: $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$. Standard errors between parentheses. Control variables include gender, education (primary, secondary, tertiary), cohort fixed effects and period fixed effects. Male in the NCDS cohort in his forties with primary education as the reference group. GirlFirst and GotCancer are the life events. In GirlFirst regressions, parents who have had a boy as a first child are the reference group. In GotCancer regressions, individuals who never had a cancer are the reference group. The baseline outcome of the multinomial logistic regression is the vote for Other (encompassing all other parties, blank votes, and abstention). Vote_{t-1} corresponds to the effect of having voted for the same party in the previous period. Table E.3 and E.4 in the appendix present all the coefficients for both life events.

introduce a weaker assumption using a simultaneous equation model.

5 Simultaneous equations model

The identification of the spillover effect in the previous section relies on the exclusion restriction that assumes that the information shock characterized by the life event affects only conservatism. First, one may consider that this assumption is too strong. Second, this assumption does not hold for any information shock that would have a two-sided effect, that is, would affect both conservatism and collectivism at the same time.

In this section, I turn to simultaneous equations model which provides less restrictive assumptions for identification. First, I present the empirical specification and the (weaker) identification assumption. Second, I decompose the total effect between the direct effect of the life-changing event on values and the indirect effect that is due to spillover effects.

Third, I analyze the spillover effects' dynamics to identify regularities in the patterns of these spillover effects and link the analysis to the social psychology literature.

5.1 Empirical specification

I consider a Simultaneous Equations Model (SEM) in which conservatism and collectivism are jointly determined, also determined by their own previous values and related to individual characteristics. Each observation consists of an individual i observed in period t. With two values, the structural form of the SEM can be written in matrix notation as:

$$V_{i,t}\Gamma = z_{i,t}\Theta + V_{i,t-1}H + X_iB + U_{i,t} \tag{15}$$

where $V_{i,t} = \begin{bmatrix} Cons_t & Coll_t \end{bmatrix}$ is the matrix of dependent values in period t, z is a dummy vector which indicates whether the life-changing event occurred, X are the individual characteristics vector including the intercept, gender, education and cohort and period fixed effects, and U is a matrix of the error terms.

The coefficient matrices are as follows. The matrix $\Gamma = \begin{pmatrix} 1 & -\gamma_2^1 \\ -\gamma_1^2 & 1 \end{pmatrix}$ describes the relation between values, $\Theta = \begin{pmatrix} \theta_1 \\ \theta_2 \end{pmatrix}$ captures the effect of the life event on each value, $H = \begin{pmatrix} \eta_1 & 0 \\ 0 & \eta_2 \end{pmatrix}$ describes the relation between a value in period t and this same value in period $t-1$, that is, the time consistency of values, and B corresponds to all coefficients that are associated to X.

Multiplying Equation (15) by the inverse of the Γ matrix leads to the reduced form of the SEM such as

$$V_{i,t} = z_{i,t}\Phi + V_{i,t-1}\Psi + X_i\Pi + \epsilon_{i,t}, \tag{16}$$

where $\Phi = \Theta\Gamma^{-1}$, $\Psi = H\Gamma^{-1}$, $\Pi = B\Gamma^{-1}$, and $\epsilon = U\Gamma^{-1}$.

Identification. In this SEM, the identification assumption is that one value is not *directly* affected by the lag of the other value, that is, $Coll_t \perp Cons_{t-1}$ and $Cons_t \perp Coll_{t-1}$.[29] This assumption is consistent with the theoretical framework in which I suppose that values are permanently adjusted over time in order to have consistent values, it implies that, for instance, any change in $Coll_{t-1}$ can affect $Cons_t$ but only through $Cons_{t-1}$.

The *rank condition* is satisfied for both equations because the number of excluded en-

[29] In Equations (15) and 16, the exclusion restriction corresponds to the zeros in the H matrix.

dogenous variables in the reduced form (either $Cons_t$ or $Coll_t$) is equal to the number of excluded exogenous variables in the structural form (either $Coll_{t-1}$ or $Cons_{t-1}$). Thus, the SEM can be identified.

In addition, the *order condition* is also satisfied for both equations because the number of excluded exogenous variables ($Cons_{t-1}$ and $Coll_{t-1}$) is also equal to the number of included endogenous variables ($Cons_t$ and $Coll_t$). Therefore, the SEM is exactly identified.

This assumption is less restrictive compared to the one in Section 4.3 and consistent with the theoretical framework in Section 2.

Estimation. I estimate the SEM with Two Stage Least Square (2SLS) by instrumenting the endogenous variables of each equation with all exogenous variables from all equations. In a first step, I estimate the reduced form in Equation (16) and obtain the predicted conservatism and collectivism, i.e. $\widehat{Cons}_t$ and $\widehat{Coll}_t$.

In a second step, I estimate the structural form in Equation (15) in which I replace the endogenous variables with the predictions obtained in the first step. Thus, I estimate the following system of equations:

$$\widetilde{V}_{i,t}\Gamma = z_{i,t}\Theta + V_{i,t-1}H + X_iB + U_{i,t}$$

where $\widetilde{V}_{i,t} = \begin{bmatrix} v_t & -\hat{v}_t \end{bmatrix}$ in which v_t is the dependent value and $-\hat{v}_t$ encompasses the predictions of the endogenous value from the first step estimate. The 2SLS estimates of the simultaneous equations model for all the life events, which are analyzed below, are available in Appendix E.

5.2 Decomposing the total effect

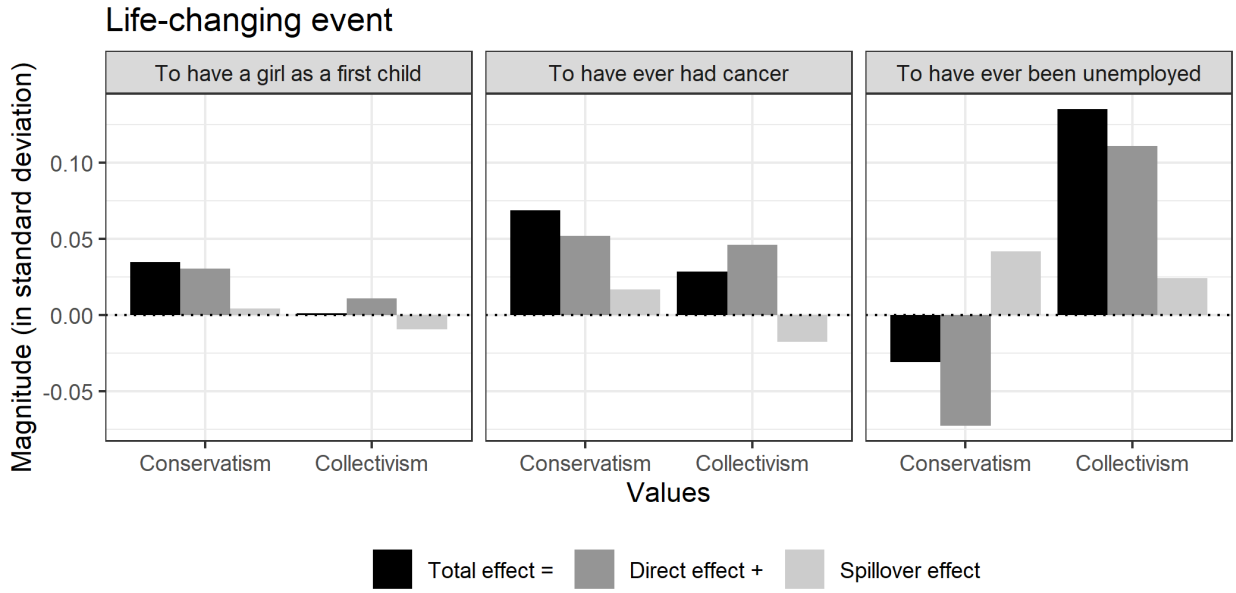
One of the advantage of the SEM is that one can decompose the effect of life-changing events as the sum of a direct effect, that is the effect of the information shock on values, and an indirect effect, that is, the spillover effect which captures the adjustment of values to be consistent with social identity.

From the reduced form in Equation (16), I decompose the total effect of the life event z on value $v \in V = \{v, -v\}$, where v is the value of interest and $-v$ the other value, as follows:

$$\phi_v = \underbrace{\tilde{\gamma}_v^v \times \theta_v}_{\text{Direct effect}} + \underbrace{\tilde{\gamma}_v^{-v} \times \theta_{-v}}_{\text{Indirect effect}}, \tag{17}$$

where ϕ_v is the total effect of the life event z on value v, $\tilde{\gamma}_v^v$ is the element on the diagonal of Γ^{-1} associated to the value v, $\tilde{\gamma}_v^{-v}$ is the off-diagonal element of Γ^{-1} on the same column,

Figure 6: Decomposition of the effect of life-changing events on values



Notes: This figure presents the decomposition of the total effect of each life-changing event on both values, Conservatism and Collectivism. The magnitude of effects is expressed in standard deviation. Decompositions are respectively derived from Tables E.8, E.9 and E.10.

while θ_v and θ_{-v} are respectively the information shocks associated to the life event z on values v and $-v$ from the structural form in Equation (15).

Figure 6 decomposes the total effect of each life-changing events on values between the information shock (direct effect) and the spillover effect (indirect effect). I describe the results by life-changing events.

Girl First. Collectivism remains unchanged when an individual gets a girl as a first child rather than a boy, while conservatism does increase. Having a girl as a first child *directly* increases conservatism by 0.03 standard deviation and collectivism by 0.01 standard deviation. As the life event increases conservatism, it spills over the other value and *indirectly* increases individualism which cancels out the direct increase in collectivism. Yet, this *direct* increase in collectivism also spills over and *indirectly* increases conservatism. This indirect channel amplifies the total change in conservatism by 14%.

Looking at heterogeneity across parents that are affected by this life event delivers two additional results (see Figure E.1 and E.2 in Appendix E).

First, for both, mothers and fathers, the direct effects go in the same direction (more conservatism and collectivism) but they are more pronounced for mothers. For fathers, the negative spillover effect on collectivism offsets the positive information shock which leads to

an increase in individualism.

Second, splitting parents according to their education level shows that those with secondary education are the most affected. The effect of having a girl as a first child on tertiary-educated parents generates more progressive values which is consistent with Washington (2008) results showing that congresspersons, hence, mostly highly educated men, become more progressive in their voting after having a daughter.

These results suggest that tertiary educated parents become more progressive when they have a daughter (as a first child) as they want more gender equality for her. Conversely, parents with primary or secondary education tend to become more conservative as they value more authority in society since they are worried about their daughter being more exposed. An issue that is likely to come after gender equality for highly educated parents.

Got Cancer. Both conservatism and collectivism increase when an individual has ever had cancer. This life-changing event directly increases both conservatism and collectivism by 0.05 standard deviation. Due to values consistency, the increase in collectivism spill over conservatism and increase the latter by 0.02 standard deviation, which represents almost a fourth of the total effect on conservatism. Meanwhile, the direct increase in collectivism is partially offset by the fact individualism rises by 0.02 standard deviation as a spillover, which corresponds to 38% of the direct effect. Thus, without spillovers, the increase in collectivism would have been 38% much larger.

One may be concerned by the NCDS58 cohort at age 50 as they are likely to anticipate sickness, thus, changing their values. Excluding the NCDS58 cohort at age 50 provides very similar results with respect to the full sample, whereas considering exclusively this cohort at that age shows that the direct effect on conservatism is four times larger with respect to the baseline specification (see Figure E.3 in appendix E). Interestingly, the direct effect on collectivism is much closer to zero. Thus, those who have had cancer at age 50 are not different from those who have not had one. Such an effect may be due to the anticipation of the sickness of the whole cohort at that age as they will rely more on others, hence, they increase their collectivism. Nonetheless, the total effect on collectivism is positive—about 0.1 standard deviation—which is mostly due to the positive spillover effect on collectivism. I also provide these estimates by focusing only on individuals who have never had cancer in the previous period (see Figure E.4 in Appendix E). Although the direct effect on collectivism is larger, qualitative results hold.

Been Unemployed. Having ever been unemployed is associated with higher progressivism and collectivism. Focusing on the third panel, those who have ever been unemployed expe-

rience a direct decline in conservatism, i.e. an increase in progressivism, by 0.07 standard deviation and a direct increase in collectivism by 0.11 standard deviation. The increase in progressivism spills over collectivism and increases it by 0.02 standard deviation, that is, 22%. Meanwhile, the increase in collectivism spills over conservatism which offsets half of the direct increase in progressivism. As a result, the increase in conservatism is dampened by the spillover effect whereas collectivism increases substantively.[30]

One may be concerned by the current employment status that would be the driving factor for the effect of having ever been unemployed on values. I estimate the SEM using two subsamples (see Figure E.5 in Appendix E). First, I remove unemployed individuals at the time of the interview, then, I remove those out-of-work (unemployed and inactive). Both estimates do not differ with respect to the full sample.

5.3 Spillover effects' dynamics

The intensity of inter-dependence between values drives the magnitude of the spillover effects of life events on values. In the SEM, the matrix Γ captures the relation between values within the structural form. Once we consider the estimated reduced form for the decomposition, the spillover effects appear through Γ^{-1}. For instance, in the case of the girl-first life event, the Γ matrix corresponds to

$$\Gamma = \begin{pmatrix} 1 & 0.39 \\ -0.31 & 1 \end{pmatrix} \implies \Gamma^{-1} = \begin{pmatrix} 0.89 & -0.35 \\ 0.28 & 0.89 \end{pmatrix}.$$

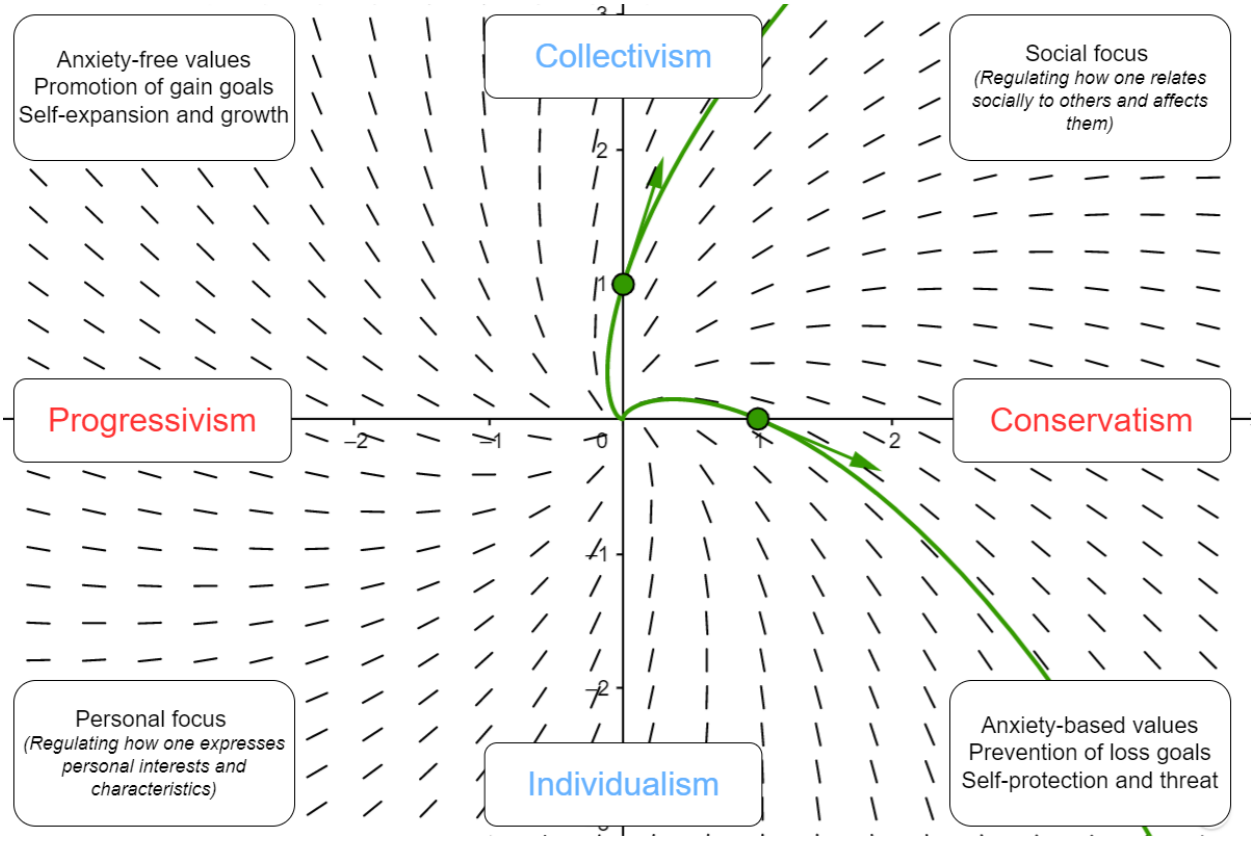
For both other life events, the coefficients in the matrices Γ are very close to these ones which indicates that spillover effects do not depend on life events but are rather inherent.[31] Thus, the effect of the life event Z on values is derived from the matrix product of $\Theta = \begin{pmatrix} \theta_{Cons} & \theta_{Coll} \end{pmatrix}$ and the propagation matrix Γ^{-1} that accounts for direct and spillover effects.

Considering the effect of the life event Z on both values as a homogeneous system of

[30] In the extension of the theoretical framework in Appendix F, I show that there is a bias when measuring the effect of an endogenous life event—such as unemployment—on values and I derive its expression. The bias does not affect the relative shares of the total effect that are due to the direct and spillover effects, nor the sign of the latter. However, the bias may affect the magnitude of the effect. In an extreme case of endogeneity of unemployment to values, the magnitudes have to be multiplied by a factor of 2/5, whereas feasible scenarios are likely to lie within a scale factor ranging from 1 (no endogeneity) to 2/3.

[31] See Tables E.6 and E.7 in the appendix from which the Γ matrix can be derived. For the got-cancer life event, $\Gamma = \begin{pmatrix} 1 & 0.37 \\ -0.34 & 1 \end{pmatrix}$. For the been-unemployed life event, $\Gamma = \begin{pmatrix} 1 & 0.37 \\ -0.33 & 1 \end{pmatrix}$.

Figure 7: Dynamics between values



Notes: This figure presents the phase plane of the homogeneous system of first-order linear differential equations that describes the relationship between conservatism (versus progressivism) and collectivism (versus individualism) values. Green arrows decompose the direct effect and the indirect effect, i.e. spillover effect, due to a one standard deviation increase in each value.

first-order linear differential equations leads to

$$x' = 0.89x + 0.28y,$$
$$y' = -0.35x + 0.89y,$$

where x and y are the magnitudes of both information shocks from Θ, whereas x' and y' correspond to the net effects on values from Φ. Solving this system leads to complex eigenvalues with positive real parts. This is due to the fact that, in Γ, the coefficients on the diagonal are equal to one and both off-diagonal coefficients have opposite signs.

Figure 7 illustrates the phase plane of this system. Both dots are set to 1 on both axes, thus, the arrows describe the change in values for a one standard deviation increase on either the x-axis or the y-axis, i.e. in conservatism or in collectivism. An increase in conservatism has a negative spillover effect on collectivism, while an increase in collectivism has a positive

spillover effect on conservatism. Thus, the relationship between values is *not reciprocal* because of the spiral pattern in the system of first-order linear differential equations that is derived from the propagation matrix Γ.

Social psychology literature provides dynamic principles that shed light on the spiral pattern. Those principles correspond to the dynamic underpinnings of changes in values and correspond to the four corners of the figure (see Schwartz 2012 for more details). For instance, any simultaneous increase in both conservatism and collectivism, hence toward the top-right corner, refers to a rise in *social focus*, i.e. preferring to live within a community and reinforcing the stability, tradition, and conformity to that community. Conversely, a decrease in those two values, hence toward the bottom-left corner, corresponds to a raise in *personal focus*, i.e. preferring to focus on self and not being constrained by rules. Looking at the two other corners, when individualism increases along with conservatism, hence toward the bottom-right corner, this refers to changes in values that help to deal with anxiety and the fear of loss goals, thus, they are self-protective values. Conversely, the top-left corner corresponds to self-expansive and anxiety-free based values.

Examining the spiral pattern of spillover effects through the lens of the dynamic underpinnings of value changes (from social psychology) provides several keys to understanding how life-changing events affect individuals' values in Figure 6. First, the initial increase in conservatism for both girl-first and got-cancer life events generates a spillover in individualism as those two life events are associated with anxiety, hence, self-protective values. Meanwhile, the initial raise of collectivist values reinforces the increase in conservatism by generating a positive spillover as it triggers a rise in social focus, i.e. relying more on the community and its rules. For the been-unemployed life event, the initial increase in progressivism characterizes an increase in anxiety-free values as the fear of being unemployed is not relevant anymore compared to those who have never been unemployed, hence, preventing themselves from losses. This raise in anxiety-free values has a positive impact on collectivism. The direct effect on collectivism is positive as the individual had relied more on the community since she had been unemployed, thus, this increases the social focus, hence conservative values.

6 Summary and concluding remarks

Extensive literature has studied the effect of life experiences, such as parenthood, sickness or unemployment, on values while assuming that values are independent; hence, neglecting all the indirect consequences of a change in one value for the other values. In this paper, I show that values are inter-dependent as they are central to individuals' social identity.

My results suggest that the inter-dependence between values, due to social identity, plays an important role in the dynamics of values. This inter-dependence emerges from the willingness of individuals to be consistent with respect to values held in the group with which they identify. Thus, I show that neglecting this mechanism underestimates to which extent life-changing events affect individuals' values.

This paper has two main limitations that open up several avenues for future research. First, I assume that value frontiers between groups are exogenous, while they are most likely endogenous. In my theoretical framework, I assume that the population is sufficiently large to ensure the anonymity of the agent, meaning that any change of value from the agent does not change the distribution. Relaxing this assumption would make the value frontier between groups endogenous. It would also relate the theoretical framework to the literature on networks, considering, for instance, some individuals are more influential than others according to their position within the network. Such a framework could lead to a new approach in linking behaviors, values, and networks in a context of inter-dependence between values. Although I do not consider this approach in this paper, I intend to explore it in future works.

Second, I focus on individual life events, hence, the model is a partial equilibrium model. I assume that values held in the group are time-invariant. An extension of the model would be to make them time-dependent, such that sufficiently large shocks in one period, such as economic crises or global pandemics, would affect the average values. However, this extension goes beyond the scope of the paper and is also intentionally left for future research.

This paper raises an issue that has received little attention in the economic literature, namely, the consequences of life events on values and social identity. As values are at the roots of agents' preferences, which themselves can explain gaps in economic outcomes, I believe that values dynamics could be incorporated in future work to explain how observed gaps between individuals can be due to differences in exposure to life events.

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Appendices

A Model details

This appendix presents the details of the theoretical framework.

Proof of Proposition 1. The value converges as $\lim_{t\to+\infty} a_t = a^\star$ since $(\eta_a, \phi_a) \in (\mathbb{R}_+^\star)^2$. The rate of convergence $\eta_a/(\eta_a + \phi_a)$ is a decreasing in ϕ_a/η_a. The smaller the rate of convergence, the faster the speed of convergence. Therefore, the speed of convergence is an increasing function of the relative weight of the group consistency with respect to the time consistency in the utility function. ■

Proof of Proposition 2. $\forall s \in \{1,2\}, \forall a_t \in \mathbb{R},\ \exists |\Delta a_t| > |\Delta \tilde{a}_t|$ such that $\lim_{t\to+\infty} a_{t+1} = a^\star(-s_t)$ ■

Proof of Proposition 3. Starting with the expression of the indifference value $\tilde{a}$ from equation (9), it is straightforward to show that $\frac{\partial^2 \tilde{a}}{\partial(\bar{b}_2 - \bar{b}_1)^2} > 0$. In this example, $\tilde{a}$ is a convex function of $\bar{b}_2 - \bar{b}_1$. Thus, the greater the gap between both groups in value b with respect to value a, the greater the information shock in value a has to be so that the agent identifies with the other group. Therefore, the less relevant is this latter value in its choice of social identity. ■

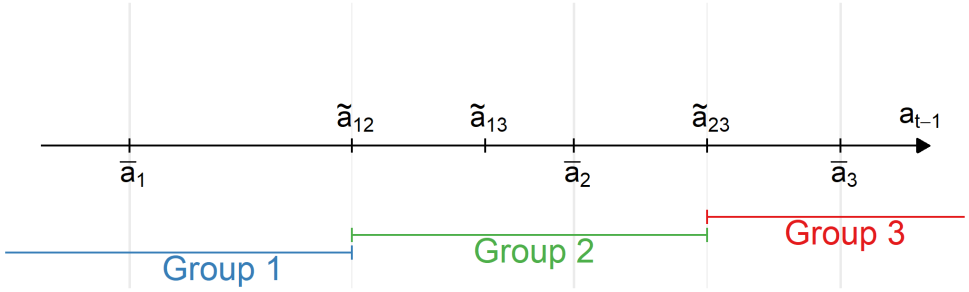
Proof of Proposition 4. If $\bar{b} - \underline{b} \neq 0$, then $\exists \Delta a_{t-1}$ such that $|a'_{t-1}| > |\tilde{a}_{t-1}|$ which implies that the individual identifies to the other group in period t. Therefore, both values a_t and b_t converge toward those of the other group. ■

Theoretical framework with three groups. One may ask to which extent the results hold with more than two groups. So, suppose that instead of having two groups in the reference population, we introduce a third group between both groups. I refer to the former groups as s_A and s_C instead of $\overline{s}$ and $\underline{s}$, while s_B is the new group.

Starting with the single-value model, the ranking is as follows $a_A < a_B < a_C$. Reproducing figure 1 but with three groups leads to figure A.1. Introducing an additional group does not change the indifference value between two groups—which remains the midpoint value. Propositions 1 and 2 hold in the three-group model.

Consider the two-value model by introducing the second value b. Assume the following ranking $a_C < a_B < a_A$ and $b_C < b_B < b_A$, which means that values are positively correlated across groups. I use the simplest case as an example, but other types of ranking are possible. Suppose the setup of section 2 with respect to the agent. She belongs to the group with the lowest value a, hence, s_A. It is still possible to derive the expression of the indifference value

Figure A.1: Indifference value and group membership (with three groups)



Notes: This figure is an extension of figure 1 when there are three groups instead of two in the single value model. The figure presents the indifference values $\tilde{a}_{ij}$ which are defined as the threshold values a in $t-1$ such that the agent is indifferent between two groups. When the value a in previous period lie in the area of one group, the agent prefers to identify to this group.

between the groups A and $j \in \{B, C\}$ from equation (9), namely,

$$\tilde{a}_{Aj} = \hat{a}_{Aj} + \frac{1}{2\gamma} \frac{(b_j - b_A)^2}{a_j - a_A}, \tag{18}$$

where $\hat{a}_{Aj}$ is the midpoint value between those of both groups A and j. Since $a_j - a_A > 0$, it means that the second term of (18) is positive. As a result, the indifference value $\tilde{a}$ is greater than the midpoint value. Both frontiers are pushed further right with respect to the single-value model in figure A.1.

Under those conditions, it is still always possible to find an information shock such that the agent changes her group. Therefore, both propositions 3 and 4 hold. Although spillover effects still exist, their magnitudes are different with respect to the case with the two groups. Information shocks that move a'_{t-1} between $\tilde{a}_{AB}$ and $\tilde{a}_{BC}$ generate smaller spillover effects—with respect to the two-group model—as the agent identifies to the group s_B; while shocks that move a'_{t-1} beyond $\tilde{a}_{BC}$ generate larger spillover effects.

B Statement details

This appendix presents the details of statements according to attitudes and their availability in interviews. Table B.1 presents the number of available statements at each interview. Tables B.2, B.3 and B.4 present the details of statement by attitudes.

Table B.1: Number of available statements at each interview

	BCS70			NCDS58		
Attitude	26	30	42	33	42	50
Authority	4	6	3	6	6	3
Anti-Racism		5	2	5	5	3
Children		4	2	2	4	
Environment		3	2	3	3	3
Inequality Aversion	1	7	5	7	7	3
Info. Techno.		4			4	
Learning		4			4	
Morale	3	6	3	6	6	3
Political Cynicism	3	3	3	3	3	3
Work Ethic	2	3	3	3	3	3
Working Mother		5	2		5	

Notes: This table presents the number of available statements in each attitudes at each age for the NCDS58 and BCS70 cohorts. Details on statements are reported in Tables B.2, B.3 and B.4.

Table B.2: Statements details by attitudes - Part 1/3

Variable	Question	Rev
Authority (A)		
A1	The law should be obeyed, even if a particular law is wrong?	
A2	For some crimes the death penalty is the most appropriate sentence?	
A3	Censorship of films and magazines is necessary to uphold moral standards?	
A4	People who break the law should be given stiffer sentences?	
A5	Young people today don't have enough respect for traditional British values?	
A6	Schools should teach children to obey authority?	
Anti-Racism (AR)		
AR1	It is alright for people from different races to get married?	
AR2	I would not mind if a family from another race moved in next door to me?	
AR3	I would not mind if my child went to a school where half the children were of another race?	
AR4	I would not mind working with people from other races?	
AR5	I would not want a person from another race to be my boss?	X
Children (C)		
C1	Unless you have children you'll be lonely when you get old?	
C2	People can have a fulfilling life without having children?	X
C3	Having children seriously interferes with the freedom of their parents?	X
C4	People who never have children are missing an important part of life?	
Environment (E)		
E1	Problems in the environment are not as serious as people claim?	X
E2	We should tackle problems in the environment even if this means slower economic growth?	
E3	Preserving the environment is more important than any other political issue today?	

Notes: The *Rev* column indicates whether the scale has been reversed in the analysis to make it consistent with the other questions.

Table B.3: Statements details by attitudes - Part 2/3

Variable	Question	Rev
Inequality Aversion (IA)		
IA1	Big business benefits owners at the expense of the workers?	
IA2	Private schools should be abolished?	
IA3	Management will always try to get the better of employees if it gets the chance?	
IA4	The time has come for everyone to arrange their own private health care and stop relying on the NHS?	X
IA5	Ordinary working people do not get their fair share of the nation's wealth?	
IA6	Government should redistribute income from the better off to those who are less well off?	
IA7	There is one law for the rich and one for the poor?	
Information Technology (IT)		
IT1	Computers at work are destroying people's skills?	X
IT2	Computers enrich the lives of those who use them?	
IT3	Every family should have a computer?	
IT4	Learning to use a computer is more trouble than it's worth?	X
Learning (L)		
L1	You are more likely to get a better job if you do some learning, training or education?	
L2	For getting jobs, knowing the right people is more important than the qualifications?	X
L3	Learning about new things boosts your confidence?	
L4	The effort of getting qualifications is more trouble than it's worth?	X
Morale (MOR)		
MOR1	Divorce is too easy to get these days?	
MOR2	Married people are generally happier than unmarried people?	
MOR3	Couples who have children should not separate?	
MOR4	Marriage is for life?	
MOR5	All women should have the right to choose an abortion if they wish?	X
MOR6	It is alright for people to have children without being married?	X

Notes: The *Rev* column indicates whether the scale has been reversed in the analysis to make it consistent with the other questions.

Table B.4: Statements details by attitudes - Part 3/3

Variable	Question	Rev
Political Cynicism (PC)		
PC1	None of the political parties would do anything to benefit me?	
PC2	It does not really make much difference which political party is in power in Britain?	
PC3	Politicians are mainly in politics for their own benefit and not for the benefit of the community?	
Work-Ethic (WE)		
WE1	Having almost any job is better than being unemployed?	
WE2	If I didn't like a job I'd pack it in, even if there was no other job to go to?	X
WE3	Once you've got a job it's important to hang on to it even if you don't really like it?	
Working Mother (WM)		
WM1	A pre-school child is likely to suffer if his or her mother works?	X
WM2	All in all, family life suffers when the mother has a full time job?	X
WM3	Children benefit if their mother has a job outside the home?	
WM4	A mother and her family will all be happier if she goes out to work?	
WM5	A father's job is to earn money; a mother's job is to look after the home and family?	X

Notes: The *Rev* column indicates whether the scale has been reversed in the analysis to make it consistent with the other questions.

C Principal component analysis

This appendix presents the principal components eigenvectors from the Principal Component Analysis (PCA) in section 3. Table C.1 presents the eigenvectors for the BCS70 cohort, while table C.2 displays those for the NCDS58 cohort.

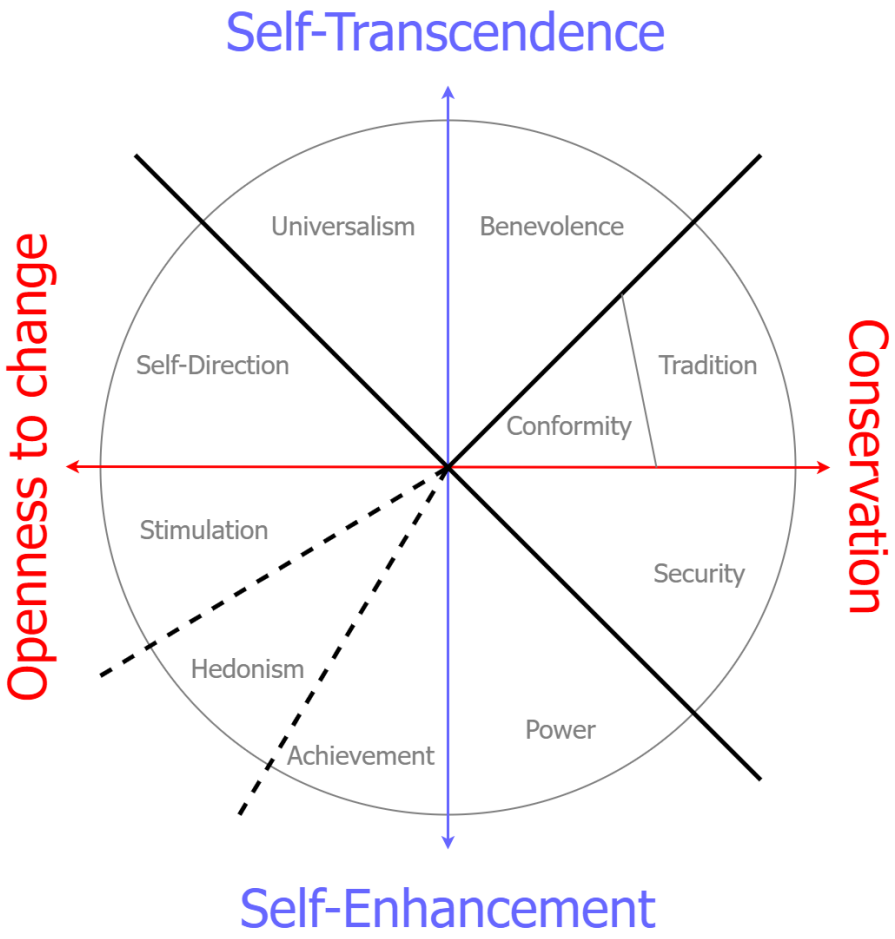
Table C.1: Principal components eigenvectors for the BCS70 cohort

	PC1	PC2	PC3	PC4	PC5
Age 26					
Authority	0.622	0.011	0.136	-0.146	-0.757
Inequality Aversion	-0.182	0.686	-0.533	0.348	-0.303
Morale	0.521	0.244	-0.453	-0.513	0.449
Political Cynicism	0.149	0.656	0.695	0.065	0.245
Work Ethic	0.535	-0.200	-0.093	0.769	0.272
Standard deviation	1.262	1.087	0.929	0.866	0.783
Proportion of Variance	0.319	0.236	0.173	0.150	0.123
Cumulative Proportion	0.319	0.555	0.727	0.877	1.000
Age 30					
Authority	0.614	-0.162	-0.050	0.281	-0.718
Inequality Aversion	0.153	0.702	0.013	-0.638	-0.278
Morale	0.534	-0.109	-0.678	-0.202	0.450
Political Cynicism	0.326	0.605	0.221	0.592	0.359
Work Ethic	0.456	-0.321	0.699	-0.351	0.276
Standard deviation	1.243	1.137	0.918	0.827	0.797
Proportion of Variance	0.309	0.259	0.169	0.137	0.127
Cumulative Proportion	0.309	0.568	0.736	0.873	1.000
Age 42					
Authority	0.570	-0.360	-0.004	-0.519	-0.526
Inequality Aversion	0.172	0.722	0.172	0.280	-0.584
Morale	0.462	-0.048	-0.749	0.466	0.079
Political Cynicism	0.517	0.474	0.122	-0.368	0.598
Work Ethic	0.406	-0.350	0.628	0.548	0.135
Standard deviation	1.184	1.124	0.968	0.882	0.787
Proportion of Variance	0.281	0.253	0.187	0.156	0.124
Cumulative Proportion	0.281	0.533	0.721	0.876	1.000

Table C.2: Principal components eigenvectors for the NCDS58 cohort

	PC1	PC2	PC3	PC4	PC5
Age 33					
Authority	0.607	-0.150	0.155	-0.546	0.535
Inequality Aversion	0.006	0.730	-0.072	0.353	0.580
Morale	0.548	-0.077	0.551	0.591	-0.201
Political Cynicism	0.276	0.654	0.053	-0.414	-0.567
Work Ethic	0.504	-0.102	-0.815	0.237	-0.122
Standard deviation	1.250	1.162	0.901	0.851	0.741
Proportion of Variance	0.313	0.270	0.162	0.145	0.110
Cumulative Proportion	0.313	0.583	0.745	0.890	1.000
Age 42					
Authority	0.605	-0.141	-0.156	0.369	0.674
Inequality Aversion	0.173	0.713	0.178	-0.559	0.342
Morale	0.500	-0.245	-0.542	-0.534	-0.333
Political Cynicism	0.446	0.521	0.038	0.480	-0.546
Work Ethic	0.395	-0.375	0.805	-0.187	-0.144
Standard deviation	1.258	1.101	0.916	0.875	0.775
Proportion of Variance	0.317	0.242	0.168	0.153	0.120
Cumulative Proportion	0.317	0.559	0.727	0.880	1.000
Age 50					
Authority	0.531	-0.134	0.063	-0.816	-0.173
Inequality Aversion	0.554	0.296	-0.075	0.441	-0.637
Morale	0.157	-0.663	-0.716	0.152	0.018
Political Cynicism	0.578	0.264	-0.063	0.170	0.750
Work Ethic	0.229	-0.620	0.689	0.296	0.033
Standard deviation	1.373	1.046	0.945	0.804	0.694
Proportion of Variance	0.377	0.219	0.179	0.129	0.096
Cumulative Proportion	0.377	0.596	0.775	0.904	1.000

Figure C.1: Two-dimensional structure of universal motivational types of values



Notes: This figure reproduces the two-dimensional structure of motivational types of values from Schwartz (1992, 2012).

D Data details

This appendix presents the details of the data. Table D.1 shows the shares of vote in general elections in both cohorts.

Table D.1: Shares of vote in general elections in both cohorts

		Proportion of total (in percent)					
		Other	Con	Grn	Lab	LD	UKIP
BCS70	Age 26 (GE 1997)	45.5	15.6	0.5	30.8	7.6	
BCS70	Age 30 (GE 2001)	51.6	13.0	1.0	25.8	7.8	0.8
BCS70	Age 42 (GE 2010)	30.4	28.8	1.7	23.1	14.3	1.7
NCDS58	Age 33 (GE 1987)	27.6	34.0		26.8	11.6	
NCDS58	Age 42 (GE 1997)	27.6	21.5	0.6	40.5	9.8	
NCDS58	Age 50 (GE 2010)	43.2	22.9	1.1	19.0	10.8	3.0

Notes: This table presents the vote proportions (in percentage) for both cohorts at different ages according to the closest General Election (GE). Political parties are (in alphabetical order): Conservative (Con), Green (Grn), Labour (Lab), Liberal Democrat (LD), and UK Independence Party (UKIP). Other encompasses all other parties, blank votes, and abstention.

E Estimates

This appendix presents additional regression tables of the paper. Table E.1 presents the long-version table of the regression table 3 in the paper. Table E.2 presents the IV estimate of the spillover effects. Tables E.3 and E.4 correspond to the IV estimate of the group membership. Table E.5, E.6, and E.7 present the details of the 2SLS estimates of the SEM for, respectively, the girl-first, got-cancer, and been-unemployed life event. Tables E.8, E.9, and E.10 summarize the decomposition of the total effect from the SEM for, respectively, the girl-first, got-cancer, and been-unemployed life event. Figure E.1 summarizes the decomposition of the total effect of girl-first life event by parent. Figure E.2 summarizes the decomposition of the total effect of girl-first life event by education level. Figure E.5 summarizes the decomposition of the total effect of been-unemployed life event according to the current activity status.

Table E.1: Effect of life events on values

	Linear regression - OLS					
	GirlFirst		GotCancer		BeenUnemp	
	(Cons)	(Coll)	(Cons)	(Coll)	(Cons)	(Coll)
Intercept	0.32^{***}	-0.15^{***}	0.27^{***}	-0.07^{***}	0.26^{***}	-0.11^{***}
	(0.02)	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)
Female	-0.19^{***}	0.07^{***}	-0.17^{***}	0.02	-0.17^{***}	0.03^{***}
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Educ. Secondary	-0.29^{***}	-0.04^{**}	-0.28^{***}	-0.03^{**}	-0.28^{***}	-0.03^{**}
	(0.02)	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)
Educ. Tertiary	-0.52^{***}	-0.04^{**}	-0.50^{***}	-0.03^{**}	-0.50^{***}	-0.03^{***}
	(0.02)	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)
Life event	0.03^{**}	0.00	0.09^{***}	0.02	0.02^{*}	0.18^{***}
	(0.01)	(0.01)	(0.03)	(0.03)	(0.01)	(0.01)
Value_{t-1}	0.54^{***}	0.49^{***}	0.56^{***}	0.50^{***}	0.56^{***}	0.49^{***}
	(0.01)	(0.01)	(0.00)	(0.00)	(0.00)	(0.00)
R^2	0.37	0.26	0.39	0.27	0.39	0.27
Adj. R^2	0.37	0.26	0.39	0.27	0.39	0.27
Num. obs.	23354	23354	32885	32885	32885	32885

Notes: $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$. Standard errors between parentheses. Male in the NCDS cohort in his forties with primary education as the reference group. GirlFirst and GotCancer are the life events. In GirlFirst regressions, parents who have had a boy as a first child are the reference group. In GotCancer regressions, individuals who never had a cancer are the reference group. In BeenUnemp, individuals who have never been unemployed are the reference group. Table 3 in the paper summarizes the coefficients.

Table E.2: IV Estimate of the spillover effect

	IV regression - 2SLS			
	GirlFirst		GotCancer	
	(Cons)	(Coll)	(Cons)	(Coll)
Intercept	0.32^{***}	0.07^{***}	0.27^{***}	0.10^{***}
	(0.02)	(0.02)	(0.01)	(0.01)
Female	-0.19^{***}	-0.02^{**}	-0.17^{***}	-0.06^{***}
	(0.01)	(0.01)	(0.01)	(0.01)
Educ. Secondary	-0.29^{***}	-0.18^{***}	-0.28^{***}	-0.19^{***}
	(0.02)	(0.02)	(0.01)	(0.01)
Educ. Tertiary	-0.52^{***}	-0.33^{***}	-0.50^{***}	-0.36^{***}
	(0.02)	(0.02)	(0.01)	(0.01)
Life event	0.03^{**}		0.09^{***}	
	(0.01)		(0.03)	
$\widehat{\text{Cons}}_t$		-0.32^{***}		-0.34^{***}
		(0.01)		(0.01)
Value_{t-1}	0.54^{***}	0.48^{***}	0.56^{***}	0.49^{***}
	(0.01)	(0.01)	(0.00)	(0.00)
R^2	0.37	0.30	0.39	0.31
Adj. R^2	0.37	0.30	0.39	0.31
Num. obs.	23354	23354	32885	32885

Notes: $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$. Standard errors between parentheses. Control variables include gender, education (primary, secondary, tertiary), cohort fixed effects and period fixed effects. Male in the NCDS cohort in his forties with primary education as the reference group. GirlFirst and GotCancer are the life events. In GirlFirst regressions, parents who have had a boy as a first child are the reference group. In GotCancer regressions, individuals who never had a cancer are the reference group. Table 5 in the paper summarizes the coefficients.

Table E.3: IV Estimate of the group membership (GirlFirst)

	IV regression - GirlFirst - Multinomial logit - Dep. var.: Vote				
	(Con)	(Grn)	(Lab)	(LD)	(UKIP)
Intercept	-1.41^{***}	-3.58^{***}	-1.10^{***}	-1.98^{***}	-5.08
	(0.04)	(0.14)	(0.04)	(0.05)	(3.22)
Female	-0.15^{***}	0.04	-0.04	-0.02	-0.27^{**}
	(0.04)	(0.15)	(0.04)	(0.05)	(0.12)
Educ. Secondary	0.56^{***}	0.35^{*}	0.09^{*}	0.55^{***}	0.08
	(0.05)	(0.20)	(0.05)	(0.07)	(0.16)
Educ. Tertiary	0.78^{***}	0.62^{***}	0.36^{***}	0.94^{***}	-0.22
	(0.06)	(0.19)	(0.06)	(0.07)	(0.20)
$\widehat{\text{Cons}}_t$	0.01	-0.85^{***}	-0.27^{***}	-0.34^{***}	0.18^{*}
	(0.03)	(0.10)	(0.03)	(0.04)	(0.09)
Con Vote_{t-1}	2.56^{***}	0.13	0.46^{***}	0.91^{***}	1.27^{***}
	(0.05)	(0.27)	(0.06)	(0.08)	(0.18)
Grn Vote_{t-1}	0.63^{*}	3.75^{***}	0.77^{**}	1.59^{***}	0.49
	(0.33)	(0.31)	(0.35)	(0.31)	(1.03)
Lab Vote_{t-1}	0.50^{***}	0.81^{***}	2.19^{***}	1.01^{***}	1.14^{***}
	(0.06)	(0.18)	(0.05)	(0.07)	(0.15)
LD Vote_{t-1}	1.06^{***}	1.02^{***}	1.08^{***}	2.73^{***}	1.71^{***}
	(0.08)	(0.25)	(0.08)	(0.08)	(0.20)
UKIP Vote_{t-1}	1.57^{***}	1.46	-0.02	1.21^{**}	3.25^{***}
	(0.38)	(1.06)	(0.66)	(0.50)	(0.49)
Num. obs.	23354	23354	23354	23354	23354

Notes: $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$. Standard errors between parentheses. Control variables include gender, education (primary, secondary, tertiary), cohort fixed effects and period fixed effects. Male in the NCDS cohort in his forties with primary education as the reference group. GirlFirst and GotCancer are the life events. Parents who have had a boy as a first child are the reference group. The baseline outcome of the multinomial logistic regression is the vote for Other (encompassing all other parties, blank votes and abstention). Vote_{t-1} corresponds to the effect of having voted for the corresponding party in the previous period. Table 6 in the paper summarizes the coefficients.

Table E.4: IV Estimate of the group membership (GotCancer)

	IV regression - GotCancer - Multinomial logit - Dep. var.: Vote				
	(Con)	(Grn)	(Lab)	(LD)	(UKIP)
Intercept	-1.43^{***}	-3.47^{***}	-1.19^{***}	-1.97^{***}	-5.49
	(0.03)	(0.10)	(0.03)	(0.04)	(11.53)
Female	-0.09^{***}	0.08	0.03	0.06	-0.28^{***}
	(0.03)	(0.11)	(0.03)	(0.04)	(0.10)
Educ. Secondary	0.58^{***}	0.23	0.09^{**}	0.50^{***}	0.06
	(0.04)	(0.16)	(0.04)	(0.06)	(0.13)
Educ. Tertiary	0.74^{***}	0.65^{***}	0.36^{***}	0.88^{***}	-0.22
	(0.05)	(0.14)	(0.04)	(0.06)	(0.16)
$\widehat{\text{Cons}}_t$	0.08^{***}	-0.67^{***}	-0.24^{***}	-0.32^{***}	0.19^{**}
	(0.03)	(0.07)	(0.02)	(0.03)	(0.07)
Con Vote_{t-1}	2.56^{***}	0.09	0.47^{***}	0.82^{***}	1.22^{***}
	(0.04)	(0.21)	(0.05)	(0.07)	(0.15)
Grn Vote_{t-1}	0.29	3.31^{***}	0.36	1.24^{***}	1.28^{***}
	(0.25)	(0.23)	(0.27)	(0.23)	(0.48)
Lab Vote_{t-1}	0.41^{***}	0.73^{***}	2.21^{***}	0.99^{***}	0.87^{***}
	(0.05)	(0.14)	(0.04)	(0.06)	(0.13)
LD Vote_{t-1}	1.00^{***}	1.17^{***}	1.11^{***}	2.71^{***}	1.54^{***}
	(0.07)	(0.18)	(0.06)	(0.06)	(0.16)
UKIP Vote_{t-1}	1.46^{***}	1.60^{**}	-0.03	1.28^{***}	3.06^{***}
	(0.32)	(0.77)	(0.57)	(0.41)	(0.42)
Num. obs.	32885	32885	32885	32885	32885

Notes: $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$. Standard errors between parentheses. Control variables include gender, education (primary, secondary, tertiary), cohort fixed effects and period fixed effects. Male in the NCDS cohort in his forties with primary education as the reference group. GirlFirst and GotCancer are the life events. Individuals who never had a cancer are the reference group. The baseline outcome of the multinomial logistic regression is the vote for Other (encompassing all other parties, blank votes and abstention). Vote_{t-1} corresponds to the effect of having voted for the corresponding party in the previous period. Table 6 in the paper summarizes the coefficients.

Table E.5: SEM Estimate of the spillover effects (GirlFirst)

	2SLS regression			
	Reduced form (Stage 1)		Structural form (Stage 2)	
	(Cons)	(Coll)	(Cons)	(Coll)
GirlFirst	0.03^{***}	0.00	0.03^{***}	0.01
	(0.01)	(0.01)	(0.01)	(0.01)
Cons_{t-1}	0.55^{***}	-0.17^{***}	0.62^{***}	
	(0.01)	(0.01)	(0.01)	
Coll_{t-1}	0.19^{***}	0.48^{***}		0.54^{***}
	(0.01)	(0.01)		(0.01)
$\widehat{\text{Cons}}_t$				-0.31^{***}
				(0.01)
$\widehat{\text{Coll}}_t$			0.39^{***}	
			(0.01)	
R^2	0.40	0.30	0.40	0.30
Adj. R^2	0.40	0.30	0.40	0.30
Num. obs.	23354	23354	23354	23354

Notes: $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$. Standard errors between parentheses. Control variables in all regressions include cohort, period, gender and education.

Table E.6: SEM Estimate of the spillover effects (GotCancer)

	2SLS regression			
	Reduced form (Stage 1)		Structural form (Stage 2)	
	(Cons)	(Coll)	(Cons)	(Coll)
GotCancer	0.07^{**}	0.03	0.06^{*}	0.05^{*}
	(0.03)	(0.03)	(0.03)	(0.03)
Cons_{t-1}	0.57^{***}	-0.19^{***}	0.64^{***}	
	(0.00)	(0.00)	(0.00)	
Coll_{t-1}	0.18^{***}	0.49^{***}		0.55^{***}
	(0.00)	(0.00)		(0.00)
$\widehat{\text{Cons}}_t$				-0.34^{***}
				(0.01)
$\widehat{\text{Coll}}_t$			0.37^{***}	
			(0.01)	
R^2	0.42	0.31	0.42	0.31
Adj. R^2	0.42	0.31	0.42	0.31
Num. obs.	32885	32885	32885	32885

Notes: $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$. Standard errors between parentheses. Control variables in all regressions include cohort, period, gender and education.

Table E.7: SEM Estimate of the spillover effects (BeenUnemp)

	2SLS regression			
	Reduced form (Stage 1)		Structural form (Stage 2)	
	(Cons)	(Coll)	(Cons)	(Coll)
BeenUnemp	-0.03^{***}	0.14^{***}	-0.08^{***}	0.12^{***}
	(0.01)	(0.01)	(0.01)	(0.01)
Cons_{t-1}	0.57^{***}	-0.19^{***}	0.64^{***}	
	(0.00)	(0.00)	(0.00)	
Coll_{t-1}	0.18^{***}	0.48^{***}		0.54^{***}
	(0.00)	(0.00)		(0.00)
$\widehat{\text{Cons}}_t$				-0.33^{***}
				(0.01)
$\widehat{\text{Coll}}_t$			0.37^{***}	
			(0.01)	
R^2	0.42	0.31	0.42	0.31
Adj. R^2	0.42	0.31	0.42	0.31
Num. obs.	32885	32885	32885	32885

Notes: $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$. Standard errors between parentheses. Control variables in all regressions include cohort, period, gender and education.

Table E.8: Decomposition of the effect of GirlFirst on values

	Direct and indirect effects		Total effect
Value (v)	$\tilde{\gamma}_v^{Cons} \times \theta_{Cons}$	$\tilde{\gamma}_v^{Coll} \times \theta_{Coll}$	ϕ_v
Conservatism ($Cons$)	**0.030**	0.004	0.035
	(100.0)	(13.9)	(113.9)
Collectivism ($Coll$)	-0.010	**0.011**	0.001
	(-88.2)	**(100.0)**	(11.8)

Notes: Magnitudes in standard deviations. Direct effects in bold. Relative share with respect to the direct effect in percent between parentheses.

Table E.9: Decomposition of the effect of GotCancer on values

Value (v)	Direct and indirect effects $\tilde{\gamma}_v^{Cons} \times \theta_{Cons}$	Direct and indirect effects $\tilde{\gamma}_v^{Coll} \times \theta_{Coll}$	Total effect ϕ_v
Conservatism ($Cons$)	**0.052**	0.017	0.069
	(100.0)	(32.5)	(132.5)
Collectivism ($Coll$)	-0.018	**0.046**	0.029
	(-38.1)	**(100.0)**	(61.9)

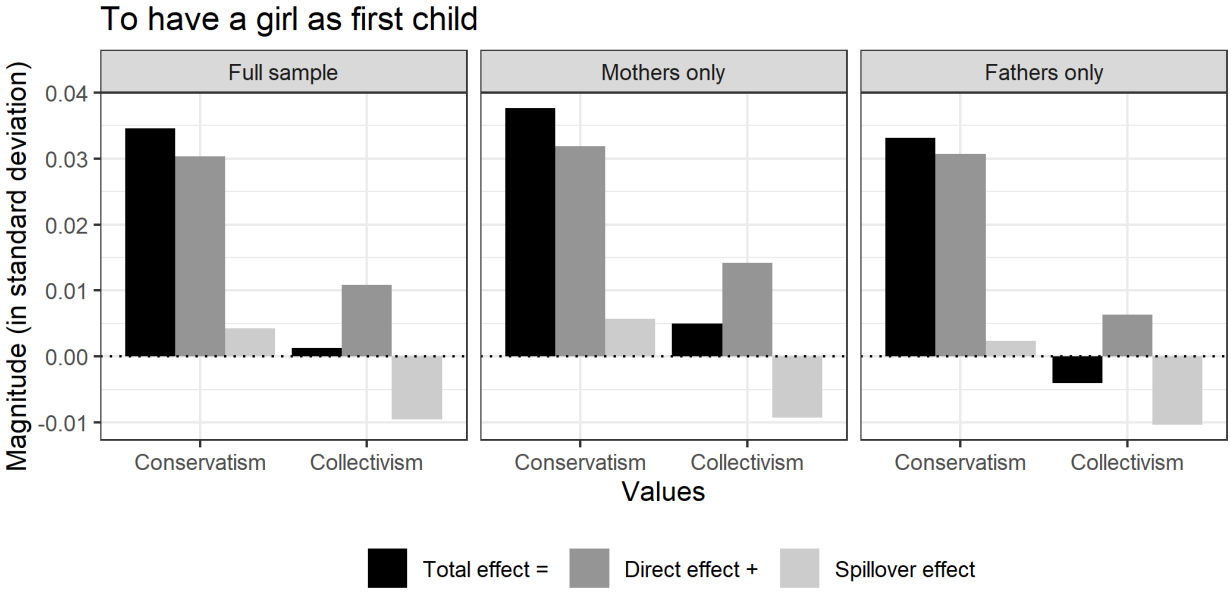
Notes: Magnitudes in standard deviations. Direct effects in bold. Relative share with respect to the direct effect in percent between parentheses.

Table E.10: Decomposition of the effect of BeenUnemp on values

Value (v)	Direct and indirect effects $\tilde{\gamma}_v^{Cons} \times \theta_{Cons}$	Direct and indirect effects $\tilde{\gamma}_v^{Coll} \times \theta_{Coll}$	Total effect ϕ_v
Conservatism ($Cons$)	**-0.073**	0.042	-0.031
	(100.0)	(-57.2)	(42.8)
Collectivism ($Coll$)	0.024	**0.111**	0.135
	(21.7)	**(100.0)**	(121.7)

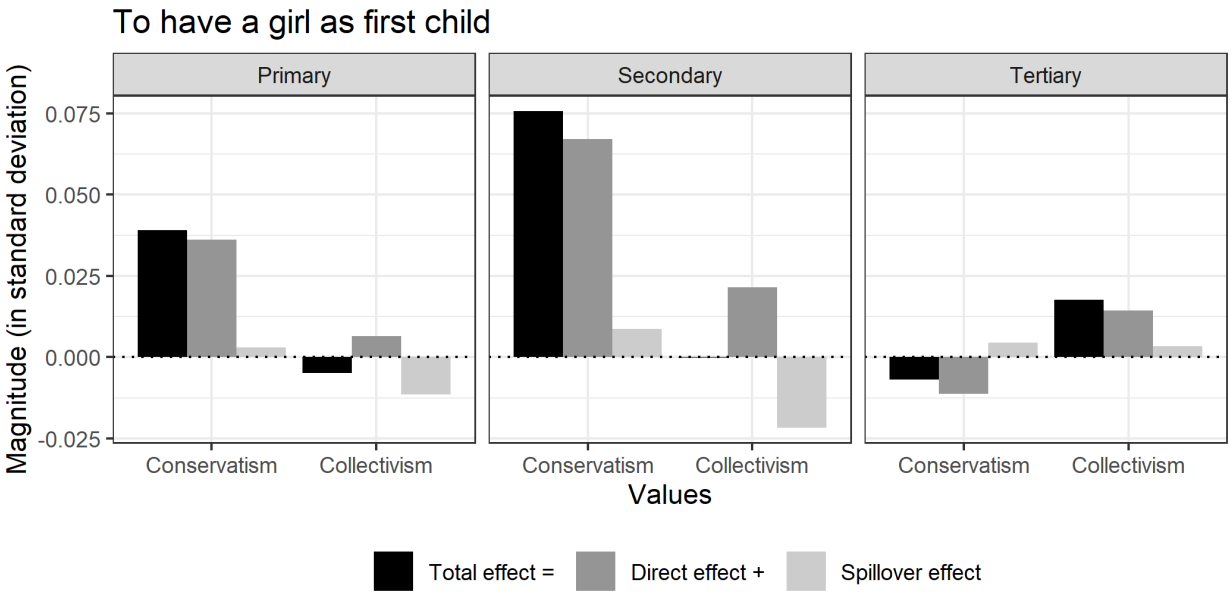
Notes: Magnitudes in standard deviations. Direct effects in bold. Relative share with respect to the direct effect in percent between parentheses.

Figure E.1: Decomposition of the effect of GirlFirst by parent



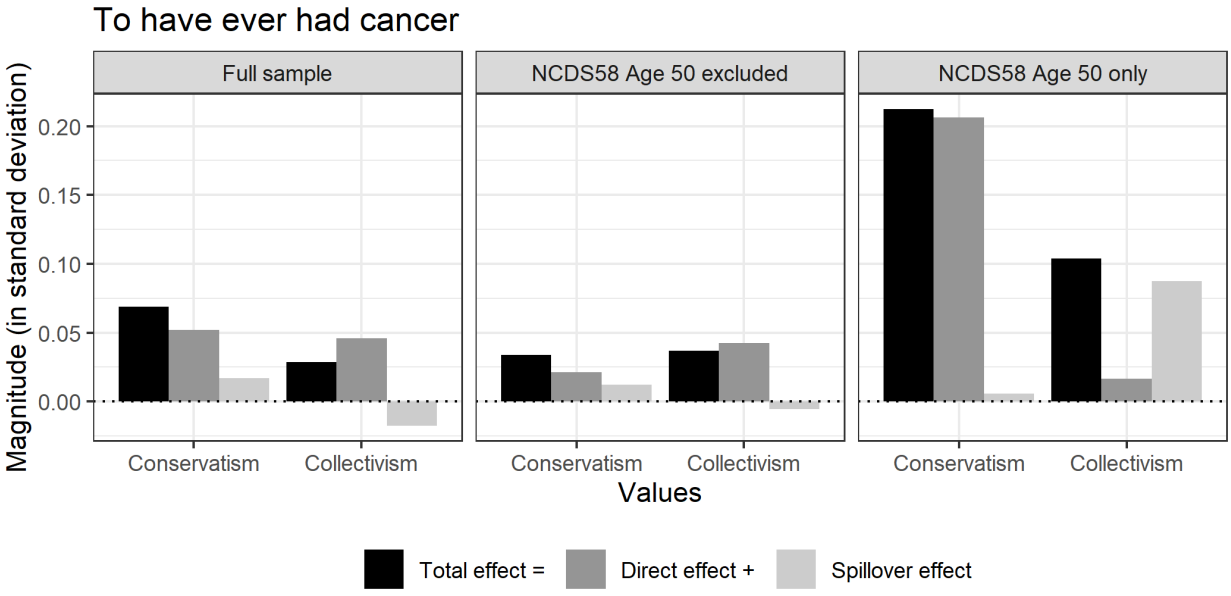
Notes: This figure presents the decomposition of the total effect of the girl-first life event on both values, Conservation and Collectivism, according to the parent. The magnitude of each effect is expressed in standard deviation.

Figure E.2: Decomposition of the effect of GirlFirst by education



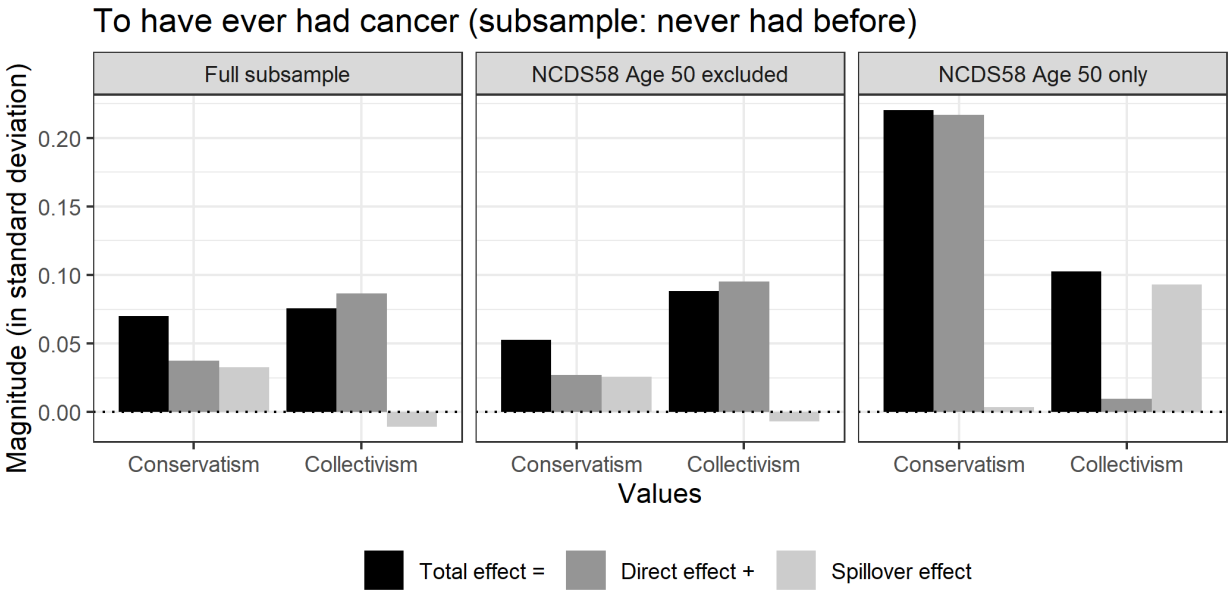
Notes: This figure presents the decomposition of the total effect of the girl-first life event on both values, Conservation and Collectivism, according to education. The magnitude of each effect is expressed in standard deviation.

Figure E.3: Decomposition of the effect of GotCancer with and without the NCDS58 Age 50



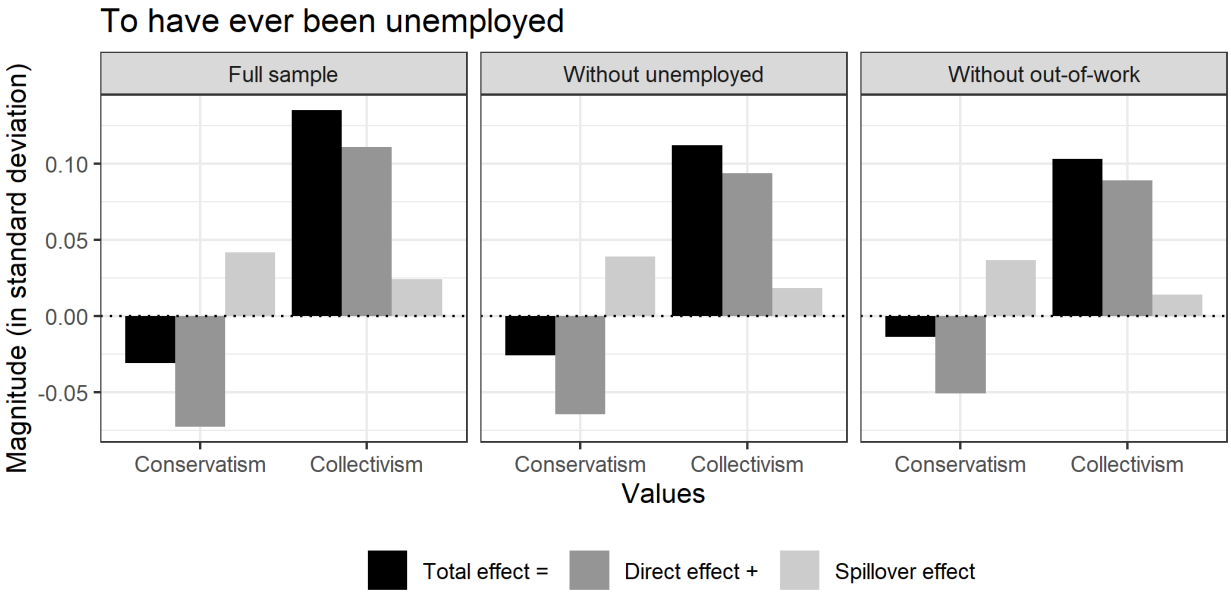
Notes: This figure presents the decomposition of the total effect of the got-cancer life event on both values, Conservation and Collectivism, for the NCDS58 cohort at age 50 only and without them. The magnitude of each effect is expressed in standard deviation.

Figure E.4: Decomposition of the effect of GotCancer for those who never have had cancer before



Notes: This figure presents the decomposition of the total effect of the got-cancer life event on both values, Conservation and Collectivism, for the NCDS58 cohort at age 50 only and without them. The magnitude of each effect is expressed in standard deviation.

Figure E.5: Decomposition of the effect of BeenUnemp by current activity status



Notes: This figure presents the decomposition of the total effect of the been-unemployed life event on both values, Conservation and Collectivism, according to the current activity status. The magnitude of each effect is expressed in standard deviation.

F Extension of the theoretical framework

To quantify the effect of life events on values, we compare two individuals based on their life trajectories and values using the theoretical framework presented in Section 2. Suppose there exist two individuals i and j that are identical except in their initial value a_0, with $a_0^j > a_0^i$. Both individuals belong to the group s_1. Let $\pi_t = \pi(a_t)$ be the probability that a life event occurs which is endogenous to the value a.

Suppose the information shock Δa_0—due to the life event—has the same magnitude for both individuals and would be sufficiently large such that both individuals would identify to the other group. The expected values a_1 and b_1 for the individual j are

$$\mathbb{E}(a_1^j) = \frac{\eta_a a_0^j + \phi_a \bar{a}_1}{\eta_a + \phi_a} + \pi(a_0^j)\left[\frac{\eta_a \Delta a_0 + \phi_a(\bar{a}_2 - \bar{a}_1)}{\eta_a + \phi_a}\right], \tag{19}$$

$$\mathbb{E}(b_1^j) = \frac{\eta_b b_0^j + \phi_b \bar{b}_1}{\eta_b + \phi_b} + \pi(a_0^j)\frac{\phi_b(\bar{b}_2 - \bar{b}_1)}{\eta_b + \phi_b}, \tag{20}$$

where $\mathbb{E}$ is the expectation operator. It is straightforward to show that these values are symmetrical for the individual i. Hence, the biases due to the endogeneity of values can be written as

$$\mathbb{E}(a_1^j) - a_1^j = \pi(a_0^j) \times \Delta A, \tag{21}$$

$$\mathbb{E}(b_1^j) - b_1^j = \pi(a_0^j) \times \Delta B, \tag{22}$$

where $\Delta A \equiv \frac{\eta_a \Delta a_0 + \phi_a(\bar{a}_2 - \bar{a}_1)}{\eta_a + \phi_a}$ is the direct effect of the life changing event on value a, and $\Delta B \equiv \frac{\phi_b(\bar{b}_2 - \bar{b}_1)}{\eta_b + \phi_b}$ is the spillover effect of the life event on value b.

Let $\Delta\mathbb{E}v_t$ be the difference in expected value v_t with respect to the true difference between both individuals, namely,

$$\Delta\mathbb{E}v_t \equiv \mathbb{E}(v_t^j) - \mathbb{E}(v_t^i) - (v_t^j - v_t^i) \tag{23}$$

Thus,

$$\Delta\mathbb{E}a_1 = \left[\pi(a_0^j) - \pi(a_0^i)\right] \times \Delta A, \tag{24}$$

$$\Delta\mathbb{E}b_1 = \left[\pi(a_0^j) - \pi(a_0^i)\right] \times \Delta B, \tag{25}$$

When the probability that the life event occurs is exogenous to values, i.e. $\pi(a_0^j) = \pi(a_0^i)$, there is no bias when estimating the difference between both individuals. However, in many cases such as unemployment, this probability is likely to be endogenous, i.e. $\pi(a_0^j) \neq \pi(a_0^i)$,

Table F.1: Endogeneity bias

	$\beta_a = \log(2)$						
a_0^j	-2	-1	-0.5	0	0.5	1	2
a_0^i	2	1	0.5	0	-0.5	-1	-2
$\pi(a_0^j)$	0.2	0.33	0.41	0.5	0.59	0.66	0.8
$\pi(a_0^i)$	0.8	0.66	0.59	0.5	0.41	0.33	0.2
$\Delta\pi$	-0.6	-0.33	-0.17	0	0.17	0.33	0.6

Notes: This table presents the magnitude of the endogeneity bias due to the difference in initial value a between two individuals. $\pi(a_0, \beta_a)$ corresponds to the probability derived from the binomial logistic function and $\Delta\pi$ to the difference in probabilities between both individuals.

which leads to a bias when gauging the effect of a life event on values.

The magnitude of the bias depends on two components: the difference in terms of probabilities that captures the degree of endogeneity of the life event with respect to values; and the magnitude of either the direct effect or the spillover effect. Although the endogeneity issue affects the magnitude of the total effect, it does not change the relative shares of the direct and spillover effects because it is a scale factor of the total effect.

In order to evaluate the magnitude of the bias, I assume that the probability $\pi(a_t)$ is an increasing function of a_t. The individual j is more likely to face the life event since $a_0^j > a_0^i$. For simplicity, let assume a binomial logistic function such that

$$\pi(a_0, \beta_a) = \frac{e^{\beta_a a_0}}{1 + e^{\beta_a a_0}}. \tag{26}$$

Note that the intercept has been omitted. Suppose a large endogeneity, namely, that the advantage in terms of the probability that the life event occurs given by a higher value a has an odd-ratio about 2, which means that an individual with a one-standard-deviation increase in a_0 would be two times more likely that the life event occurs. As β_a corresponds to the log-odd ratio, it implies that $\beta_a = \log(2)$.

Table F.1 summarizes the size of the bias according to the gap in initial values between both individuals. Since $|\Delta\pi| < 1$, it implies that the endogeneity bias does not change the sign of the direct and indirect effects. The (2, -2) and (-2, 2) scenarii are extreme cases in which there is a high degree of polarization in terms of values such that both groups have respectively 2 and -2 standard deviations on average while the average value in the population remains 0. Even in those extreme cases, both the direct and spillover effects can be biased by at the most a scale factor of plus or minus 0.6.