# Individuals' values over the lifecycle: does consistency matter?*

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**Abstract**

Values capture what is important to an individual and can shape economic behaviors through attitudes and preferences. Yet, no attention has been paid to the fact that individuals hold a variety of values and that there may be costs when these are not consistent with each other. This paper examines how individuals reconcile their values, both over time and across different categories of values, when values are interdependent. The model shows that individuals adjust their values simultaneously when an experience occurs in their life, thus leading to spillover effects across values. Using British data, I assess the impact of several life events—parenthood, sickness and unemployment—on values. The empirical results suggest that (i) values change over the lifecycle due to life events, (ii) spillover effects do exist and are important, and (iii) values are linked to each other in a non-reciprocal way.

**Keywords:** Values dynamics; Cognitive dissonance; Spillover effects; Simultaneous equations model.

**JEL Classification:** A13, D63, D91, Z10.

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# 1 Introduction

Values are beliefs about what is important to every human being and therefore characterize the motivational bases of attitudes and preferences (Schwartz 1992, 2012). The latter then influence individuals' behaviors, such as social interactions, voting preferences and economic decisions. For instance, universalism—which characterizes the understanding, appreciation, tolerance, and protection for the welfare of all people and for nature—can explain the left-right divide in terms of preferences for redistribution (Enke et al. 2020). Studying the dynamics of values is therefore crucial to understand what objectives economic agents pursue in their decision-making process.

The dynamics of values is disciplined by two anchoring forces: *time consistency* and *group consistency*. The former induces rigidity by shaping how values adjust over time, with values being mostly affected by life-changing events that bring new information. The latter relates to the proximity of values held within the group with which we identify. Both are based on the concept of cognitive dissonance introduced by Festinger (1957) and induce a consistency trade-off within our values. Since values are correlated within groups in society, it gives rise to a form of dependence across values that influences the way we adjust our values over time. For instance, the loss—or the illness—of a loved one are among the most difficult periods we have to go through. In addition to the grief, this event can directly affect some of our values, e.g. benevolence. Yet, we embody several values simultaneously and we are psychologically more comfortable when they are not dissonant. The search for consistency raises several questions. Can a value change, such as benevolence or universalism, also trigger changes in other values, such as security or tradition, as we seek to be consistent across our values? How do life events (e.g. unemployment, parenthood, illness, discrimination, etc.) affect our values over the lifecycle when values are inter-dependent?

In this paper, I provide theory and evidence on how individuals reconcile their values, both over time and across different categories, when values are inter-dependent. The literature has so far focused on the relationship between one particular experience and independent attitudes or independent preferences (Piketty 1995, Fernández et al. 2004, Alesina et al. 2018, i.a.), hence, neglecting that values—which characterize attitudes and preferences—are inter-dependent in society (Acemoglu and Robinson 2021). This paper aims to fill this gap and argues that inter-dependence affects the way individuals adjust their values. The basic idea is that individuals adjust their values as a response to a new experience in order to be consistent with, on the one hand, the values held in the group to whom they belong, on the other hand, their past values. When values are independent in society, the adjustment of one value is done independently from the others. Yet, the distribution of values between groups is not random, hence, values are inter-dependent and individuals take this into account. Therefore, they adjust their values *simultaneously* rather than independently, thus, leading to spillover effects across values. To illustrate this idea, I provide both theoretical and empirical frameworks to explore how individuals adjust values subsequent to a life-changing event.

I first develop a model where an individual subject to information shocks sets values so as to limit time inconsistency within values and group dissonance. After a shock, and with endogenous group membership, she will consider identifying with another group, which may imply resetting all her values toward those of this new group. In this framework, the apparent dissonance across values arises from the desire to match a fixed set of values (a group): a shock may lead the agent to identify to a new group, which implies converging in values toward the values of this new group. For this, the information shock needs to be sufficient to make this costly convergence process more desirable than keeping the previous group identity. Since values are correlated among groups, the initial information shock on one value triggers a spillover effect on another value when the agent starts to identify to another group. The inter-dependency 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.

I test the predictions of the theory using data from two mature British cohort studies in which I measure individuals' values at several ages. I show that the variation in the answers to a large set of questions about attitudes can be captured by two main dimensions, which correspond to the two first principal components. These dimensions coincide with the terminology introduced by Schwartz (1992, 2012), namely, the two-dimensional structure of motivational types of values. The first dimension captures *conservation* versus *openness to change*—the preference for stability, security, tradition and conformity versus the openness to new experiences related to self-direction and stimulation. The second dimension reflects *self-transcendence* versus *self-enhancement*—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.

The identification of values' dynamics is challenging. I estimate separately the effect of two exogenous and non-reversible life events on values, namely, to have a girl (instead of a boy) as a first child and to have ever had cancer. To examine the presence of spillover effects within values, I instrument conservation by the information shocks associated to both life events and look at the impact on self-transcendence. The identification relies on the assumption that both life events do not provide any information shock on self-transcendence.

This empirical framework has limits as the identification condition may be too strict for some life events. For instance, to have ever been unemployed generates information shocks on both values, hence, the spillover effects cannot be identified in this case. To deal with the two-side effect of unemployment on values that threatens identification, I use a simultaneous equations model in which I instrument endogenous values with their own respective lags (past values). Thus, the identification relies on symmetrical exclusion restrictions which assume that one value is not directly affected by the lag of the other value. I hence develop an extension of the model which provides a theoretical framework from which I can derive the structure of the simultaneous equations model. Based on the that, 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 main results. First, the inter-dependence between values distorts the consistency trade-off between time consistency and group consistency. When values are independent, the agent adjusts her values *independently* by simply minimizing the distance between her past values (time consistency) and the values of the group to which she decides to belong (group consistency). When values are correlated within groups, the agent adjusts her values *simultaneously* as the relative weight of both consistencies depends on the inter-dependency between values. When the correlation is positive, the trade-off is in favor of the group consistency as the group dissonance is more costly to the individual. Conversely, when values are negatively correlated, the cost to identify to an other group after an information shock is lower, hence, the trade-off is in favor of the time consistency.

Second, spillover effects across values do exist and account for a third of information shocks. After an increase in conservation due to a changing-life event, such as the birth of a girl (instead of a boy) as a first child, self-transcendence declines by a third of the increase in conservation. Once the framework is generalized to shocks that can affect both values at the same time, the spillover effects become non-reciprocal. As before, an increase in conservation fosters a *negative* spillover effect in self-transcendence; but an increase in self-transcendence generates a *positive* spillover effect on conservation. Thus, the adjustment process between values exhibits a spiral pattern.

Third, having ever been unemployed directly raises self-transcendence by 0.204 standard deviation and declines conservation by -0.064 standard deviation, however, the latter effect is offset by the positive spillover effect of the former. As a result, unemployment increases self-transcendence values by 0.227 standard deviation, without any change on the conservation versus openness-to-change dimension. These magnitudes are lower-bound estimates because, in this context, endogeneity biases the estimate toward zero, owing to the fact that individuals with initial high self-transcendence and low conservation are more likely to be unemployed. Nonetheless, this does not bias the relative share of the information shock versus the spillover effect since the bias act as a scale factor of the total effect.

This paper is the first to emphasize that neglecting the inter-dependence between values leads to underestimating of the effects of life experiences on the formation of beliefs—such as values and preferences—as it omits spillover effects. Thus, I contribute to the literature on the formation of beliefs which has so far focused on the relationship between one particular experience and preferences that are assumed to be independent (Piketty 1995, Fernández et al. 2004, Mayda 2006, Alesina et al. 2018, i.a.). The closest work is Zimmermann (2020) who shows that feedback drive the dynamics of motivated beliefs. My approach builds on his results in the sense that feedback are provided by relatives with whom individuals share values, hence, linking to the group consistency and the inter-dependency of values. These latter mechanisms compete with time consistency that captures the persistence of beliefs over time.

This paper also relates to the literature on the formation and dynamics of beliefs. Prior work highlights 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 beliefs. Recent work focuses on the development of beliefs during childhood (Fehr et al. 2013, Doepke and Zilibotti 2017, Bašić et al. 2020). Building on work that highlights the role of life experiences to explain beliefs formation, I provide an additional mechanism that is based on the concept of cognitive dissonance introduced by Festinger (1957) and McGuire (1960).

This paper fits into the literature on the consequences of cognitive dissonance in economics (Akerlof and Dickens 1982, Konow 2000, Bénabou and Tirole 2006). Prior works use the concept to explain belief-behavior relationship. I, instead, consider its effects on the between-values relationship; either to avoid dissonance with the previous self (past values) or to avoid dissonance with the values of the group or across different sets of values.

My approach is also inspired by the literature on identity in economics (Akerlof and Kranton 2005, 2010, Shayo 2009, Bénabou and Tirole 2011, Kranton 2016, Bonomi et al. 2021). I motivate the underlying mechanism of group dissonance by group membership which reflects the choice of the agent. Thus, the agent decides with which group she prefers to identify according to the values held in these groups with respect to her values.

This paper builds an additional bridge between the social psychology literature and the economic literature. Psychological determinants of economic behaviors have been earlier on 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 (Terracciano et al. 2006, 2010, Cobb-Clark and Schurer 2012) and therefore can hardly explain changes in individuals' decision-making process. Thus, I introduce motivational types of values *à la* Schwartz (1992, 2012) as novel determinants of economic behaviors, which are more volatile with respect to personality traits because of the impact of life experiences (Lönnqvist et al. 2011, Daniel et al. 2021). Yet, personality traits and values are related (Caprara et al. 2009, Fischer and Boer 2015, Parks-Leduc et al. 2015) as they look at the same object, individuals, from different perspectives which are therefore complementary.

Lastly, my results relate to the literature on unemployment scarring as they open another potential explanation. 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 increases self-transcendence. As people with high self-transcendence are more likely to be unemployed, the framework provides a novel mechanism in which past unemployment could affect future employment through values.

The paper is organized as follows. Section 2 presents a theoretical framework that depicts the role of inter-dependency between values and sheds light on the consequences of omitting this mechanism. Section 3 describes the cohort data, derives values from statements about attitudes and presents the life events that are used as information shocks in the paper. Section 4 shows the presence of spillover effects using instrumental variable regressions and discusses the identification assumption. Section 5 presents the simultaneous equations model to identify spillover effects when the information shock affects both values simultaneously, and discusses the consistency of values. 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 the time consistency and the group consistency. I proceed in two steps. First, I describe the baseline model with only one value and show what happens when there is an information shock. Then, I replicate the process in a model with two values that are correlated between groups and show the difference with respect to the baseline model when there is an information shock.

## 2.1 Single-value model

Consider an agent that is characterized by one (motivational type of) value $a_t \in \mathbb{R}^2$ in period $t$. The agent considers her value with respect to the norm, namely, the average value within the reference population.[1] Hence, values are normalized to the population level, so that the mean value in the population is equal to zero. Suppose the population is sufficiently large in order to ensure *anonymity*, meaning that any change of value from the agent does not change the distribution. The agent belongs to group $s \in \{\underline{s}, \overline{s}\}$. The average values within both groups are respectively $\underline{a}$ and $\overline{a}$.[2] For the remaining of the paper, I set $\overline{a} > \underline{a}$ which implies that $\overline{a} > 0 > \underline{a}$ since values are standardized.

In any period $t$, the agent solves the following maximization program in order to determine her values and the group to which she belongs:

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

where $a^\star(s_t) = \{\underline{a}, \overline{a}\}$ 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 each utility components.[3] Components of the utility function are expressed in one-dimension Euclidean distances.

The agent seeks to avoid two psychological costs, namely, *time inconsistency* and *group dissonance*. The former implies that the agent prefers when her today's values are close from her yesterday's values, thus, she suffers from a utility loss the further her value in period $t$ is from her value in period $t-1$, i.e. $a_t - a_{t-1}$. The literature on social psychology shows that individuals tend to resist to change their attitudes, beliefs and values through behaviors such as cognitive inertia or belief perseverance, providing empirical evidences of such a component in agent's utility; see Kunda (1990) for a review of biased information processing through which people maintain their beliefs.

The latter psychological cost implies that the agent prefers to hold values that are close to norms within the group to whom she belongs, hence, having a disutility the further her

[1] 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.

[2] So far, I focus on individual life events, hence, the model is a partial equilibrium model. Thus, I suppose that average value within each groups are time invariant. An extension of the model would be to make them time-dependent, hence, sufficient large shocks in one period, such as economic crises or global pandemic, would affect the average values. However, this extension goes beyond the scope of the paper and is intentionally left for future research.

[3] 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.

value is from the average value within her group, i.e. $a_t - a^\star(s_t)$. 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, here values, 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 presence of norms.

The optimal value satisfies both the time and group consistencies, hence, it is equal to the weighted average between the agent's value in previous period and the average value in her group. It corresponds to the first-order condition that solves the maximization program (1), namely,

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

Thus, the optimal value depends on the group to which the agent decides to belong, hence, to identify.

Suppose the agent has an initial value $a_0$ but cannot identify to an other group. She belongs to a group with $a^\star$ as the group-average value. The dynamics of $a$ in period $t$ is derived from equation (2) and correspond to

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

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

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

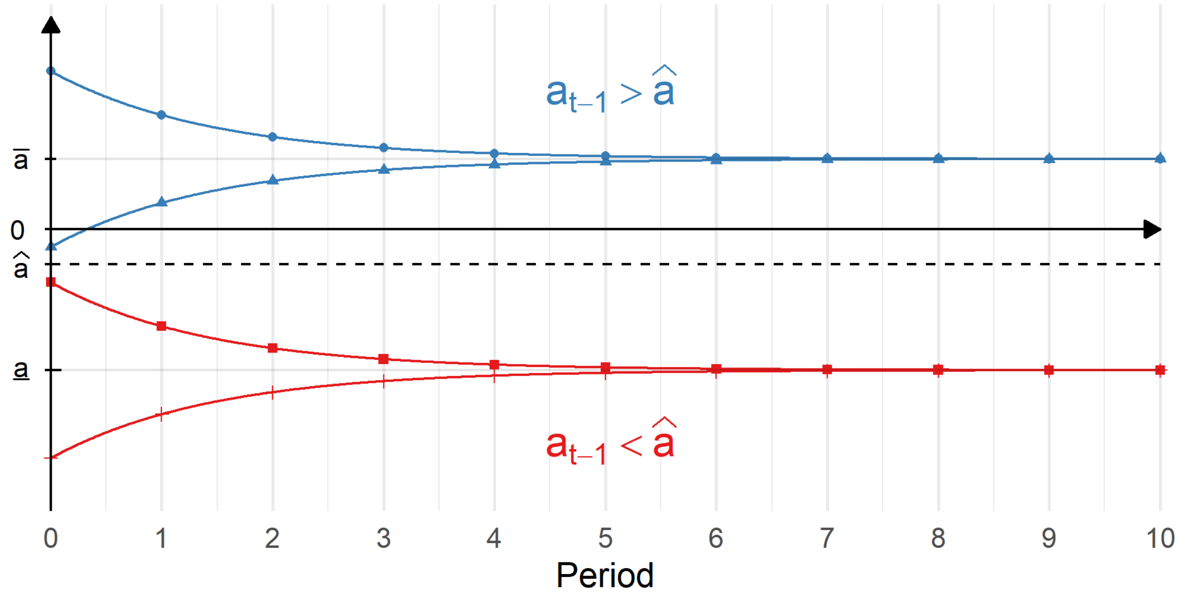
Thus, leading to Proposition 1.

**Proposition 1** *Any individual converges to the average value within her group and the rate of convergence depends positively on the relative weight of the time consistency (with respect to the group consistency) in the utility function.*

Let allow the agent to choose her group. So far, I do not consider any uncertainty in the ability to identify to a group neither any cost. She compares both indirect utilities to determine which group she prefers, i.e. $U_t(\overline{s}) - U_t(\underline{s})$. Using the utility function from the maximization problem (1) along with the optimal value in equation (2), I obtain

$$U_t(\overline{s}) - U_t(\underline{s}) = -\gamma_a \left(\sqrt{[a_{t-1} - \overline{a}]^2} + \sqrt{[a_{t-1} - \underline{a}]^2}\right), \tag{4}$$

Figure 1: Value convergence and endogenous group membership in the single-value model.




*Notes:* This figure presents the convergence of one value toward the average value within the group according to the initial value $a_0$ with respect to the midpoint value $\hat{a}$.

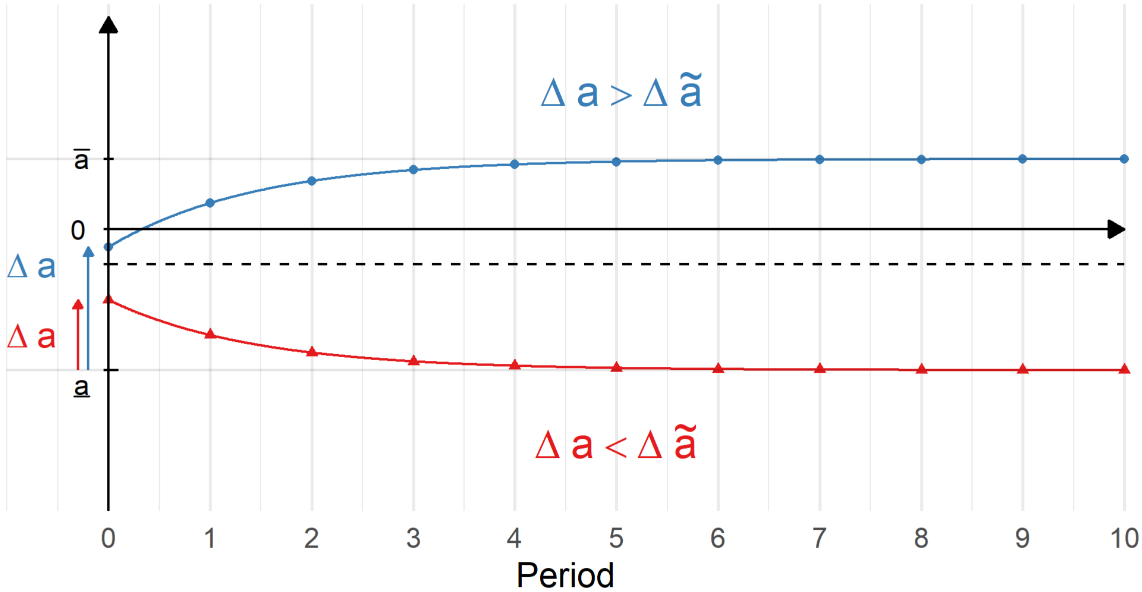
where $\gamma_a \equiv 2\eta_a\phi_a/(\eta_a + \phi_a) > 0$. The agent weakly prefers her group to the other as long as her indirect utility in this group is greater or equal to the one she would get in the other.

Let $\tilde{a}_{t-1}$ be the *indifference value* which is defined as the value in $t-1$ such that the agent is indifferent between both groups in period $t$, i.e. $U_t(\overline{s}) - U_t(\underline{s}) = 0$. Using equation (4), the indifference value is $\tilde{a}_{t-1} = \hat{a}$, where $\hat{a} \equiv (\overline{a} + \underline{a})/2$ is the *midpoint value*. The midpoint value refers to the middle of the distance between the average values in both groups. Figure 1 illustrates the value convergence for several initial values $a_0$. In the single-value model, as long as the value in previous period $a_{t-1}$ is greater (resp. smaller) than the midpoint value $\hat{a}$, the agent prefers to belong to group $\overline{s}$ (resp. $\underline{s}$). Therefore, in absence of shocks, the agent converges toward a steady state value which corresponds to the average value within her group. What happens when there is a shock?

Similarly to the indifference value, we define the *indifference shock* $\Delta\tilde{a}_{t-1}$ as the shock in $t-1$ such that the agent is indifferent between both groups in period $t$, namely, $\Delta\tilde{a}_{t-1} \equiv \tilde{a}_{t-1} - a_{t-1}$. To illustrate the idea, suppose the agent belongs to the group $\underline{s}$ and she is in her steady state in initial period. Thus, her initial value is the average-group value, i.e. $a_0 = \underline{a}$. There is a shock $\Delta a$ at the end of this period such that her value becomes $a'_0 = \underline{a} + \Delta a$. How large has the shock to be for the agent to change group in the next period and converge toward the other group-average value?

In the single-value model, the magnitude of the shock has to be greater than the midpoint

Figure 2: Value convergence after a shock in the single-value model.




*Notes:* This figure presents the value convergence after a shock in $a_0$ according to the magnitude of the shock $\Delta a$.

distance between $\underline{a}$ and $\overline{a}$ when the agent is in a steady state. Thus, $\Delta\tilde{a}_0 = \hat{a} - \underline{a} = (\overline{a} - \underline{a})/2$. Figure 2 depicts the value convergence after a shock. When the shock is sufficiently large, i.e. $\Delta a_0 > \Delta\tilde{a}_0$, the agent identifies to the other group because the psychological cost induced by the group dissonance with her initial group becomes too high after the shock. Hence, she converges toward this new-group average value. This result leads to Proposition 2.

**Proposition 2** *For any individual, it always exists a shock such that she prefers to identify to the other group.*

The single-value model delivers two main results. First, any individual converges to the average value within her group. The length of time to convergence depends on two components: the rate of convergence and the distance with the group-average value. The relative weight between both parameters $\eta_a$ and $\phi_a$ determines the rate of convergence. The greater is $\eta_a$, the more costly is the time inconsistency with respect to the group dissonance, hence, the faster the convergence. The further the current value is from the group-average value, the slower the convergence.

Second, it is always possible to find a shock such that an individual starts to identify to 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 is 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 she is from the the midpoint value, the smaller has to be the shock.

## 2.2 Two-value model

We aim to understand the difference in terms of values dynamics when there are two values instead of one. Suppose there are two (motivational types of) values $V_t = (a_t, b_t) \in \mathbb{R}^2$. Consider the same utility function as before but including the second value $b_t$. The maximization program of the agent becomes:

$$\max_{a_t, b_t, s_t} U_t(a_t, b_t, s_t) = -\eta_a \sqrt{[a_t - a_{t-1}]^2} - \phi_a \sqrt{[a_t - a^\star(s_t)]^2} - \eta_b \sqrt{[b_t - b_{t-1}]^2} - \phi_b \sqrt{[b_t - b^\star(s_t)]^2}, \tag{5}$$

where $v^\star(s_t) = \{\underline{v}, \overline{v}\}$ is the average-group value $v \in \{a, b\}$ 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 are identical to the single-value model, hence, the weighted average between the past value and the average value within the group:

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

Thus, the dynamics of values are also identical to equation (3). It is therefore straightforward to show that Proposition 1 holds. So far, nothing has changed with respect to the single-value model although we add one value.

The difference in this setup arises from the inter-dependency between both values. There exist two groups, $\underline{s}$ and $\bar{s}$, in which the average values are respectively $(\underline{a}, \underline{b})$ and $(\overline{a}, \overline{b})$. Since values are standardized in the population, it implies that $\underline{v}$ and $\overline{v}$ have opposite signs. We have set the average value $a$ in both groups such that $\overline{a} > 0 > \underline{a}$. Thus, the inter-dependency between values is captured by the sign of $\overline{b}$ (or equivalently by the sign of $\underline{b}$). If $\overline{b}$ is positive, then both values are positively correlated in the population. Otherwise, they are negatively correlated. Does the inter-dependency between values affect the conditions under which the agent changes group?

Suppose the agent belongs to the group $\underline{s}$ and she is in the steady state such that $a_0 = \underline{a}$ and $b_0 = \underline{b}$. There is an information shock on value $a$ at the end of the initial period, hence,

$a_0' = \underline{a} + \Delta a_0$. In period $t = 1$, the agent has to choose whether she wants to stay in her group or change for the other group. Her values depend on this choice. If she decides to stay in her current group, her indirect utility is

$$U_1(\underline{s}) = -\gamma_a \sqrt{(\Delta a_0)^2}. \tag{6}$$

Otherwise, she changes her group and gets the following indirect utility:

$$U_1(\overline{s}) = -\gamma_a \sqrt{[\Delta a_0 - (\overline{a} - \underline{a})]^2} - \gamma_b \sqrt{[\overline{b} - \underline{b}]^2}, \tag{7}$$

where $\gamma_b \equiv 2\eta_b \phi_b / (\eta_b + \phi_b) > 0$.

To make her decision, she compares both indirect utilities, i.e. $U_1(\overline{s}) - U_1(\underline{s})$, given the correlation between values in the population. Figure 3 provides a mapping of choices of the agent according to the inter-dependency between values. The right-hand side of the figure corresponds to cases in which both values are positively correlated in society (i.e. $\overline{b} - \underline{b} > 0$), whereas the left-hand side refers to cases in which they are negatively correlated (i.e. $\overline{b} - \underline{b} < 0$). The dashed line corresponds to the indifference value which is a function of the distance between both group-average values, i.e. $\tilde{a}(\overline{b} - \underline{b})$.

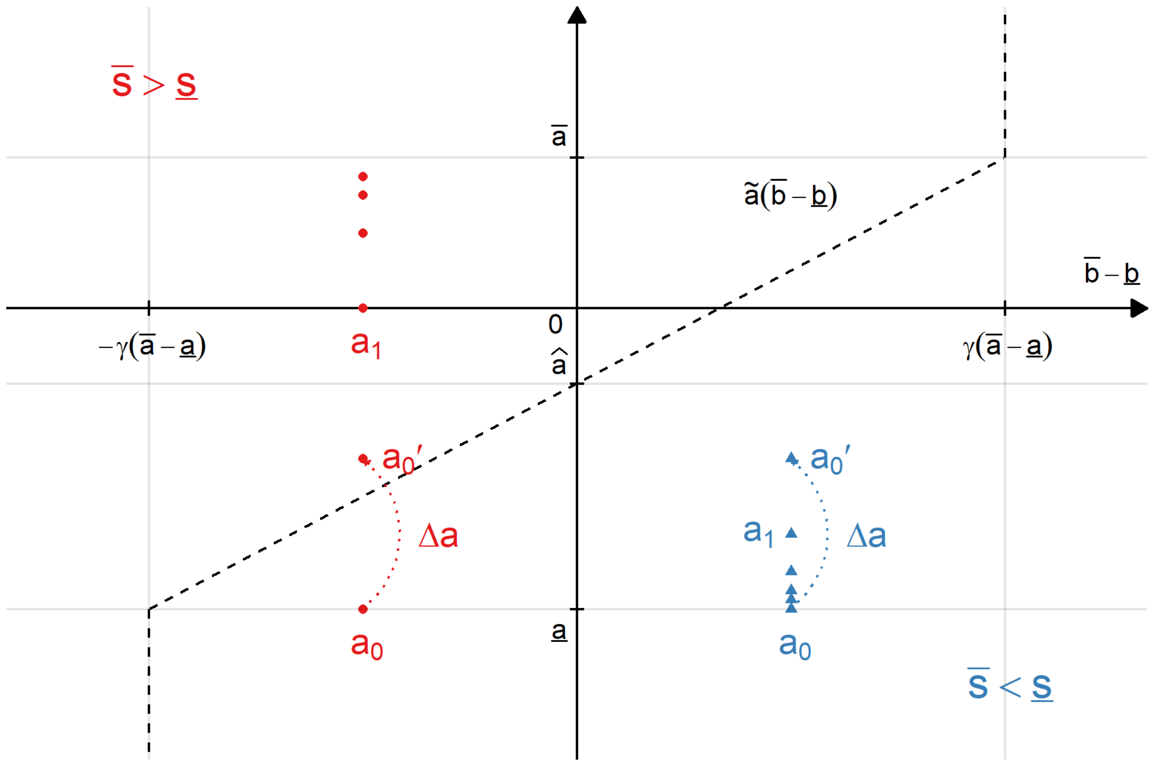
The figure delivers two results. First, it shows that Proposition 2 does not hold when there is an inter-dependent value that is too much discriminating between both groups. It means that, in this case, it is not possible to find a shock sufficiently large such that the agent prefers to identify to the other group. Hence, it implies Proposition 3.

**Proposition 3** *If a value poorly discriminates groups with respect to the other, then this value is not relevant in the choice of the individual and information shocks have no effect on individual's group membership.*

When the gap between groups in terms of value $b$ is too large in absolute terms, i.e. $|\overline{b} - \underline{b}| > \gamma(\overline{a} - \underline{a})$, it indicates that the polarization between both groups in terms of $b$ is so important that the value $a$ is not relevant. In this case, the agent chooses her group regardless of any information shock that could affect $a$ because the group dissonance with respect to $b$ generates a psychological cost that cannot be offset by any other consideration than keeping up with the group.

Second, neglecting the inter-dependency between values leads to a misunderstanding of the consistency trade-off in individual choices. When values are both relatively discriminant, Proposition 2 holds, and the agent may change her group after an information shock. This decision depends on the new value $a_0'$ with respect to the indifference value $\tilde{a}$, as in the single-value model. However, in the two-value model, the indifference value corresponds to a

Figure 3: Mapping of choices in the two-value model.



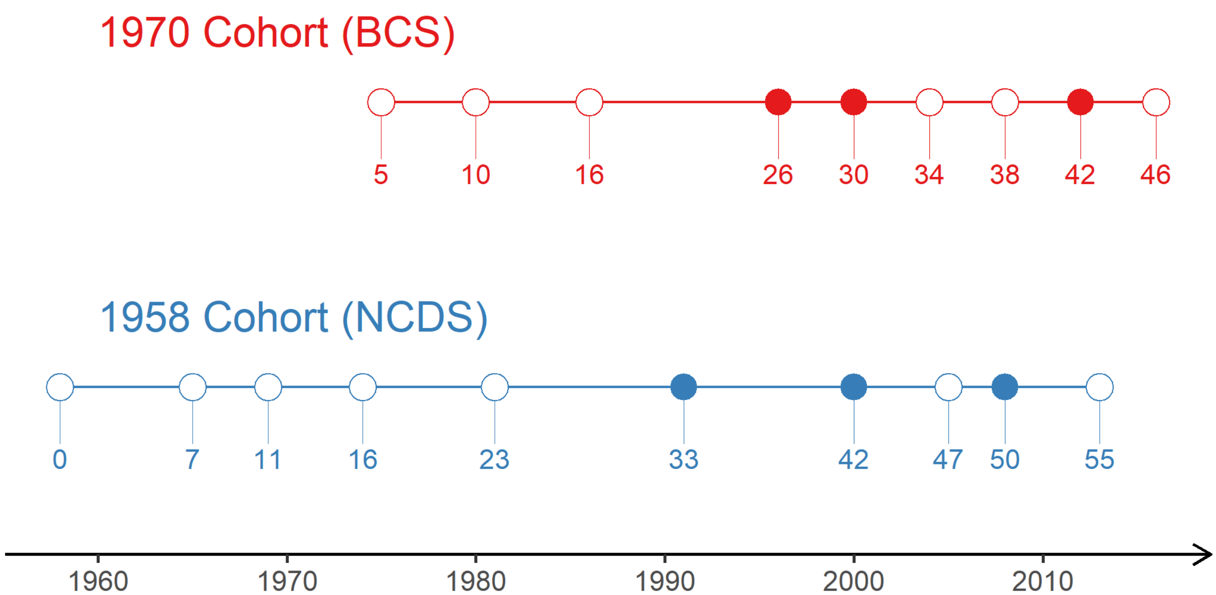

*Notes:* This figure presents the mapping of choices the agent makes given the correlation between values in the population. The x-axis corresponds to the gap between both group averages in terms of value $b$. The y-axis corresponds to the value $a$. The dash line refers to the indifference value and indicates the frontier between both agent's choices. The dotted curve shows the information shock $\Delta a$. Appendix A provides the details to derive the figure.

distorted version of the midpoint value. This distortion is introduced by the inter-dependency between values. Thus, the indifference value becomes

$$\tilde{a} = \hat{a} + \frac{\bar{b} - \underline{b}}{2\gamma},$$

where $\gamma \equiv \gamma_a / \gamma_b$. Note that the single-value model is a special case of the two-value model in which the $b$ value is orthogonal to the $a$ value in society. The figure shows that when both values are positively (resp. negatively) correlated in society, the shock has to be large (resp. small), with respect to the single-value model's shock, for the agent to change group. For instance, when the correlation is positive, the inter-dependence between values gives more weight to the group consistency with respect to time consistency. Conversely, when the correlation is negative, the consistency trade-off is in favor of the time consistency because the psychological cost due to the group dissonance is dampen by the inter-dependency of values.

Figure 4: 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.

# 3 Data

## 3.1 Sample

I use two mature British cohort studies that have been widely used in social sciences-related works. The National Child Development Study (NCDS58) is a cohort of individuals born during a same week in March 1958. The British Cohort Study (BCS70) is composed of those born during a same week in April 1970. Cohort members were born in England, Scotland and Wales.

Both cohorts participated to several interviews at different ages. Figure 4 presents the ages at which cohort members may have been interviewed and the corresponding years. The black circles on the figure indicate interviews from which attitudes 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, to period 2 for the one at 30, and to period 3 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.

Table 1: Number of individuals and response rates by periods.

| | BCS | NCDS |
|---|---|---|
| Initial | 19006 (100%) | 17885 (100%) |
| Period 1 | 9003 (47.4%) | |
| Period 2 | 11261 (59.2%) | 11469 (64.1%) |
| Period 3 | 9841 (51.8%) | 11419 (63.8%) |
| Period 4 | | 9790 (54.7%) |
| All | 6115 (32.2%) | 8107 (45.3%) |

*Notes*: Response rates between parentheses. The last row corresponds to individuals who have been interviewed at all periods.

One of the main issue with cohort studies is attrition. Cohort members do not participate at every interviews and therefore some individuals are either missing at some interviews or lost definitely at some point. Table 1 presents the responses rates by periods of interest. The second period interview is the one with the greater response rate, i.e. with 64.1% for the NCDS58 cohort and 59.2% for the BCS70 one. This latter, when BCS70 cohort members are 30, has been conducted at the same time as the third period interview for the NCDS58 cohort, when they are 42, so in year 2000. Thus, they share the same set of statements about attitudes.

## 3.2 From statements to attitudes

I derive attitudes from individuals' answers to statements. These statements cover several topics and can be grouped into categories that correspond to attitudes towards (in alphabetical order): Anti-Racism (AR), Authority (A), Children (C), Environment (E), Inequality Aversion (IA), Information Technology (IT), Learning (L), Morale (MOR), Political Cynicism (PC), Work-Ethic (WE), and Working Mother (WM). The full list of statements are reported in Appendix B. Some examples of statements are the following:

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

(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.*

At each interview, cohort members answer to these statements using a 5-level scale (strongly disagree/disagree/neither agree nor disagree/agree/strongly agree). I attribute

Table 2: 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 the appendix, see tables B.1, B.2 and B.3 in appendix B.

them a score for each statement between -2 and 2 according to the answer. I compute the average score among all the statements by attitude categories for each individual at each period. I standardize each attitude score at the cohort and period level. Thus, each individual belongs to a cohort and has, for each period, a standardized score for each attitude.

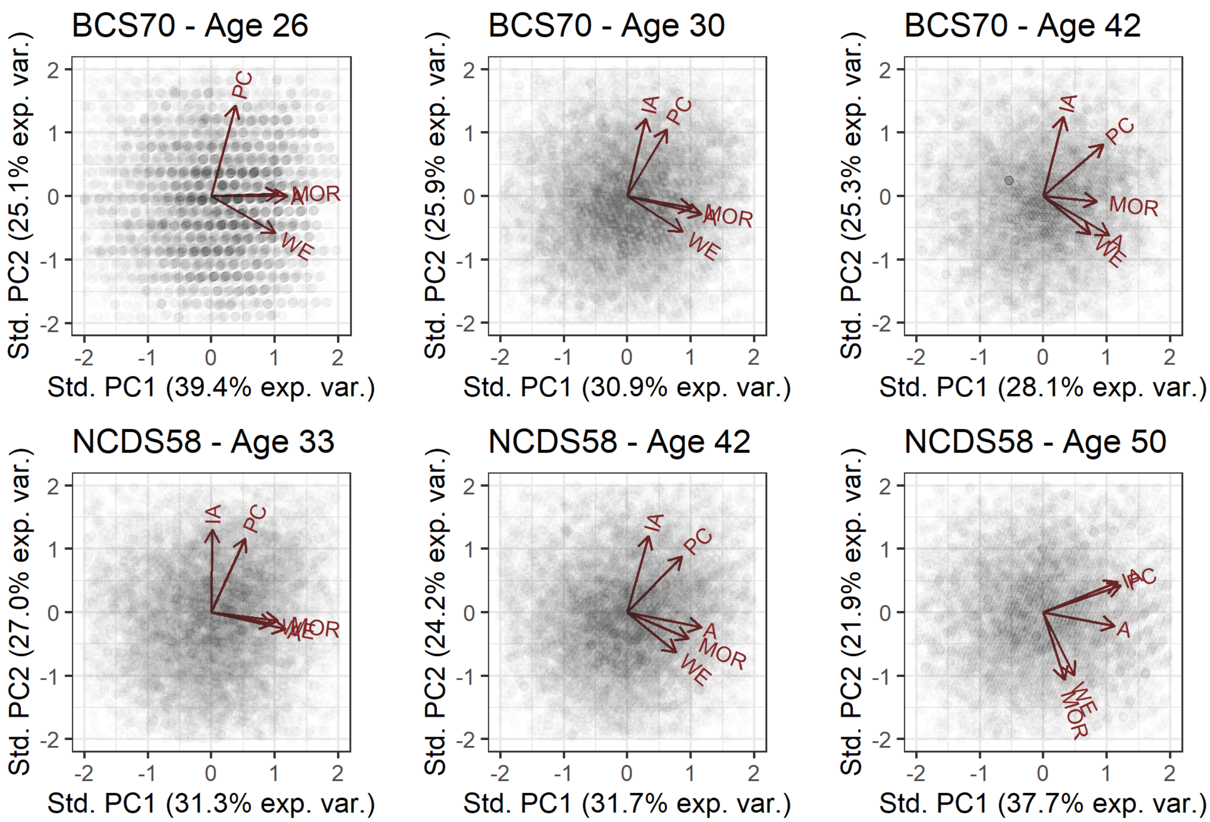
Nonetheless, the number of available statements depends on the cohort and the period. Table 2 summarizes the number of available statements at each interview. Thus, interviews do not necessary share the same set of statements, except when the BCS70 are 30 and the NCDS58 are 42 because interviews were performed using the same questionnaires.

## 3.3 From attitudes to motivational types of values

I derive motivational types of values from attitudes. I focus on the five attitudes that are available in all interviews in order to have the same baseline for each period of both cohorts. These attitudes are Authority (A), Inequality Aversion (IA), Morale (MOR), Political Cynicism (PC) and Work Ethic (WE).

I use a Principal Component Analysis (PCA) to reduce the dimension of attitudes. PCA increases the interpretability of vectors while minimizing the information loss. By focusing on the two first components, which are orthogonal due to the PCA, I can interpret them as the two main values that discriminate and, therefore, characterize individuals in their attitudes.

Figure 5: Two first principal components of the PCA to derive values from attitudes.




*Notes:* This figure presents the direction of the two first principal components. 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). The attitude toward Inequality Aversion (IA) is removed for the PCA on the BCS70 cohort at the age of 26 years because only one statement is available.

The other principal components act as a kind of residuals. Although they might be incorporated to the analysis, Proposition 3 states that a value needs to be sufficiently discriminatory between groups in order to be relevant in the decision-making process after an informational shock. The two first principal components capture more than 50% of the explained variance in attitudes, which makes the discriminatory power of the other principal components not relevant. Therefore, I focus on the two first components.

PCA allows to determine values by summarizing attitudes through dimension reduction which reduces the noise in attitudes, hence, this noise is relegated to the unused components that explain the smaller part of the variance and are not relevant.

I perform PCA at the cohort and period level. Figure 5 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 of them as the two-dimensional structure of universal motivational types of values, as introduced by Schwartz (1992, 2012).

Focusing on the first principal component (PC1), the x-axis directions of vectors highlight attitudes that characterize *conservation*, in the terms of Schwartz (1992), which is the preference for stability, security, tradition and conformity. In terms of attitudes in the data, they reflect taste for Authority, Morale and Work Ethic. Thus, the value which discriminates the most between individuals is *conservation* (versus *openness to change*). 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 *self-transcendence*. This motivational type of values refers to the care and concern about others, reflecting universalism and benevolence. In these data, this value is associated with attitudes toward Political Cynicism and aversion for Inequality and Work Ethic. Therefore, the second value that discriminates the most individuals is *self-transcendence* (versus *self-enhancement*).

I make a projection of both principal components for all individuals at each period. Thus, each cohort member has a Conservation score ($Cons$) and a Self-Transcendence score ($Trans$) at each period. By construction, both scores are standardized at the cohort-period level and *orthogonal*. Thus, the values are not inter-dependent *per se*. The inter-dependency arises with socio-economic characteristics—such as gender, education, etc.—once they are introduced as control variables. These covariates capture several dimensions of groups to which individuals identify, hence, it creates inter-dependency between values as they are correlated among groups.

## 3.4 Life events as informational shocks

We are interested in life events that generate an informational shocks on conservation ($Cons$) or self-transcendence ($Trans$) in order show whether there exist spillover effects or not. The type of life events that I have to consider to test this hypothesis requires two properties: *exogeneity* and *non-reversibility*. On the one hand, the life event has to be exogenous so that values at 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.

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 first child conditional on having a baby*. The former life event is exogenous in the sense that values, such as conservation and self-transcendence, do not affect the probability to have cancer. It is also non-reversible because I compare individuals who have *ever* had cancer with respect to people who never had one. The focus is set on the informational shock on values related to the fact that people have known they have a cancer, not on the illness *per se* as someone might have one without knowing it.

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 gave birth to 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, assuming that sex-selective abortion is very rare in the UK.[4] Once the baby is born, the life event is non-reversible because it has occurred and remains for ever. I do not also consider adopted child 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 from the baby does not occur.

I only focus on the first child as fertility decisions for the following children might be linked to the sex of the eldest child and values, e.g. a preference for diversity in children birth sex. Moreover, some parents may have a boy as first child and a girl thereafter. Some changes in values may be specific to have 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.

In the later of the paper, I study the role of unemployment on values as it is an sizeable informational 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. For instance, individuals with high work ethic, so high conservation and low self-transcendence, have a lower probability to be unemployed as they are less likely to quit their job with respect to people with low work ethic.

### 3.5 Variables and summary statistics

For life events, I focus on three of them: to have had a girl as 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 0 if it is a male. $GotCancer$ is also a dummy variable that equals one if the individual has ever had a cancer by the time of the interview.

[4] Dubuc and Coleman (2007) argue that sex-selective abortion occurs among mothers born in India and living in 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, I do not believe that it statistically affects my results because it represents a minority in the data.

Table 3: 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 because they are standardized.

$BeenUnemp$ is a dummy variable that equals one if the individual has ever been unemployed at least one month by the time of the interview. Activity status are 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.

I consider several socio-economic characteristics as control variables that will introduce the inter-dependency between values. 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 ($Educ$).

Table 3 presents the descriptive statistics for the NCDS58 and BCS70 cohorts. Both cohorts contain respectively 30,552 and 27,906 observations. Period variables corresponds to dummy variables to determine the decade in which individuals are.

# 4 Empirical results

The empirical work aims to investigate the presence of spillover effects across values and how they behave. I proceed in several steps. First, I investigate the effect of both exogenous life

Table 4: Effect of life events on values.

| | Linear regression - OLS | | | |
|---|---|---|---|---|
| | GirlFirst | | GotCancer | |
| | (Cons) | (Trans) | (Cons) | (Trans) |
| Life event | $0.032^{**}$ | $-0.002$ | $0.088^{***}$ | $0.045$ |
| | (0.013) | (0.013) | (0.034) | (0.036) |
| $\text{Value}_{t-1}$ | $0.545^{***}$ | $0.350^{***}$ | $0.560^{***}$ | $0.275^{***}$ |
| | (0.006) | (0.006) | (0.005) | (0.005) |
| $R^2$ | 0.371 | 0.144 | 0.392 | 0.090 |
| Adj. $R^2$ | 0.371 | 0.144 | 0.392 | 0.089 |
| 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 D.1 in the appendix presents all the coefficients.

events, which characterize the informational shocks, on conservation and self-transcendence values but independently. I observe that only the conservativeness is affected. Second, I show the presence of spillover effects by instrumenting conservative values with the life event. Third, I raise the issue of two-side effect in the case of unemployment as unemployment does affect both values at the same time, hence, the identification using instrumental variables does not hold in this setting.

## 4.1 Effect of life events on values

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

$$v_{it} = \alpha + \beta \times z_{it} + \eta \times v_{i,t-1} + X_i\delta + u_{it} \tag{8}$$

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

Table 4 summarizes the coefficients. Coefficients associated to the life event are positive and significant in both (Cons) columns; while they are not significant in (Trans) ones. Parents who have had a girl as first child, instead of a boy, tend to hold more conservative values, about 0.032 sd., without any change in their values about self-transcendence. Individuals who have ever had a cancer seem to be more conservative, about 0.088 sd., although they do not differ from others in terms of self-transcendence versus self-enhancement.

Coefficients associated to the lag of the value lie around 0.55 sd. for conservation while hardly reaching 0.35 sd. for self-transcendence. This pattern indicates that conservative values are more correlated over periods than self-transcendence values. In terms of the theoretical framework, it provides evidences that the time consistency may be more important in terms for conservative values.

## 4.2 Spillover effects

To test the existence of spillover effects, I estimate instrumental variable (IV) regressions using two-stage least squares (2SLS). I assume that the informational shock associated to the life event ($z$) affects the conservative value ($Cons$) but not the self-transcendence ($Trans$). Thus, by instrumenting $Cons_t$ with $z$—conditional on $Cons_{t-1}$—in a first stage, I am able to test whether there is spillover effect in the second stage in which I regress $Trans_t$ on the predicted $Cons_t$—conditional on $Trans_{t-1}$. The two stages of the 2SLS estimate can be written as:

$$Cons_{it} = \alpha_1 + \beta_1 \times z_{it} + \eta_1 \times Cons_{i,t-1} + X_i\delta_1 + \varepsilon_{it}, \qquad \text{(IV - Stage 1)}$$

$$Trans_{it} = \alpha_2 + \beta_2 \times \widehat{Cons}_{it} + \eta_2 \times Trans_{i,t-1} + X_i\delta_2 + u_{it}, \qquad \text{(IV - Stage 2)}$$

where $\widehat{Cons}$ are the predicted $Cons$ and $X$ are control variables including gender, education, along with period and cohort fixed effects.

The identification relies on the assumption that the informational shock, associated to the life event, does not directly affect self-transcendence, i.e. $Trans \perp z$. The assumption is based on results obtained from table 4 which suggest that individuals who went through both life experiences have no difference with respect to people who did not in terms of self-transcendence.

Table 5 summarizes the coefficients for the IV regressions. In both first-stage regressions, the informational shock on conservation due to the life event is positive and significant. To have a girl instead of a boy as a first child increases conservation by 0.032 sd., while to have ever had a cancer raises conservation by 0.088 sd..

In both second-stage regressions, the spillover effect—associated to the increase in conservation—is negative and significant. For the first life event, a one standard-deviation increase in conservation decreases self-transcendence by 0.330 sd.; while an increase of the same magnitude for the second life event also reduces self-transcendence by 0.373 sd.. As the values associated to self-transcendence decrease, it means that those related to self-enhancement increase.

Table 5: IV Estimate of the spillover effect.

| | IV regression - 2SLS | | | |
|---|---|---|---|---|
| | GirlFirst | | GotCancer | |
| | (Stage 1) | (Stage 2) | (Stage 1) | (Stage 2) |
| Life event | $0.032^{**}$ | | $0.088^{***}$ | |
| | (0.013) | | (0.034) | |
| $\widehat{\text{Cons}}_t$ | | $-0.330^{***}$ | | $-0.373^{***}$ |
| | | (0.010) | | (0.008) |
| $\text{Value}_{t-1}$ | $0.545^{***}$ | $0.348^{***}$ | $0.560^{***}$ | $0.269^{***}$ |
| | (0.006) | (0.006) | (0.005) | (0.005) |
| $R^2$ | 0.371 | 0.182 | 0.392 | 0.143 |
| Adj. $R^2$ | 0.371 | 0.182 | 0.392 | 0.143 |
| 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 D.2 in the appendix presents all the coefficients.

Both exogenous and irreversible life events show that spillover effects do exist across values. They account for a third of any informational shock on one value that is due to a life event.

## 4.3 Two-side effect as threat to identification

The identification of the spillover effect in the latter estimates relies on the exclusion restriction that assumes that the informational shock characterized by the life event affects only one value. This assumption does not hold for any informational shock that would have two-side effect, that is, would affect both values at the same time.

Suppose the following life event: to have ever been unemployed. Let estimate independently with OLS the effect of the life event $z = \{BeenUnemp\}$ on both values for an individual $i$ in period $t$ according to equation (8).

Table 6 summarizes the coefficients. Individuals who have ever been unemployed tend to have higher conservation about 0.025 sd., and higher self-transcendence about 0.280 sd. conditional on education and past value. These results show a clear threat in the identification strategy which relies on the assumption that one value is not affected by the life event that characterizes the informational shock, i.e. $Trans \perp z$.

Table 6: Effect of having ever been unemployed on values.

| | Linear regression - OLS | |
|---|---|---|
| | (Cons) | (Trans) |
| Been Unemp. | $0.025^{**}$ | $0.280^{***}$ |
| | (0.012) | (0.013) |
| $\text{Value}_{t-1}$ | $0.561^{***}$ | $0.265^{***}$ |
| | (0.005) | (0.005) |
| $R^2$ | 0.392 | 0.103 |
| Adj. $R^2$ | 0.392 | 0.103 |
| Num. obs. | 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. Been Unemp. is the life event. Individuals who have never been unemployed are the reference group. Table D.3 in the appendix presents all the coefficients.

# 5 Simultaneous equations model

To generalize the role of inter-dependency between values, I test the presence of spillover effects in a context where informational shocks can change both values. I consider a Simultaneous Equations Model (SEM) in which individuals' values are jointly determined, also determined by their own previous values and related to individual characteristics. Each observation consists in an individual $i$ observed in period $t$. With two values, the structural form of the SEM can be written in matrix notation as

$$V_{i,t}\Gamma = z_{i,t}\Theta + V_{i,t-1}H + X_i B + U_{i,t} \tag{9}$$

where $V_{i,t} = \begin{bmatrix} Cons_t & Trans_t \end{bmatrix}$ is the matrix of dependent values in period $t$; $\Gamma = \begin{pmatrix} 1 & -\gamma_2^1 \\ -\gamma_1^2 & 1 \end{pmatrix}$ describes the relation between values; $z$ is a dummy vector which indicates whether the life event $Z$ occurred; $\Theta = \begin{pmatrix} \theta_1 \\ \theta_2 \end{pmatrix}$ 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 $t-1$; $X$ are the individual characteristics vector including the intercept; $B$ corresponds to all coefficients that are associated to $X$; and $U$ is a matrix of the error terms.

Multiplying equation (9) by the inverse of the $\Gamma$ matrix leads to the reduced form of the

SEM such as

$$V_{i,t} = z_{i,t}\Phi + V_{i,t-1}\Psi + X_i\Pi + \epsilon_{i,t}, \tag{10}$$

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

**Identification.** The *rank condition* is satisfied for both equations because the number of excluded endogenous variables in the reduced form, i.e. either $Cons_t$ or $Trans_t$, is equal to the number of excluded exogenous variables in the structural form, i.e. either $Trans_{t-1}$ or $Cons_{t-1}$. Thus, the SEM can be identified.

The identification relies on the assumption that $Cons_{t-1}$ does not affect $Trans_t$ and that $Trans_{t-1}$ does not affect $Cons_t$. As I suppose that values are permanently adjusted over time in order to have consistent values, it implies that, for instance, any change in $Trans_{t-1}$ can affect $Cons_t$ only through $Cons_{t-1}$. In addition, the *order condition* is also satisfied for both equations because the number of excluded exogenous variables, i.e. $Cons_{t-1}$ and $Trans_{t-1}$, is also equal to the number of included endogenous variables, i.e. $Cons_t$ and $Trans_t$. Therefore, the SEM is exactly identified.

**Decomposition of the total effect.** From the reduced form equation (10), it is possible to decompose the total effect of the life event $z$ on value $v \in V = \{v, -v\}$ as the sum of a direct effect (information shock) and an indirect effect (spillover effect), namely

$$\phi_v = \underbrace{\tilde{\gamma}_v^v \times \theta_v}_{\text{Direct effect}} + \underbrace{\tilde{\gamma}_v^{-v} \times \theta_{-v}}_{\text{Indirect effect}}, \tag{11}$$

where $\phi_v$ is the total effect of the life event $Z$ on value $v$, $\tilde{\gamma}_v^v$ is the element on the diagonal of $\Gamma^{-1}$ associated to the value $v$, $\tilde{\gamma}_v^{-v}$ is the off-diagonal element of $\Gamma^{-1}$ on the same column, while $\theta_v$ and $\theta_{-v}$ are respectively the marginal effects of the life event $Z$ on values $v$ and $-v$ from the structural form.

In Appendix F, I develop an extension of the two-value model which provides a theoretical framework to the structure the SEM. The empirical decomposition of equation (11), refers to the general-case equation (22). Thus, when the life event is exogenous, it is possible to properly estimate the magnitudes and the relative shares of the direct and indirect effects that compose the marginal effect of the life event on values, as described in equation (16). However, when the life event is endogenous, such as having ever been unemployed, the magnitudes of the direct and indirect effects are biased but their relative shares in the marginal effect are not.

**Estimation method.** I use a 2SLS estimation method to estimate the SEM. Thus, I instrument the endogenous variables of each equation with all exogenous variables from all equations. In a first step, I estimate the reduced form in equation (10) and obtain the

Table 7: Decomposition of the effect of having a girl first on values.

| | Direct and indirect effects | | Total effect |
|---|---|---|---|
| Value ($v$) | $\tilde{\gamma}_v^{Cons} \times \theta_{Cons}$ | $\tilde{\gamma}_v^{Trans} \times \theta_{Trans}$ | $\phi_v$ |
| Conservation ($Cons$) | **0.030** | 0.003 | 0.033 |
| | **(100.0)** | (9.9) | (109.9) |
| Self-Transcendence ($Trans$) | -0.010 | **0.008** | -0.002 |
| | (-120.9) | **(100.0)** | (-20.9) |

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

predicted values, i.e. $\widehat{Cons}_t$ and $\widehat{Trans}_t$.

In a second step, I estimate the structural form in equation (9) in which I replace the endogenous variables with the predicted values 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 D.

## 5.1 Effect of exogenous life events on values

I start by examining the decomposition of the total effect for both exogenous and non-reversible life events. First, I decompose the total effect of having a girl, instead of a boy, as first child on values. Second, I also decompose the total effect of having ever had a cancer on values.

**Girl first.** Table 7 summarizes the decomposition of the effect of having a girl as first child on values. Having a girl as first child directly increases conservative values by 0.03 sd. and self-transcendence by 0.008 sd. Due to the consistency of values, about 10% of the increase in conservation is amplified by the raise in self-transcendence that has a positive impact on conservatism. Meanwhile, the increase in conservation totally offsets the increase in self-transcendence, leading to a total effect that is negative although close to zero. Thus, due to the consistency of values and therefore the offsetting effect, self-transcendence does not increase when an individual gets a girl as first child rather than a boy, while conservation does increase.

Table 8: Decomposition of the effect of having ever had a cancer on values.

| Value ($v$) | Direct and indirect effects | | Total effect |
|---|---|---|---|
| | $\tilde{\gamma}_v^{Cons} \times \theta_{Cons}$ | $\tilde{\gamma}_v^{Trans} \times \theta_{Trans}$ | $\phi_v$ |
| Conservation ($Cons$) | **0.054** | 0.025 | 0.079 |
| | **(100.0)** | (46.6) | (146.6) |
| Self-Transcendence ($Trans$) | -0.020 | **0.075** | 0.055 |
| | (-26.8) | **(100.0)** | (73.2) |

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

**Got cancer.** Table 8 summarizes the decomposition of the effect of having ever had a cancer on values. Having ever had cancer increases conservation by 0.054 sd. and self-transcendence by 0.075 sd. Due to values consistency, the increase in self-transcendence also increases conservative values through the spillover effect by 0.025 sd., which represents almost a third of the total effect of the life event on conservation. Meanwhile, part of the effect on self-transcendence is offset by the spillover effect of the life event through conservation. As conservation raises, it also decreases self-transcendence by -0.02 sd. which corresponds to a fourth of the total effect of having ever had a cancer on self-transcendence. Thus, without the consistency of values, the increase in self-transcendence would have been 26.8% much larger.

## 5.2 Role of the consistency of values

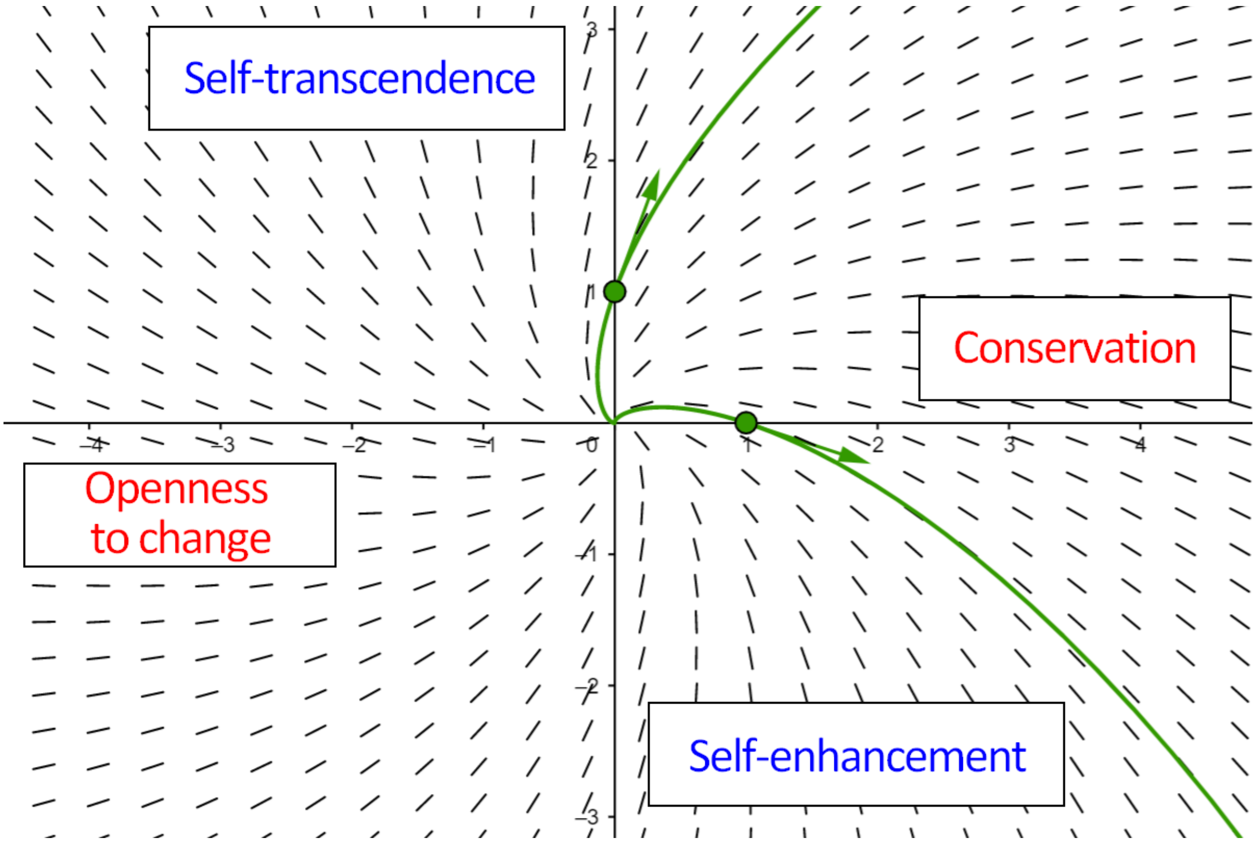
Values consistency drives the magnitude of the spillover effects of life events on values. In the simultaneous equations model, the matrix $\Gamma$ captures the relation between values within the structural form. Once we consider the estimated reduced form for the decomposition, the spillover effects appear through $\Gamma^{-1}$. For instance, in the case of the girl-first life event, the $\Gamma$ matrix corresponds to

$$\Gamma = \begin{pmatrix} 1 & 0.329 \\ -0.365 & 1 \end{pmatrix} \implies \Gamma^{-1} = \begin{pmatrix} 0.893 & -0.294 \\ 0.326 & 0.893 \end{pmatrix}.$$

In the case of the other life events, the coefficients associated to the matrix $\Gamma$ are very close to these ones.[5] Thus, the effect of the life event $Z$ on values is derived from the matrix product of $\Theta = \begin{pmatrix} \theta_{Cons} & \theta_{Trans} \end{pmatrix}$ and the propagation matrix $\Gamma^{-1}$ that accounts for spillover effects. Considering the effect of the life event $Z$ on both values as a homogeneous system

[5] See tables D.5 and D.6 in the appendix.

Figure 6: Phase plane of the relation between values.




*Notes:* This figure presents the phase plane of the homogeneous system of first-order linear differential equations that describes the relationship between conservation (versus openness to change) and self-transcendence (versus self-enhancement) values. Green arrows decompose the direct effect and the indirect effect, i.e. spillover effect, due to an increase of 1 sd. in each value.

of first-order linear differential equations leads to

$$x' = 0.893x + 0.326y,$$
$$y' = -0.294x + 0.893y,$$

where $x$ and $y$ are the magnitudes of both gross effects from $\Theta$, whereas $x'$ and $y'$ corresponds to the net effects on values from $\Phi$.

Solving this system, it leads to complex eigenvalues with positive real parts. This is due to the facts that, in $\Gamma$, the coefficients on the diagonal are equal to one and both off-diagonal coefficients have opposite signs. Figure 6 describes the phase plane of this system. Green dots are set to 1 on both axis, thus, the green arrows describes what happens for a marginal increase of 1 sd. on either the x-axis or the y-axis, i.e. in conservation or in self-transcendence. An increase in conservatism has a negative spillover effect on self-transcendence while an increase in self-transcendence 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 $\Gamma$.

## 5.3 Effect of unemployment on values

In the theoretical framework, I show that there is a bias when measuring the effect of an endogenous life event on values and I derive its expression. The main issue is to determine whether the estimate of the effect, here having known unemployment, is a lower- or an upper-bound estimate. I start by discussing the sign of the bias before estimating the effect.

### 5.3.1 Sign of the bias

As previously mentioned, the probability to become unemployed or to find a job is endogenous to values. Attitudes toward work ethic are likely to be the main determinant to predict employment status dynamics. Figure 5 displays the direction of the eigenvector that is associated to work ethic. Work ethic attitudes are associated to greater conservation and lower self-transcendence. These correlations help to determine the signs of the parameters in the linear probability functions; and to define what are the values that two individuals are likely to hold to generate a bias.

Starting with the linear probability functions, remind equations (23) and (24), which are the probabilities to, respectively, either upgrade or downgrade in terms of status, namely,

$$\overline{\pi}(V_{t-1}) = \overline{\mu} + \overline{\alpha} a_{t-1} + \overline{\beta} b_{t-1},$$
$$\underline{\pi}(V_{t-1}) = \underline{\mu} + \underline{\alpha} a_{t-1} + \underline{\beta} b_{t-1}.$$

In the case of employment dynamics, an upgrading (resp. downgrading) of status refers to finding (resp. losing) a job. As individuals with higher conservation are *more* likely to find a job and to not lose it, we expect $\overline{\alpha} > 0$ and $\underline{\alpha} < 0$. Conversely, supposing that individuals with higher self-transcendence are *less* likely to find a job and not lose it, we also expect $\overline{\beta} < 0$ and $\underline{\beta} > 0$.

Let rewrite the expression of the bias from equation (25) as

$$Bias_t = \overline{\alpha} a^i_{t-1} + \underline{\alpha} a^j_{t-1} + \overline{\beta} b^i_{t-1} + \underline{\beta} b^j_{t-1},$$

where individual $i$ is the one who has been unemployed while individual $j$ has never been unemployed. For the ease of the exercise, I suppose that both individuals have opposite values in previous period that lie at one standard deviation. Let suppose that individual $i$ has low

Table 9: Decomposition of the effect of having ever been unemployed on values.

| Value ($v$) | Direct and indirect effects | | Total effect |
|---|---|---|---|
| | $\tilde{\gamma}_v^{Cons} \times \theta_{Cons}$ | $\tilde{\gamma}_v^{Trans} \times \theta_{Trans}$ | $\phi_v$ |
| Conservation ($Cons$) | **-0.064** | 0.071 | 0.006 |
| | **(100.0)** | (-110.1) | (-10.1) |
| Self-Transcendence ($Trans$) | 0.023 | **0.204** | 0.227 |
| | (11.2) | **(100.0)** | (111.2) |

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

conservation and high self-transcendence, hence $V_{t-1}^i = (-1, 1)$, which explains why he was more likely to be unemployed; and that individual $j$, who has never been unemployed, has high conservation and low self-transcendence, hence $V_{t-1}^j = (1, -1)$. Thus, the bias becomes

$$Bias_t = -\overline{\alpha} + \underline{\alpha} + \overline{\beta} - \underline{\beta} < 0,$$

and is negative according to parameter values discussed before.

Reminding the expression of the difference in expected value from equation (22),

$$\Delta \mathbb{E} v_t = \Delta v_{t-1} + \Delta v^s \Big[ 1 + \underline{\mu} + \overline{\mu} + Bias_t \Big]$$

Since $Bias_t < 0$, it indicates that, regardless of the sign of $\Delta v^s$, the effect of having ever been unemployed on the value $v$ is biased toward zero. Therefore, the magnitudes are lower-bound estimates. Note that, the relative share of the direct and indirect effects are not biased because the bias acts only as multiplier of $\Delta v^s$.

### 5.3.2 Lower-bound estimate

Table 9 summarizes the decomposition of the effect of having ever been unemployed on values. For those who have ever been unemployed, they experience a direct decline in conservatism, i.e. an increase in openness to change, by -0.064 sd. and an self-transcendence by 0.204 sd. The spillover effect of the decline in conservatism increases the self-transcendence by 0.023 sd. Thus, the self-transcendence raises by 11.2% due to the spillover effect. Meanwhile, the increase in self-transcendence leads to a positive spillover effect on conservative values which totally offset the direct raise in openness to change. As a result, conservation does not change whereas self-transcendence increases substantively. Note that, all the magnitudes are lower-bound estimates. Thus, the positive effect of having ever been unemployed on self-transcendence is likely to be more important.

# 6 Summary and concluding remarks

An extensive literature has studied the effect of life experiences on beliefs—such as preferences or values—but supposing that they are independent. I present a framework that jointly analyzes the dynamics of values over the lifecycle when life events provide information shocks on values in a context where values are correlated in society. My results suggest that values inter-dependence plays an important role as individuals seek to be consistent in the dynamics of their values and with respect to values held in the group to which they identify. I show that spillover effects account for a third of the magnitude of information shocks on values after changing-life events.

The main limitation of the paper relates to the non-reciprocal pattern of the spillover effects across values. They are the result of several forces among individual's values which try to achieve cognitive consistency. Although I show that spillover effects exist, the observed spiral pattern remains a puzzle that I intend to address in future research.

This paper raises an issue that as not been considered yet, namely, the consistency among values at the individual level in a context of inter-dependent values which could be incorporated in future work in order to study the complex effects of socio-economic decisions (labor supply decisions, educational choices, i.a.) or life events (disease, global pandemic, discrimination, i.a.) on values. Consistency may also be the ground for future research to investigate the mechanisms of the rising polarization in beliefs, values and preferences.

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# Appendices

## A Model details

This appendix presents the details of the theoretical framework.

**Details to derive figure 3.** Suppose both values are positively correlated in society, thus, $\overline{b} > 0 > \underline{b}$. There are three cases of interest about the shock $\Delta a_0$. First, the shock is negative, i.e. $\Delta a_0 < 0$. Hence, $\Delta a - (\overline{a} - \underline{a}) < 0$ which implies that the sign within the first square brackets of equation (7) has to be inverted. The indirect utilities become $U_1(\overline{s}) = -\gamma_a \left[(\overline{a} - \underline{a}) - \Delta a_0\right] - \gamma_b \left[\overline{b} - \underline{b}\right]$ and $U_1(\underline{s}) = \gamma_a \Delta a_0$. Thus,

$$U_1(\overline{s}) > U_1(\underline{s}) \;\Leftrightarrow\; \overline{b} - \underline{b} < -\gamma(\overline{a} - \underline{a}).$$

Second, the shock is positive and large, i.e. $\Delta a_0 > \overline{a} - \underline{a}$. Hence, $\Delta a_0 - (\overline{a} - \underline{a}) > 0$. The indirect utilities become $U_1(\overline{s}) = -\gamma_a \left[\Delta a_0 - (\overline{a} - \underline{a})\right] - \gamma_b \left[\overline{b} - \underline{b}\right]$ and $U_1(\underline{s}) = -\gamma_a \Delta a_0$. Thus,

$$U_1(\overline{s}) > U_1(\underline{s}) \;\Leftrightarrow\; \overline{b} - \underline{b} < \gamma(\overline{a} - \underline{a}).$$

Third, the shock is positive but small, i.e. $\Delta a_0 \in [0, \overline{a} - \underline{a}]$. Hence, $\Delta a_0 - (\overline{a} - \underline{a}) < 0$ which implies that the sign within the first square brackets of equation (7) has to be inverted. The indirect utilities become $U_1(\overline{s}) = -\gamma_a \left[(\overline{a} - \underline{a}) - \Delta a_0\right] - \gamma_b \left[\overline{b} - \underline{b}\right]$ and $U_1(\underline{s}) = -\gamma_a \Delta a_0$. Thus,

$$U_1(\overline{s}) > U_1(\underline{s}) \;\Leftrightarrow\; \Delta a_0 > \Delta \tilde{a}_0 \equiv \frac{\overline{a} - \underline{a}}{2} + \frac{1}{\gamma}\frac{\overline{b} - \underline{b}}{2}.$$

When the informational shock is larger than the indifference shock $\Delta \tilde{a}_0$, the agent identifies to the other group. The indifference value is therefore

$$\tilde{a}_0 = \frac{\overline{a} + \underline{a}}{2} + \frac{1}{\gamma}\frac{\overline{b} - \underline{b}}{2},$$

which is an increasing function of the distance between both group-average value $b$. When both values are negatively correlated in society, i.e. $\overline{b} < 0 < \underline{b}$, the indifference value becomes a decreasing function of the distance between both group-average value $b$.

## B Statement details

This appendix presents the details of statements according to attitudes. These details have been split into three tables, namely, tables B.1, B.2 and B.3.

Table B.1: 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.

Table B.2: 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.

Table B.3: 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.

# C Principal component analysis

This appendix presents the principal components eigenvectors from the Principal Component Analysis (PCA) in section C. 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 | 0.620 | 0.001 | 0.053 | -0.783 | |
| Inequality Aversion | | | | | |
| Morale | 0.551 | 0.025 | -0.739 | 0.387 | |
| Political Cynicism | 0.197 | 0.926 | 0.270 | 0.176 | |
| Work Ethic | 0.523 | -0.377 | 0.615 | 0.455 | |
| Standard deviation | 1.255 | 1.003 | 0.883 | 0.800 | |
| Proportion of Variance | 0.394 | 0.251 | 0.195 | 0.160 | |
| Cumulative Proportion | 0.394 | 0.645 | 0.840 | 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 |

*Notes*: Signs of eigenvectors have been inverted for age 30 and age 42 in order to have the same axis direction for the first principal component.. The attitude toward Inequality Aversion (IA) is removed for the PCA on the BCS70 cohort at the age of 26 years because only one statement is available.

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 |

*Notes*: Signs of eigenvectors have been inverted for age 33 and age 50 in order to have the same axis direction for the first principal component.

# D Estimates

This appendix presents the additional regression tables of the paper. Table D.1 presents the long-version table of the regression table 4 in the paper. Table D.2 presents the long-version table of the regression table 5 in the paper. Table D.3 presents the long-version table of the regression table 6 in the paper. Table D.4 presents the details of the 2SLS estimates of the SEM for the girl-first life event: table D.5 for the got-cancer life event and table D.6 for the been-unemployed life event.

Table D.1: Effect of life events on values.

| | Linear regression - OLS | | | |
|---|---|---|---|---|
| | GirlFirst | | GotCancer | |
| | (Cons) | (Trans) | (Cons) | (Trans) |
| Intercept | $0.217^{***}$ | $-0.064^{**}$ | $0.181^{***}$ | $-0.028$ |
| | (0.027) | (0.027) | (0.020) | (0.022) |
| Female | $-0.194^{***}$ | $0.063^{***}$ | $-0.172^{***}$ | $-0.022^{*}$ |
| | (0.013) | (0.013) | (0.011) | (0.012) |
| Educ. Secondary | $-0.286^{***}$ | $-0.139^{***}$ | $-0.278^{***}$ | $-0.169^{***}$ |
| | (0.017) | (0.017) | (0.014) | (0.015) |
| Educ. Tertiary | $-0.522^{***}$ | $-0.126^{***}$ | $-0.501^{***}$ | $-0.166^{***}$ |
| | (0.017) | (0.016) | (0.014) | (0.014) |
| Life event | $0.032^{**}$ | $-0.002$ | $0.088^{***}$ | 0.045 |
| | (0.013) | (0.013) | (0.034) | (0.036) |
| $\text{Value}_{t-1}$ | $0.545^{***}$ | $0.350^{***}$ | $0.560^{***}$ | $0.275^{***}$ |
| | (0.006) | (0.006) | (0.005) | (0.005) |
| $R^2$ | 0.371 | 0.144 | 0.392 | 0.090 |
| Adj. $R^2$ | 0.371 | 0.144 | 0.392 | 0.089 |
| Num. obs. | 23354 | 23354 | 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. Table 4 in the paper summarizes the coefficients.

Table D.2: IV Estimate of the spillover effect.

| | IV regression - 2SLS | | | |
|---|---|---|---|---|
| | GirlFirst | | GotCancer | |
| | (Stage 1) | (Stage 2) | (Stage 1) | (Stage 2) |
| Intercept | $0.217^{***}$ | $0.113^{***}$ | $0.181^{***}$ | $0.109^{***}$ |
| | (0.027) | (0.026) | (0.020) | (0.021) |
| Female | $-0.194^{***}$ | $-0.039^{***}$ | $-0.172^{***}$ | $-0.103^{***}$ |
| | (0.013) | (0.013) | (0.011) | (0.011) |
| Educ. Secondary | $-0.286^{***}$ | $-0.284^{***}$ | $-0.278^{***}$ | $-0.335^{***}$ |
| | (0.017) | (0.017) | (0.014) | (0.015) |
| Educ. Tertiary | $-0.522^{***}$ | $-0.432^{***}$ | $-0.501^{***}$ | $-0.518^{***}$ |
| | (0.017) | (0.018) | (0.014) | (0.016) |
| Life event | $0.032^{**}$ | | $0.088^{***}$ | |
| | (0.013) | | (0.034) | |
| $\widehat{\text{Cons}}_t$ | | $-0.330^{***}$ | | $-0.373^{***}$ |
| | | (0.010) | | (0.008) |
| $\text{Value}_{t-1}$ | $0.545^{***}$ | $0.348^{***}$ | $0.560^{***}$ | $0.269^{***}$ |
| | (0.006) | (0.006) | (0.005) | (0.005) |
| $R^2$ | 0.371 | 0.182 | 0.392 | 0.143 |
| Adj. $R^2$ | 0.371 | 0.182 | 0.392 | 0.143 |
| 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 D.3: Effect of having ever been unemployed on values.

| | Linear regression - OLS | |
|---|---|---|
| | (Cons) | (Trans) |
| Intercept | $0.173^{***}$ | $-0.119^{***}$ |
| | (0.021) | (0.022) |
| Educ. Secondary | $-0.278^{***}$ | $-0.163^{***}$ |
| | (0.014) | (0.015) |
| Educ. Tertiary | $-0.501^{***}$ | $-0.167^{***}$ |
| | (0.014) | (0.014) |
| Female | $-0.167^{***}$ | 0.004 |
| | (0.011) | (0.012) |
| Been Unemp. | $0.025^{**}$ | $0.280^{***}$ |
| | (0.012) | (0.013) |
| $\text{Value}_{t-1}$ | $0.561^{***}$ | $0.265^{***}$ |
| | (0.005) | (0.005) |
| $R^2$ | 0.392 | 0.103 |
| Adj. $R^2$ | 0.392 | 0.103 |
| Num. obs. | 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. Been Unemp. is the life event. Individuals who have never been unemployed are the reference group. Table 6 in the paper summarizes the coefficients.

Table D.4: 2SLS estimate of the SEM for the girl-first life event.

| | 2SLS regression | | | |
|---|---|---|---|---|
| | Reduced form (Stage 1) | | Structural form (Stage 2) | |
| | (Cons) | (Trans) | (Cons) | (Trans) |
| GirlFirst | $0.033^{***}$ | $-0.002$ | $0.034^{***}$ | 0.009 |
| | (0.013) | (0.013) | (0.013) | (0.013) |
| $\text{Cons}_{t-1}$ | $0.546^{***}$ | $-0.180^{***}$ | $0.612^{***}$ | |
| | (0.005) | (0.005) | (0.006) | |
| $\text{Trans}_{t-1}$ | $0.127^{***}$ | $0.348^{***}$ | | $0.389^{***}$ |
| | (0.006) | (0.006) | | (0.006) |
| $\widehat{\text{Cons}}_t$ | | | | $-0.329^{***}$ |
| | | | | (0.010) |
| $\widehat{\text{Trans}}_t$ | | | $0.365^{***}$ | |
| | | | (0.017) | |
| $\text{R}^2$ | 0.384 | 0.182 | 0.384 | 0.182 |
| Adj. $\text{R}^2$ | 0.384 | 0.182 | 0.384 | 0.182 |
| 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 D.5: 2SLS estimate of the SEM for the got-cancer life event.

| | 2SLS regression | | | |
|---|---|---|---|---|
| | Reduced form (Stage 1) | | Structural form (Stage 2) | |
| | (Cons) | (Trans) | (Cons) | (Trans) |
| GotCancer | $0.079^{**}$ | 0.055 | $0.061^{*}$ | $0.084^{**}$ |
| | (0.034) | (0.035) | (0.034) | (0.035) |
| $\text{Cons}_{t-1}$ | $0.562^{***}$ | $-0.209^{***}$ | $0.632^{***}$ | |
| | (0.004) | (0.005) | (0.006) | |
| $\text{Trans}_{t-1}$ | $0.090^{***}$ | $0.269^{***}$ | | $0.302^{***}$ |
| | (0.005) | (0.005) | | (0.005) |
| $\widehat{\text{Cons}}_t$ | | | | $-0.372^{***}$ |
| | | | | (0.008) |
| $\widehat{\text{Trans}}_t$ | | | $0.336^{***}$ | |
| | | | (0.018) | |
| $\text{R}^2$ | 0.399 | 0.143 | 0.399 | 0.143 |
| Adj. $\text{R}^2$ | 0.398 | 0.143 | 0.398 | 0.143 |
| 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 D.6: 2SLS estimate of the SEM for the been-unemployed life event.

| | 2SLS regression | | | |
|---|---|---|---|---|
| | Reduced form (Stage 1) | | Structural form (Stage 2) | |
| | (Cons) | (Trans) | (Cons) | (Trans) |
| BeenUnemp | 0.006 | $0.227^{***}$ | $-0.072^{***}$ | $0.230^{***}$ |
| | (0.012) | (0.012) | (0.013) | (0.012) |
| $\text{Cons}_{t-1}$ | $0.562^{***}$ | $-0.201^{***}$ | $0.632^{***}$ | |
| | (0.005) | (0.005) | (0.006) | |
| $\text{Trans}_{t-1}$ | $0.090^{***}$ | $0.261^{***}$ | | $0.293^{***}$ |
| | (0.005) | (0.005) | | (0.005) |
| $\widehat{\text{Cons}}_t$ | | | | $-0.357^{***}$ |
| | | | | (0.008) |
| $\widehat{\text{Trans}}_t$ | | | $0.345^{***}$ | |
| | | | (0.019) | |
| $\text{R}^2$ | 0.399 | 0.152 | 0.399 | 0.152 |
| Adj. $\text{R}^2$ | 0.398 | 0.151 | 0.398 | 0.151 |
| 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.1: Values according to first child's sex.

| | Linear regression - 5-attitude Principal Comp. | | | | | |
|---|---|---|---|---|---|---|
| | Conservative (Cons) | | | Self-Transcendence (Trans) | | |
| | (1) | (2) | (3) | (1) | (2) | (3) |
| Intercept | $0.263^{***}$ | $0.455^{***}$ | $0.217^{***}$ | $0.035^{**}$ | $0.135^{***}$ | $-0.064^{**}$ |
| | (0.016) | (0.016) | (0.027) | (0.014) | (0.014) | (0.027) |
| Female | $-0.293^{***}$ | $-0.289^{***}$ | $-0.194^{***}$ | 0.001 | 0.007 | $0.063^{***}$ |
| | (0.013) | (0.013) | (0.013) | (0.012) | (0.012) | (0.013) |
| Girl first | $0.026^{*}$ | $0.026^{**}$ | $0.032^{**}$ | $-0.010$ | $-0.011$ | $-0.002$ |
| | (0.013) | (0.013) | (0.013) | (0.012) | (0.012) | (0.013) |
| Educ. Secondary | | $-0.404^{***}$ | $-0.286^{***}$ | | $-0.345^{***}$ | $-0.139^{***}$ |
| | | (0.017) | (0.017) | | (0.015) | (0.017) |
| Educ. Tertiary | | $-0.890^{***}$ | $-0.522^{***}$ | | $-0.308^{***}$ | $-0.126^{***}$ |
| | | (0.016) | (0.017) | | (0.015) | (0.016) |
| $\text{Value}_{t-1}$ | | | $0.545^{***}$ | | | $0.350^{***}$ |
| | | | (0.006) | | | (0.006) |
| $R^2$ | 0.016 | 0.098 | 0.371 | 0.001 | 0.022 | 0.144 |
| Adj. $R^2$ | 0.016 | 0.097 | 0.371 | 0.001 | 0.022 | 0.144 |
| Num. obs. | 34440 | 34440 | 23354 | 34440 | 34440 | 23354 |

*Notes*: $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$. Standard errors between parentheses. Male in the NCDS cohort with primary education and a boy as first child as the reference group.

## E Additional regressions

This appendix presents additional estimate of the effect of life events on values and attitudes.

I estimate independently with OLS the effect of the life event $z \in Z = \{GotCancer, GirlFirst\}$ on values $V = (Cons, Trans)$ for an individual $i$ in period $t$ with the following equations:

$$Cons_{it} = \alpha_1 + \beta_1 \times z_{it} + \eta_1 \times Cons_{i,t-1} + X_i\delta_1 + u_{it}$$
$$Trans_{it} = \alpha_2 + \beta_2 \times z_{it} + \eta_2 \times Trans_{i,t-1} + X_i\delta_2 + u_{it}$$

where $X$ are control variables including gender and education. Table E.1 and E.2 summarize the coefficients for, respectively, having a girl as first child and having ever had cancer.

The coefficient associated to $GirlFirst$ in table E.1 is positive and significant for $Cons$ while it is negative but non-significant for $Trans$. Thus, individuals who have had a girl as first child instead of a boy tend also to have more conservative values without change in their values about self-transcendence. The former effect is even more stronger once we introduce controls about education and lag of conservation. On average, parents who have had a girl instead of a boy as first child hold more conservative values by 0.032 sd.

Focusing on the levels of education, coefficients reveal two patterns. First, a higher

Table E.2: Values according to getting cancer.

| | Linear regression - 5-attitude Principal Comp. | | | | | |
|---|---|---|---|---|---|---|
| | Conservative (Cons) | | | Self-Transcendence (Trans) | | |
| | (1) | (2) | (3) | (1) | (2) | (3) |
| Intercept | 0.090*** | 0.312*** | 0.181*** | 0.034** | 0.105*** | −0.028 |
| | (0.019) | (0.019) | (0.020) | (0.017) | (0.017) | (0.022) |
| Female | −0.164*** | −0.150*** | −0.172*** | −0.057*** | −0.050*** | −0.022* |
| | (0.010) | (0.010) | (0.011) | (0.009) | (0.009) | (0.012) |
| Got cancer | 0.111*** | 0.073** | 0.088*** | 0.107*** | 0.096*** | 0.045 |
| | (0.037) | (0.036) | (0.034) | (0.033) | (0.033) | (0.036) |
| Educ. Secondary | | −0.370*** | −0.278*** | | −0.241*** | −0.169*** |
| | | (0.013) | (0.014) | | (0.012) | (0.015) |
| Educ. Tertiary | | −0.866*** | −0.501*** | | −0.169*** | −0.166*** |
| | | (0.012) | (0.014) | | (0.011) | (0.014) |
| $\text{Value}_{t-1}$ | | | 0.560*** | | | 0.275*** |
| | | | (0.005) | | | (0.005) |
| $R^2$ | 0.004 | 0.084 | 0.392 | 0.001 | 0.009 | 0.090 |
| Adj. $R^2$ | 0.004 | 0.084 | 0.392 | 0.001 | 0.009 | 0.089 |
| Num. obs. | 58216 | 58216 | 32885 | 58216 | 58216 | 32885 |

*Notes*: $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$. Standard errors between parentheses. Male in the NCDS cohort with primary education and who never had cancer as the reference group.

level of education is associated with lower conservative values, hence, greater openness to change. Coefficients are significantly different between the three levels of education. Second, individuals with secondary and tertiary levels of education hold more self-enhanced values with respect to those with primary education. Although, coefficients of the secondary and tertiary levels are not statistically different from each other. These patterns point out the fact that conservative values are much more discriminatory than self-transcendence according to the educational level, which is consistent with the ranking of principal components based on the explained variance.

In table E.2, the coefficient associated to *GotCancer* is positive and significant for *Cons* and *Trans*, except for the latter once I introduce the lag of the value. Thus, individuals who have ever had a cancer tend to hold more conservative and self-transcendent values. On average, individuals who went through this life event becomes more conservative by 0.088 sd. Coefficients associated to the level of education are close to those obtained in the previous table, showing once again the difference in terms of values between less and more educated individuals.

Since values are derived from attitudes, I look at the effect of these life events on attitudes in order to understand which attitudes drive the observed shifts in values. Hence, I estimate

Table E.3: Attitudes according to first child's sex.

| | Linear regression - Attitudes | | | | |
|---|---|---|---|---|---|
| | (A) | (IA) | (MOR) | (PC) | (WE) |
| Intercept | $0.133^{***}$ | $0.067^{***}$ | $0.136^{***}$ | $0.064^{***}$ | $0.071^{***}$ |
| | (0.021) | (0.022) | (0.023) | (0.023) | (0.024) |
| Female | $-0.083^{***}$ | $-0.040^{***}$ | $-0.171^{***}$ | $-0.132^{***}$ | $-0.070^{***}$ |
| | (0.010) | (0.011) | (0.011) | (0.011) | (0.012) |
| GirlFirst | $0.038^{***}$ | 0.009 | 0.004 | 0.002 | 0.007 |
| | (0.010) | (0.011) | (0.011) | (0.011) | (0.012) |
| Educ. Secondary | $-0.144^{***}$ | $-0.154^{***}$ | $-0.033^{**}$ | $-0.147^{***}$ | $-0.024$ |
| | (0.013) | (0.014) | (0.014) | (0.014) | (0.015) |
| Educ. Tertiary | $-0.338^{***}$ | $-0.237^{***}$ | $-0.049^{***}$ | $-0.314^{***}$ | $-0.078^{***}$ |
| | (0.013) | (0.013) | (0.014) | (0.014) | (0.015) |
| $\text{Attitude}_{t-1}$ | $0.558^{***}$ | $0.535^{***}$ | $0.533^{***}$ | $0.467^{***}$ | $0.405^{***}$ |
| | (0.005) | (0.005) | (0.006) | (0.006) | (0.006) |
| $R^2$ | 0.378 | 0.321 | 0.301 | 0.271 | 0.173 |
| Adj. $R^2$ | 0.378 | 0.321 | 0.300 | 0.271 | 0.172 |
| Num. obs. | 23483 | 23443 | 23460 | 23458 | 23408 |

*Notes*: $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$. Standard errors between parentheses. Male in the NCDS cohort with primary education and a boy as first child as the reference group.

independently with OLS the effect of the life event $z \in Z = \{GotCancer, GirlFirst\}$ on attitudes $Y^j$ with $j \in \{A, IA, MOR, PC, WE\}$ for an individual $i$ in period $t$ with the following equation:

$$Y_{it}^j = \alpha_j + \beta_j \times Z_{it} + \eta_j \times Y_{it-1}^j + X_i\delta_j + u_{it}$$

where $X$ are control variables. Table E.3 and E.4 summarize the coefficients for, respectively, having a girl as first child and having ever had cancer.

Table E.3 indicates that having a girl as first child is associated with an increase in attitudes towards Authority (A) by 0.038 sd. One mechanism explaining this could be that parents internalize that their girl is more likely to be exposed to abuse or bad behaviors with respect to a boy, therefore, they increase their support towards a more authoritarian society. Other coefficients are also positive but not significantly different from zero. Since authority is strongly associated with conservation and much less with self-transcendence, see figure 5, it is consistent with the fact that we observe only a shift in the former and not in the latter in table E.1.

Table E.4 shows that individuals who have ever had a cancer tend also to increase their attitudes towards Inequality Aversion (IA) by 0.043 sd., although not significant, and towards Political Cynicism (PC) by 0.057 sd. Sick individuals may become more dependent and rely

Table E.4: Attitudes according to getting cancer.

| | Linear regression - Attitudes | | | | |
|---|---|---|---|---|---|
| | (A) | (IA) | (MOR) | (PC) | (WE) |
| Intercept | $0.105^{***}$ | $0.027$ | $0.073^{***}$ | $0.089^{***}$ | $0.046^{**}$ |
| | (0.016) | (0.017) | (0.017) | (0.017) | (0.018) |
| Female | $-0.057^{***}$ | $-0.062^{***}$ | $-0.143^{***}$ | $-0.120^{***}$ | $-0.041^{***}$ |
| | (0.009) | (0.009) | (0.009) | (0.009) | (0.010) |
| GotCancer | $0.037$ | $0.043$ | $0.014$ | $0.057^{**}$ | $0.006$ |
| | (0.026) | (0.028) | (0.029) | (0.029) | (0.031) |
| Educ. Secondary | $-0.139^{***}$ | $-0.155^{***}$ | $-0.043^{***}$ | $-0.137^{***}$ | $-0.022^{*}$ |
| | (0.011) | (0.012) | (0.012) | (0.012) | (0.013) |
| Educ. Tertiary | $-0.325^{***}$ | $-0.251^{***}$ | $-0.065^{***}$ | $-0.297^{***}$ | $-0.089^{***}$ |
| | (0.011) | (0.011) | (0.011) | (0.012) | (0.012) |
| $\text{Attitude}_{t-1}$ | $0.585^{***}$ | $0.535^{***}$ | $0.538^{***}$ | $0.473^{***}$ | $0.429^{***}$ |
| | (0.004) | (0.005) | (0.005) | (0.005) | (0.005) |
| $R^2$ | 0.408 | 0.317 | 0.305 | 0.273 | 0.189 |
| Adj. $R^2$ | 0.408 | 0.317 | 0.305 | 0.273 | 0.189 |
| Num. obs. | 33094 | 33017 | 33062 | 33066 | 32986 |

*Notes*: $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$. Standard errors between parentheses. Male in the NCDS cohort with primary education and who never had cancer as the reference group.

more on institutions, they increase their support towards redistribution and scepticism about politicians who lead these institutions. The effect on other attitudes is not significantly different from zero. Since both attitudes are strongly associated with self-transcendence and slightly associated with conservation, see figure 5, it explains the increase we observe in both values for individuals who went through this life event in table E.2.

## F Extension of the model

Consider an agent that is characterized by two motivational types of values $V_t = (a_t, b_t) \in \mathbb{R}^2$ in period $t$. Suppose the population is sufficiently large in order to ensure *anonymity*, meaning that any change of values from the agent does not change the distribution of values. The agent considers her values with respect to norms, namely, the average values within the reference population. Hence, values are normalized to the population level, so that the mean of each value in the population is equal to zero, i.e. $\bar{a} = \bar{b} = 0$. Let the agent be in status $s \in \{\underline{s}, \bar{s}\}$ and therefore belonging to the group of individuals in this status. The average values within the group are $\bar{a}^s$ and $\bar{b}^s$, $\forall s \in \{\underline{s}, \bar{s}\}$.

**Utility.** In any period $t$, the agent solves the following maximization program in order to determine her values:

$$\begin{aligned}\max_{a_t, b_t} U_t(a_t, b_t, s_t) = &- \phi_a \frac{(\bar{a}^{s_t} - a_t)^2}{2} - \eta_a \frac{(a_t - a_{t-1})^2}{2} - \frac{(b_t^\star - \rho_a a_t)^2}{2} \\ &- \phi_b \frac{(\bar{b}^{s_t} - b_t)^2}{2} - \eta_b \frac{(b_t - b_{t-1})^2}{2} - \frac{(a_t^\star - \rho_b b_t)^2}{2}\end{aligned} \tag{12}$$

where $(\phi_a, \phi_b, \eta_a, \eta_b) \in (\mathbb{R}_+^\star)^4$ are parameters that account for the relative importance of each utility components; $v_t^\star \in V_t$ are the target values for which values are perfectly consistent; and $(\rho_a, \rho_b) \in [-1, 1]^2$ capture the exogenous inter-dependency between both values within the population. Note that both inter-dependency parameters, i.e. $\rho_a$ and $\rho_b$, are not necessarily equal. For instance, the former can be equal to zero while the latter is different from zero, meaning that the agent only cares about the consistency of the value $b_t$ given the value $a_t$.

This utility function has three components which are all expressed in squared Euclidean distance. First, the agent prefers to hold values that are close to norms within the group to whom she belongs, hence, having a disutility the further her value is from the average value within her group, i.e. $\bar{v}^{s_t} - v_t$. I define this as the *group consistency* which can be interpreted as a social cost for the agent to hold different values with respect to her peers.

Second, the agent also prefers when her today's values are close from her yesterday's values, thus, she suffers from a utility loss the further her value in period $t$ is from her value in period $t-1$, i.e. $v_t - v_{t-1}$. I define this as the *time consistency* which refers to the psychological cost for the agent to change her values.

Third, the agent derives utility from the between-values consistency because she is psychologically more comfortable when two values are not in conflict, thus, she has a disutility the further her value is from the optimal pairwise value, e.g. $b_t^\star - \rho_a a_t$. Since $\rho_a$ and $\rho_b$ capture the inter-dependency between values within the population, the agent is comfortable if her values diverge as much as in the population as a whole. I define this as the *cognitive* *consistency* which reflects a psychological cost due to the cognitive dissonance of having values that are inconsistent with each other. The parameters $(\phi_a, \phi_b, \eta_a, \eta_b)$ account for the relative importance of each utility component relative to the cognitive consistency one.

**Optimal values.** The first-order conditions solving the maximization program (12) are

$$\phi_a(\bar{a}^{s_t} - a_t) - \eta_a(a_{t-1} - a_t) + \rho_a(b_t^\star - \rho_a a_t) = 0,$$
$$\phi_b(\bar{b}^{s_t} - b_t) - \eta_b(b_{t-1} - b_t) + \rho_b(a_t^\star - \rho_b b_t) = 0.$$

With $a_t^\star = a_t$ and $b_t^\star = b_t$, the optimal values become functions of the current status $s_t$ and previous values $V_{t-1}$, hence,

$$a_t(s_t, V_{t-1}) = \frac{\gamma_b(\phi_a \bar{a}^{s_t} + \eta_a a_{t-1}) + \rho_a(\phi_b \bar{b}^{s_t} + \eta_b b_{t-1})}{\gamma}, \tag{13}$$
$$b_t(s_t, V_{t-1}) = \frac{\gamma_a(\phi_b \bar{b}^{s_t} + \eta_b b_{t-1}) + \rho_b(\phi_a \bar{a}^{s_t} + \eta_a a_{t-1})}{\gamma}, \tag{14}$$

where $\gamma_v \equiv \phi_v + \eta_v + \rho_v^2 \ \forall v \in (a, b)$ and $\gamma \equiv \gamma_a\gamma_b - \rho_a\rho_b$.[6] When both values are independent, i.e. $\rho_v = 0 \ \forall v \in (a, b)$, then, it is straightforward to show that each optimal value is the weighted average between the group-average value and the value in the previous period. Hence,

$$v_t(s_t, v_{t-1}) = \frac{\phi_v \bar{v}^{s_t} + \eta_v v_{t-1}}{\phi_v + \eta_v},$$

Let rewrite equations (13) and (14) in terms of $v$ and $-v$ since optimal values for $a$ and $b$ are symmetrical, thus,

$$v_t(s_t, V_{t-1}) = \frac{\gamma_{-v}}{\gamma}\Big[\phi_v \bar{v}^{s_t} + \eta_v v_{t-1}\Big] + \frac{\rho_v}{\gamma}\Big[\phi_{-v}\overline{(-v)}^{s_t} + \eta_{-v}(-v)_{t-1}\Big]. \tag{15}$$

**Change in status.** Using equation (15), I derive the marginal effect of an upgrading of status, from $\underline{s}$ to $\bar{s}$, on both values such that $\Delta v^s \equiv v(\bar{s}, V_{t-1}) - v(\underline{s}, V_{t-1})$. Thus,

$$\Delta v^s = \underbrace{\frac{\gamma_{-v}}{\gamma}\phi_v\Big[\bar{v}^{\bar{s}} - \bar{v}^{\underline{s}}\Big]}_{\text{Direct effect}} + \underbrace{\frac{\rho_v}{\gamma}\phi_{-v}\Big[\overline{(-v)}^{\bar{s}} - \overline{(-v)}^{\underline{s}}\Big]}_{\text{Indirect effect}}. \tag{16}$$

The marginal effect of an upgrading of status on the value $v$, given the same set of values in previous period, consists of a direct effect and an indirect effect. On the one hand, the direct effect is motivated by the group consistency and its magnitude is driven by the between-

[6] It can be shown that $\gamma > 0, \ \forall(\rho_a, \rho_b) \in [-1, 1]^2$ if $(\phi_a + \eta_a)(\phi_b + \eta_b) > 1/16$. This condition is satisfied as long as the relative weight in utility of the group and time consistencies (with respect to the cognitive consistency) are large enough.

group gap in value $v$. On the other hand, the indirect effect captures the combination of two mechanisms, namely, the group consistency and the cognitive consistency. The magnitude of this latter effect is driven by the product of the between-group gap in value $-v$ and the level of inter-dependency of $v$ with respect to $-v$, i.e. $\rho_v$. Conversely, in the case of a downgrading of status, from $\underline{s}$ to $\overline{s}$, the marginal effect would be $-\Delta v^s$.

**Transition probabilities.** Once the marginal effect of changing status can be decomposed. One must define when these changes occur. Among the main issues that this paper has to deal with, the fact that transition probabilities are hardly ever exogenous to values, but rather endogenous, is by far one of the main ones. For instance, when thinking about unemployed and employed people, one does not need to be economist to argue that the probability of quitting or getting fired from a job along with the probability to success in finding a job are more than likely to be endogenous to values.[7]

Suppose that transition probabilities between status are as follows. The probability of having an upgrading of status, hence, of being in status $\overline{s}$ in period $t$ while in $\underline{s}$ in the previous period, is a function of values in previous period such that

$$Pr(s_t = \overline{s} \mid s_{t-1} = \underline{s}) = \overline{\pi}(V_{t-1}). \tag{17}$$

Therefore, the complement of this event is the probability to remain in status $\underline{s}$, namely, $Pr(s_t = \underline{s} \mid s_{t-1} = \underline{s}) = 1 - \overline{\pi}(V_{t-1})$. Similarly, the probability of having a downgrading of status corresponds to

$$Pr(s_t = \underline{s} \mid s_{t-1} = \bar{s}) = \underline{\pi}(V_{t-1}), \tag{18}$$

with $Pr(s_t = \bar{s} \mid s_{t-1} = \bar{s}) = 1 - \underline{\pi}(V_{t-1})$ being the complement.

**Expected values.** As we are interested in the effect of a life event, occurring in period $t-1$, on values in period $t$, let define $\mathbb{E}v_t$ as the expected value of $v_t$ which is a function of the previous status $s_{t-1}$ and the previous of set of values $V_{t-1}$, such that,

$$\mathbb{E}v_t(s_{t-1}, V_{t-1}) = Pr(s_t = \bar{s})v_t(\bar{s}, V_{t-1}) + Pr(s_t = \underline{s})v_t(\underline{s}, V_{t-1}),$$

where $\mathbb{E}$ is the expectation operator. Using transition probabilities from equations (17) and

[7] See, for instance, Alesina et al. (2015) who show that individuals with stronger family ties are less mobile because moving away is costly, thus, they choose regulated labor markets and therefore experience higher unemployment.

(18),

$$\mathbb{E}v_t(s_{t-1},V_{t-1}) = \Big[\overline{\pi}(V_{t-1})Pr(s_{t-1}=\underline{s}) + (1-\underline{\pi}(V_{t-1}))Pr(s_{t-1}=\overline{s})\Big]v_t(\overline{s},V_{t-1})$$
$$+\Big[\underline{\pi}(V_{t-1})Pr(s_{t-1}=\overline{s}) + (1-\overline{\pi}(V_{t-1}))Pr(s_{t-1}=\underline{s})\Big]v_t(\underline{s},V_{t-1}).$$

Regrouping terms,

$$\begin{aligned}\mathbb{E}v_t(s_{t-1},V_{t-1}) &= Pr(s_{t-1}=\overline{s})v_t(\overline{s},V_{t-1}) + Pr(s_{t-1}=\underline{s})v_t(\underline{s},V_{t-1})\\ &\quad+\Delta v^s\Big[\overline{\pi}(V_{t-1})Pr(s_{t-1}=\underline{s}) - \underline{\pi}(V_{t-1})Pr(s_{t-1}=\overline{s})\Big]\end{aligned} \tag{19}$$

where $v_t$ and $\Delta v^s$ are respectively defined in equations (15) and (16).

To understand the effect of life events on values, we want to compare individuals on the basis of their life trajectories and values. Thus, suppose there exist two individuals $i$ and $j$ respectively characterized by their status in previous period, i.e. $s^i_{t-1}$ and $s^j_{t-1}$, and their values in previous period, i.e. $V^i_{t-1}$ and $V^j_{t-1}$. Let $\Delta\mathbb{E}v_t$ be the difference in expected value $v_t$ between both individuals, namely,

$$\Delta\mathbb{E}v_t \equiv \mathbb{E}v_t(s^i_{t-1},V^i_{t-1}) - \mathbb{E}v_t(s^j_{t-1},V^j_{t-1}),$$

where $\mathbb{E}v_t$ corresponds to equation (19). Suppose both individuals have the same status and values in period $t-1$, i.e. $s^i_{t-1}=s^j_{t-1}$ and $V^i_{t-1}=V^j_{t-1}$. Then, it is straightforward to show that $\Delta\mathbb{E}v_t=0$ which means they have the same expected value in period $t$.

**Endogeneity issue.** Now, suppose they still have the same status, say $\overline{s}$, but they do not share the same values in $t-1$, i.e. $s^i_{t-1}=s^j_{t-1}=\overline{s}$ and $V^i_{t-1}\neq V^j_{t-1}$. For instance, two individuals may have the same employed status (e.g. employed), although one is conservative and the other one progressive. Thus, the difference in expected value $v_t$ becomes

$$\Delta\mathbb{E}v_t = \underbrace{v^i_t - v^j_t}_{\text{True effect}} - \underbrace{\Delta v^s\times\Delta\underline{\pi}}_{\text{Bias}}, \tag{20}$$

where

$$v^i_t - v^j_t = \Delta v_{t-1} \equiv \frac{\gamma_{-v}}{\gamma}\eta_v\Big[v^i_{t-1}-v^j_{t-1}\Big] + \frac{\rho_v}{\gamma}\eta_{-v}\Big[(-v)^i_{t-1}-(-v)^j_{t-1}\Big], \tag{21}$$

$-\Delta v^s$ is the marginal effect of a downgrading of status defined in equation (16), and $\Delta\underline{\pi}\equiv \underline{\pi}(V^i_{t-1}) - \underline{\pi}(V^j_{t-1})$ the difference in probability of having a downgrading of status between both individuals.

If employment status dynamics were exogenous to values, then transition probabilities would not depend on values, i.e. $\partial\overline{\pi}/\partial v_{t-1} = \partial\underline{\pi}/\partial v_{t-1} = 0 \; \forall v \in V$, which implies that there would be no difference in probabilities between both individuals, i.e. $\Delta\underline{\pi} = 0$. Thus, equation (20) would only be a linear function of both values' gaps in previous period, i.e. $\Delta v_{t-1}$. However, in many cases such as unemployment, transition probabilities are endogenous, hence $\Delta\underline{\pi} \neq 0$, which, therefore, leads to a bias when gauging the effect of a life event on values.

**General case.** In order to understand the role of the bias, let us consider the most general case in which individuals do not share the same values in $t-1$, i.e. $V_{t-1}^i \neq V_{t-1}^j$, neither they have the same status such that $s_{t-1}^i = \underline{s}$ and $s_{t-1}^j = \overline{s}$. Thus, the difference in expected value $v_t$ becomes

$$\Delta\mathbb{E}v_t = v_t^i(\underline{s}, V_{t-1}^i) - v_t^j(\overline{s}, V_{t-1}^j) + \Delta v^s\Big[\overline{\pi}(V_{t-1}^i) + \underline{\pi}(V_{t-1}^j)\Big],$$

Rewriting the expression,

$$\Delta\mathbb{E}v_t = \Delta v_{t-1} + \Delta v^s\Big[1 + \Delta\pi\Big] \tag{22}$$

where $\Delta v_{t-1}$ and $\Delta v^s$ are respectively defined in equations (21) and (16), and $\Delta\pi = \overline{\pi}(V_{t-1}^i) + \underline{\pi}(V_{t-1}^j)$.

**Bias identification.** For simplicity, suppose that $\overline{\pi}$ and $\underline{\pi}$ are linear probability functions such that

$$\overline{\pi}(V_{t-1}) = \overline{\mu} + \overline{\alpha}a_{t-1} + \overline{\beta}b_{t-1} \tag{23}$$

$$\underline{\pi}(V_{t-1}) = \underline{\mu} + \underline{\alpha}a_{t-1} + \underline{\beta}b_{t-1} \tag{24}$$

In the case where transition probabilities are exogenous, all $\alpha$ and $\beta$ parameters in equations (23) and (24) would be equal to zero, which implies that $\Delta\pi = \overline{\mu} - \underline{\mu}$. Thus, the difference in expected value $v_t$ is composed of, on the one hand, the total effect of a change in status $\Delta v^s[1 + \overline{\mu} + \underline{\mu}]$, on the other hand, the reproduction of the difference in values in previous period $\Delta v_{t-1}$.

In the case of an endogenous life event, the difference in transition probabilities from equation (22) depends on values in previous period. Thus, using equations (23) and (24), we can write the bias as

$$\Delta\pi - \overline{\mu} - \underline{\mu} = \overline{\alpha}a_{t-1}^i + \underline{\alpha}a_{t-1}^j + \overline{\beta}b_{t-1}^i + \underline{\beta}b_{t-1}^j. \tag{25}$$

By determining the parameters of equation (25) and therefore its sign, it is possible to understand how the bias affect the difference in expected values, due to a life event, between two individuals from two different backgrounds. When equation (25) is positive (resp. negative), it means that the observed total effect of a downgrading of status on values is biased upward (resp. downward). Note that, the values of these parameters along with the marginal effect of a change in status depend on the life event that we consider.