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Raising Children to Be (In-)Tolerant. Influence of Church, Education, and Society on Adolescents' Stance towards Queer People in Germany

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Abstract: *»Erziehung zur (In-)Toleranz. Einfluss von Kirche, staatlicher Bildung und Zivilgesellschaft auf die Einstellung Jugendlicher zu sexueller Vielfalt«.* There recently was a highly emotional debate in Germany regarding what to teach children about sexual plurality; different actors accuse each other of wrongful indoctrination. This paper presents a computational model based on the results of the SINUS youth study 2016 indicating that the dynamics of adolescents finding their own stance towards sexual plurality are resilient towards external pressure by clerical or government activities. Instead, civil society plays a strong role in the process of children developing their own opinions. This underlines that values in society can be reproduced between generations.

Keywords: Agent-based modelling, social values, adolescents, sexual plurality, church.

1.   Introduction

In 2014, the green-red government of Baden-Württemberg, Germany, planned to introduce a new education agenda meant to raise awareness for sexual plurality (among other purposes). Pupils were to implicitly encounter the topic during lessons in all subjects (e.g. by occasionally including trans- instead of cis-gender in mathematical text problems) and thereby be encouraged to reflect on it. This was heavily opposed by Christian Conservatives and Christian fundamentalists because they suspected such approaches to be a promotion of LGBTQ[1] lifestyle or at least presenting something as normal and acceptable

[1]   **L**esbian, **G**ay, **B**isexual, **T**ransgender, **Q**ueer. This paper uses *LGBTQ*, *queer*, and *sexual plurality* as synonyms to describe any exception from the norm of romantic relationships being

which they considered merely a deviation from the norm. The opponents of the new education agenda feared an indoctrination of adolescents to become excessively open towards sexual plurality (Burchard et al. 2014). Their resistance was successful: the government froze its plans for the new education agenda and later altered it to grant sexual plurality less room and importance (Kultusministerium Baden-Württemberg 2016). This seems to prove complaints by some promoters of sexual plurality right that the church is an institution which undermines and marginalises interests of LGBTQ people. They suspect Christian moralistic values transported by the institutional church through different channels in education (e.g. religious education lessons) to hinder children from developing their own, open stance towards sexual plurality (Blech 2015). That view of religion as a reason for being critical of LGBTQ people seems intuitive and scholars using different methodological approaches back up this intuition empirically, as Bhugra (1987) and Ahmad and Bhugra (2010) point out in their literature reviews.

Furthermore, both parties in the debate stress that education could be used to deliberately influence adolescents' opinions concerning LGBTQ people. Since Plato (The Republic, 456-8), education plays a major role for many regimes of all political colour to introduce and sometimes impose their values on children. Such indoctrination does not only happen at school but also via youth groups and other leisure activities. Modern Democracies like Germany claim to teach a plurality of values and stay (relatively) neutral as a state. However, it seems understandable for those who view plurality as distinct from neutrality and as a doctrine itself to fear an "indoctrination of plurality," given the history of education impacting children's value systems.

Despite the impact of formal education agendas, children develop their values via communication with their social environment. This environment consists of an adolescent's family members but also of teachers and guides in youth groups and it passes latent values to her that are present in a society or its sub-groups. Changing those latent values is not as easy for state or church as altering an education agenda. But especially in puberty, many adolescents seem not to care about adults much and instead develop their values in exchanges with peers who come with a different perspective depending on their background. Overall, one could expect children's views of queer people to depend

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constituted by one cisgender (identification with one's sex assigned at birth) male and one cisgender female. The study investigates adolescents' stances towards queerness understood that way. Colloquially, queer often includes allies (heterosexual cisgender men or women not living in an open or polyamorous relationship). However, being an ally describes acting upon a positive stance towards other queer people and since the aim of the research presented here is to evaluate the development of the stance itself, including allies in the term would cause circularity.

on society as a whole but also on deliberate interventions by actors like church or state.

This paper tests that hypothesis and investigates how openness towards sexual plurality of German teenagers develops between their 14th and 18th birthday with a special focus on influences by church and education. To capture that development a computational model is developed based on the SINUS youth study 2016. This study employs a mix of quantitative and qualitative methods to categorise children aged 14 to 17 by their attitudes as well as their living conditions into seven distinct milieus and describes properties of these milieus in depth. Section 2 introduces the model and data used to develop it. The most important results from simulating the model are presented in Section 3, and Section 4 discusses them.

2. Introduction to the Model

2.1 Model Description

The model simulates the changing attitudes towards LGBTQ people of adolescents in all seven SINUS milieus.[2] For that purpose, a population of 2,500 agents as teenagers of similar age is introduced. The simulation is assumed to start when they become 14 years old and runs until their 18th birthday in 48 steps, whereby each step represents one month. The population can be understood as the children of a small town or a district of a bigger city. However, the model landscape constitutes no representation of a physical space but instead agents' movement and encounters are a proxy for their communication. Each agent is part of a group representing a milieu from the SINUS study and their susceptibility to different influences depends on their group belonging. Agents are assigned their milieu at initialisation such that the milieu sizes from the SINUS study are mirrored. They stay within their milieu during the whole course of the simulation because the simulation only cares about openness towards queer people and changes in that openness alone are not sufficient to justify shifting from one milieu to another as milieus consist of various social, economic, and educational layers.

Besides her milieu belonging an agent's openness is her main property in the model. It is represented on a linear scale reaching from −1 (extremely closed) to +1 (fully open). This scale is somewhat artificial but it mirrors reality as psychology treats openness rather as a matter of degree than a black and

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[2] Those milieus are Conservatives (15%), Adaptive Pragmatics (24%), Precarious (5%), Hedonic Materialists (15%), Hedonic Experimentalists (12%), Social Ecologicals (8%) and Movers and Shakers (21%). These are the names used in the SINUS study. For a detailed description see Section 2.2.

white distinction.[3] The endpoints of the scale represent the most extreme political views on LGBTQ issues that would still (at least partially) be seriously considered. For Germany, this excludes criminalising LGBTQ people from the scale and rather sets pathologising them and excluding them from social and legal or health-care benefits as the extremely closed position. The initial value of openness is derived from the SINUS study (cf Section 2.2) and depends on the milieu: the *Conservatives'* general sceptical opinion towards changes and "deviant" behaviour is mirrored by an initial openness of −0.73. The *Adaptive Pragmatics* tend to get along with everyone and are thus relatively open (0.33) towards LGBTQ people. The *Precarious* view them as a factor that makes their own struggle harder at the age of 14 (−0.6) and the *Hedonic Materialists* dislike any lifestyle apart mainstream consuming (−0.33). Contrary to that, the *Hedonic Experimentalists* partly identify with a queer lifestyle (0.67). The *Social Ecologicals* feel more attracted to a traditional life themselves but also treasure toleration since early childhood (0.5). The *Movers and Shakers* embrace any nonconformist lifestyle and view their own highly tolerant attitude (0.9) as superiority over their age-mates when they are 14.

While an agent belongs to her initial milieu throughout the whole course of the simulation, her openness can change in each period (which means monthly) and is influenced by the following three channels:

- *Impact of friends*: Each adolescent has a fixed number of friends with whom she exchanges her views regarding LGBTQ people. As friends trust each other, a child adopts her friends' views quite directly.
- *Impact of strangers*: Sometimes, children happen to talk about LGBTQ people with age-mates who are not their friends. Their opinion still has some impact but it is not trusted blindly and instead has to lie within a confidence interval to be taken seriously.
- *Impact of the adult world*: As explained above, adults impact children when talking to them about queer matters.

Before exploring these three channels in detail, it is important to keep in mind that communicating one's view regarding LGBTQ people is to be understood broadly. For example, a negative attitude towards them can be directly expressed by saying "Being gay is bad!" but more commonly it will surface implicitly for example in jokes about LGBTQ people or complaints about the coming out of a celebrity. Likewise, one can express her affinity to queer issues directly or indirectly and even non-verbally.

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[3] Cf. for example Caligiuri et al. (2000) or Nevill and White (2011).

Impact of Friends

The number and kind of friends which an agent has stays constant throughout the simulation and is determined by her milieu. These numbers do not hold for every child of a milieu in reality but represent a stereotypical member as described by the SINUS study. Moreover, children in the model have five friends in average, which is backed by empirical findings (Wagner et al. 2008, cf. data provided with their paper). The *Conservatives*, *Social-Ecologicals*, *Hedonic-Materialists*, and *Precarious* have five friends. The *Adaptive-Pragmatics* who greatly value peer relations have seven friends and the *Hedonic-Experimentalists* have eight since experiences with different people is a core element of their lifestyle. On the other hand, the *Movers and Shakers* only have a single peer friend whom they deeply value. Generally, children tend to stick with members of their own milieu, as suggested by the SINUS study. Only the *Adaptive-Pragmatics* have two of their five friends belonging to either the *Precarious* or the *Hedonic-Materialist* milieu (meaning in turn that members of those two groups have between two and three *Adaptive-Pragmatic* friends).

Adolescents highly value friendships and tend to fully trust their friends (Shell-Deutschland 2015, 307); thus, they take their opinion about LGBTQ people seriously. In the model, all agents enter the process of updating their openness with its old value from any calculation because when discussing queer issues with friends, teenagers straightforwardly express their current beliefs. They calculate the mean of their own openness and the openness of the friend in question, separately for each friend. This is done simultaneously for all children and friendships. Then, the average of those means is calculated and set as the agent's new openness so that each agent updates her openness based on values before any update has taken place. This results in a strong impact of friends consistent with tendencies towards social conformity in small groups explored by Asch (1955, 34). However, two agents who are linked as friends usually do not synchronise their openness values immediately (or within few periods) since their cliques do overlap but are not identical; the only exception from that being the *Movers and Shakers* who only have a single friend with whom they intensely discuss and agree on most matters.

Impact of Strangers

Adolescents spend most of their free time with friends but they occasionally also meet other age-mates and exchange views on queer issues with them. This may happen in various situations, e.g. on the bus, in sports clubs, at parties, or even in the school yard – as longs as the setting is not immediately influenced or supervised by an adult. The model represents these random discussions by agents moving to a random spot in the model world each period and exchang-

ing the openness with those others who are at the same spot.[4] Given size and population density of the model world, children have such exchanges with one or more age-mates in average every other month.

While children trust their friends' opinions "blindly," they are more wary about what strangers state (Freitag and Traunmüller 2009). To represent this behaviour in the model, for each spot in the world with more than one agent on it, the average openness of all agents on the spot is calculated. However, agents only adopt this average if it is significantly close to their own openness, i.e. at most 0.5 more open or less open than itself. Members of different milieus are differently receptive to strangers they meet and thus the general factor of 0.5 is modified with a milieu specific factor to represent milieu specific confirmation biases (Kahneman 2011, 107). Only the *Precarious*, who struggle to find their own position and thus look to others, have a confidence of $1 \cdot 0.5 = 0.5$. The confidence level of the *Adaptive-Pragmatics* and the *Hedonic-Experimentalists* is $0.7 \cdot 0.5 = 0.35$ since members of these groups are still quite open towards strangers. The *Social-Ecologicals* and the *Hedonic-Materialists* entertain different lifestyles but they are equally committed to theirs and are considerably wary about strangers, as represented by a confidence level of $0.3 \cdot 0.5 = 0.15$. The *Conservatives* mainly focus on their equally conservative friend and the *Movers and Shakers* generally try to stay away from most age mates. Therefore, both groups only take those strangers seriously who almost share their own opinion (confidence level $0.1 \cdot 0.5 = 0.05$). This updating can be understood as a variant of the Deffuant-Weisbuch-Dynamics (Deffuant et al. 2000), where the calculated average takes the role of the opinion value of the second agent in updating the opinion of the first. However, we use the more explicit definition of confidence as an interval introduced by Hegselmann and Krause and pick 0.5 as its size, following them, here too: They identify 0.25 on the unit interval, which is equivalent to 0.5 in this model, as a paradigmatic case of reaching consensus reliably (Hegselmann and Krause 2002, 15). This guarantees an impact of strangers in the model which resembles how adolescents treat them in reality: Their views are taken seriously and probably adopted to a point where everyone agrees with each other but they do not possess the credit of trust that friends have.

Thus, there are two main differences between impact of friends and impact of strangers: Firstly, every friend matters each month while a stranger's view is not regularly considered (usually, two agents will meet at the same patch at most once or twice during the 48 simulation periods). Secondly, the openness

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4 Note that in this view all communication is reciprocal, i.e. one adolescent does not for example overhear someone else talking about LGBTQ people without engaging actively in the conversation.

of friends is always fully considered whereas strangers are only taken seriously if their stance is sufficiently close to the one of the agent in question.[5]

Impact of the Adult World

Her peers play an important role in the development of an adolescent's values but this development is also impacted by adults in different ways. The model captures these impacts (with regard to LGBTQ people) in a term that is added to each agent's openness every period:[6]

Function 1 (General adult impacts):
$$(\theta \cdot ReligiousEducation + \iota \cdot OtherSubjects + \kappa \cdot RETeachers + \lambda \cdot OtherTeachers + \mu \cdot Church + \nu \cdot Family)/12$$

The size of a weight varies between milieus but each weight is always positive and the sum of all weights is strictly smaller than 1 for each milieu. The weights for the different milieus and a rationale for their distribution based on the SINUS study are described in the next section. Weights were chosen to represent the strength of the yearly impact of a factor but as the term is used each period (meaning each month in real time), it is divided by 12. In reality, precise strengths of influences presented below vary depending on where a child lives, which school she attends, and socio-economic factors. However, the weights used in the model are a plausible idealisation and moreover model dynamics are resilient towards changes in these weights.

While weights depend on a child's milieu, parameter values themselves are externally given and are the same for all agents. Each parameter can take values between -1 and 1. *Church*, *Theology-Uni*, and *Education Agenda State* are exogenous, all other values are derived from external parameters.

Family directly mirrors *Society* because a child's family lives within society and will thus in average hold its values.

RETeachers derive a fourth of their openness from the openness of society as a whole but since they are connected with the church, its explicit openness is equally important to them. The remaining half of their openness value is derived from their *TheologicalTraining* at university. The latter has a notable impact because at university, training of theological knowledge and personal development go hand in hand. It is important to bear in mind that not only teachers in schools but all religious guides who were trained at university are included.

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[5] Note here that the model allows for friends to meet in the same spot, too. In this case, a friend is treated as any other agent on the spot when calculating the impact of strangers but additionally fulfils her role as a friend.

[6] If an agent's openness after adding the term is below -1 or above 1, it is automatically capped.

As described for the adolescents' families above, *Other Teachers* derive their openness directly from society. Again, the group of these teachers in the model not only consists of teachers in schools but of all sorts of guides who are accepted as role models by teenagers. Therefore, the weight of this factor can be high for a milieu, even if children of that milieu do not pay much respect to teachers but spend their free time with social workers or in sport clubs.

Education Agenda Church is the average of the openness of the institutional church and of scientific theology done at universities. A lack of interdependence between it and *Church* is plausible because on the one hand, theology at universities is free from ideological predispositions and often tries to emancipate from doctrines of the church. On the other hand, the institutional church sometimes consults theologians from universities but is free to waive their advices afterwards and often does so.[7] Thus, scientific theology is left to efficiently influence the church position only in specific cases, such as setting up an education agenda (where expertise in pedagogical matters is important).

Figure 1 shows the causes determining how open religious education in school is. Church and state have an equal say in setting the curriculum because both parties must approve it (Religionswissenschaftsinformationsdienst 2012). The curriculum, on which church and state agree, shapes the openness of actual religious education lessons to 75%, while the remaining 25% are under each teacher's influence because she can treat parts that she disagrees with less carefully or more quickly.

Figure 1: Causes Determining Openness of Religious Education
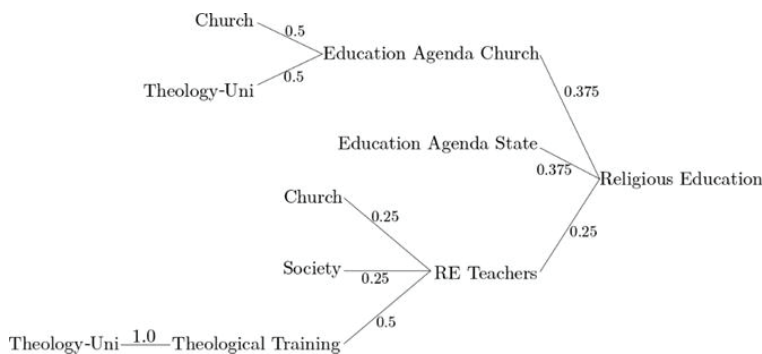
The causes determining Other Subjects are shown in Figure 2. The curriculum is set by the state alone and as for religious education, it determines to 75% how lessons actually look like. The teaching staff of all secular subjects partially

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7   For example, Dabrock et al. (2015) were asked to compose a new guideline on sexuality for the Protestant church in Germany but the resulting text was too progressive and thus not officially published by the church.

consists of theologically trained teachers because in Germany teachers usually study two subjects.

Figure 2: Causes Determining the Openness of All Subjects but Religious Education
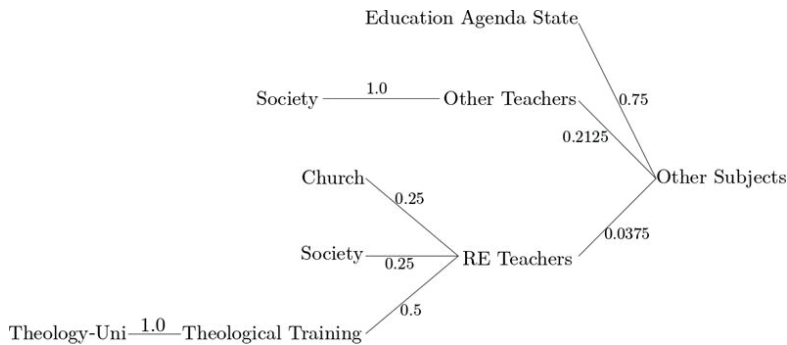
All factors together determine the direction and strength of adults' influences on adolescents' openness towards LGBTQ people. Together with impacts from friends and other age-mates, they constitute the model dynamics.

2.2   Grouping Children Using the Sinus Study

"SINUS is an independent, owner-managed institute for psychological and social science research and consulting" (SINUS 2016). Its data is used by companies (mainly for marketing purposes) and the church.[8] In Germany, the SINUS institute carries out a specific milieu study for children aged 14 to 17. Its methodology has quantitative as well as qualitative components: 2000 children were given a questionnaire to distinguish different milieus and broadly describe their core characteristics. This allowed to match 71 adolescents, who were selected as interview partners, with the overall milieus (Calmbach et al. 2016, 33). The groups in the model presented below in this section are directly derived from the seven milieus which SINUS defines. The descriptions summarise the relevant parts of the overall picture of each milieu drawn in the SINUS Youth Study 2016 resulting in specific weights of external influences:

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[8] Consider e.g. internal documents from the diocese of Speyer working with results from the SINUS study for adults (Diocese-Speyer 2015). Furthermore the Federation of German Catholic Youth (BDKJ) and the taskforce for pastoral ministry youth of the Catholic episcopal conference in Germany are partners of the SINUS youth study 2016 (Calmbach et al. 2016, 480-3).

Conservatives – 15%

Family-oriented locally rooted adolescents with a strong sense of responsibility. They feel uncomfortable with change, deliberately pursue traditional values and look for institutions which give them security, as the church does. Therefore, they spend their free time in church communities or ecclesiastical youth organisations and live out a traditional piety there. Their opinion is that believing implies belonging to an institutional church which in turn implies practising; faith has a distinct normative dimension for them. They socialise with fellow conservatives and avoid age-mates who do not strictly abide by the law or norms, in order not to come into conflict with authorities.

Function 2 (Adult impacts *Conservatives*):
$(0.15 \cdot ReligiousEducation + 0.1 \cdot OtherSubjects + 0.15 \cdot RETeachers + 0.1 \cdot OtherTeachers + 0.05 \cdot Church + 0.2 \cdot Family)/12$

Conservatives' general sceptical opinion towards changes is mirrored by their initial share of open and closed group members: Only 2 of the 15 are open at the start of the simulation (meaning at their 14th birthday).

Adaptive Pragmatics – 24%

Meritocratic mainstream with a markedly pragmatic outlook on life. They are prepared to flexibly adapt to changes while looking for fun and entertainment as well as strong social ties, especially within their families. Faith plays no role in their highly organised daily life. They do not seek knowledge for its own sake but can work hard for school if they feel that it supports preference fulfilment (at least in the medium run). *Adaptive Pragmatics* are aware that they can gain by learning from adults' practical advice and as a by-product of this also pay attention to value education in family, school, and organised (secular) free time activities.

Function 3 (Adult impacts *Adaptive Pragmatics*):
$(0.05 \cdot ReligiousEducation + 0.25 \cdot OtherSubjects + 0 \cdot RETeachers + 0.05 \cdot OtherTeachers + 0 \cdot Church + 0.4 \cdot Family)/12$

Precarious – 5%

Precarious children struggle to emancipate from their families to escape their miserable lives. They see no justice in society, and tend to believe populists; they are uncomfortable with changes due to their sense of exclusion and embitterment. Because they come from difficult families, they spend much of their free time at activity centres under guidance of social workers or sail close to the wind with their friends, which often involves violence. They fear the future but at the

same time hold unrealistic hopes for it; however, these norms are not religious in nature since they usually have no connection with religion.

Function 4 (Adult impacts *Precarious*):
$(0 \cdot ReligiousEducation + 0.05 \cdot OtherSubjects + 0.05 \cdot RETeachers$
$+0.2 \cdot OtherTeachers + 0 \cdot Church + 0.1 \cdot Family)/12$

Hedonic Materialists – 15%

Lower class highly valuing representation by consuming trendy brands. Thus, these adolescents care much about free time, party, shopping, and money to afford those things. Family is important to them and they treasure a traditional, harmonious form of it and want to have such a family themselves later. But for now they spend much time with their many friends partying and reject any authorities which limit their lifestyle or get them to work for school. They are mainstream-oriented in any respect including gender stereotypes and neither show affinity to sub-cultures nor to the church.

Function 5 (Adult impacts *Hedonic Materlialists*):
$(0 \cdot ReligiousEducation + 0.05 \cdot OtherSubjects + 0.025 \cdot RETeachers$
$+0.125 \cdot OtherTeachers + 0 \cdot Church + 0.55 \cdot Family)/12$

Hedonic Experimentalists – 12%

Nonconformists who treasure freedom, individuality, risk, and fun for the sake of their self-realisation. Due to their border crossing, wayward lifestyle they often have conflicts with their parents, teachers, or fellow adolescents. Because they celebrate any sort of movement and change in their lives, they do not care about school, family, or any other "traditional" institution. Instead, they want to emancipate from the mainstream and develop their own style by experimenting around with e.g. their sexuality. In that field, they are open to everything and openly discuss everything with their peers. *Hedonic Experimentalists* feel devoted to having fun here and now, not making plans for the future. Naturally, they do not care about church or its values at all.

Function 6 (Adult impacts *Hedonic Experimentalists*):
$(0 \cdot ReligiousEducation + 0.05 \cdot OtherSubjects + 0 \cdot RETeachers$
$+0.1 \cdot OtherTeachers + 0 \cdot Church + 0 \cdot Family)/12$

Social Ecologicals – 8%

Socially committed and socio-critical and open to alternative ways of life as long as they fit their normative concepts, which are generally liberal and involve a strong sense of equality. They organise their free time themselves and like reading or are keen on learning and on getting to the root of a topic. That

applies to religion as well: Faith plays an important role for many *Social Ecological* adolescents and they are open to doctrines of the church but do not follow them blindly. Instead, they find their own faith in accordance with their other values. Nevertheless, their opinion is that believing implies belonging to an institutional church, which in turn implies practising. For that purpose, they often go to youth religious places (e.g. Taizé).

Function 7 (Adult impacts *Social Ecologicals*):
$(0.15 \cdot ReligiousEducation + 0.2 \cdot OtherSubjects + 0.1 \cdot RETeachers$
$+0.15 \cdot OtherTeachers + 0.05 \cdot Church + 0.175 \cdot Family)/12$

Movers and Shakers – 21%

Nonconformist ambitious avant-garde seeking new frontiers and new solutions. They hold diverse values balancing self-realisation and meritocracy. This is mirrored in their flexibility and their affinity to competition where they feel superior to age-mates. They constantly try to expand their horizon and thus strongly dislike conservative religious morals, control, and authority but at the same time enjoy contact with older children or adults. They highly treasure diversity in fashion, culture, and ways of life and compose their own style from this diversity. They are often single themselves out and instead develop a close and exclusive but platonic relationship with a friend, because they fear a relationship would limit their freedom too much.

Function 8 (Adult impacts *Movers and Shakers*):
$(0.05 \cdot ReligiousEducation + 0.35 \cdot OtherSubjects + 0 \cdot RETeachers$
$+0.2 \cdot OtherTeachers + 0 \cdot Church + 0.05 \cdot Family)/12$

3. Simulation Results

Simulation results are presented in two steps: The first one aims at understanding fundamental properties of the model, by looking at the behaviour of adolescents without external influences (Section 3.1.1) and by varying those influences one at a time (Section 3.1.2). In its second step, the analysis turns towards potential states of German society.

3.1 Model Mechanics

3.1.1 Development without External Influences

Figure 3 [Appendix] depicts the average result of the 50 simulation runs for all external variables set to 0, comparing the average overall openness with the average openness of each milieu.

This involves two steps of aggregation demanding to be justified. The first one is to look at how agents in a single run (and a single milieu) behave in average. Doing that is reasonable firstly because the average of each group is of the greatest political interest and secondly because behaviour of the mean can provide informative clues on where one must seek for more detailed explanations and investigate single agents and thus dispersion measures are also analysed. The second aggregation comprises multiple runs instead of looking at single runs, that way we do not risk overlooking any details here because the dispersion of values is sufficiently small.[9] The only feature not grasped by an aggregation over runs are oscillations of the mean openness of some milieus on the same level between time steps which are explained below; but this does not impact the aggregation, which faithfully represents general trends.

The figure shows a small increase of overall openness over time and a clear distinction between milieus: The openness of *Conservatives* and *Movers and Shakers* remains constant during the 48 simulation periods of all runs because they do not have friends outside their respective milieu and are very wary in encounters with other age-mates.

Contrary to that, *Adaptive Pragmatic*, *Hedonic Experimentalist*, and *Precarious* children change their openness over time; *Adaptive Pragmatics* have both *Precarious* and *Hedonic Experimentalist* friends meaning that those three milieus are closely linked together. Namely, *Adaptive Pragmatics* and *Hedonic Experimentalists* become similarly open. Parallel to that, *Adaptive Pragmatics* pull their *Precarious* friends towards their own position regarding LGBTQ people. Moreover, the large confidence interval of *Precarious* adolescents causes them to trust most strangers they encounter and adapt their openness accordingly. And since most other agents are significantly more open than they are, a random encounter usually makes a *Precarious* agent more open. Both factors together explain why the *Precarious* change their openness quickly.

The two milieus not discussed so far – *Social Ecologicals* and *Hedonic Materialists* – are similar in their friendship structure, as they have only friends from their own group, and in their attitude towards strangers, as they are both quite wary, with a group-specific confidence modifier of 0.3. Nevertheless, *Social Ecological* and *Hedonic Materialist* agents behave differently in simulation because of their different initial openness values: *Social Ecological* children frequently take seriously opinion exchanges regarding queer issues with age-mates they encounter randomly. Thus, they continuously adapt their own openness to the average one of the milieus close to them, which explains why

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[9] Standard deviation for the overall openness is 0.6% of the parameter space and for the *Social Ecological* milieu (the one with the largest standard deviation) it is 1.8% of the parameter space. Range of openness is 3.0% of the parameter space overall and 9.4% for the *Precarious* milieu (the one with the largest range due to oscillations of the mean for single runs).

they become slightly less open during the first simulated year but why then this trend reverses and *Social Ecologicals* end up more open after four simulated years than they were initially. *Hedonic Materialists* in contrary quickly stop seriously discussing queer issues with age-mates who are not their friends because no members of other milieus have a mindset similar to theirs.

Overall, agents' interactions based on only two of their three mechanisms to update their openness already leads to complex outcome patterns and namely provides following insights into model mechanisms

- If left to themselves, most children would become more open-minded towards LGBTQ people than they currently are at the age of 14 in Germany (represented by the initial situation in the model).
- Randomness:
    - Mainly important in children's encounters with strangers and only to a smaller extent in friendship formation.
    - It plays only a minor role since differences between simulation runs are remarkably small.
- An agent's openness does not necessarily develop monotonically but it sometimes oscillates slightly on one level (e.g. for *Precarious*) or the agent becomes more closed in the beginning and grows more open again afterwards (e.g. *Social Ecologicals* or *Hedonic Materialists*).
- The dynamics do not stabilise in a practically relevant time frame.[10]

3.1.2 Variation of Single Parameters

Figure 4 compares the changes in overall openness given extreme values of the four external variables. While those extremes are highly unrealistic in reality (at least in Germany), they are able to provide boundaries for the possible impact of a factor: Institutional church which is said to prohibit openness towards lifestyles violating its conservative moral norms can actually raise closeness only marginally while there is a potential for raising overall openness, if the church itself proclaims it distinctly. Furthermore, many Christian-fundamentalists rejecting sexual plurality accuse the state of "depraving the youth" by a too open education. The model suggests that these accusations are also pointless, since the education agenda of the state has a far higher potential for leading to closeness of adolescents than to their openness.

Impact of the two clerical variables on the system is fairly limited. The church has actually accepted its nowadays diminished impact on many members of society, as internal documents suggest (Diocese-Speyer 2015). Civil society seems to play a very important role for adolescents' openness, maybe

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[10] The median time to arrive at an equilibrium state in the sample was 1,298 steps, with a minimum of 907 steps, and five runs not reaching an equilibrium within 100,000 steps.

because of a new wish among them to adapt to conventions (Calmbach et al. 2016, 475).

3.2 Model Setups Resembling Potential States of Society

3.2.1 Open-Minded Real World Scenario

Church = −0.2; TheologyUni = 0.3; EducationAgendaState = 0; Society = 0.1

Education sends no clear message in favour or disfavour of sexual plurality, society is slightly open, especially academic circles (including the theological ones). The institutional church sticks to a more closed view but is – as Figure 5 shows – outweighed by other actors in society both overall (adolescents are 0.59 open after four years, compared to only 0.43 without external impacts) and for each milieu; all adolescents including *Conservatives*, who put great trust in what the church says, have a clear trajectory towards acceptance of sexual plurality during the whole simulation time. However, the process of becoming more open happens relatively slowly and thus changes within four years are only moderate: Altering attitudes of many individuals does take a long time in a pluralistic society. *Movers and Shakers* stick out because they become fully open-minded in 38 month but their initial opinion about queer issues is close to that full openness already.

3.2.2 Close-Minded Real World Scenario

Church = −0.3; TheologyUni = 0; EducationAgendaState = 0; Society = −0.1

Figure 6 depicts this situation, where society is slightly close-minded and institutional church holds a distinctly traditional moralistic opinion. In average, overall openness decreases over time: the *Conservatives* who are greatly influenced by the regressive institutional church become fully closed in less than four years and they also impact the *Hedonic Materialists*. The *Social Ecologicals*, *Adaptive Pragmatics*, *Hedonic Experimentalists*, and *Precarious* end up slightly less open than in a situation without influences from adults but they still maintain their general open-minded attitude towards LGBTQ people. The strong bonds between agents of the four milieus make them resilient towards external impacts in the relevant time frame. *Movers and Shakers* are more open than these four milieus but on a clear trajectory towards closeness, since they are interested in all channels of education including religious education and also talk a lot to older members of society who have a slightly critical attitude of LGBTQ people in this scenario.

3.2.3 Christian-Conservative Perception of the "Bildungsplan 2015" in Baden-Württemberg

Church = −0.5; TheologyUni = −0.3; EducationAgendaState = 1; Society = −0.4

This scenario reflects the view of those opposing the education agenda which the green-red government of Baden-Württemberg had planned for 2015. These groups assume it to be a broad consensus in society that LGBTQ people are "sexual deviations"[11] and that intersexuality is like "genetic defects."[12] The education agenda in contrary is seen as maximally open, since it does not only promote acceptance of sexual plurality against the majority opinion in society but even indoctrinates children to become lesbian, gay, bi-, trans-, or intersexual (according to its opponents).

Figure 7 shows that strong and opposed external influences largely contribute to polarised individual opinions. Furthermore, the extreme education agenda value indeed causes *Social Ecologicals*, *Adaptive Pragmatics*, *Precarious*, *Hedonic Experimentalists*, and *Movers and Shakers* to become open, whereas they would end up closed if the state did not aim at teaching any values regarding openness. However, the education agenda does actually bring about a final situation after four years that resembles the one without any external influences both in terms of average openness and of how milieus feel about LGBTQ people. As the opponents of the education agenda express their discomfort with such a state, they reveal that they have no problem with indoctrination of children in general – as long as it is their ideas that are propagated.[13]

4. Explanation of the Limited Impact of Church and Formal Education and the Unlimited One of Civil Society

Three main facts, which likely also hold for younger children and adults, are revealed by the simulation study on adolescents' value development:
- Society can distinctly shape the model outcome in some settings even when changes are only moderate.
- The influence of academic theology, institutional church, and government education agenda is limited and contradicts the common perception of these institutions.
  - Institutional church and academic theology have higher potential to induce openness than closeness.
  - The government education agenda has higher potential to induce closeness than openness.

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[11] "Sexuelle Abweichungen" (Zukunft-Verantwortung-Lernen 2016).
[12] "Gen-Defekten" (ibid.). Disclaimer: This expresses the position of the source.
[13] This is indirectly admitted by the opponents of the education agenda by demanding sovereignty of the parents (Zukunft-Verantwortung-Lernen 2016).

All agents except *Precarious* ones tend to stick to their initial openness level for small to medium changes in external factors.

The first statement reflects neo-conventionalism and a view of one's parents as trustworthy role models which the SINUS study (2016, 475) found among adolescents: Openness of family is directly derived from the external value of society. While there are vivid dynamical interactions within and between milieus, openness of society as external variable can decide in which direction those dynamics work, because of its initial push before path dependencies kick in.

Although the other three variables also affect simulations from their start, their impact is limited. Commonly, clerical influences are expected to be traditionalistic and advocating a less open treatment of sexual plurality, while education policy seems to be a government tool to promote openness towards LGBTQ people. However, the model shows that neither of the factors can work that way in the model: Closeness of academic theology or institutional church makes fewer adolescents become closed than openness makes them become open: The milieus caring most about what church and theology (in form of religious education) say tend to become closed anyway. Thus, a church sending messages supporting this tendency to closeness has little impact while messages promoting openness can reverse the thinking of church-affine milieus. Likewise, a closed education agenda attracts more children to closeness than an open one attracts to openness since milieus affine to education have a predisposition to become open-minded.

That agents tend to stick to their initial views helps to validate the model as realistic and so does the exception of *Precarious* children joining the position of their *Adaptive Pragmatic* friends: The initial setting of the model tries to represent children when they turn 14. At this age, friends play a major role in value development whereas in earlier childhood, different (and in case of the *Precarious* sometimes LGBTQ-phobic) factors impact a child's values.

5.   Concluding Remarks

The simulation study offers mechanism-based explanations for how adolescents in Germany develop their stance towards sexual plurality given their environment of family, school, church, leisure activities, and peer interactions. However, when trying to predict specific outcomes in terms of how open adolescents of different milieus become precisely for some given circumstances, one should be careful: There are important regional differences in Germany concerning religion and religious education and the SINUS milieus are likely unevenly distributed over Germany, too. This may lead to regionally different mechanisms and simulation results. Therefore, using the model with the SINUS study as input data to make statements about a specific town would be a *fallacy of misplaced concreteness* (Whitehead 1948 [1925], 53). More generally, valid-

ity of the computational model relies on the validity of SINUS data for which this paper cannot vouch. However, if data from alternative sources stratifying adolescents becomes available, it will be easy to feed this into the model. Checking two versions of the same skeleton model informed by different data sources against each other would further aid validation.

Furthermore, openness of adolescents' families is unanimously represented for all milieus by openness of society, whereas there likely is an empirical relation between milieu belonging of children and parents. Lifting this assumption of all families being equally open and instead making their openness dependent on their milieu poses a possibly fruitful way of expanding the model and bringing it closer to reality.

The model monitors openness of a single age group during its youth within a given shape of society, church, and education. However, extending the model to a longer time frame could reveal generational effects: Adolescents grow up to be parents, teachers, or guides themselves, meaning that their value development impacts the value development of their children, pupils, and mentees, too. Such a long-term view had to internalise the four external variables of this study, foremost openness of civil society which is revealed as the most influential factor in the model:

If civil society has a dedicated position regarding queer people, the resulting dynamics among adolescents are resilient towards external pressure by government education, academic theology, or institutional church; simply changing a short-term influence on children's development process is not (necessarily) fit to alter that process as intended here with the education reform. Complex interactions between actors in the modelled system lead to unpredictable emergent results. Put differently, young citizens perceive and weight influences differently and form their own opinion; thereby, they guarantee the persistence of a strong civil society as long as they grow up in one.

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Appendix

Figure 3: Development of Openness over Time, for Church=0, Theology-Uni=0, EducationAgendaState=0, Society=0
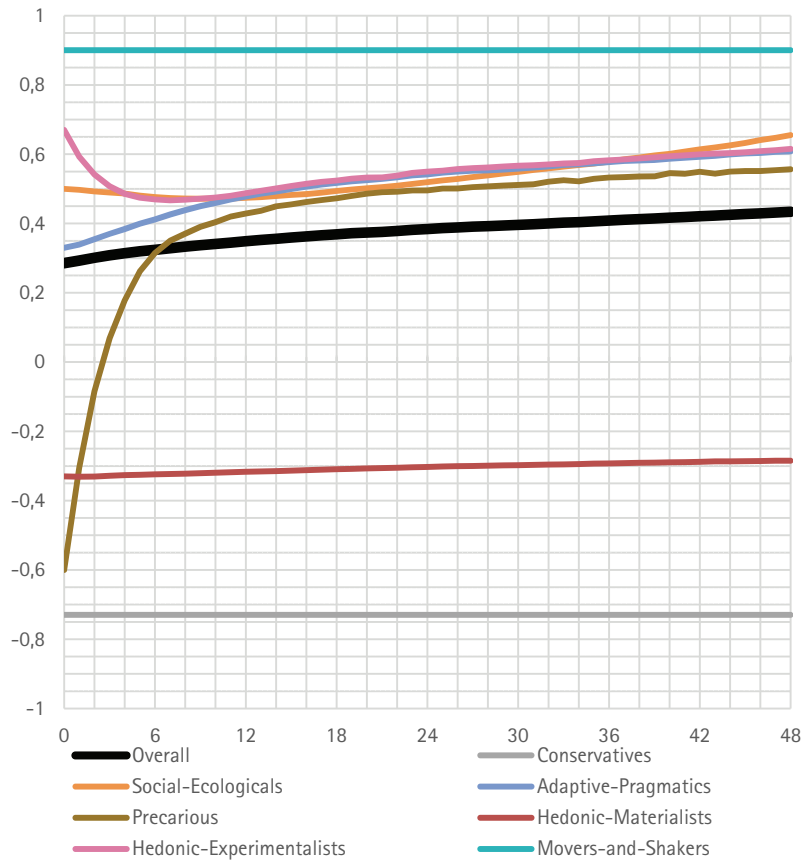
Figure 4: Comparison of Average Overall Openness over Time given
Modifications of Single Parameters between 1 (Upper Lines) and
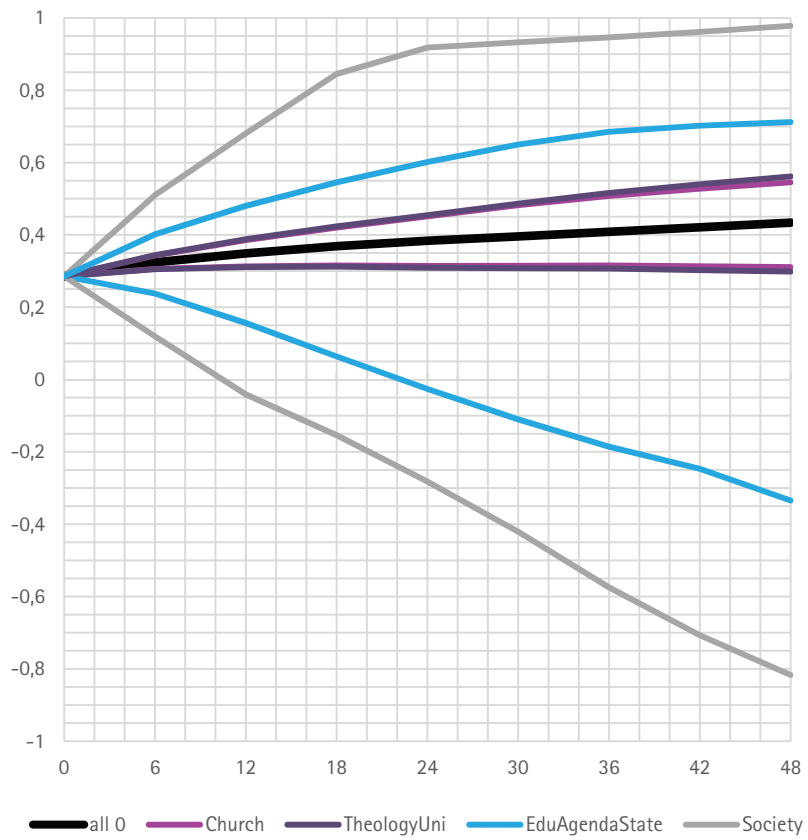–1 (Lower Lines), All Others Constant at 0

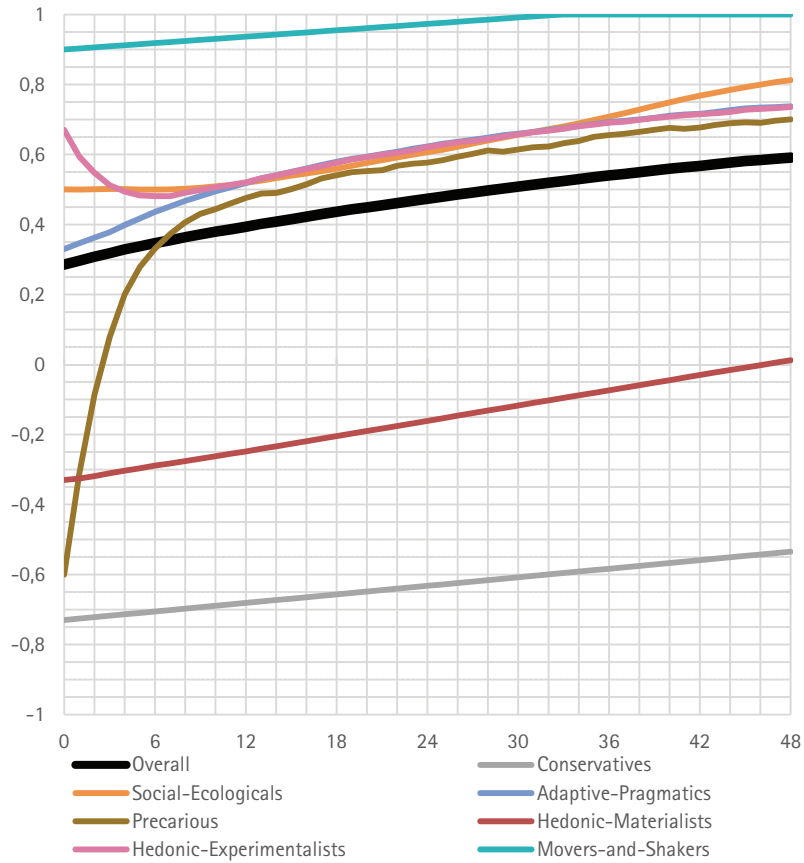**Figure 5:** Open-Minded Real World Scenario: Church=-0.2, TheologyUni=0.3, EducationAgendaState=0, Society=0.1

Figure 6: Close-Minded Real World Scenario: Church=-0.3, TheologyUni=0, EducationAgendaState=0, Society=-0.1
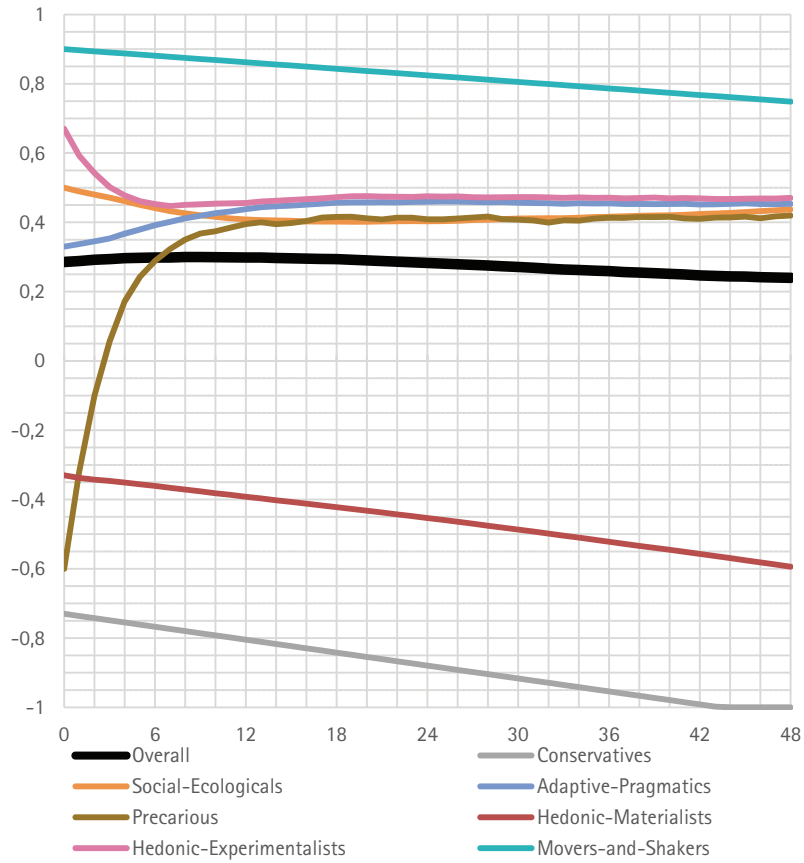
Figure 7: "Bildungsplan 2015": Church=−0.5; TheologyUni =−0.3; EducationAgendaState=1 (0 for Dotted Lines); Society=−0.4