

Cultural Evolution and Public Policy

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Abstract (150 words)

Interventions are to the social sciences what inventions are to the physical sciences—an application of science as technology. Behavioural science has emerged as a powerful toolkit for developing public policy interventions for changing behaviour. However, the translation from principles to practice is often moderated by contextual factors—such as culture—that thwart attempts to generalize past successes. Here we discuss cultural evolution as a framework for addressing this contextual gap. We describe the history of behavioural science and the role that cultural evolution plays as a natural next step in closing existing gaps. We review research that may be considered cultural evolutionary behavioural science in public policy, and the promise and challenges to designing cultural evolution informed interventions. Finally, we discuss the value of applied research as a crucial test of basic science: if theories, lab-, and field experiments don't work in the real world, they don't work at all.

Keywords: cultural evolution, behavioural public policy, endogenous change, WEIRD, applied cultural evolution, behavioural science

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Introduction

Our psychology and behaviour are shaped by millions of years of genetic evolution, thousands of years of cultural evolution, and a short lifetime of experience (Muthukrishna et al., 2021). Dual inheritance theory describes how genes, culture, and individual learning interact to shape our behaviour, explaining how we evolved as a cultural species, how culture itself evolves, and how gene-culture coevolution has shaped our genomes and physiology (Boyd et al., 2011; Boyd and Richerson, 1985; Cavalli-Sforza and Feldman, 1981; Chudek et al., 2015; Henrich, 2016; Henrich et al., 2008; Uchiyama et al., 2021). Much of our behaviour is shaped by culture—the values, beliefs, behaviours, norms, skills, know-how, and technologies each of us possesses. In this chapter, we discuss how dual inheritance theory and cultural evolution, can offer a framework for understanding and changing behaviour (Efferson, 2021; Muthukrishna, 2020; Muthukrishna et al., 2021; Muthukrishna and Henrich, 2019)⁴.

Behavioural science is a powerful toolkit for addressing global challenges in areas such as public health, economic development, and environmental policy (Jochim and Schimmelpfennig, 2022; Ruggeri, 2021; World Bank Group, 2015). The behavioural science toolkit draws primarily on cognitive psychology, social psychology, and economics, and has typically exploited empirically discovered biases and heuristics without worrying too much about why these exist. However, as a result, it has inherited the challenges of these parent fields, such as the replication crisis—many findings failing to replicate (Camerer et al., 2018; Open Science Collaboration, 2015)—and the WEIRD people problem—overreliance on findings from Western contexts and lack of attendance to cross-cultural and contextual differences (Apicella et al., 2020; Henrich et al., 2010b). Within behavioural science, cultural and other contextual heterogeneities are acknowledged as important (Bryan et al., 2021; IJzerman et al., 2020; Sunstein, 2021), but it remains unclear how to

⁴ A extended version of this chapter can be found at Schimmelpfennig & Muthukrishna (forthcoming).

systematically incorporate these factors in a principled manner. And so it is difficult to know when we should expect findings and past successes to generalize (Deaton and Cartwright, 2018).

In this chapter, we discuss cultural evolution as a framework for addressing this contextual gap. We begin by describing the history of behavioural science and how cultural evolution offers the natural next step in social science and public policy, by addressing five key gaps in current approaches of behavioural public policy. We then show examples of what may be conceived as Cultural evolutionary behavioural Science in the future, and how these approaches can solve some of the current challenges in behavioural science in public policy. We conclude the chapter by addressing the challenges Cultural evolutionary behavioural science in public policy will have to address, to advance evidence-based public policy.

Three waves of social science and public policy

Science and technology go hand in hand. Science opens new technological possibilities and technologies help us refine the science and understand how it works or even whether it works in the real world (Gibson and Reed, 2020; Hammond and Stewart, 2001; Muthukrishna and Henrich, 2016). The same is true of the social sciences. Some social sciences, such as economics, have a longer history of policy application (Buyalskaya et al., 2021). Behavioural science is the latest wave of economic public policy application, in this case, applied to human behaviour. As illustrated in Figure 1, we can trace this history from neoclassical theory, through behavioural economics, to behavioural science.

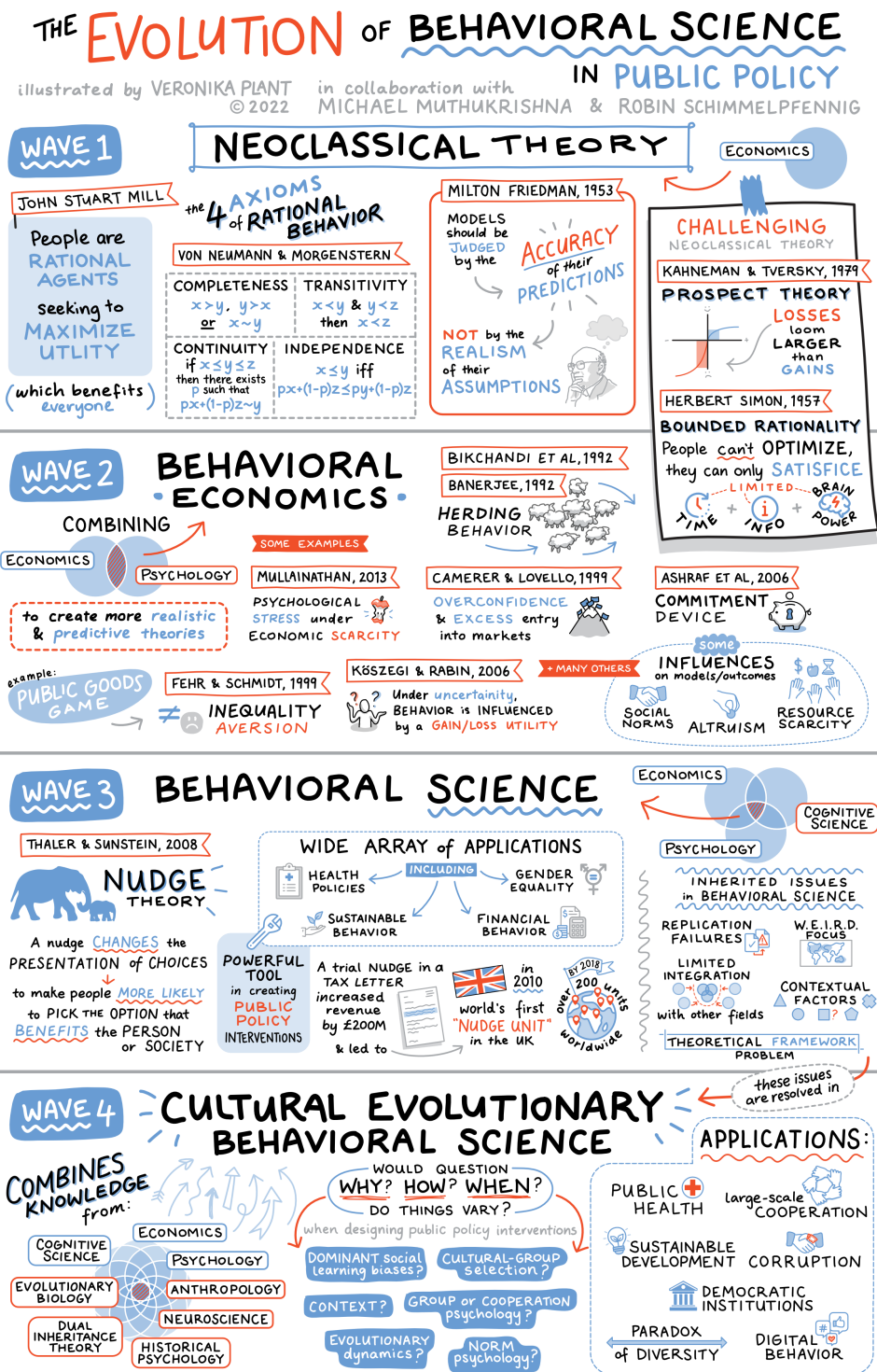


Figure 1. The evolution of behavioural science in public policy (Figure from Schimmelpfennig & Muthukrishna (forthcoming)).

Cultural evolutionary researchers will recognize these waves as an example of path dependence (Muthukrishna et al., 2021; Nunn, 2009; Page, 2006). Nineteenth-century philosophical positions on the nature of humans and the rationality of human decision-making led to formalizations of an

arguably misspecified theory of human behaviour, which were then challenged and adjusted at the margins. The initial path-dependent solution involved retaining expected utility theory but adding “patches” based on empirical psychological research. This approach, however, failed to address the replication and cross-cultural generalizability of these patched solutions—the psychology wasn’t always reliable.

The most effective critique of a theory is a better theory. Such a theory is not yet fully formed, but here we lay out a path in the context of behavioural science and public policy. We argue that the natural next step in this path is a formal theory that includes not just empirically discovered cognitive biases, social norms, and preferences, but the origins, variation, and dynamics of these—captured by models in cultural evolution.

The fourth wave: Cultural evolutionary behavioural science

Just as biological evolution is mainly driven by the transmission of genes between generations, cultural evolution is driven by the transmission of social and cultural information through social learning. This social learning is not random but selected through several interacting learning biases (Kendal et al., 2018) (Kendal, this issue). For policymakers, this has important implications. Behaviour change at scale often depends on how information is transmitted within the population. A policy designed for a population in which prestige-biased learning dominates should be designed differently than in a population in which conformist-biased learning dominates (Glowacki and Molleman, 2017; Mesoudi et al., 2016; Molleman and Gächter, 2018; Muthukrishna and Schaller, 2020; Schaller and Muthukrishna, 2021). Indeed, the interaction of these learning biases remains a neglected, but powerful method for large-scale, endogenous behavioural change (Andreoni et al., 2021; Berger, 2021; Efferson, 2021; Efferson et al., 2020b; Nyborg et al., 2016; Young, 2015).

In addition to social learning biases (Kendal et al., 2018; Mesoudi, 2016; Muthukrishna et al., 2016), cultural evolutionary behavioural science can exploit research on (a) norm psychology (Chudek and Henrich, 2011), for example, what people perceive to be fair/unfair, (b) ethnic, group, or cooperation psychology (Henrich and Muthukrishna, 2021)(Takezawa, this issue), for example, the scale of cooperation that dominates in a culture, such as kin, friends, or impartial institutions, (c) evolutionary dynamics, for example, how beliefs and behaviours endogenously spread in a population (Young, 2015), and (d) cultural-group selection (Francois et al., 2018; Richerson et al., 2016; Schimmelpfennig et al., 2022).

Incorporating cultural evolution forces us to consider not just differences in psychology, norms and preferences, but their origins and dynamics. For example, experiments with Swiss children reveal that pre-existing inequality concerns affect bargaining behaviour in subsequent games (Berger et al., 2022). Furthermore, contra Fehr and Schmidt's (1999) assumption of symmetric inequity aversion driving what is fair, children in Uganda, Canada, and the USA care about both disadvantageous and advantageous inequity, but children in India, Senegal, and Peru (at least in the communities studied) care mostly about whether they're on the losing end (Blake et al., 2015). Despite the cross-cultural variation in the content of social norms, there may be a universal psychology for responding to social norms across society (House et al., 2020). House et al. find that by middle childhood, children have similar social norms as the adults in their society and develop a uniform tendency to respond to novel social norms across societies (House et al., 2020). So yes, context matters. But the question is when and why?

Cultural evolutionary research has revealed the historical psychological origins of these differences; factors such as market integration (Henrich et al., 2010a), the presence of moralizing gods (Shariff and Norenzayan, 2007; White et al., 2019), historic exposure to the Catholic Church and their restrictive marriage and family program (Schulz et al., 2019), or kinship intensity and opportunities to cooperate with kin (Enke, 2019). These factors can exogenously explain differences in fairness

norms and how and why they've changed (for review see (Henrich and Muthukrishna, 2021; Muthukrishna et al., 2021)).

Approaches of behavioural science in public policy inherited some of the fields it has been building on. As such, research and application of behavioural science face gaps that need to be resolved.

1. **Replication crisis.** As argued by Muthukrishna and Henrich (2019), methodological malpractice and statistical shenanigans have contributed to the replication crisis and may be resolved by open science methods such as replications and transparency in research, but a larger issue is the lack of a theoretical framework (see Smaldino (2022, this issue) for more on the Cultural Evolution of Science). Cultural evolutionary theory can provide such a framework.
2. **Theoretical Framework Problem.** The list of heuristics and biases is enormous (Wikipedia, 2021) and, no doubt, several related biases masquerade under separate research programs. For example, the self-enhancement bias (Kwan et al., 2004), positivity bias (Mezulis et al., 2004), optimism bias (Sharot, 2011), and overconfidence (Johnson and Fowler, 2011) are at best strongly correlated and at worst linguistic noise describing the same concept. Identified biases such as these are a combination of genetic influences shared with other species, cultural influences through norms, and our lifetime of experience.

Imagine walking through a forest thousands of years ago. You hear a rustle and spot something long and skinny on the forest floor. In all likelihood, it's just a stick, the odds that it is a deadly snake are not high, but you probably would not want to risk it and so make a detour. Note, that in this case, you have chosen to surely avoid the unlikely, costly error (walking over the skinny thing and being bitten by a poisonous snake), in favour of the likely cheap error (walking the detour although it was just a stick). Research on error management theory describes these situations of cost asymmetries that may be shared by other animals (the example above need not be a human). Research in error management theory argues that the

human tendency to avoid losses and more costly errors has led to several adaptive cognitive biases (Haselton et al., 2015; Johnson et al., 2013), many of which interact with our social learning psychology (Park, 2022). Although loss aversion may be present in many lineages (McDermott et al., 2008), it can be difficult to separate the effects of cognitive biases and incentives (Efferson et al., 2020a; McKay and Efferson, 2010). Similarly, a world of existential threat may be a world of tight norm following (Gelfand, 2018). Finally, overconfidence may be a mix of genetic and cultural—adjusted based on the individual and population-level reward-to-benefit ratio and affecting the rate and nature of entrepreneurship and innovation (Johnson and Fowler, 2011; Muthukrishna et al., 2018; Schimmelpfennig et al., 2022).

Without a theoretical foundation predicting possible cross-cultural differences or detecting adaptive heuristics and biases, is difficult. Such work is rare but does exist, for example on the cultural evolution of prosocial religions (Norenzayan et al., 2016), and variation in personality structure (Smaldino et al., 2019).

3. **WEIRD People Problem.** The empirical basis for many behavioural insights, biases, heuristics, and assumptions about human behaviour are skewed towards WEIRD people who do not represent most people in most places (Apicella et al., 2020, 2020; Henrich, 2020; Henrich et al., 2010b). Cultural evolutionary insights can offer guidance as to which insights are likely to be universal (e.g. defaults, social influence) and which are likely to vary or likely to not replicate (e.g. endowment effect (Apicella et al., 2013). Much more cross-cultural research is required.
4. **Contextual factors.** Behavioural economics argues humans are contextually embedded decision-makers (for example on risk preferences (Imas, 2016) or incentives (Gneezy et al., 2011)), but often fail to answer how context matters. There are rarely strong predictions for how different internal, environmental, or social cues matter, even if these could be reliably measured. Some paths forward from a cultural evolutionary perspective include understanding how we integrate different social learning cues (e.g. what do we do if a

prestigious person does one thing and the majority does another) and recognizing that culture is not just cross-national, but overlapping and embedded distributions of cultural traits within societies (Muthukrishna and Henrich, 2019; Uchiyama et al., 2021). Obvious examples include regional (Talhelm et al., 2014) and religious differences (White et al., 2021), but intersections are deeper. Holding the hand of a stranger will reduce neural activation in a case of a threat. The effect will be increased if those holding are satisfied with their marriage (Coan et al., 2006). Or so it seemed, but a later study showed that the effect was only robust for well-educated, white women (Coan et al., 2017).

5. **Integration with other fields.** While not being a gap per se, cultural evolution has increasingly integrated with other biological sciences (Laland, 2018; Laland et al., 2011; Uchiyama et al., 2021), social sciences (Besley, 2020; Besley and Persson, 2019; Nunn, 2021), and the humanities (for review, see Muthukrishna et al., 2021). It thus offers a pathway for behavioural science to derive insights beyond those in economics, psychology, and cognitive science. Cultural evolution can provide a framework to understand policy problems. Its ability to integrate with other fields then helps to find solutions for problems in different settings.

There is much work to be done for a truly cultural evolutionary behavioural science for public policy, but emerging work reveals the promise and challenges. We argue that integrating the applied behavioural sciences with approaches from cultural evolution can close, or yes less shrink some of these gaps. Following, we thus showcase some approaches that may be considered cultural evolutionary behavioural science. These approaches are by no means a perfect solution to all of the above gaps, but they all represent cutting-edge research approaches that build applied approaches on sound theory.

The Promise of Cultural Evolutionary Behavioural Science

Applied cultural evolutionary behavioural science is in its infancy. Empirical work is rare and applied theoretical work is rarer still. Here we review some examples of work in different domains that reveal the promise of cultural evolutionary behavioural science.

Public health

Public health initiatives are sometimes at odds with local culture and traditions (Cloward, 2016). Policy to improve public health may thus be subject to a backlash and non-compliance by at least some parts of the population. Female genital cutting (FGC) is one such example (World Health Organisation, 2008). The conflict is that from the perspective of universal human rights, FGC is harmful to the health and well-being of women but legislation to ban it would interfere with local cultural traditions.

FGC is still pervasive in many countries. For example in Egypt, UNICEF estimates suggest that 87% of females between 15-49 years of age are cut (based on data from 2004-2015; (UNICEF, 2016). Current approaches to eradicate FGC practices often fail. In some cases, exogenous attempts to change behaviour are perceived as intrusions that impose out-group values, leading to a backlash in the local population (Camilotti, 2016; Gruenbaum, 2015; Shell-Duncan and Hernlund, 2000; Vogt et al., 2016). That is, when attempts to reduce FGC are perceived as external, FGC rates can increase because not cutting girls is seen as Westernization and cutting girls becomes an ingroup ethnic marker (Cloward, 2016). Resolving the conflict between cultural sensitivity and female public health remains a challenge.

Policy interventions in this realm are often informed by the hypothesis that FGC, similar to foot binding, involves coordination incentives for families (Efferson et al., 2015; Mackie, 1996). That is, families with sons want cut wives because FGC is perceived as a sign of fidelity, tradition, and becoming a good mother. And so, families with daughters choose to cut their daughters to increase the chances of finding a good spouse, sometimes regardless of personal preferences. In a

population where the families with sons favour uncut wives, the families with daughters may choose to coordinate their decision and not cut their daughters (Cloward, 2016). How can a policymaker switch a population from the maladaptive (cutting) to the adaptive (not cutting) equilibrium?

One tantalizing possibility is behavioural change through endogenous spillovers by affecting a social tipping point (Andreoni et al., 2021; Nyborg et al., 2016). That is, could a policymaker run an intervention with selective targets that then starts a chain reaction within the population tipping them from a cut equilibrium to an uncut equilibrium? Here, the policymaker could try to focus attention and resources on persuading just enough of the right people until the social tipping point is reached, and then the endogenous social influence mechanisms, such as conformity take over with people coordinating around the new social norm.

Relying on a minimal intervention as a small change to the incentive structure of the population is an intriguing approach for a policy, but the outcomes hinge on the characteristics of the target population. Formalizing this policy possibility, Efferson et al (2020b) developed a cultural evolutionary model informed by their previous empirical research (Efferson et al., 2015; Vogt et al., 2017, 2016), to better understand how heterogeneity in a population may affect the potential for spillovers. They model how behaviour spreads in a population via social influence after the population has been shocked by an external policy intervention. They show that the effectiveness of the policy, both in its size and target, depends on the distribution of attitudes in the population. An intervention will have a direct effect, and an indirect effect (see **Figure 2**).

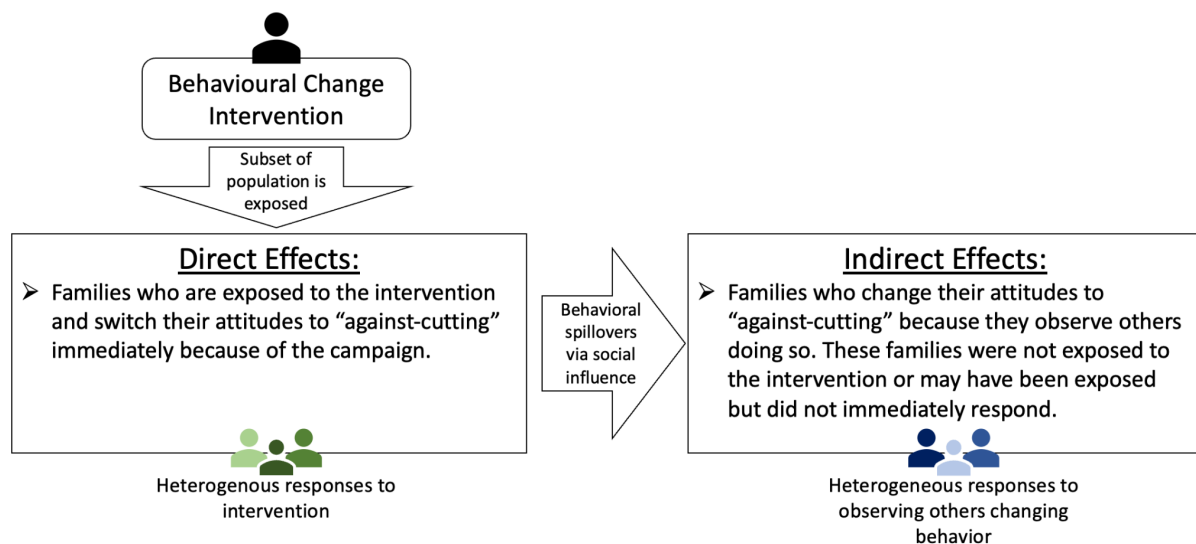


Figure 2. The direct and indirect effect of an intervention (adapted from Schimmelpfennig et al. (2021)).

Perhaps counterintuitively, the results show that in some scenarios where many in the population are resistant to the policy, policymakers can maximize the total effect of their policy by targeting not those most likely to change, but those most resistant to the policy (Efferson et al., 2020b; Schimmelpfennig et al., 2021). Convincing those resistant to change through an intervention—perhaps one that exploits social learning biases (Kendal et al., 2018)—leaves the comparably “easy” cases for the endogenous spillovers via social learning. Targeting resistant individuals can be a difficult strategy to implement. But the theoretical (Efferson et al., 2020b) and experimental results (Ehret et al., 2022) show that policymakers need to understand the cultural evolutionary dynamics driving the indirect effect of their interventions.

Efferson et al argue that in scenarios where attitudes cannot be estimated, for example, because of concerns around social desirability bias in respondents (Krumpal, 2013), policymakers may instead opt to target a random sample, for example recruiting approaches like “edutainment” (Vogt et al., 2016), rather than the most compliant, which may otherwise lead to polarization. This work may complement other behavioural and evolutionary approaches to public health (Arnot et al., 2020; Gelfand et al., 2022; Gibson and Mace, 2006; Lawson et al., 2015; Wells et al., 2017), representing the cutting-edge of integration of cultural evolutionary theory and policy interventions. The

success and value of these approaches will need to be evaluated over the coming decade. While cultural evolution can offer a framework for understanding what can work under which circumstances, however, it needs to be complemented by other work such as approaches from behavioural ecology, to better understand the nuances of contextual influences without over-generalizing (Lawson et al., 2015; Mulder, 1992; Ross et al., 2016; Schacht and Bell, 2016).

Corruption

A common assumption is that corruption is a vice and cooperation is a virtue. Corruption harms economic development and creates barriers and inefficiencies to competition in a free market. Interventions and media campaigns, often unsuccessfully, focus on portraying corruption as malicious, harmful, and unnatural. Cooperation, on the other hand, supports economic development and forms the backbone of democratic societies. But cooperation is no virtue in itself. Advances in technology and world wars, flourishing societies and genocides, our greatest achievements and our worst atrocities all require large-scale cooperation (Axelrod and Hamilton, 1981; Henrich and Muthukrishna, 2021). From a cultural evolutionary perspective, corruption is often a cooperative act (Muthukrishna et al., 2017a).

It's natural to want to help relatives—well explained by theories of inclusive fitness—but doing so at the expense of impartial institutions is nepotism. It's also natural to want to help friends, friends of friends, or those in an exchange of some sort—well explained by theories of reciprocal altruism, direct and indirect reciprocity (see Yoeli et al. (2013) for applications)—but doing so at the expense of impartial institutions is cronyism. Reducing corruption requires undermining those lower scales of cooperation or aligning them with higher scales such that what's good for family and friends is also good for everyone else. Transparency as a policy solution to corruption can backfire when norms support lower scales of cooperation (such as expectations for favouring friends or family (Abbink, 2006; Murray and Frijters, 2016; Muthukrishna et al., 2017a). Similarly, theoretical work shows that the effectiveness of centralized punishment to combat corruption can break down

when some actors can bribe the central authorities (Abdallah et al., 2014). Indeed, many empirically derived anti-corruption strategies (e.g. (Klitgaard et al., 2000)), implicitly change incentives and or move people around to disrupt these cooperative ties.

An example of how smaller scales of cooperation were undermined and norms around kin-based small-scale cooperation have changed to support states is the Catholic Church's change to traditional large kin-network family structures through policies such as banning cousin marriage. This centuries-long program decreased the power of larger family clans, laying the foundations for large-scale societies supported by impartial institutions and what we now call WEIRD-psychology (e.g. individualism) (Henrich, 2020; Schulz et al., 2019). Places, where these kin ties remain, are dominated by tribalism, increased corruption, and more fragile democratic institutions (Akbari et al., 2019) (Gelfand, this issue).

Developing policies that disrupt lower scales of cooperation and waiting half a millennium for the policies to take effect isn't likely to convince policymakers, but the same principle can be applied with more immediate results. One prominent problem in WEIRD countries is the "revolving door", whereby individuals seamlessly move between government and private sector positions. Vidal et al. (2012) reveal that 56% of the revenue by private lobbying firms in the US between 1998-2008 can be attributed to lobbyists with previous federal government experience. Furthermore, 34 of the 50 top lobbyists in Washington have previous federal government experience (Eisler, 2007). The prospect of future employment in the private sector may influence the behaviour of public servants (deHaan et al., 2015), who may thus not always act in the interest of impartial institutions. Put differently, the prospective lobbyist cooperates with the lobbying firm by which it may get hired, instead of primarily cooperating at a larger scale for the public interest. Banning the revolving door, or at least setting a long minimum time between switching from the public to private sector, may help to undermine such lower scales of cooperation that undermine the public interest (e.g., the "cooling-down" period for members of the European Commission

has been increased from 12 months in 1999, to 18 months in 2011, to 24 months in 2016, after former President of the Commission Barosso joined Goldman Sachs, shortly after he had left office (Luechinger and Moser, 2020)).

Corruption is by no means restricted to the developing world, but plagues societies with less robust democratic institutions and norms. Indeed, corruption may have a greater absolute cost in the developed world, but a greater relative cost in the developing world (Henrich and Muthukrishna, 2021; Muthukrishna, 2017; Muthukrishna et al., 2017b). Undermining informal tribal institutions is a difficult challenge for similar reasons that it's difficult to stop FGC. Aligning societal institutions with local structures may be a less ambitious, but more practical and effective approach. For example, a recent study in the Democratic Republic of Congo found that giving local chiefs the authority to collect state taxes increased property tax compliance by 3.3% (Balán et al., 2022). Although the chief still collected bribes, they were able to use local knowledge of whom to target with tax enforcement and thus increased the overall tax revenue by 43%. Their local knowledge allowed them to target high-income individuals reversing the inefficient and unfair, but common practice of targeting the more easily auditable lower-income bracket. For example, in the United States, people earning less than \$25,000 are at least three times more likely to be audited than partnership firms (Sorkin et al., 2021). Teaming up with bribe-collecting chiefs may not be the first choice for current approaches in public policy, but it can show how lower scales of cooperation can be used to support larger scales of cooperation. Thus, it is a step in the right direction and sensible from a cultural evolutionary approach, combining and aligning different scales of cooperation. Moreover, it allows us to move a society to an *adjacent possible* in the cultural space, where planned policies can continue to put a society on a path to a more efficient equilibrium (Muthukrishna et al., 2021; Muthukrishna and Henrich, 2016; Nunn, 2021).

Successful democratic institutions

Formal institutions can be thought of as hardened culture—written down to allow for easier coordination and application. But no institution can anticipate all possible behaviours. Successful institutions thus rest on necessary cultural norms. But unlike the explicit institutions, these norms are largely invisible to those who have implicitly internalized them since they were children. Therefore, foreign policymakers exporting successful WEIRD institutions, such as liberal democracies, have systematic blindspots that lead them to unknowingly ignore the invisible cultural pillars that support institutions.

Giuliano and Nunn's (2013) analyses reveal that where democratic institutions have been successfully transplanted are places where proto-democratic institutions (and presumably the requisite norms) already existed. They also offer an example of how cultural evolutionary behavioural science can be informed by historical data, building the Ancestral Characteristics Database (Giuliano and Nunn, 2018) using data from the Ethnographic Atlas (Murdock, 1967), Ethnologue (Lewis, 2009), and Landscan 2000 (Dobson et al., 2000). There is a historical path dependence of traditional local democracies on the beliefs and attitudes towards today's political institutions, robust to European influence, quality of land for agriculture and other controls.

As a contrasting example, the recent high-profile failure to implement liberal democratic institutions in Afghanistan can be at least partially blamed on differences in norms around rule of law and rules applied impartially to all people. Afghanistan is high on strong kin-based cooperation; people rely on their kin for survival through support and favours, even marrying among their extended family (the rate of cousin marriage in Afghanistan is 46%; (Saify and Saadat, 2012). Kin-based obligations undermine the kind of impartial institutions that liberal democracies are familiar with. Moreover, the exogenous laws borrowed from other cultures may be rejected by parts of the population with strong prior beliefs, such as those grounded in Islamic sharia law. A Pew survey (2013) suggests that 99% of Afghans favour making Sharia the official law of the land, 81% of

Afghans favour corporal punishment (like lashings) for theft, 85% favour stoning as the punishment for adultery, 79% favour a death penalty for leaving Islam. These numbers are likely to be affected by the timing of the survey, representativeness of the respondents, and response biases, but it is critical to have at least some measure of such norms rather than relying on assumptions about human behaviour drawn from a WEIRD life experience. Such norms are critical to predicting whether an institution or policy will succeed and assumptions about what people want (e.g., freedom of speech, freedom in behaviour, impartial rules, rule of law, secular society) based on WEIRD life experience cannot be assumed to be human universals. Without appropriate cultural pillars, institutions such as democracy collapse.

Finally, institutions interact with norms, mutually shaping one another. In 2011, the Supreme Court of the Canadian province of British Columbia ruled that the prohibition against polygamy was constitutionally valid. The case was in part decided by cultural evolutionary scientists, Joseph Henrich's primary expert witness on the role that monogamy has had in stabilizing society by solving the problem of young males who can't find a wife (Henrich et al., 2012). Henrich argued that "monogamy seems to direct male motivations in ways that create lower crime rates, greater wealth (GDP) per capita and better outcomes for children". In contrast, he argues that polygamy leads to a surplus of unmarried men, that may engage in high-risk strategies or criminal activities to secure sufficient resources to find a mate (BC Supreme Court, 2010; Bucci, 2010). Indeed, China's one-child policy combined with a cultural son preference temporarily led to a doubling of "surplus men". An analysis by Edlund et al (2013) suggested that for every 1% increase in male bias in the sex ratio, property and violent crimes rise by 3%. Similar data can be found in India (Drèze and Khera, 2000), where male-biased sex ratios are positively associated with murder rates across districts. An important caveat that also applies in the case of polygamy is that there is a tremendous amount of variation in cultural praxis around the world. Polygamy practices (Lawson et al., 2015), and possible societal consequences such as the male-violence (Schacht et al., 2014), differ across cultures and regions. Researchers and policymakers should appreciate this diversity.

Nevertheless, the British Columbian Supreme Court decision is an example of how institutions can be used to constrain and reinforce cultural practices that would otherwise undermine these institutions, and a policy decision informed by cultural evolutionary research.

Sustainable development

Taking a cultural evolutionary approach to sustainable development, Waring et al. (2017, 2015) identify four factors that academics and policymakers need to better understand to accomplish sustainability policy goals. First, policy needs to be informed by knowledge about the emergence and persistence of social-ecological states—how social and ecological factors relate and interact. Second, they need to account for endogenous cultural change. Third, they need to incorporate cooperation dynamics. And fourth, they need to address the complexities of social-ecological interactions over multiple levels (Waring et al., 2015)

Waring et al. derive several principles that can guide policy implementation. These principles include targeting the appropriate level of selection (e.g., targeting group vs. targeting individual), changing the level of selection pressure (e.g., change incentive structure to group-level payoffs), shifting trait variation across levels (between-group vs. within-group variation in cultural traits), leveraging the evolution of cooperation (e.g., creating infrastructure that allows for repeated interactions, reputational mechanisms, and peer punishments to increase prosociality), and avoiding ethnocentric solutions (e.g., counter the tendency for policies driven by social identity of groups).

The primary challenge for policy approaches to sustainable development is that the speed and effectiveness of change are often not matching the needed change (Travers et al., 2021). Recruiting social influence and norms to manage behavioural spillovers (see Figure 2) is thus a promising

approach for policymakers, and is receiving increased interest from researchers (Constantino et al., 2022) (Efferson et al. this issue).

Overall, these works on multilevel selection dynamics, transmission biases, and the importance of endogenous social dynamics illustrates the broader contribution of evolution theory to public policy (also see Kaaronen et al. this issue). These approaches provide a robust, testable framework that can guide a policymaker in a certain direction, and can integrate well with approaches from other fields, such as behavioural ecology (Alvard, 1998; Gibson and Lawson, 2014)

Summary

As the diverse domains above illustrate, cultural evolutionary public policy sometimes suggests ways of solving a problem. But a cultural evolutionary approach also fundamentally shifts the approach itself for how to go about designing a solution—a solution isn't always designed. An invisible cultural pillar of economic-derived public policy is the assumption of a great planner or policymaker. This approach is akin to an intelligent designer's view of culture and institutions. We can contrast this with genetic evolution's blind watchmaker and cultural evolution's visually impaired watchmaker. Not designing but instead *evolving* good solutions through efficient selection between different approaches designed with partial causal models of the world (Muthukrishna and Henrich, 2016; Schimmelpfennig et al., 2022). A cultural evolutionary public policy isn't simply about designing efficient institutions but designing efficiently evolving institutions.

The Challenges of Cultural Evolutionary Behavioural Science in Public Policy

The challenge of understanding ultimate causes for application

Discovering ultimate causes for why a behaviour has emerged in the past is an important goal for the social sciences, though the focus is often on proximate explanations such as situational cues

and internal motivations (Mesoudi, 2016, 2009; Tinbergen, 1963). Ultimate causes offer a more “upstream” policy lever since proximate causes may be replaced by a different proximate cause if the ultimate cause remains. As Pirsig (2006) put it, if a factory is torn down, but the reasons for the factory persist, a new factory will take its place.

Considering this ultimate level of explanation is critical to designing culturally-aware public policies. In 2005, India passed a law requiring equal female inheritance. This in turn led to increases in parallel cousin marriage and decreases in female labour force participation (Bahrami-Rad, 2021). This well-intentioned policy is a powerful illustration that people may not respond to incentives in a way that policymakers expect. Cultural evolution can offer an ultimate-level explanation for problems that get to root causes. In doing that, it can provide new solutions to problems that are often dealt with at a proximate level.

The challenge of knowing how context matters?

Context matters in behavioural science (Dolan et al., 2012; Michie et al., 2011; World Bank Group, 2015). But how does it matter? Consider research on dishonesty. Experiments reveal that a simple change in framing can lead honest citizens to behave like dishonest bankers (Cohn et al., 2014). Professionals from a Swiss bank participated in a game to measure honest behaviour. They privately rolled a die a few times and afterwards reported to the experimenter how many times they rolled an even number (for each even number the participant received a payoff). Since the die roll was private, at an individual level it was impossible to know if participants were being dishonest or were just lucky, but at a group level, researchers could measure the degree of dishonesty based on deviations from the expected distribution of even numbers. The main treatment manipulated the context, by either priming a professional (e.g. talking about their job before the task) or a personal context (e.g. talking about hobbies). The researchers found that bankers primed for the professional context were significantly more dishonest, reporting 58.6 % even dice rolls (50% would be expected on a six-sided dice). One conclusion would be that the financial sector attracts

dishonest people, but the bankers in the control group primed with a personal context did not significantly deviate from the expected frequency of even dice rolls (they reported 51.8%). These results suggest the importance of context and culture rather than types of people for creating dishonest behaviour (Cohn et al., 2014). But the conclusions are more complicated—the same prime may create different behaviours in different cultural contexts (Cohn et al., 2019; Rahwan et al., 2019) or in-person vs online (Maréchal et al., forthcoming). Participants are more dishonest (i.e., report more successful dice rolls than expected) when embedded in a digital context (i.e., when reporting results to a chatbot), compared to communicating their dice rolls to a human.

Understanding how context matters in complex systems are hard. Principles derived from cultural evolutionary research can help to make predictions about which context matters, and how it matters. An ecologist trying to make sense of the complex systems in nature may be completely lost. With the rules of evolutionary biology at hand, she can at least start understanding and testing different hypotheses – we argue that the same analogy holds for policy design and principles derived from cultural evolution. A question policymakers need answers to is how context matters for the effectiveness of their policies. Cultural differences are low-hanging fruit—the evidence for the impact of cultural differences on the replicability and generalisability of research in social science has grown in the past decade (Apicella et al., 2020; Henrich, 2020; Henrich et al., 2010b). Advancements in the measurement of cultural differences offer new tools for policymakers. Muthukrishna et al. (2020) developed a cultural distance CFst scale revealing how cultural distance from the United States—which may serve as a proxy for a ‘WEIRD scale’—predicts other cultural differences, from individualism to personality, pro-sociality, and honesty. Beyond documenting such differences, other research reveals the origins of differences in personality (Gurven et al., 2013; Smaldino, 2019), normative behaviours and prosociality (Henrich et al., 2001; Muthukrishna and Schaller, 2020; Santos et al., 2017), and more broadly, in how our brain processes visual information (Dehaene et al. 2010, Han et al. 2013). These differences are increasingly important

in interpreting research findings and possible heterogeneous treatment effects (Bryan et al., 2021; IJzerman et al., 2020; Sunstein, 2021).

The challenge of traditions and historical path dependencies

Societies do not emerge spontaneously, but evolve over decades and centuries – they are shaped by history (Henrich, 2020; Muthukrishna et al., 2021; Uchiyama et al., 2021). Genetic drift may play an important role in how societies develop, but the effect of cultural evolution is much larger (Bell et al., 2009; Uchiyama et al., 2021). Cultural evolutionary public policy can thus also use history to identify the ultimate causes of present-day psychology (Muthukrishna et al., 2021). This historical psychology matters for present-day policy interventions.

One dark example of historical path dependency is the effects of ‘Tuskegee Study’ on trust in public health services. The Tuskegee Study was a longitudinal study in the US between the 1930s and 1970s. Researchers wanted to better understand the health consequences of untreated syphilis. The participants, African Americans who had contracted Syphilis, were assigned to not receive available treatments against the disease. Worse still, participants were not informed about the nature of the experiment. Over 100 died as a result and many family members also contracted the disease. These historical events contribute to the mistrust of medical communities and public health in present-day African American communities (Corbie-Smith, 1999; Corbie-Smith et al., 1999; Thomas and Quinn, 1991). In an influential study, Alsan and Wanamaker (2018) offer support for this claim with an identification strategy using publicly available data. Using an interacted difference-in-difference-in-differences model, which compared older black men to other demographic groups before and after the disclosure of the study in 1972 (Alsan and Wanamaker, 2018). Their results reveal that exposure to the disclosure of the event is correlated with increases in medical mistrust and decreases in both outpatient and inpatient physician interactions for older black men. As a consequence, life expectancy fell by up to 1.5 years in

response to the exposure. Although improving, health outcomes are still comparably worse for African American families, a tragedy reinforced by data from the COVID-19 pandemic (Price-Haywood et al., 2020). Similar decreases in medical mistrust have been attributed to medical campaigns in colonial Africa (Lowe and Montero, 2021) and a CIA-staged vaccination campaign in Pakistan (Martinez-Bravo and Stegmann, 2021). A better understanding of historical psychology is thus an important part of cultural evolutionary behavioural science.

The challenge of modern technologies and online interactions

Getting into a stranger's car or spending the night in their empty home was once dangerous and ill-advised. Today it's commonplace thanks to companies like Uber and Airbnb. These platforms facilitate cooperation by brokering reputational information (Muthukrishna, 2021). Online reviews and ratings are an institutionally mediated form of indirect reciprocity and an example of cultural evolution interacting with modern technologies and online interactions. These institutions securitize and centralize trust, allowing us to scale up reputational cooperation through trust in the institution rather than several independent sources of reputational information. But that reputational information isn't always present, and we can't trust everything we find online.

The cultural cues we would normally use to distinguish truth from falsehoods are often missing online perhaps making us more susceptible to believing misinformation. Cultural evolution reveals that we learn what is right and true not through a deep causal understanding of information, but through trust in whom we receive the information. We believe that the world is round and rotating around the sun in violation of our everyday experience because we trust those who told us and live in a world where everyone we trust also holds this belief. We believe that a virus caused the COVID-19 pandemic, and an mRNA vaccine can help mitigate it, not because we really understand germ theory or exactly what messenger RNA is or does, but because of whom we trust. Trust that the sources of information are knowledgeable, prestigious, sincere, and in the same cooperative group, such that actions are for our mutual benefit. But information on the Internet

often lacks the signals we have evolved to pay attention to, such as cues of prestige, sincerity displays or credibility enhancing displays (CREDS) (Chudek et al., 2015; Henrich, 2016). Misinformation can undermine the foundations of our societies and so incorporating our understanding of our cultural learning psychology into the design of digital infrastructure is an important direction for applied behavioural science.

If it doesn't work in the real world, it doesn't work at all

As scientists, our goal is to develop theories and models to explain the world (Muthukrishna and Henrich, 2019). Often the methods we use to test these models and theories are not in the world but in a more constrained lab or online setting. But of course, the ultimate test of our theories is the real world. If our theories don't work in the real world, they don't work at all. Thus, cultural evolutionary behavioural science in public policy is not just a useful extension of the cultural evolutionary framework and research program, it is essential to the development of the science. It offers a true test of cultural evolution as a theory of human behaviour. Basic and applied science go hand in hand. Electrons and molecules behave the same way in a lab as they do in the real world. People do not.

In this chapter, we have introduced the marriage of cultural evolution and behavioural science as a more effective method for developing public policies. We've shown how this combined approach can guide researchers and practitioners in designing legitimate, ethical, and sustainably effective policies and programmes. But the intersection of cultural evolution and public policy isn't just a useful approach for policymakers. Cultural evolutionary public policy is critical to the future of the discipline.

Acknowledgement

We would like to thank the Swiss National Science Foundation for support (Grant Nr. 100018 185417).

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