Zero-Sum Traps: The Evolution of Productivity-Stifling Beliefs and Material Wellbeing*

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Abstract:

We study the evolution of beliefs that discourage productive effort. Such beliefs include concerns about the jealousy of others, beliefs in the importance of luck for success, disdain for competitive effort, and traditional supernatural beliefs in witchcraft or the evil eye. We show that when interactions are zero-sum in nature, meaning that the gains for one individual tend to come at the expense of another, demotivating beliefs that reduce effort can arise. These beliefs can make society better off in the short run but inhibit innovation in the long run, causing economic underdevelopment. Thus, the model predicts that zero-sum thinking and demotivating beliefs lead to lower levels of material and psychological wellbeing. We then verify the assumptions and test the predictions of the model using data from two samples in the Democratic Republic of Congo and from the World Values Survey. We find a relationship between zero-sum thinking and the presence of demotivating beliefs, such as concerns about jealousy and beliefs in witchcraft (in the DRC) or lower importance placed on success and weaker belief in the importance of hard work for success (globally). We also find that zero-sum thinking is associated with lower incomes, less educational attainment, less financial security, and lower levels of life satisfaction.

Keywords: Cultural evolution, beliefs, zero-sum, innovation.

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1. Introduction

Beliefs and values that discourage effort and productive activity are surprisingly common across time and space. They often take the form of warnings against and even punishment for personal ambition and success. In the Nordic countries, the laws of Jante state, 'Du skal ikke tro at du er noget,' which means 'don't think that you are anything'. In Australia and New Zealand, a 'tall poppy' syndrome is said to lead others to cut down those who stick out in terms of personal achievement. In Japan, a common phrase warns that 'the nail that sticks out will be hammered down.' Sometimes these beliefs and norms are embedded in class-based status systems that stigmatize aspiration and effort as 'social climbing' (McCloskey, 2010). Accordingly, British Prime Minister Herbert Asquith praised the students of his Oxford College, Balliol, for exhibiting "effortless superiority." Other forms of demotivating belief systems include pessimistic beliefs in an 'unjust world' (Benabou and Tirole, 2006), anti-materialistic beliefs that reduce the enjoyment of consumption (Flouri, 1999), and supernatural beliefs such as the evil eye and witchcraft beliefs that act as a kind of psychic tax on success (Gershman, 2014, 2015). But if such beliefs reduce productive effort, why are they so prevalent both historically as well as across the world today?

We study this question by building on ideas and insights from anthropology on the 'image of limited good,' first highlighted by George Foster (Foster, 1962, 1965, 1967, 1972). According to Foster, beliefs in the zero-sum nature of economic transactions create a sense of rivalry and envy that influences economic choices and overall performance. In the small-scale traditional societies he studied, Foster described that the dominant belief is that if one person does better, somebody else must do worse, or if someone gets ahead, someone else must fall behind. He hypothesized that this zero-sum worldview directly or indirectly inhibited entrepreneurial activity, innovation, and economic development.

Modeling the cultural evolution of belief systems, we study the emergence and spread of demotivating beliefs in zero-sum environments, where some of the benefits to one person are obtained at the expense of others. We find that when there is a zero-sum component to economic interactions, demotivating beliefs can emerge and spread, reducing incentives for productive effort and innovation, and thereby inhibiting economic development. The more zero-sum the economic environment is, the more intense are the demotivating beliefs that evolve.

In the model, members of a population are matched and engage in production. While an

individual's effort increases their output, a fraction α of their output comes at the cost of their partner. We refer to α as the degree to which the environment is zero-sum. This production function captures a range of economic interactions with different degrees of rivalry, ranging from merchants competing for the same fixed set of customers (a completely zero-sum situation) to business partners working together in an enterprise but ultimately dividing the profits from their joint endeavor (a partially zero-sum situation).

Individuals can hold one of a number of demotivating beliefs, each of which amounts to an incorrect perception about individuals' return to efforts. They can also have a neutral belief system that conforms to the true return to efforts. While individuals choose effort based on subjective beliefs, cultural evolution is based on the (true) material payoffs. Despite the distortion in behavior generated by (incorrect) demotivating beliefs, we show that such beliefs can survive and spread when there is positive assortativity and economic interactions are zero-sum. In such environments, the direct cost of holding a demotivating belief is overwhelmed by the benefit of being matched with other players who hold demotivating beliefs and do not compete aggressively against others. This is a simple but largely overlooked mechanism. A similar logic applies to social efficiency. Where interactions are mainly zero-sum, effort primarily redistributes resources and is thus socially inefficient. Hence demotivating belief systems improve short-run efficiency by limiting excessive competition within groups. However, despite improving welfare, which is based on the true (objective) payoffs, we show that demotivating beliefs can reduce subjective well-being by making an individual's situation seem worse than it is.

Motivated by Foster's arguments, we then connect demotivating beliefs to economic development by introducing technological innovation through learning by doing. We find that while demotivating beliefs improve short-run efficiency, they can also have harmful long-term consequences. Since technological innovation arises through productive effort, demotivating beliefs, by discouraging this effort, can trap a society in a low technological state. When this occurs, demotivating belief systems can act as a *kludge* – an adaptation that compensates for, but does not eliminate and even deepens, inefficiencies in a system (Ely, 2011).

Having developed a theoretical understanding of Foster's arguments, we then turn to the data. We begin by analyzing a modern and less-industrialized population within the city of Kananga, located in the Democratic Republic of the Congo. We examine two samples: a 200-person sample collected in 2015 and a 1,000-person sample collected in 2019. The smaller 2015 sample is used

to validate the measures of zero-sum thinking, traditional supernatural beliefs, and beliefs in Christianity used in our analysis by looking at a broader set of measurements. The 2019 sample focuses on a more-limited set of core variables, but comprises a much larger sample.

Using the two Congolese samples, we examine the link between zero-sum thinking and the emergence of the demotivating beliefs that were the focus of George Foster's research: beliefs about jealousy and traditional supernatural beliefs (which in the West is commonly called 'witchcraft'). We measure zero-sum thinking through a series of survey questions that ask respondents their views of the link between those who are better off (in terms of wealth, income, business, trade, power, and happiness) and those who are worse off (in the same domains). We measure a person's belief in witchcraft through a series of survey questions. We also measure belief in the competing belief system, Christianity, using similar survey questions.

In both samples, we find strong and robust evidence that respondents who have a more zero-sum view of the world report being more jealous about the success of others, are more likely to hold strong traditional religious beliefs, and are less likely to hold strong Christian beliefs.

In the estimated relationships, we find that the strongest association is between zero-sum views and Christianity. Although Foster was initially motivated by rural pre-industrial society, given the presence of Christianity (and other big god religions) in contemporary industrialized societies, our findings suggest that his insights might also be applicable today in the developed world. Motivated by this, we examine these same relationships globally using data from the World Values Survey (WVS), which contains measures of zero-sum thinking, religiosity, and demotivating beliefs.

The broader sample provided by the WVS allows us to examine whether a zero-sum environment leads to more zero-sum thinking. In our Congolese samples, everyone faced the same environment and had similar income levels, close to subsistence. By contrast, in the global sample, where many countries are included, we have far greater variation in the degree to which the respondent's environment is zero-sum. Therefore, the first exercise we undertake is verifying that facing a zero-sum environment is associated with individuals being more likely to view the world as zero-sum (which is the model's assumption). We estimate the relationship between a respondent's zero-sum thinking and the rate of economic growth in their country during the first 20 or 30 years of their life and confirm that growing up in an environment of economic scarcity (i.e., a more zero-sum environment) is associated with more zero-sum thinking in adulthood.

Having provided some verification of the zero-sum measure, we estimate the relationship between zero-sum thinking and a range of demotivating beliefs. We first verify that the relationship between zero-sum thinking and beliefs in Christianity we found in the Congolese samples holds in the global WVS sample. We confirm that belief in Christianity is associated with less zero-sum thinking in the WVS. Other big god religions (Islam, Hinduism, etc.) are also associated with less zero-sum thinking. By contrast, beliefs in traditional indigenous religions or not having a religious belief are associated with more zero-sum thinking. In short, we find that the expanded WVS estimates are very much in line with our findings from the Congolese sample.

Because the WVS does not include information on jealousy, we cannot look at the relationship between jealousy and zero-sum thinking. However, we can look at a broader set of demotivating beliefs, including those particularly relevant to the modern industrialized world. These include belief in the inherent value of work, in the returns to hard work (e.g., whether income is determined by luck or effort), whether success is important in life, and whether receiving help from others is humiliating. We find a robust association between zero-sum thinking and these demotivating beliefs.

The broader sample also allows us to test the comparative static prediction made by Foster and our theory regarding equilibrium effort and economic production. Consistent with predictions, we find that at the individual level, less zero-sum thinking is associated with higher income, more educational attainment, more savings, and higher occupational status. It is also associated with greater life satisfaction and reported happiness.

In short, by providing a formal theory of Foster's insights and testing the subsequent predictions, we find evidence for the mechanisms he proposes – namely, links between scarcity, zero-sum thinking, demotivating beliefs, and economic activity – not only in small-scale societies with low levels of industrialization but also in more industrialized contemporary societies. In short, our findings suggest that zero-sum thinking is essential in understanding the causes and consequences of economic thinking and economic development.

Our analysis of the evolution of demotivating beliefs draws upon the literature on the evolution of preferences (Alger and Weibull, 2019, Newton, 2018), as well as the literature on the cultural transmission of preferences (Bisin and Verdier, 2000, 2017). When preferences are private and individuals are matched uniformly at random in a population, evolution 'endows' individuals with subjective payoff functions that match the fitness function governing the reproduction of

preferences (Ok and Vega-Redondo, 2001, Ely and Yilankaya, 2001, Robson and Samuelson, 2007). When preferences are observable, they create public *commitment* and thereby shape the behavior of one's partners in an interaction (Schelling, 1960, Becker, 1976, Frank, 1988). Due to this interactive effect, evolution may select subjective payoff functions that depart from the objective fitness function (Güth and Yaari, 1992, Heifetz, Shannon and Spiegel, 2007). Economists, however, do not typically consider preferences to be observable but rather revealed through behavior (Robson and Samuelson, 2011). Hence, we follow a more recent approach developed by Alger and Weibull (2013, 2016) in which preferences are private, but there is positive assortativity in matching.

Our theory is also related to a recent literature on games in which players have misspecified subjective models of the environment (Esponda and Pouzo, 2016). Massari and Newton (2020) provide an evolutionary analysis of such games. Misspecification is not assumed in our model, but (misspecified) demotivating beliefs arise endogenously even when the true beliefs can be learned. Unlike work on evolutionary implementation (Sandholm, 2005), negative externalities are internalized here not through pricing schemes but rather through changes in beliefs/preferences, akin to Akerlof, Matouschek and Rayo (2020). Our work is also connected to the literature on the evolution of cooperation, especially under cultural group selection (see Cooper and Wallace, 2004, and references therein).

Finally, and perhaps most importantly, our work is related to the economics literature on social institutions (e.g., Young, 2015). Gershman (2015, 2016, 2020) work is considered the seminal work on witchcraft beliefs in economics. On the theoretical front, Gershman (2015) develops a model in which evil-eye and witchcraft beliefs emerge to reduce an individual's output and thereby discourage envious destruction. The study fits into a larger literature on second-best institutions (e.g., Carvalho, 2013, Leeson, 2014, Nunn and Sanchez de la Sierra, 2017). Our findings also speak to Bowles (2006), who shows that sharing norms and other forms of reproductive leveling favor the evolution of cooperation by reducing the gains from defection. We show how a seemingly unproductive cultural trait – i.e., demotivating beliefs equivalent to *incorrect* beliefs that output will be confiscated and burned rather than redistributed – can improve short-run efficiency and proliferate when the economic environment is zero-sum.

Our analysis may help explain "puzzling" behaviors that have been highlighted by development economics, for example the reluctance to take up seemingly profitable investment opportu-

nities. Duflo, Kremer and Robinson (2011) examine fertilizer use among farmers in contemporary Kenya. They document that farmers under-invest in fertilizer use, foregoing higher profits. Their explanation is that farmers are not sufficiently patient or forward-looking and, therefore, make sub-optimal decisions. Our line of inquiry does not assume that decision-makers behave suboptimally; they behave optimally given their beliefs, but these beliefs and the associated subjective payoffs do not necessarily conform to reality.

We now turn to the model and its predictions, followed by the empirical analysis. In the following section, we provide an overview of the hypothesis from anthropology about the importance of zero-sum thinking and the 'image of limited good.' In Section 3, we build on these arguments and insights and develp a formal model which generates predictions that, in Section 4, we then bring to the data, examining a contemporary pre-industrial population in the DRC. In Section 5, we examine the generality of the insights by expanding the empirical analysis to include countries worldwide. Section 6 concludes.

2. The 'Image of Limited Good'

Beliefs that discourage effort and productive activity are surprisingly common across time and space. Although they take a variety of forms, they have the common feature of discouraging individual effort. Often they take the form of a warning against personal ambition. In the Nordic cultures, there are the laws of Jante stating, 'Du skal ikke tro at du er noget,' which means 'don't think that you are anything'. In Australia and New Zealand, a 'tall poppy' syndrome is believed to lead others to cut down those who stick out in terms of personal achievement. In Japan, the same warning is provided by the analogous phrase 'the nail that sticks out will be hammered down.'

It has also been common for these beliefs to be embedded in class-based status systems that look positively upon inherited wealth but stigmatize aspiration, effort, and other attempts at 'social climbing' (McCloskey, 2010). In other cases, demotivating beliefs are embedded within religious values. Gibbon (1996) famously implicated Christianity and its discouragement of worldly endeavors in the decline of the Roman Empire. Of course, this otherworldly orientation was recommended by Augustine (2003)—a witness of Rome's fall—in his distinction between the City of Man and the City of God.

In contemporary society, we continue to find many examples of demotivating belief systems, including beliefs about the extent to which success is primarily outside of one's control (i.e., due to luck) rather than within one's control (i.e., due to hard work), a belief that is the majority view in most countries outside of the United States (Alesina, Glaeser and Sacerdote, 2001, Benabou and Tirole, 2006). Also common are anti-materialistic beliefs that reduce the enjoyment of consumption (Flouri, 1999), supernatural beliefs such as the evil eye and witchcraft beliefs that act as a kind of psychic tax on success (Gershman, 2014, 2015).

At first glance, it is paradoxical that beliefs and value systems that induce individuals to work less hard could evolve and exist in the longer run. This is even more puzzling when one recognizes that many scholars have associated these demotivating beliefs with economic underdevelopment, whether it is connecting the valuing of leisure over work to the fall of the Roman Empire (Finley, 1973) or the elimination of these values being a necessary pre-condition for the Industrial Revolution (McCloskey, 2006, 2010, 2016).

This raises the question of why demotivating beliefs have been so prevalent throughout human history. To answer this question, we start with the work of anthropologist George Foster, which arose from fieldwork in rural Mexico starting in the 1960s (Foster, 1967). Based on his observations, he reached the conclusion that people in most small-scale pre-industrial societies have a "zero-sum" view of the world, which he referred to as the "image of limited good". This model of the world suggests that if one person does better, then somebody else must do worse and that if you yourself get ahead, then someone else must fall behind.

This cognitive orientation (as Foster calls it) arises in a world in which all important resources and assets are in limited supply so that, quite literally, the world is zero-sum. Land is limited and so more land for one individual means less land for another. The same is true for livestock, wives, authority, and social status. In less-developed societies, where markets are not developed and there is no technological advance, the only way for an individual to get ahead is at the expense of others. Therefore, it is logical that this view of the world would arise in many parts of the world and particularly pre-industrial societies that have not yet experienced rapid economic growth.

Although Foster himself proposed this as a model of rural Mexican society specifically and the root cause of its development problems, the theory was believed to be more general and he gave many other examples from around the world Foster (1962, 1967, 1972). Foster also informally

connects a zero-sum world to demotivating beliefs. Foster (1965) noted in his original article that zero-sum societies exhibit an apparent lack of what McClelland (2003) calls a "need for achievement."

The first goal of the paper is to bring together these insights into a formal model that connects a zero-sum world, demotivating beliefs, effort, innovation, and ultimately economic growth. The second is to take the assumptions of the model and its predictions to the data. In doing so, an important consideration is how one identifies and measures demotivating beliefs. Foster's writings tend to emphasize jealousy and supernatural beliefs like witchcraft or the evil eye. This was primarily because his interest was in smaller-scale pre-industrial societies.

Given this, our analysis begins by examining the types of beliefs that Foster had in mind, which continue to be prevalent, especially in the developing world. We consider indigenous supernatural beliefs in the Democratic Republic of the Congo. This bundle of beliefs is commonly given the label of 'witchcraft,' particularly by those from Western European cultures. One common feature of such belief systems, which causes them to discourage effort, is that unfortunate events are often linked to the success of others. Success is often perceived to be due the use of witchcraft. Thus, if you are particularly successful, others may perceive this to have been achieved through the use of witchcraft. This often also generates feelings of jealousy. In these cases, it is also believed that jealous individuals can harm others, even unintentionally through supernatural means, if they harbor sufficient greed or envy.

Holland (2001) explicitly draws a connection between a zero-sum mentality and the 'Image of Limited Good' and the function of witchcraft, writing:

> The social purpose of witchcraft accusations is to apportion blame for misfortune and to ensure that each member of a community has an equal share in its prosperity – an anthropological concept known as the Image of Limited Good...
>
> Although expressed in different ways, the Image of Limited Good prevails throughout Africa and lies at the heart of witchcraft accusations. It is the belief that the pie is limited and one person's success is always at the expense of another's. If an individual prospers beyond the expectations of the others in his community, the success one may be labeled a witch because he is believed to have augmented personal progress via witchcraft and to have impoverished others in the process. (Victims of witchcraft are

often relatively prosperous individuals.)

> This notion breeds constant envy in traditional communities. Africans believe the witch's damaging hatred comes from her remorseless jealousy of others. And ordinary people are assumed to run a greater risk of being attacked by witchcraft if they become more prosperous than their neighbors because they are inviting not only the jealousy of the village but also of the witch.

Our analysis will examine the relationship between a zero-sum mentality, traditional religious beliefs (e.g., 'witchcraft'), jealousy, and economic prosperity with the Congolese context.

In contemporary post-industrial societies, the exact nature of the beliefs may differ, although they share the fact that they serve to discourage ambition and effort. Perceptions of jealousy are also common in the developed world and may play an important role. There are also beliefs that explicitly discourage ambition, such as the previously-noted laws of Jante in Nordic countries; the 'tall poppy syndrome' in Australia and New Zealand; or the belief that 'the nail that sticks out will be hammered down' in Japan. We will examine such beliefs in our analysis.

3. The Model

As described in the introduction, there are a great variety of demotivating belief systems with the common feature being that they reduce incentives for productive effort. Thus, it is a mystery why they are so widely observed in human populations. We turn to a model that examines the evolution of such beliefs in an environment that is more or less zero-sum in nature.

A. *Basic Set Up*

Players. Consider a population that is a continuum of mass one. The population could be a village, district, or whole society. Time is continuous and denoted by $t \in \mathbb{R}_+$.

Belief systems. There is a potentially large (but finite) set of belief systems $\Theta = \{\theta_1, \theta_2, \ldots, \theta_n\}$, where the intensity of belief i is $\theta_i \in [0,1]$, $i = 1, 2, \ldots, n$. As we shall see, $\theta = 0$ is the true belief and any $\theta > 0$ is a demotivating belief. The share of each trait i in the population is denoted by q_i, with the population state denoted by $\mathbf{q} = (q_1, q_2, \ldots, q_n)$ and $\sum_{i=1}^{n} q_i = 1$.

Actions. Individuals are paired and engage in production. The effort exerted in production by type i is denoted by $x_i \in \mathbb{R}_+$. The production function is $A\sqrt{x_i}$, where $A > 0$ is the state of

technology in the economy. (We make this endogenous in Section F.) The cost of production is $\frac{1}{2}x_i$. A positive fraction of tasks $\alpha \in (0,1]$ are zero-sum in nature, meaning that the benefit to the individual undertaking the task comes at the expense of the player with whom they are paired.[1]

Payoffs. The true (objective) payoff function to type i when matched with type j is

$$U(x_i, x_j) = A\left[\alpha\left(\sqrt{x_i} - \sqrt{x_j}\right) + (1-\alpha)\sqrt{x_i}\right] - \tfrac{1}{2}x_i. \tag{1}$$

If $\alpha = 0$, we have a simple production decision: each individual's payoff is independent of their partner's effort. If $\alpha = 1$, the environment is purely zero-sum: all gains come at the expense of one's partner. This is what Foster (1965) describes as a 'limited good' environment.

Players maximize a potentially distorted version of the true payoff function. Specifically, a type i player chooses production effort x_i to maximize the following subjective payoff:

$$\hat{U}(x_i, x_j) = (1-\theta_i)A\left[\alpha\left(\sqrt{x_i} - \sqrt{x_j}\right) + (1-\alpha)\sqrt{x_i}\right] - \tfrac{1}{2}x_i. \tag{2}$$

That is, an individual with belief system i discounts the return to effort by a factor $(1-\theta_i) \in [0,1]$. This specification captures various kinds of demotivating belief systems. For example, individuals may try to estimate the true return to effort in the economy, as in Benabou and Tirole (2006). In that case, we characterize conditions under which an incorrect belief $\theta_i > 0$, which underestimates the return to effort, can survive and spread. $\theta_i > 0$ could also be the product of a supernatural belief, such as belief in the evil eye, according to which envious individuals cause harm to others through supernatural forces (Gershman, 2014, 2015). Hence, envy exacts a kind of supernatural tax on effort with believers expecting to lose a fraction θ_i of their output. These belief systems reduce perceived returns to effort and are thus demotivating. The higher is the belief intensity θ_i, the more demotivating is the belief i.

Maximizing (2) with respect to x_i, we get optimal production effort for each type i:

$$x_i^* \;=\; \arg\max_{x_i \in \mathbb{R}_+} \hat{U}(x_i, x_j) \;=\; (1-\theta_i)^2 A^2.$$

Match Payoffs. While individual choices are based on their subjective payoff functions given by (2), evolution is determined by the true payoff function (1). Denote the equilibrium (true)

[1] An alternative interpretation is that there is a probability α that the environment is zero-sum, and whatever type i gains through production, their partner j loses. With probability $1-\alpha$, i 's effort is truly productive and does not come at the expense of j. Under both interpretations, α measures the degree to which the environment is zero-sum.

payoff to a type i individual matched with a type j individual by

$$\begin{aligned} U_{ij} &= U(x_i^*, x_j^*) \\ &= \left(1 - \theta_i - \alpha(1-\theta_j) - \tfrac{1}{2}(1-\theta_i)^2\right) A^2. \end{aligned}$$

By observation, the payoff to i in an i,j match is strictly decreasing in the intensity of i's belief θ_i and strictly increasing in the intensity of j's belief θ_j. Therefore, one would ideally wish to hold the true belief $\theta_i = 0$, but be matched with individuals who hold a highly demotivating belief.

Assortative Matching. The success of trait i is based on its 'fitness', which we denote by $F_i(\mathbf{q})$, and is given by the expected payoff across all possible matches; it is, thus, a function of the population state $\mathbf{q}$. We assume partial assortative matching as in Cavalli-Sforza and Feldman (1981). Specifically, fraction σ of the population matches with its own type and fraction $1-\sigma$ is matched uniformly at random with another member of the population. We refer to σ as the index of assortativity.

Another interpretation is that σ is a proxy for group-level selection in the population. For example, consider the population being split into two groups, labeled 1 and 2. Suppose trait i has achieved fixation (i.e., is present in 100% of the population) in group 1 and trait j has achieved fixation in group 2 so that the share of trait i in the population, q_i, is also the share of group 1. The index of assortativity σ is then the likelihood of a within-population match.

Given an index of assortativity σ, the fitness of trait i is

$$\begin{aligned} F_i(\mathbf{q}) &= \sigma U_{ii} + (1-\sigma) \sum_{j=1}^{n} q_j U_{ij} \\ &= (1-\theta_i)\left(1 - \tfrac{1}{2}(1-\theta_i)\right) A^2 - \sigma\alpha(1-\theta_i)A^2 - (1-\sigma)\alpha A^2 \sum_{j=1}^{n} q_j(1-\theta_j). \end{aligned} \tag{3}$$

B. ***Cultural Evolution***

The evolution of beliefs in the population is given by a dynamical system operating on the n-dimensional unit simplex. We place only a minimal restriction that the distribution of beliefs/types $\mathbf{q}$ evolves according to a deterministic payoff monotone dynamic. A leading example is the replicator dynamic, which can be the product of natural selection, imitation, or reinforcement learning (Sandholm, 2010). Specifically, for all i, j such that $q_i > 0$ and $q_j > 0$,

$$\frac{dq_i}{dt} \begin{matrix} > \\ = \\ < \end{matrix} \frac{dq_j}{dt} \iff F_i(\mathbf{q}) \begin{matrix} > \\ = \\ < \end{matrix} F_j(\mathbf{q}).$$

That is, if the payoff to type i is higher than the payoff to type j, then i's population share grows faster.

We single out two belief intensities. The first is $\theta = 0$, which is the (true) non-demotivating belief. The second is $\theta^* = \sigma\alpha$, which is the belief intensity with the highest relative fitness vis-à-vis any other belief intensity. We denote each belief's population share at time t by $q^0(t)$ and $q^*(t)$, respectively.

Proposition 1. ***Evolution of Demotivating Beliefs.*** *Cultural evolution selects a belief system as follows:*

(i) If the set of beliefs Θ contains $\theta_i < 2\sigma\alpha$ and the initial state is such that $q^0(0) < 1$, then $q^0(t)$ converges monotonically to zero. Otherwise, $\lim_{t\to\infty} q^0(t) = 1$.

(ii) If the set of beliefs Θ contains $\theta^* = \sigma\alpha$ and the initial state is such that $q^*(0) > 0$, then $q^*(t)$ converges monotonically to one.

All proofs are in Appendix A.

Even though incorrect, demotivating belief systems, including the evil eye and witchcraft beliefs, survive and spread through the population. According to part (i) of the proposition, as long as demotivating beliefs are present initially and are not too intense given the degree of zero-sumness $\alpha > 0$ and index of assortativity $\sigma > 0$, the true belief $\theta = 0$ will be driven to extinction. Only demotivating beliefs will survive in the population. Part (ii) tells us that the demotivating belief with intensity $\theta^* = \sigma\alpha$ will win out, driving all other belief systems to extinction. Hence, under positive assortativity ($\sigma > 0$), the belief intensity that is selected is strictly increasing in the degree of zero-sumness α. This result also helps us to understand part (i). Specifically, the (true) non-demotivating belief $\theta = 0$ is driven to extinction whenever there is a demotivating belief that is closer than it to the fitness-maximizing belief $\theta^* = \sigma\alpha$. Note that these results do not depend on the specific form of payoff monotone cultural dynamic.

In addition, even when $q^*(0) = 0$, evolution will select a belief intensity in the support of $\mathbf{q}(0)$ that is approximately equal to θ^*. Defining an interior state $\mathbf{q}(t)$ as one with full support on Θ, we can state the following corollary:

Corollary 1 . ***Evolution of Optimal Demotivating Beliefs.*** *Let* $\Theta = \left\{0, \frac{1}{\Delta}, \frac{2}{\Delta}, \ldots 1\right\}$, *where* $\Delta \in \mathbb{N}$.

From any interior initial state $\mathbf{q}(0)$ *and for all* Δ *sufficiently large,* $q_i(t)$ *converges monotonically to one for some* $\theta_i \in \left(\theta^* - \frac{1}{\Delta}, \theta^* + \frac{1}{\Delta}\right)$, *i.e., a belief approximately equal to* $\theta^* = \sigma\alpha$.

The intuition behind the survival of (incorrect) demotivating beliefs is as follows. By discounting the return to effort, the belief $\theta > 0$ depresses productive effort below the first-best level. The direct effect of this distortion is to reduce fitness. There is also a second effect that we call the 'interactive effect,' which is to increase the likelihood of being matched with another believer who exerts low effort. When interactions are primarily zero-sum (α large) and there is a high degree of assortative matching (σ large), the interactive effect dominates the direct effect. In this case, demotivating beliefs evolve to internalize part of the negative externalities in such an environment.

C. *Comparative Dynamics: Zero-Sumness and Demotivating Beliefs*

We would now like to compare the evolution of demotivating beliefs in two different populations (or subpopulations), a and b. The degree to which the environment faced by population k is zero-sum is α^k, $k = a, b$. To focus on the degree of zero-sumness, the parameter of interest in the empirical analysis, we assume each population has the same index of assortativity σ and set of beliefs Θ.

Define the population k share of belief i at time t by $q_i^k(t)$ and the population k state by $\mathbf{q}^k(t)$. As before, an interior population k state is one with full support on Θ. In addition, define the mean demotivating belief in population k at time t as

$$\overline{\theta}^k(t) = \sum_{i=1}^{n} q_i(k,t)\theta_i.$$

We can then state the following proposition.

Proposition 2 . ***Zero-Sum Environments and Demotivating Beliefs.*** *Let* $\Theta = \left\{0, \frac{1}{\Delta}, \frac{2}{\Delta}, \ldots 1\right\}$, *where* $\Delta \in \mathbb{N}$. *Suppose the initial state* $\mathbf{q}^k(0)$ *is interior for* $k = a$,b *and there is positive assortativity,* $\sigma > 0$.

If $\alpha^a > \alpha^b$ *and* Δ *is sufficiently large, there exists a finite time* T *such that for all* $t \geq T$ *the mean demotivating belief is larger in population* a: $\overline{\theta}^a(t) > \overline{\theta}^b(t)$.

Therefore, where the environment is more zero-sum, a population will eventually hold more intense demotivating beliefs. Again, this applies independently of the initial conditions for each population, as long as they are interior. The result also does not depend on the precise form of payoff monotone cultural dynamic. This will be one of the key propositions for empirical testing.

D. *Comparative Dynamics: Zero-Sumness and Economic Outcomes*

We are also interested in the effect of demotivating belief systems on economic outcomes. The three outcomes that are of interest here are effort, income, and subjective well-being.

The mean level of effort in population k at time t is

$$\begin{aligned} X^k(t) &= \sum_{i=1}^{n} q_i^k(t) x_i^* \\ &= A^2 \sum_{i=1}^{n} q_i^k(t)(1-\theta_i)^2. \end{aligned} \tag{4}$$

Mean income in population k at time t is the mean (objective) payoff minus the cost of effort averaged over all interactions:

$$Y^k(t) = \sum_{i=1}^{n} q_i^k(t) A \left[\sqrt{x_i} - \alpha^k \left(\sigma \sqrt{x_i} + (1-\sigma) \sum_{j=1}^{n} q_j^k(t) \sqrt{x_j} \right) \right]. \tag{5}$$

Subjective well-being in population k at time t is defined as the mean subjective (or fictitious) payoff given by (2) evaluated at the equilibrium effort levels $(x_i^*)_{i=1}^n$ and averaged over all interactions:

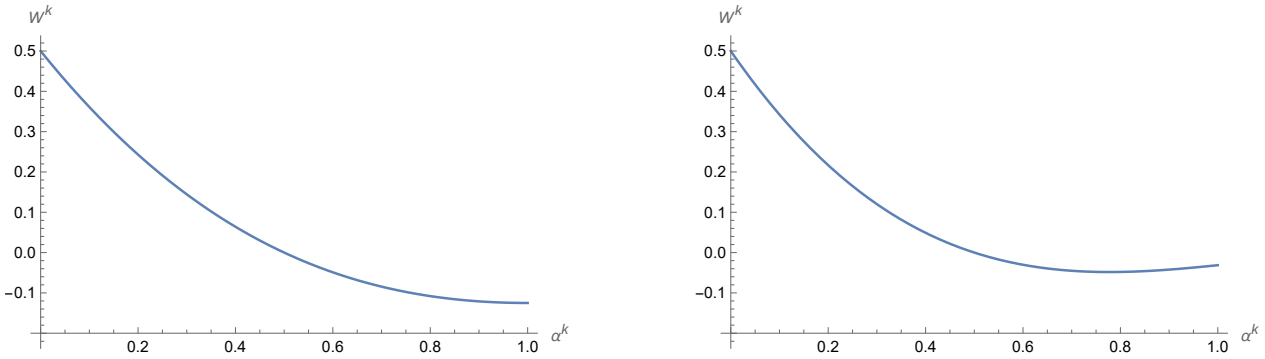
$$\hat{W}^k(t) = \sum_{i=1}^{n} q_i^k(t) \left[\sigma \hat{U}(x_i^*, x_i^*) + (1-\sigma) \sum_{j=1}^{n} q_j^k(t) \hat{U}(x_i^*, x_j^*) \right]. \tag{6}$$

We can now show how effort, income, and subjective well-being vary with the degree to which the environment is zero sum.

Proposition 3 . ***Zero-Sum Environments and Economic Outcomes.*** *Let $\Theta = \left\{0, \frac{1}{\Delta}, \frac{2}{\Delta}, \ldots 1\right\}$, where $\Delta \in \mathbb{N}$. Suppose the initial state $\mathbf{q}^k(0)$ is interior for $k = a$,b and there is positive assortativity, $\sigma > 0$.*

If $\alpha^a > \alpha^b$ and Δ is sufficiently large, there exists a finite time T such that for all $t \geq T$ population A's mean effort and income are lower: $X^a(t) < X^b(t)$ and $Y^a(t) < Y^b(t)$.

Hence, worse economic outcomes are produced in zero-sum economic environments. We can also examine the effect on subjective well-being.



(a) $\sigma = 0.5$ (b) $\sigma = 0.75$

Figure 1: Plot of subjective well-being $\hat{W}^k$ on the degree to which the environment is zero-sum α^k, when all individuals hold the limiting belief $\theta^* = \sigma\alpha^k$.

Proposition 4 . ***Zero-Sum Environments and Subjective Well-Being.*** *Again, suppose $\alpha^a > \alpha^b$. In addition to the conditions of Proposition 3, if $\sigma \leq \frac{1}{2}$ or $\alpha^a \leq \frac{1+\sigma}{3\sigma}$, then there exists a finite time T such that for all $t \geq T$ population A's subjective well-being is lower: $\hat{W}^a(t) < \hat{W}^b(t)$.*

The reason behind the qualification in Proposition 4 is as follows. There are three effects of a more zero-sum environment on subjective well-being. The first is obviously to increase negative externalities and thereby lower subjective well-being. The remaining two effects depend on the limiting demotivating belief, approximately $\theta^* = \sigma\alpha^k$, being increasing in zero-sumness. Specifically, the second effect is the additional 'affective cost' of demotivating beliefs, i.e., the discounting of returns to effort by approximately $1 - \theta^*$, which reduces well-being by making an individual's situation seem worse than it is. The third effect of higher zero-sumness is to raise well-being by producing demotivating beliefs that internalize part of the negative externalities from zero-sum interactions. When positive assortativity σ and the degree of zero-sumness α^k are large, the third effect dominates and subjective well-being can rise with α^k.

This is illustrated by Figure 1 in which we plot the limiting value of subjective well-being, when all individuals hold the belief $\theta^* = \sigma\alpha^k$, as a function of α^k. Panel (a) depicts a case in which subjective well-being $\hat{W}^k$ is strictly decreasing in α^k on [0,1]. Panel (b) shows that for high values of σ and α^k, $\hat{W}^k$ can be increasing in α^k. In both cases, the subjective well-being curve becomes relatively flat for high degrees of zero-sumness, α^k.

We now investigate whether demotivating beliefs mitigate the economic loss from zero-sum interactions.

E. *The Welfare Effect of Demotivating Beliefs*

We have suggested that demotivating beliefs can improve welfare by limiting excessive competition. We now formalize this claim. Returning to a single population (i.e., holding α fixed), let us define material welfare at time t for a person holding belief θ_i as the objective (or true) payoff given by (1) evaluated at the equilibrium effort levels $(x_i^*)_{i=1}^n$ and averaged over all interactions:

$$W^i(t) \quad = \quad F_i\left(\mathbf{q}(t)\right) \quad = \quad \left[\sigma U(x_i^*, x_i^*) + (1-\sigma)\sum_{j=1}^{n} q_j(t) U(x_i^*, x_j^*)\right].$$

In particular, let us denote by $W^*(t)$ the material welfare at time t of someone holding the limiting demotivating belief $\theta^* = \sigma\alpha$ and by W^0 someone holding the (true) non-demotivating belief $\theta = 0$.

Proposition 5 . ***Demotivating Beliefs and Material Welfare.*** *Regardless of the initial condition* $\mathbf{q}(0)$*, the material welfare at time t of someone holding the limiting demotivating belief is larger than the material welfare of someone holding the (true) non-demotivating belief:* $W^*(t) > W^0(t)$ *for all t.*

Therefore, demotivating beliefs improve welfare by internalizing the negative externalities from production in zero-sum environments.

F. *The Long Run: Beliefs and Innovation*

We have shown that demotivating beliefs spread and improve welfare, holding the environment fixed. In the long run, however, demotivating beliefs may affect the environment and in particular inhibit innovation. Hence, we now make the state of technology, denoted by $A(t)$, endogenous and examine its co-evolution with the distribution of beliefs $\mathbf{q}$.[2] While demotivating beliefs reduce a negative *contemporaneous* externality by limiting zero-sum competition, we find that they could also reduce a positive *intertemporal* externality from knowledge accumulation, trapping the economy in a low-technology state.

To say more about the expanded system $(\mathbf{q}, A)$, we need to specify a technology dynamic. We assume that technology cannot go below some subsistence level $\underline{A} > 0$. If $A(T) \leq \underline{A}$ for some

[2]Note that Propositions 1 and 2 continue to hold when A is endogenous. The results in Proposition 3 can be tested empirically while controlling for the level of technology A.

$t = T$, then $A(T) = \underline{A}$ for all $t > T$. Otherwise, if $A > \underline{A}$, technological development is governed by the following equation of motion:

$$\frac{dA}{dt} = X(\mathbf{q}, A) - \delta A, \tag{7}$$

where $\delta \in (0,1)$ is the rate of technological depreciation and again $X(\mathbf{q}, A)$ is the mean level of effort in the population given by (4).[3]

The positive effect of effort on the rate of innovation could arise from learning-by-doing and knowledge spillovers from productive activity, as in Aghion, Caroli and Garcia-Penalosa (1999) and Gershman (2014).[4]

To examine the long-term effect of demotivating beliefs on development, substitute (4) into (7) to get:

$$\frac{dA}{dt} \begin{array}{c} > \\ = \\ < \end{array} 0 \iff A \begin{array}{c} > \\ = \\ < \end{array} \frac{\delta}{\sum_{i=1}^{n} q_i (1-\theta_i)^2} \equiv D^*(\mathbf{q}, \Theta). \tag{8}$$

We call $D^*(\mathbf{q}, \Theta)$ the development barrier.

As a benchmark, consider a degenerate set of beliefs labeled Θ^0 in which $\theta_i = 0$ for all i. In this case, all beliefs are true and not demotivating. The development barrier is $D^*(\mathbf{q}, \Theta^0) = \delta$. Starting from $A(0) > \delta$, there is perpetual technological progress and growth. Starting from $A(0) < \delta$ there is technological regress and contraction of the economy until $A(t) = \underline{A}$, the subsistence level. Hence a technological shock of size greater than $\delta - \underline{A}$ is required to transition the economy from the $A = \underline{A}$ steady state to perpetual growth. Now consider a non-degenerate belief system Θ. In this case, the development barrier $D^*(\mathbf{q}, \Theta)$ depends on $\mathbf{q}$. In particular, $D^*(\mathbf{q}, \Theta) > D^*(\mathbf{q}, \Theta^0)$ whenever there exists a belief such that $\theta_i > 0$ and $q_i > 0$.

Now write $(\mathbf{q}, A) \in \Omega(\Theta)$ if starting from $(\mathbf{q}, A)$ and given the set of beliefs Θ, $dA/dt > 0$ for all $t > 0$ under a payoff monotone cultural dynamic and the technology dynamic (7). That is, $\Omega(\Theta)$ is the set of states from which the *co-evolution* of beliefs $\mathbf{q}$ and technology A leads to perpetual growth.

By Proposition 1(i), for demotivating beliefs to spread under a payoff monotone dynamic from an interior state, there must exist $\theta_i \in \Theta$ such that $\theta_i < 2\sigma\alpha$ (which requires $\sigma\alpha > 0$). When Θ has this property, we refer to the environment as one that supports demotivating beliefs.

[3]The results do not change qualitatively if we assume $\frac{dA}{dt} = (1-\alpha)X(\mathbf{q}, A) - \delta A$, so that effort in zero-sum interactions does not contribute to innovation.

[4]The effort choices characterized here continue to hold even with forward-looking agents, because agents are non-atomic and thus do not individually affect mean effort.

To assess the impact of beliefs on long-run economic development, we can compare technological progress in an environment that supports demotivating beliefs to technological progress under the degenerate set of beliefs Θ^0.

Proposition 6 . ***Demotivating Beliefs Undermine Technological Progress.*** *Suppose* $\underline{A} < \delta$.[5] *For any environment* Θ *that supports demotivating beliefs, the set of conditions from which there is perpetual growth is a strict subset of the set of conditions from which there is perpetual growth under the degenerate (non-demotivating) set of beliefs* Θ^0*:*

$$\Omega(\Theta) \subsetneq \Omega(\Theta^0).$$

That is, removing demotivating beliefs expands the set of conditions that lead to perpetual growth. In this sense, demotivating belief systems can be viewed as a kludge (Ely, 2011). While they reduce wasteful zero-sum competition, they also create productive inefficiencies that can trap the economy in a low-technology state.

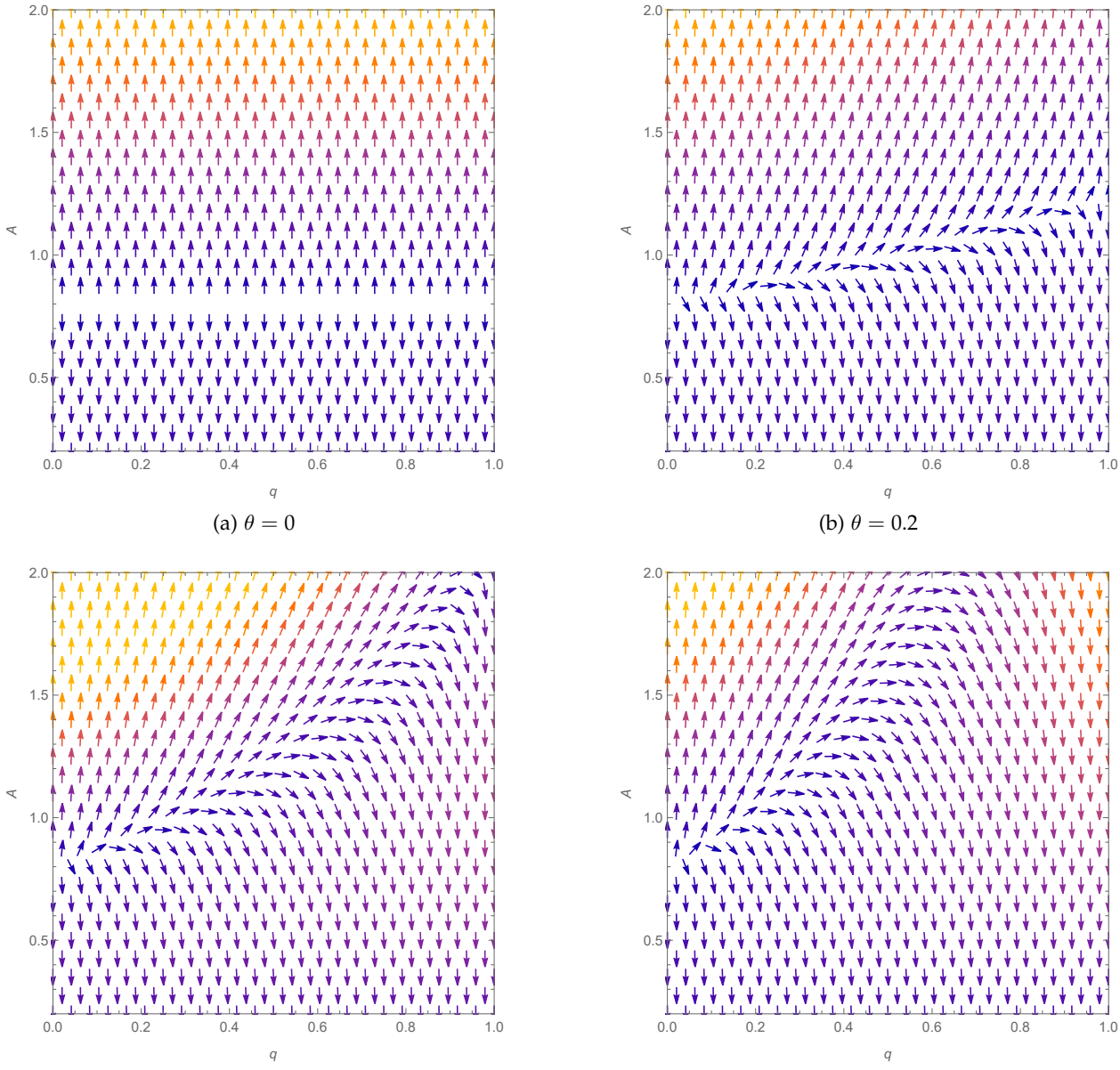
To illustrate visually, consider the binary case $\Theta = \{0, \theta\}$. Let q be the population share of the demotivating belief θ and let the cultural dynamic dq/dt be the replicator dynamic. Vector plots are presented in Figure 2. Panel (a) depicts the case of the degenerate belief system Θ^0, i.e., with $\theta = 0$. In this case, we know the development barrier is $D^*(q, \Theta^0) = \delta$ for all $q \in [0,1]$. An increase in the intensity of the demotivating belief θ in panels (b)-(d) shifts the development barrier up and to the right. Thus, it is harder for the economy to escape low levels of development in an environment that supports the demotivating belief.

G. *Zero-Sum, Institutions, and Demotivating Beliefs*

Rather than the distribution of demotivating beliefs being determined by cultural evolution in a bottom-up manner, it could be directed by a community leader who sets local institutions. We examine this alternative formulation of our model in detail in Appendix B and sketch out its basic logic here.

Suppose the set of beliefs is binary, $\Theta = \{\theta_1, \theta_2\}$. Let $\theta_1 = 0$, which is the correct belief, and let $\theta_2 = \theta(t)$, which is a demotivating belief. We assume a community leader or some process is able

[5]Note that $\underline{A} > \delta$ is a trivial case, in which there is perpetual technological progress from every initial condition regardless of θ.



(a) $\theta = 0$

(b) $\theta = 0.2$

(c) $\theta = 0.4$

(d) $\theta = 0.8$

Figure 2: Vector plot of (q, A) under belief set $\Theta = \{0, \theta\}$, where q is the population share of the demotivating belief θ. Parameter values: $\alpha = 0.9$, $\sigma = 0.75$, $\delta = 0.8$, $\underline{A} = 0.2$.

to set an institution that determines $\theta(t)$ in a way that maximize the spread of the demotivating belief.

This is meant to capture the influence that political or religious leaders can have on beliefs $\theta(t)$ (e.g., Verdier and Zenou, 2018, Carvalho and Sacks, 2021). For religious beliefs, examples would be church doctrine, such as the well-known Marriage and Family Program of the Catholic Church dating back to the medieval period (Schulz, Bahrami-Rad, Beauchamp and Henrich, 2019). When considering supernatural beliefs such as the evil eye or witchcraft beliefs, the relevant leaders are chiefs, shamans, and witchdoctors.

We find that the demotivating belief chosen by the leader each period is $\theta^* = \sigma\alpha$, precisely the belief intensity selected by cultural evolution. In addition, as with cultural evolution, the demotivating belief spreads from all interior initial states and achieves fixation. Once again, we find that a population in which interactions are more zero-sum (larger α) will have more intense demotivating beliefs on average.

We now examine the primary predictions that arise from our theory. Proposition 2 highlights the link between a zero-sum environment and the presence of demotivating beliefs, such as jealousy and witchcraft, which were the focus of Foster's original studies. Proposition 3 highlights the effect of zero-sum on economic outcomes, namely effort and income, while Proposition 4 makes the connection to happiness and subjective well-being.

4. Testing Foster in the Developing World: Evidence from the DRC

A. *Data*

Our empirical analysis studies two samples from the city of Kananga in the Democratic Republic of the Congo (DRC). The city is the capital of the Kasai-Central province and is situated at the center of the Kasai region. The city, formerly known as Luluabourg, was created by colonial administrators in 1884 and, therefore, consists primarily of migrants from surrounding areas.

The first sample of our study is from 2015 and has a sample size of approximately 200 individuals. The second sample is from 2019 and has a sample size of approximately 1,000 individuals. While the first sample is smaller, the questions are more extensive.

For the 200-person sample, the data were collected between June and September 2015. Sampling occurred in several steps. First, we conducted a screening survey in 85 neighborhoods across

the city of Kananga: 60 were randomly sampled, and 25 were intentionally sampled because they were thought to contain ethnic minorities (of interest chiefly for a different project). The randomly selected neighborhoods were chosen with probabilities proportional to their estimated populations (without replacement). In each randomly selected neighborhood, enumerators sampled 33 households by walking along each street and counting houses according to a neighborhood-specific skip pattern. GIS coordinates confirm that houses are spread homogeneously throughout neighborhoods. In non-randomly selected neighborhoods, enumerators similarly sampled households following a skip pattern. In total, enumerators conducted 2,496 screening surveys, of which 1,964 came from the 60 randomly chosen neighborhoods ("random sample"), and the remaining 532 came from the non-randomly chosen neighborhoods ("targeted sample").

From this screening survey sample, we then selected the sub-sample for this project. We first excluded three types of individuals: (1) those who had participated in a previous study, (2) those who were planning to travel during the study period, and (3) ethnic groups with fewer than ten individuals in the random screening survey sample. We then randomly sampled up to 18 individuals per remaining ethnic group. We always prioritized the random sample, but if we did not reach 18 for a particular ethnic group, we supplemented the respondents from the random sample with those from the targeted sample. The final sample includes 227 individuals: 193 from the random sample and 34 from the targeted sample.

Each respondent was invited to participate in a set of activities at their home. Home activities were conducted during three enumerator visits. During the first visit, enumerators conducted a 90-minute survey. Our measures of zero-sum views and envy are based on this survey.In the second home visit participants conducted IATs about religion, which we use to validate our survey measures of strength of belief in traditional religion and Christianity.In the third home visit, respondents completed a short survey module about religious beliefs. Our measures of the strength of beliefs in traditional religion and Christianity are based on this survey.Of the 227 individuals we selected to participate, 224 completed the first home visit; 221 completed the second visit; and 213 completed the third visit.

For the 1,000-person sample, the data were collected between June and September of 2019. We conducted a screening survey in 225 neighborhoods across the city of Kananga. These neighborhoods were selected using two-stage clustered sampling, where the probability of selecting a neighborhood was proportional to its estimated population. The sampling of respondents inside

a selected neighborhood occurred in two steps. First, enumerators conducted a short screening survey of 15 surveys per neighborhood for a total of 3,372 respondents.[6] Second, we selected 1,019 respondents to receive a second visit. Respondents were selected to receive the second visit (1) if their village of origin was in one of the five provinces of the Kasai region (Kasai Central, Kasai, Kasai Oriental, Sankuru or Lomami) and (2) if their self-reported ethnicity was one of the four main ethnicities in their province of origin.[7]

During this second visit, the enumerators conducted a survey, which comprised the questions about zero-sum thinking, envy, and strength of beliefs in traditional religion and Christianity that we use in our analysis.

Central to our analysis is measuring the extent to which the world faced by an individual is zero-sum, which is α in the model. We proxy for this by an individual's self-reported perception of the world they face. We measure this using survey questions that provide respondents with two contrasting statements, which we call statements 1 and 2. Respondents are then asked which they agree with, choosing one of the following options: 'agree strongly with statement 1', 'agree with statement 1', 'agree with statement 2', 'agree strongly with statement 2'.

The six statement pairs are as follows.

- Statement 1: Gaining happiness requires taking it away from others.
  Statement 2: It is possible for everyone to be happy.

- Statement 1: A person can only gain power by taking it away from others.
  Statement 2: A person can gain power without taking it away from others.

- Statement 1: In trade, if one party gains the other party loses.
  Statement 2: In trade, it is possible for both parties to gain at the same time.

- Statement 1: If one person in a village gets very wealthy, other people in the village will become poorer.

[6] The total number of screening surveys is not equal to 3,375 because in fifteen polygons 1–4 too many respondents were surveyed by mistake, in five polygons 1–2 respondents were not surveyed by mistake and in one polygon the enumerator did not manage to find 15 respondents to work with and only conducted 9 surveys.

[7] In the Kasai Central province, these are Luluwa, Luntu, Bindi and Kete; in the Kasai province, they are Luluwa, Kete, Kuba, Lele and in the Kasai Oriental; and in both Sankuru and Lomami provinces the main ethnicities are Luba, Tetela, Songe.

Statement 2: If one person in a village gets very wealthy, other people in the village will not necessarily become poorer.

- Statement 1: In Kananga, people only make money when others lose money.
  Statement 2: In Kananga, no one need lose money for others to make money.

- Statement 1: In Kananga, businesses only make money when others lose money.
  Statement 2: In Kananga, no one need lose money for businesses to make money.

For each survey question, we create a variable that takes on an integer value from 1–4 and is increasing in how zero-sum the choice of the respondent is. We then use principal components analysis to distill an index of a zero-sum mentality, which is based on the first principal component of the factor analysis. In the 200-person sample, the first principal component loads positively on all six variables with the following coefficients (respectively): 0.45, 0.47, 0.34, 0.28, 0.49, 0.38. In the 1,000-person sample, the first principal component loads positively on all four variables with the following coefficients (respectively): 0.34, 0.36, 0.41, 0.38, 0.47, 0.47.

B. ***Findings***

We begin the analysis by first examining the relationship between zero-sum and an individual's beliefs in witchcraft and Christianity. This is motivated by Proposition 2 of the model, which predicts that zero-sum environments lead to more demotivating beliefs in the long-run. We do this by estimating the following equation:

$$y_i = \alpha_{e(i)} + \beta \, \text{Zero Sum}_i + \mathbf{X}_i \mathbf{\Omega} + \epsilon_i \tag{9}$$

where i indexes individuals, e indexes ethnic groups. The dependent variable y_i captures one of our outcomes of interest, either indigenous religious beliefs or jealousy. The vector $\mathbf{X}_i$ includes demographic controls for age, age squared, a gender indicator and its interaction with age.

While we do not have a measure of the extent to which individuals face a zero-sum environment – α in the model – we do have our measure of the extent to which they view the world in zero-sum terms. This is our independent variable of interest. We expect a more zero-sum view to be associated with stronger beliefs in jealousy and witchcraft.

Estimates of equation (9) are reported in Tables 1 and 2. We begin by looking at jealousy as an outcome of interest. In column 1, we control for age, age squared, gender, and gender interacted

Table 1: Zero-Sum, Jealousy, and Witchcraft in the DRC: 200 Person Sample

	Principal-Component Based Measures of Strength of Beliefs							
	Self Reported Jealousy Of Others		Witchcraft		Christianity		Difference btw Witchcraft & Christianity	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Zero Sum	0.328***	0.325***	0.204***	0.174***	-0.149**	-0.146**	0.128***	0.115***
	(0.070)	(0.078)	(0.044)	(0.046)	(0.063)	(0.067)	(0.030)	(0.031)
Gender, age, age squared	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Ethnicity FEs	No	Yes	No	Yes	No	Yes	No	Yes
Observations	204	204	197	197	197	197	193	193
R squared	0.112	0.205	0.059	0.127	0.027	0.110	0.059	0.133

Table 2: Zero-sum, jealousy, and witchcraft in the DRC: 1,000 Person Sample

	Principal-Component Based Measures of Strength of Beliefs							
	Self Reported Jealousy Of Others		Witchcraft		Christianity		Difference btw Witchcraft & Christianity	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Zero Sum	0.191***	0.188***	0.059**	0.059**	-0.108**	-0.110**	0.062**	0.062**
	(0.031)	(0.031)	(0.029)	(0.029)	(0.041)	(0.041)	(0.028)	(0.028)
Gender, age, age squared	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Ethnicity FEs	No	Yes	No	Yes	No	Yes	No	Yes
Observations	985	985	985	985	985	985	985	985
R squared	0.043	0.046	0.009	0.013	0.013	0.016	0.014	0.017

with age and age squared. In column 2, we also control for ethnicity fixed effects. We find a strong positive relationship between zero-sum view and jealousy in both samples.

In columns 3 and 4, we look at the intensity of witchcraft beliefs as an outcome. These are measured as the first principal component of four questions that ask about the strength of belief in traditional religion, frequency of prayer to ancestors, frequency of participation in rituals devoted to ancestors, and how close they feel to non-Christians who live in Kananga. The exact wording of the questions is provided in Appendix C. We also find a positive relationship between zero-sum thinking and witchcraft beliefs in both samples. Within the context of the model, our interpretation of these relationships is that they are showing that α results in demotivating beliefs θ. Individuals who view the world as more zero-sum also experience jealousy more strongly and are more likely to believe in witchcraft.

In the DRC, as is the case for the rest of Africa and also in much of the world outside of Africa, there has been a rapid rise in Christianity. Christianity provides a striking contrast to indigenous witchcraft beliefs. Compared to witchcraft, which tends to view any benefits as coming at the expense of others, Christianity teaches that everyone can receive blessings from God (they are not zero-sum) and also that God rewards hard work and economic ambition. These beliefs are particularly strong from Pentecostal denominations which had spread rapidly in the past decades in the DRC and across the African continent in general.

Motivated by this, we also examine the relationship between zero-sum thinking and one's own belief in Christianity. This is measured using four questions that ask about the strength of one's belief in the Christian God, frequency of prayer, frequency of attending church, and how close you feel to non-Christians who live in Kananga. Thus, the questions, and the variable construction, mimic the questions asked about indigenous spiritual (i.e., witchcraft) beliefs. The exact wording of the questions is provided in Appendix C. The estimates are reported in columns 5 and 6. We find that a zero-sum view is negatively associated with a belief in Christianity. Again this is true in both samples.

Given the divergent relationships between zero-sum thinking and witchcraft versus Christianity, we next create a measure that is the difference in the respondent's beliefs in witchcraft relative to Christianity. As reported in columns 7 and 8, zero-sum thinking is highly predictive of the difference in these beliefs.

5. Testing Foster Globally: Evidence from the WVS

We now turn to a global analysis of the predictions of our model. The Congolese setting provides a nice first step for our analysis because it is a setting that is similar to the small-scale pre-industrial societies that Foster had in mind when he developed his thinking. A downside of the setting is its lack of economic opportunity and limited variation in economic wellbeing, which is determined primarily by factors outside of his theory like the provision of jobs and resources by foreign aid organizations.

Given this, we now expand our analysis to consider a broader set of societies. This allows us to not only test Proposition 2 of the model, which links zero-sum thinking to demotivating beliefs, as well as Propositions 3 and 4, which links zero-sum to lower effort, lower incomes, and lower subjective well-being. We now turn to this analysis.

A. *Data*

We measure zero-sum thinking using a question from the World Values Survey (WVS). Respondents are given two opposing statements, one that is zero-sum and the other positive sum. The zero-sum statement is: "People can only get rich at the expense of others." The positive sum statement is: "Wealth can grow so there's enough for everyone." The respondents are asked to report their view on a ten point scale, which lies between the two extremes. We measure the variable so that it is increasing in how zero-sum the view is. For ease of interpretation, we also normalize it to lie between zero and one.

The distribution of the zero-sum measure is shown in Figure 3. The figure shows the distribution of respondent answers for each of the four waves of the WVS, and for the aggregate sample. As shown, there is a fair amount of dispersion in the answers provided. The most common answer is for individuals to agree fully that "Wealth can grow so there's enough for everyone." The next most common is the intermediate position between the two statements. Beyond this, all other points on the ten point scale are fairly common and there's a substantial proportion of individuals who agree fully with the statement "People can only get rich at the expense of others." In short, there appears to be a rich amount of variation in the extent to which individuals view wealth as zero-sum.

B. *Validating zero-sum thinking as a reflection of a zero-sum environment*

We now test one of the basic assumptions of our empirical analysis, which is that a respondent's self-reported zero-sum worldview is reflected of, α in the model; namely, the extent to which the environment is zero sum. We test this with the following equation:

$$\text{Zero Sum}_{i,c,v,t} = \alpha_{c,v} + \alpha_t + \beta\,\text{Growth}_{c,t} + \mathbf{X}_{i,c,v,t}\mathbf{\Gamma} + \varepsilon_{i,c,t} \tag{10}$$

where i indexes individuals, c indexes countries, v indexes survey waves, and t indexes person i's year of birth. The variable $\text{Growth}_{c,t}$ is the average annual growth rate of economic growth during the first 20 or 30 years of person i's life given that they are from country c and were born in year t. According to the theory, we should obtain a negative estimate of β: weaker economic growth early in one's life should be associated with a more zero-sum view of the world in adulthood.

The vector $\mathbf{X}_{i,c,t}$ includes the following controls: individual i's age, age squared, an indicator for their gender, and this interacted with both age and age squared. In less-parsimonious

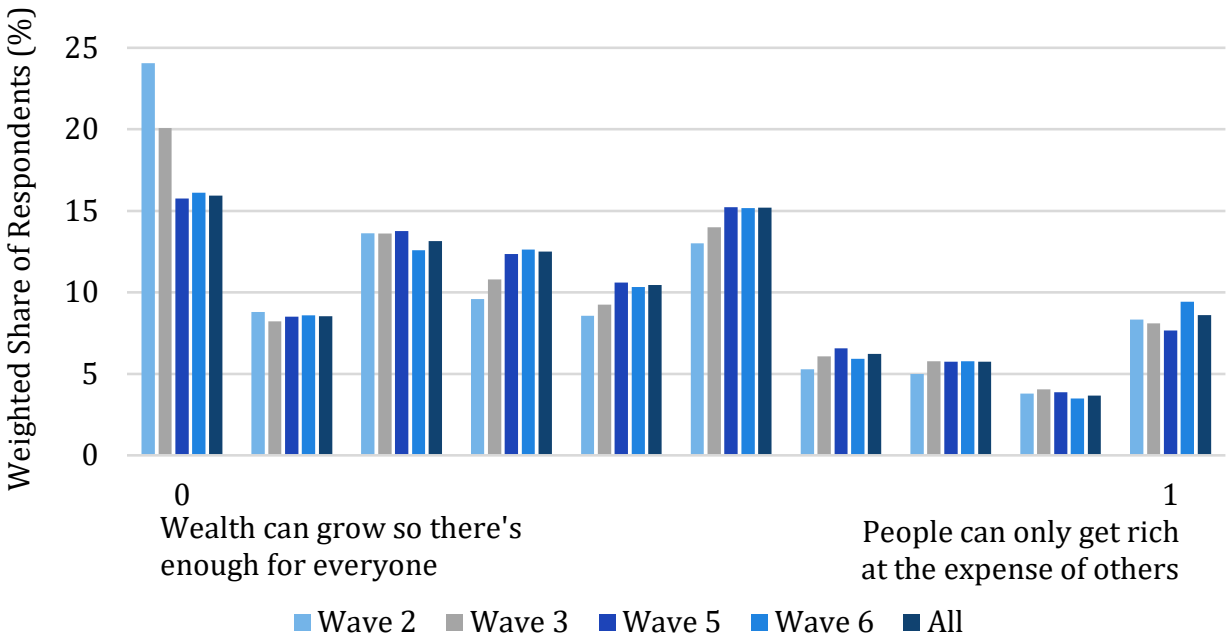


Figure 3: Distribution of the Zero-Sum Measure across Waves of the WVS.

specifications, we also include education fixed effects, income fixed effects, and employment fixed effects. All estimates are clustered at the country level.

Estimates of equation (11) are reported in Table 3. The odd numbered columns report estimates with only the age and gender controls, while the even numbered columns also add fixed effects for contemporaneous education, income, and employment status. Columns 1–4 use total real GDP growth rates, while columns 5–8 use per capita real GDP growth rates.

We find a consistent negative relationship between the economic conditions an individual faces in the first 20 or 30 years of their life and the extent to which they view the world as zero-sum today. Consistent with expectations, worse economic conditions are associated with a more zero-sum view in adulthood. The estimated relationships appear strong and are highly significant.

If early economic conditions are associated with later economic conditions, then we'd expect that such a relationship could arise because the world is in fact more zero-sum today. However, we find that even conditioning on current education, income, and employment status, each measured finely and estimated flexibly, we continue to find a relationship between early life economic conditions and a zero-sum view of the world in adulthood. In addition, as reported in Table

Table 3: Zero-Sum Thinking and Economic Growth: Baseline Estimates

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Dependent variable: Scale ranging from zero to one with one corresponding to zero-sum beliefs							
GDP 20 year growth (constant $)	-0.383***	-0.379***						
	(0.106)	(0.103)						
GDP 30 year growth (constant $)			-0.538**	-0.615**				
			(0.241)	(0.242)				
GDP per capita 20 year growth (constant $)					-0.429***	-0.421***		
					(0.105)	(0.101)		
GDP per capita 30 year growth (constant $)							-0.611**	-0.696***
							(0.235)	(0.233)
Age, age^2, gender, age*gender, age^2*gender controls	Y	Y	Y	Y	Y	Y	Y	Y
Education and income controls	N	Y	N	Y	N	Y	N	Y
Wave-country FE	Y	Y	Y	Y	Y	Y	Y	Y
Birth-year FE	Y	Y	Y	Y	Y	Y	Y	Y
Observations	102,234	87,710	95,368	81,219	102,175	87,653	95,368	81,219
Number of clusters/countries	74	74	70	70	74	74	70	70
Mean dependent variable	0.406	0.403	0.406	0.403	0.406	0.403	0.406	0.403
Std. dev. dependent variable	0.305	0.303	0.305	0.303	0.305	0.303	0.305	0.303
Mean independent variable	0.038	0.038	0.038	0.038	0.020	0.020	0.021	0.021
Std. dev. independent variable	0.022	0.022	0.019	0.019	0.021	0.022	0.018	0.019

Notes: The table reports OLS estimates in columns 1 and 2 and ordered logit estimates in columns 3 and 4. An observation is an individual, weighted to make the sample nationally representative. All specifications include wave-country and birth-year fixed effects. The dependent variable is a scale variable ranging from zero to one with one representing "People can only get rich at the expense of others" and zero representing "Wealth can grow so there's enough for everyone." GDP growth rates are estimated as GDP growth for the first 20 or 30 years of a respondent's life. Education and income are categorical variables. Income identifies an individual's household income decile (self-identified). Education is the highest education completed (e.g., secondary). Coefficients are reported with standard errors clustered at the country-level in parantheses. ***, **, and * indicate significance at the 1, 5, and 10 percent levels.

Table 4: Zero-Sum Thinking and Economic Growth: Conditioning on Subnational District FEs

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Dependent variable: Scale ranging from zero to one with one corresponding to zero-sum beliefs							
GDP 20 year growth (constant $)	-0.345***	-0.322***						
	(0.095)	(0.088)						
GDP 30 year growth (constant $)			-0.490**	-0.523**				
			(0.227)	(0.224)				
GDP per capita 20 year growth (constant $)					-0.387***	-0.354***		
					(0.096)	(0.089)		
GDP per capita 30 year growth (constant $)							-0.563**	-0.592***
							(0.222)	(0.217)
Age, age^2, gender, age*gender, age^2*gender controls	Y	Y	Y	Y	Y	Y	Y	Y
Education and income controls	N	Y	N	Y	N	Y	N	Y
Wave-region FE	Y	Y	Y	Y	Y	Y	Y	Y
Birth-year FE	Y	Y	Y	Y	Y	Y	Y	Y
Observations	99,173	85,255	92,530	78,979	99,116	85,199	92,530	78,979
Number of clusters/countries	73	69	73	69	73	69	73	69
Mean dependent variable	0.405	0.402	0.405	0.403	0.405	0.403	0.405	0.403
Std. dev. dependent variable	0.306	0.303	0.306	0.304	0.305	0.303	0.306	0.304
Mean independent variable	0.038	0.038	0.038	0.038	0.019	0.019	0.021	0.021
Std. dev. independent variable	0.021	0.022	0.019	0.019	0.021	0.022	0.018	0.019

Notes: The table reports OLS estimates in columns 1 and 2 and ordered logit estimates in columns 3 and 4. An observation is an individual, weighted to make the sample nationally representative. All specifications include wave-region and birth-year fixed effects. The dependent variable is a scale variable ranging from zero to one with one representing "People can only get rich at the expense of others" and zero representing "Wealth can grow so there's enough for everyone." GDP growth rates are estimated as GDP growth for the first 20 or 30 years of a respondent's life. Education and income are categorical variables. Income identifies an individual's household income decile (self-identified). Education is the highest education completed (e.g., secondary). Coefficients are reported with standard errors clustered at the country-level in parantheses. ***, **, and * indicate significance at the 1, 5, and 10 percent levels.

4, the magnitude of the estimated effect is very similar with or without the additional controls and if we account for fixed effects for finely defined subnational districts (and wave), we obtain estimated effects that are very similar. The fixed effects should, to a large extent, capture the external setting of respondents, including how zero-sum their environment was at the time they were completing the survey.

C. *Zero-sum thinking and religious beliefs*

While the WVS has no information on jealousy and limited data on traditional beliefs, we do have information on religious beliefs with traditional religions being one category. When examining the DRC, consistent with the arguments of George Foster, we found that individuals who held stronger traditional beliefs tended to be more zero-sum and those who held stronger Christian beliefs tended be less zero-sum. We now test the generality of this finding using information from the WVS on the religious beliefs of the respondents.

$$\text{Zero Sum}_{i,c,v} = \alpha_{c,v} + \sum_{r \in R} \beta^r \, I^r_{i,c,v} + \mathbf{X}_{i,c,v}\mathbf{\Gamma} + \varepsilon_{i,c,v} \tag{11}$$

where i indexes individuals, c indexes countries, and v survey waves. The indicators $I^r_{i,c,v}$ equal one if individual i reports belonging to religion r among the set of all religions R. The omitted category is for no belief in a religion. We expect the coefficient, β^r to be larger for Christianity and other moralizing god religions that are also less zero-sum in nature, such as Islam or Hinduism, relative to traditional/indigenous religions, which are more zero-sum in nature.

The estimates are reported in Table 5. All specifications include country-by-survey wave fixed effects. In column 2, we also include our set of demographic covariates, and column 3 includes fixed effects for the respondent's income and education. While potentially endogenous to religion, they also may affect both zero-sum thinking and one's religious beliefs. The results indicate that the findings from the DRC are also present in the global sample (and are similar across the three specifications). Relative to individuals who do not believe in a religion, we see that Christians tend to hold beliefs that are less zero-sum. The same is also true for the other big god religions; namely, Islam and Hinduism, as well as Buddhism/Confucianism. We find that Indigenous beliefs, which would contain beliefs that the West would call 'witchcraft,' do not exhibit lower zero-sum thinking and actually tend to hold slightly higher zero-sum beliefs, although this is not statistically significant. Interestingly, we see no effect for Jewish beliefs. The estimate for the 'other' category, which primarily comprises unspecified religions, but also Jains, Sikhs, Zoroastrians, etc, is negative and statistically significant. A breakdown of the religions within the 'other' category is provided in Appendix Table A1.

Thus, consistent with our findings from the DRC, we see that traditional smaller-scale religious beliefs, like witchcraft, tend to be associated with more zero-sum thinking while big god religions, like Christianity, are associated with less zero-sum thinking. This provides some indication that the mechanisms highlighted by Foster may be more general. In addition, because of the prevalence of big god religions in the developed world, his theory may also be as applicable to those living in industrialized nations today not just those living in small-scale societies in the past.

As noted, when thinking about the contemporary setting, the most-relevant consequence of zero-sum thinking may be demotivating beliefs, which reduce industriousness and effort. We now turn to an explicit examination of this possibility using the WVS data.

Table 5: Religion and Zero-Sum Thinking in the WVS

	(1)	(2)	(3)
	Dependent variable:		
	Scale ranging from zero to one with one corresponding to zero-sum beliefs		
Christian	-0.020***	-0.017***	-0.019***
	(0.005)	(0.005)	(0.006)
Muslim	-0.017*	-0.016*	-0.018**
	(0.009)	(0.009)	(0.009)
Hindu	-0.030***	-0.028***	-0.031***
	(0.010)	(0.010)	(0.008)
Buddhism/Confucianism	-0.032***	-0.030***	-0.035***
	(0.010)	(0.010)	(0.011)
Jewish	0.002	0.003	0.004
	(0.015)	(0.016)	(0.023)
Native	0.030	0.032	0.015
	(0.020)	(0.020)	(0.013)
Other	-0.032***	-0.031***	-0.035***
	(0.010)	(0.010)	(0.010)
Income			-0.044***
			(0.008)
Education			-0.013**
			(0.006)
Age, age^2, gender, age*gender, age^2*gender controls	N	Y	Y
Wave-country FE	Y	Y	Y
Number of clusters/countries	74	74	72
Observations	157,089	156,636	121,849
Mean dependent variable	0.402	0.402	0.398
Std. dev. dependent variable	0.309	0.309	0.307

Notes: The table reports OLS estimates in columns 1, 2 and 3. An observation is an individual, weighted to make the sample nationally representative. All specifications include wave-country fixed effects. The dependent variable is a scale variable ranging from zero to one with one representing "People can only get rich at the expense of others" and zero representing "Wealth can grow so there's enough for everyone.". Education and income are categorical variables. Income identifies an individual's household income decile (self-identified). Education is the highest education completed (e.g., secondary). Coefficients are reported with standard errors clustered at the country-level in parantheses. ***, **, and * indicate significance at the 1, 5, and 10 percent levels.).

D. ***Zero-sum thinking and demotivating beliefs***

Our analysis is guided by the model's predicted associations between an individual's zero-sum view, the presence of demotivating beliefs (Proposition 2); lower levels of economic effort (e.g., education) and income (Proposition 3), and lower levels of subjective wellbeing (Proposition 4). The model predicts that a zero-sum view of the world is associated with demotivating beliefs that serve to reduce effort. In different countries, the specifics of these beliefs will be different. In some countries, they may take the form of beliefs in witchcraft or the evil eye. In others, they may take the form of norms of sharing and a dislike for greed and individual accumulation. In others, it may take the form of a belief that hard work does not result in success.

To examine this, we estimate the following equation:

$$Y_{i,c,t} = \alpha_{c,t} + \beta \, \text{Zero Sum}_{i,c,t} + \mathbf{X}_{i,c,t}\mathbf{\Gamma} + \varepsilon_{i,c,t} \tag{12}$$

where i indexes individuals, c country of residence, and t the year of the survey. $\text{Zero Sum}_{i,c,t}$ is our measure of zero-sum for individual i. $\alpha_{c,t}$ denote country and survey year fixed effects. $Y_{i,c,t}$ denotes a measure of the extent to which person i holds a particular demotivating belief.

We begin by first considering the belief of whether or not hard work brings success. Respondents report their answer on a 1 to 10 integer scale. We reorder and normalize the variable such that zero equals full agreement with "hard work doesn't generally bring success" and one equals full agreement with "in the long run, hard work usually brings a better life." (The exact wording of this and all other WVS questions from the analysis is provided in Appendix C.)

The estimates, which are reported in column 1 of Table 6 show that, consistent with Proposition 2, a zero-sum belief is associated with less of a belief that hard work brings success. Within the context of the model, we interpret this as showing that a more zero-sum environment α (as reflected by a perception of the world as being more zero-sum) is positively associated with demotivating beliefs θ.

We next look at two closely-related measures that capture respondents' views of whether people's effort can keep them from poverty. The first variable captures the respondents' view about whether the poor can escape poverty through effort. This is based on the question: "In your opinion, do most poor people in this country have a chance of escaping from poverty, or is there very little of chance escaping?" We create a variable that takes on the value of zero if the respondent chooses the answer "There is very little chance" and one if they choose "They have a

Table 6: Zero-Sum and Demotivating Values/Beliefs

	(1)	(2)	(3)	(4)	(5)	(6)
	Dependent variable:					
	Hard work brings success, 0 = disagreement to 1 = agreement	People are poor because of laziness, 0 = disagreement to 1 = agreement	People have a chance to escape poverty, 0 = disagreement to 1 = agreement	Humiliating to receive money without working for it, 0 = disagreement to 1 = agreement	Important to me to be successful, 0 = disagreement to 1 = agreement	How important is work: 0 = not at all to 1 = very important
Zero-sum beliefs, 0-1	-0.113***	-0.074***	-0.120***	-0.021**	-0.025***	-0.032***
	(0.015)	(0.013)	(0.015)	(0.010)	(0.005)	(0.004)
Demographic controls	Y	Y	Y	Y	Y	Y
Wave-country FE	Y	Y	Y	Y	Y	Y
Observations	246,408	55,871	59,052	60,856	151,270	242,255
Number of clusters/countries	92	50	49	47	78	92
Mean dependent variable	0.637	0.302	0.397	0.648	0.609	0.840
Std. dev. dependent variable	0.320	0.459	0.489	0.296	0.290	0.247
Mean independent variable	0.406	0.393	0.395	0.406	0.417	0.408
Std. dev. independent variable	0.309	0.317	0.315	0.297	0.304	0.309

Notes: The table reports OLS estimates. An observation is an individual, weighted to make the sample nationally representative. Specifications either include wave-country fixed effects or year-country fixed effects depending on whether the sample includes multiple waves. The independent variable is a scale variable ranging from zero to one with one representing "People can only get rich at the expense of others" and zero representing "Wealth can grow so there's enough for everyone." The dependent variables are categorical variables appearing as column heads. Demographic controls include age, age squared, gender, and their interactions. Coefficients are reported with standard errors clustered at the country-level in parantheses. ***, **, and * indicate significance at the 1, 5, and 10 percent levels.

chance" equal to one. The second measure, similar to the first, captures the extent to which the respondent feels that the poor are poor because of a lack of effort. The original survey question is: "Why, in your opinion, are there people in this country who live in need?" We create a variable that takes on the value of 0 if they choose the answer: "Poor because of an unfair society," and the value of one if they choose the answer "Poor because of laziness and lack of willpower." Respondents can also choose "Other answer," which we code as a missing value. Thus, both questions measure the belief that effort and hard work (or lack thereof) is responsible for relative wealth differences. The estimates with these two measures as the outcomes are reported in columns 2 and 3. We find that if an individual has a more zero-sum view of the world, then they have a weaker belief in the effect that hard work/laziness has on economic success.

We next consider three additional measures of demotivating beliefs. The first is the extent to which people get disutility from asking others for money. In a setting where it is shameful to be helped by others, individuals will be more motivated to exert effort to ensure that they can provide for themselves. The survey question asks respondents if they agree with the statement "It is humiliating to receive money without having to work for it?" Respondents can choose strongly agree, agree, neither, disagree, or strongly disagree. We normalize the measure to lie between zero and one and be increasing in respondent's agreement with the statement. The estimates, which are reported in column 4, show that a more zero-sum view of the world is associated with individuals feeling less humiliation when they receive money from others.

The last two questions measure individuals' self-reported importance of success and work. The first question asks the respondent whether they agree that it is important to be "very suc-

Table 7: Zero-Sum Thinking and Economic Wellbeing

	(1)	(2)	(3)	(4)	(5)	(6)
	Dependent variable:					
	Income decile, 0 = bottom decile to 1 = top decile	Family savings, 0=borrowed to 1=saved	Educational attainment, 0 = primary school or less to 1 = university or more	Cognitive vs. manual work tasks, 0=manual to 1=cognitive	Supervising someone at work, 0=no to 1=yes	Class, 0 = lower class to 1 = upper class
Zero-sum beliefs, 0-1	-0.038***	-0.033***	-0.030***	-0.049***	-0.044***	-0.045***
	(0.005)	(0.005)	(0.005)	(0.007)	(0.008)	(0.005)
Demographic controls	Y	Y	Y	Y	Y	Y
Wave-country FE	Y	Y	Y	Y	Y	Y
Observations	229,719	203,716	219,524	116,885	119,888	207,165
Number of clusters/countries	92	90	91	79	79	90
Mean dependent variable	0.403	0.623	0.513	0.439	0.322	0.416
Std. dev. dependent variable	0.257	0.309	0.336	0.345	0.467	0.245
Mean independent variable	0.405	0.407	0.406	0.416	0.416	0.410
Std. dev. independent variable	0.309	0.308	0.309	0.300	0.302	0.307

Notes: The table reports OLS estimates in columns 1 through 6. An observation is an individual, weighted to make the sample nationally representative. Specifications either include wave-country fixed effects since the sample includes multiple waves. The independent variable is a scale variable ranging from zero to one with one representing "People can only get rich at the expense of others" and zero representing "Wealth can grow so there's enough for everyone." The dependent variables are categorical variables appearing as column heads. Demographic controls include age, age squared, gender, and their interactions. Coefficients are reported with standard errors clustered at the country-level in parantheses. ***, **, and * indicate significance at the 1, 5, and 10 percent levels.

cessful. . . to have people recognize one's achievement". The second question asks the respondent how important work is to them. Respondents choose responses ranging from not at all important to very important. Both measures are coded to be increasing in the importance of work. The first is an indicator variable and the second ranges from zero to one. The estimates, reported in columns 5 and 6, show that individuals with a more zero-sum worldview place less importance on their success and on their work. All in all, the estimates suggest that zero-sum thinking is associated with beliefs that demotivate and lead to less economic effort.

E. *Zero-sum thinking, effort, and economic wellbeing*

An additional prediction of the model, laid out in Proposition 3, is that a more zero-sum environment, due to the demotivating beliefs they engender, should also result in less effort and therefore lower income. We now turn to an examination of this prediction. We begin by first measuring income using the respondents' self-reported income on a 1-10 integer scale that we normalize to range from zero to one. We supplement this question with another that provides a measure of the net savings of the respondent's family. Details of the underlying survey question (and all others in the analysis) are provided in the Appendix. We normalize the variable to lie between zero and one and to be increasing in savings. As reported in columns 1 and 2 of Table 7, individuals with a more zero-sum view of the world, report having lower incomes and less savings. Thus, consistent with the model, zero-sum is associated with lower material payoffs.

An important form of productivity-enhancing effort is education. Consistent with the model's

prediction that zero-sum is associated with less effort, as reported in column 3, we find that zero-sum thinking is associated with less educational attainment.

We next turn to an examination of aspects of one's career that is affected by education and also important for the income one earns. In column 4, we measure the extent to which the respondent is employed in a cognitively demanding occupation rather than a manually intensive occupation. The original question asks respondents to report this aspect of the task of their job on a 1-10 scale. Along similar lines, we also examine whether the respondent supervises someone at their work. We find that individuals with more zero-sum thinking are less likely to be employed in cognitively demanding tasks and are less likely to have a supervisory role (columns 4 and 5).

The last outcome we examine is a measure of the socioeconomic class that the respondent reports belonging to, either: (1) Lower class; (2) Working class; (3) Lower middle class; (4) Upper; (5) Upper class. We use integer values reported for each category and normalize the index to lie between 0 and 1. As reported in column 6, we find that zero-sum thinking is associated with a lower self-reported socioeconomic class.

F. *Zero-sum thinking and happiness*

The next prediction of the model that we consider is the prediction summarized by Proposition 4 regarding the relationship between a zero-sum environment and an individual's happiness and subjective well-being. We test Proposition 4 of the model by examining the relationship between zero-sum thinking and two measures of happiness and well-being. One measures 'happiness' and the other 'life satisfaction.' The raw cross-individual relationship between zero-sum and either happiness or life satisfaction, conditional on country by survey wave fixed effects is reported in Figure 4, which shows a binscatter plot. In the raw data, one observes a clear negative relationship between zero-sum and the different measures of happiness and wellbeing.

Estimates of equation (6) with each of the three measures as the outcome of interest are reported in Table 8. Reflecting the relationships in the raw data, we continue to find a negative and significant relationship between zero-sum thinking and life satisfaction.

6. Conclusions

We have studied the evolution of demotivating belief systems, which can take a wide variety of forms: beliefs that success is primarily determined by luck rather than hard work, concerns

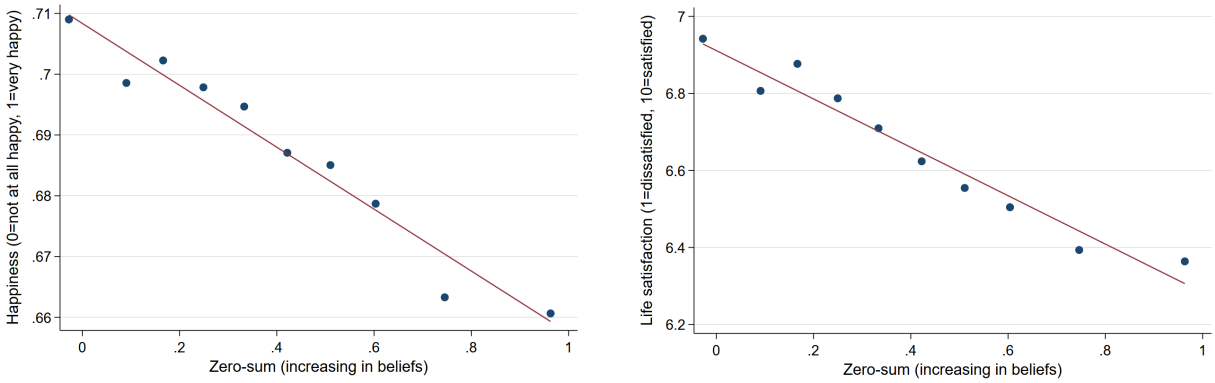


Figure 4: Relationship between the Zero-Sum Measure and Happiness and Perceived Wellbeing.

Table 8: Zero-Sum Thinking and Happiness

	(1)	(2)	(3)
	Dependent Variable:		
	How satisfied are you with your life? 1=completely dissatisfied to 10=completely satisfied	How happy are you? 0=Not at all happy to 1=very happy	How satisfied are you with the financial situation of your household? 1=completely dissatisfied to 10=completely satisfied
Zero-sum beliefs, 0-1	-0.627***	-0.050***	-0.607***
	(0.044)	(0.004)	(0.057)
Demographic controls	Y	Y	Y
Wave-country FE	Y	Y	Y
Observations	245,792	246,094	243,864
Number of clusters/countries	92	92	92
Mean dependent variable	6.638	0.686	5.647
Std. dev. dependent variable	2.391	0.310	0.309
Mean independent variable	0.407	0.406	0.408
Std. dev. dependent variable	0.310	0.249	2.562

Notes: The table reports OLS estimates. An observation is an individual, weighted to make the sample nationally representative. Specifications either include wave-country fixed effects or year-country fixed effects depending on whether the sample includes multiple waves. The independent variable is a scale variable ranging from zero to one with one representing "People can only get rich at the expense of others" and zero representing "Wealth can grow so there's enough for everyone." The dependent variables are categorical variables appearing as column heads. Demographic controls include age, age squared, gender, and their interactions. Coefficients are reported with standard errors clustered at the country-level in parentheses. ***, **, and * indicate significance at the 1, 5, and 10 percent levels.

about adverse consequences of envy from others, and witchcraft beliefs that cast suspicion on the origins of one's success. We have examined how these are formed and shaped by the nature of production and how they affect entrepreneurial activity, innovation, and ultimately economic development.

Motivated by the seminal work of George M. Foster and his 'image of limited good', we first formalized the effects of a zero-sum view of the world on demotivating beliefs. Our analysis showed that demotivating beliefs can spread in environments in which the production process and the resulting economic interactions tend to be zero-sum in nature, meaning that the gains from one individual tend to come at the expense of another.

The effects of zero-sum production are very different depending on whether one looks at their static or dynamic consequences. We find that, statically, demotivating beliefs reduce the negative externalities that arise from effort in a zero-sum environment. Dynamically, the belief systems inhibit learning-by-doing and can thereby trap an economy in a state of low innovation and underdevelopment. Thus, the demotivating beliefs that arise from a view of the world as zero-sum can be an important cultural barrier to long-run economic development.

Having developed a theoretical understanding of Foster's arguments, we then turn to the data, first examining two samples from the Democratic Republic of the Congo. We find strong and robust evidence that, in both samples, respondents who have a more zero-sum view of the world report more jealousy about the success of others, stronger traditional religious beliefs, and weaker Christian beliefs.

We then turned to a global analysis using data from the World Values Survey. This more diverse sample allowed us to examine whether a more scarce zero-sum environment, in fact, leads to more zero-sum thinking. We found that growing up in an environment of economic scarcity (which is more zero-sum) is associated with more zero-sum thinking in adulthood.

Having provided some verification of the zero-sum measure, we then estimated the relationship between zero-sum thinking and a range of demotivating beliefs. We first verified that the same relationship between zero-sum thinking and Christian religious beliefs that we found in the Congolese samples applies to the global WVS sample. We found that a belief in Christianity rather than traditional indigenous religions is associated with less zero-sum thinking and that other big god religions (like Islam, Hinduism, etc) are also associated with less zero-sum thinking.

We looked at a broader set of demotivating beliefs, including those that are particularly

relevant to the modern industrialized world, such as belief in the inherent value of work, beliefs about the returns to hard work (e.g., whether incomes determined by luck or effort), whether it is important to be successful in life, and whether receiving help from others is humiliating or not. We found a very strong association between zero-sum thinking and all demotivating beliefs examined.

The broader sample also allowed us to test the comparative static of Foster and our theory about equilibrium effort and economic production. Consistent with predictions, we find that at the individual-level zero-sum thinking is associated with higher incomes, more educational attainment, more savings, and higher occupational status.

By providing a formalization of Foster's insights and testing the resulting predictions, we were able to assess the validity of the mechanisms he proposed; namely, of relationships between between scarcity, zero-sum thinking, demotivating beliefs, and ultimately economic activity. Our findings suggest that zero-sum thinking is an important factor in understanding the causes and consequences of economic thinking and economic development.

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Online Appendix (Not for Publication)

Appendix A. Mathematical Proofs

Proof of Proposition 1. Under a payoff monotone dynamic for two traits i and j that are present in the population, $\frac{d}{dt}\left[\frac{q_i}{q_j}\right] > 0$ if and only if $F_i(\mathbf{q}) > F_j(\mathbf{q})$.

The fitness of trait i is given by (3). Thus,

$$\begin{aligned} & F_i(\mathbf{q}) > F_j(\mathbf{q}) \\ \iff \quad & (1-\theta_i)\left(1-\tfrac{1}{2}(1-\theta_i)\right)A^2 - \sigma\alpha(1-\theta_i)A^2 > (1-\theta_j)\left(1-\tfrac{1}{2}(1-\theta_j)\right)A^2 - \sigma\alpha(1-\theta_j)A^2. \end{aligned} \tag{A1}$$

Recall that $A > 0$. Hence:

(i) Setting $\theta_j = 0$, (A1) becomes $\theta_i < 2\sigma\alpha$. Since this is independent of the state, part (i) follows immediately.

(ii) If θ_i is chosen to maximize the left-hand side of (A1), then the growth rate of trait i will be higher than any other trait. The unique maximizer is $\theta^* = \sigma\alpha$. Since this is independent of the state, the share of such types will converge monotonically to one as long as $q^*(0) > 0$. □

Proof of Proposition 2. By Corollary 1, for any interior initial state and Δ sufficiently large, $q_i^k(t)$ converges monotonically to one, where θ_i is approximately $\sigma\alpha^k$. Therefore, $\overline{\theta}^k(t)$ converges to approximately $\sigma\alpha^k$. The result follows immediately. □

Proof of Proposition 3. Again, by Corollary 1, for any interior initial state and Δ sufficiently large, $q_i^k(t)$ converges monotonically to one, where θ_i is approximately $\sigma\alpha^k$.

Therefore, $X^k(t)$ given by (4) converges to approximately $\left(1-\sigma\alpha^k\right)^2 A^2$ and $Y^k(t)$ given by (5) converges to approximately $(1-\alpha^k)\left(1-\sigma\alpha^k\right)^2 A^2$. Each limit point is strictly decreasing in α^k, thus establishing the proposition for Δ sufficiently large, as hypothesized.

Proof of Proposition 4. Note that $\hat{W}^k(t)$ given by (6) converges to approximately $(\frac{1}{2} - \alpha^k)\left(1-\sigma\alpha^k\right)^2 A^2$.

$$\frac{d\hat{W}^k}{d\alpha^k} = -(1-\sigma\alpha^k)^2 A^2 - 2\sigma(\tfrac{1}{2}-\alpha^k)(1-\sigma\alpha^k)A^2 \tag{A2}$$

$$= -(1-\sigma\alpha^k)\left[1+\sigma-3\sigma\alpha^k\right]A^2. \tag{A3}$$

For $\alpha^k \in [0,1)$, this is negative if the term in square brackets is positive. For $\sigma \in (0,\frac{1}{2}]$, the term in the square brackets is positive for all $\alpha^k \in [0,1)$. Therefore, $\frac{d\hat{W}^k}{d\alpha^k} < 0$ is strictly decreasing in α^k on $[0,1]$. For $\sigma \in (\frac{1}{2},1]$, the term in the square brackets is positive if and only if $\alpha^k < \frac{1+\sigma}{3\sigma}$.

Hence, again, the limit point is strictly decreasing in α^k for $\sigma \leq \frac{1}{2}$ or $\alpha^k < \frac{1+\sigma}{3\sigma}$, thus establishing the proposition for Δ sufficiently large, as hypothesized. □

Proof of Proposition 5.

$$W^*(t) > W^0(t) \tag{A4}$$

$$\iff (1-\alpha)(1-\sigma\alpha) - \sigma\alpha(1-\sigma\alpha) - \tfrac{1}{2}(1-\sigma\alpha)^2 > (1-\alpha) - \sigma\alpha - \tfrac{1}{2} \tag{A5}$$

$$\iff -(1-\alpha)\sigma\alpha + (\sigma\alpha)^2 - \tfrac{1}{2}(\sigma\alpha)^2 + \sigma\alpha > 0 \tag{A6}$$

$$\iff \sigma\alpha^2\left(1+\tfrac{1}{2}\sigma\right) > 0, \tag{A7}$$

which holds because $\alpha > 0$ and $\sigma \in (0,1]$ by hypothesis. □

Proof of Proposition 6. By (8), for Θ^0, i.e., $\theta_i = 0$ for all i, the development barrier is $D^*(\mathbf{q},\Theta^0) = \delta$. As this is independent of $\mathbf{q}$,

$$\Omega(\Theta^0) = \{(\mathbf{q},A) \in [0,1] \times \mathbb{R}_+ : A > \delta\}. \tag{A8}$$

More generally, by (8), $\frac{dA}{dt} < 0$ in all states $(\mathbf{q},A)$ such that $A < D^*(\mathbf{q},\Theta)$. We have established $D^*(\mathbf{q},\Theta) \geq D^*(\mathbf{q},\Theta^0) = \delta$, and strictly so if there exists i such that θ_i and $q_i > 0$.

Hence, as with Θ^0, if $A(0) < \delta$, then $\frac{dA}{dt}|_{t=0} < 0$. By induction then, $\frac{dA}{dt}|_{t=\tau} < 0$ for all τ until the lower bound $\underline{A}$ is reached.

In addition, we claim that there is perpetual technological regress from an open set of initial conditions $(\mathbf{q},(0),A(0))$ such that $A(0) > \delta$ for any Θ that supports demotivating beliefs. This would imply $\Omega(\Theta) \subsetneq \Omega(\Theta^0)$.

To establish the claim, plot the development barrier D^* as a function of $V \equiv \sum_{i=1}^n q_i(1-\theta_i)^2$ as in Figure A1. By (8), D^* is strictly decreasing in V on $[0,1]$. At $V = 1$, $D^* = \delta$, as in the degenerate set of beliefs. We know from Proposition 1(i) that $\mathbf{q}(t)$ converges to a state in which $\lim_{t\to\infty} q_i(t) > 0$ for some $\theta_i > 0$ as long as $\theta_i < 2\sigma\alpha$, i.e., in an environment that supports demotivating beliefs. Therefore, $V(t)$ converges to some value denoted by $\bar{V} < 1$ in an environment that supports demotivating beliefs.

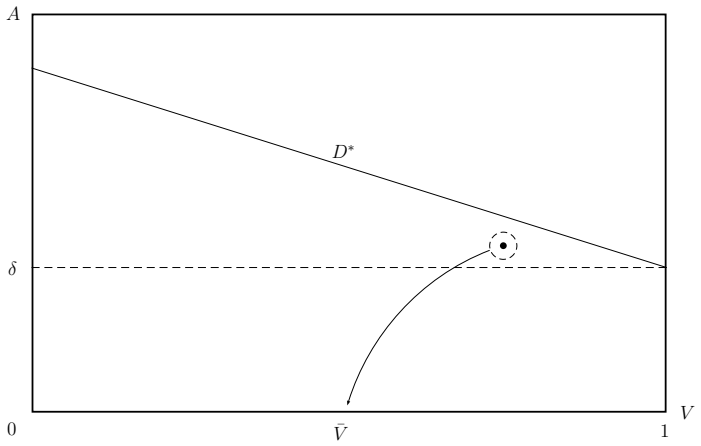


Figure A1: Plot of two-dimensional system (V,A), where D^* is the development barrier, δ is the technology depreciation rate, and $\bar{V}$ is the value of V under the limiting distribution of beliefs $\lim_{t\to\infty} q(t)$.

Hence for $A(0)$ close to but larger than δ and $V(0)$ close to but less than 1 (as shown in the figure), $\frac{dA}{dt}|_{t=0} < 0$ and $\frac{dV}{dt}|_{t=0} < 0$, and the solution path never crosses the development barrier D^*. As shown in the figure, there exists an open set of such initial states. This establishes the claim and the proposition. □

Appendix B. Alternative Formulation: Leader-directed beliefs

Suppose the set of beliefs is binary, $\Theta = \{\theta_1, \theta_2\}$. Let $\theta_1 = 0$, i.e., the true belief, and $\theta_2 = \theta(t)$, which could be a demotivating belief. We assume a community leader or institution tunes $\theta(t)$ over time to maximize the spread of the demotivating belief. Given the binary case, we can rewrite $q(t) = q_2(t)$ and refer to it as the share of 'believers'. *We find that the demotivating belief chosen by the leader is the same as the belief selected by cultural evolution in a bottom-up manner.*

Proposition B1 *Consider a leader who sets $\theta(t)$ to maximize $q(t)$ at each time t.*

(i) The leader chooses belief intensity $\theta^* = \sigma\alpha$ for all t.

(ii) From every initial state $q(0) > 0$, if $\sigma\alpha > 0$, the share of believers $q(t)$ converges monotonically to one.

Proof. (i) Under a payoff monotone cultural dynamic, maximizing the spread of belief 2 from an interior state is equivalent to maximizing

$$\begin{aligned} F_2(q,A) - F_1(q,A) &= A^2\left\{[\sigma + (1-\sigma)q](1-\theta)\left(1-\alpha-\tfrac{1}{2}(1-\theta)\right) + (1-\sigma)(1-q)\left((1-\theta)-\tfrac{1}{2}(1-\theta)^2-\alpha\right)\right\} \\ &\quad -A^2\left\{[\sigma+(1-\sigma)(1-q)]\left(\tfrac{1}{2}-\alpha\right) + (1-\sigma)q\left(\tfrac{1}{2}-\alpha(1-\theta)\right)\right\} \\ &= A^2[\theta\sigma\alpha - \tfrac{1}{2}\theta^2]. \end{aligned} \tag{A9}$$

Hence the maximizer is $\theta^* = \sigma\alpha$.

(ii) Evaluating $F_2 - F_1 = A^2\left[\theta\sigma\alpha - \frac{1}{2}\theta^2\right]$ at θ^* yields

$$F_2(\theta^*) - F_1(\theta^*) = A^2\left[(\sigma\alpha)^2 - \tfrac{1}{2}(\sigma\alpha)^2\right] = \tfrac{1}{2}A^2(\sigma\alpha)^2, \tag{A10}$$

which is positive for $\sigma\alpha > 0$, independently of the state. Hence, in a payoff monotone cultural dynamic, $q(t)$ converges monotonically to one from any initial state $q(0) > 0$. □

First, the familiar belief $\theta^* = \sigma\alpha$ is independent of the state (q, A).[A1] Therefore, θ^* can be set by the leader once and for all at time $t = 0$ without having to be dynamically tuned as (q, A) evolves. Second, only a weak belief system (low θ^*) is optimal when the degree of zero-sumness α is low, because the negative externalities in the system are weak compared to the direct effect

[A1] Since $A(t)$ is a linear transformation of each player's payoffs, θ^* does not depend on the state of technology. In addition, θ^* also does not depend on the current population state because the negative externality imposed on player i from j's effort is independent of i's type.

of demotivating individuals. Third, the design of belief intensity by the leader guarantees the spread and eventual fixation of the demotivating belief system from all interior states, whenever $\sigma\alpha > 0$. All of this mirrors the results of bottom-up cultural evolution.

Appendix C. Data: Sources and Measurement

A. Surveys Conducted in Kanaga, DRC

- Age: How old were you at your last birthday?
- Tribe: Bindi, Tshokwe, Kete, Kongo, Kuba, Lele, Luba, Luluwa, Luntu, Sala, Songe, Tetela.
- zero-sum 1: Which Statement do you agree with? Statement 1: Gaining happiness requires taking it away from others. Statement 2: It is possible for everyone to be happy. 1 Agree strongly with statement 1; 2 Agree with statement 1; 3 Agree with statement 2; 4 Agree strongly with statement 2; 9999 Agree with neither statement; 8888 Don't want to say.
- zero-sum 2: Which Statement do you agree with? Statement 1: A person can only gain power by taking it away from others. Statement 2: A person can gain power without taking it away from others. 1 Agree strongly with statement 1; 2 Agree with statement 1; 3 Agree with statement 2; 4 Agree strongly with statement 2; 9999 Agree with neither statement; 8888 Don't want to say.
- zero-sum 3: Which Statement do you agree with? Statement 1: In trade, if one party gains the other party loses. Statement 2: In trade, it is possible for both parties to gain at the same time. 1 Agree strongly with statement 1; 2 Agree with statement 1; 3 Agree with statement 2; 4 Agree strongly with statement 2; 9999 Agree with neither statement; 8888 Don't want to say.
- zero-sum 4: Which Statement do you agree with? Statement 1: If one person in a village gets very wealthy, other people in the village will become poorer. Statement 2: If one person in a village gets very wealthy, other people in the village will not necessarily become poorer. 1 Agree strongly with statement 1; 2 Agree with statement 1; 3 Agree with statement 2; 4 Agree strongly with statement 2; 9999 Agree with neither statement; 8888 Don't want to say.
- zero-sum 5: Which Statement do you agree with? Statement 1: In Kananga, people only make money when others lose money. Statement 2: In Kananga, no one need lose money for others to make money. 1 Agree strongly with statement 1; 2 Agree with statement 1; 3 Agree with statement 2; 4 Agree strongly with statement 2; 9999 Agree with neither statement; 8888 Don't want to say.

- zero-sum 6: Which Statement do you agree with? Statement 1: In Kananga, businesses only make money when others lose money. Statement 2: In Kananga, no one need lose money for businesses to make money. 1 Agree strongly with statement 1; 2 Agree with statement 1; 3 Agree with statement 2; 4 Agree strongly with statement 2; 9999 Agree with neither statement; 8888 Don't want to say.

- Envy 1: It is so frustrating to see some people succeed so easily. 1 strongly disagree; 2 moderately disagree; 3 slightly disagree; 4 slightly agree; 5 moderately agree; 6 strongly agree.

- Envy 2: It somehow doesn't seem fair that some people seem to have all the talents. 1 strongly disagree; 2 moderately disagree; 3 slightly disagree; 4 slightly agree; 5 moderately agree; 6 strongly agree.

- Envy 3: Frankly, the success of my neighbors makes me resent them. 1 strongly disagree; 2 moderately disagree; 3 slightly disagree; 4 slightly agree; 5 moderately agree; 6 strongly agree.

- Envy 4: I sometimes wish that rich and powerful people lose their advantage. 1 strongly disagree; 2 moderately disagree; 3 slightly disagree; 4 slightly agree; 5 moderately agree; 6 strongly agree.

- Witchcraft beliefs 1: What is the strength of your belief in the existence of other gods and spirits, including ancestor spirits? 1 With no strength at all; 2: With a little bit of strength; 3 With strength; 4 With a lot of strength; 5 With all my heart.

- Witchcraft beliefs 2: How often do you pray other gods and spirits including ancestor spirits? 1 never; 2 very rarely; 3 a few times per year; 4 a few times per month; 5 a few times per week.

- Witchcraft beliefs 3: How often do you participate in rites devoted to other gods and spirits, including ancestor spirits? 1 never; 2 very rarely; 3 a few times per year; 4 a few times per month; 5 a few times per week.

- Witchcraft beliefs 4: Using the figures provided, which set of figures best represents how close you feel to non Christians in Kananga?

- Christian beliefs 1: What is the strength of your belief in the existence of the Christian God? 1 With no strength at all; 2: With a little bit of strength; 3 With strength; 4 With a lot of strength; 5 With all my heart.

- Christian beliefs 2: How often do you pray the Christian God or Jesus? 1 never; 2 very rarely; 3 a few times per year; 4 a few times per month; 5 a few times per week.

- Christian beliefs 3: How often do you attend church? 1 never; 2 very rarely; 3 a few times per year; 4 a few times per month; 5 a few times per week.

- Christian beliefs 4: Using the figures provided, which set of figures best represents how close you feel to Christians in Kananga?

B. World Values Survey

- Income decile: 0 = bottom decile to 1 = top decile [X047_WVS][A2] On this card is an income scale on which 1 indicates the lowest income group and 10 the highest income group in your country. We would like to know in what group your household is. Please, specify the appropriate number, counting all wages, salaries, pensions and other incomes that come in.

- Family savings: 0=borrowed to 1=saved [X044] During the past year, did your family: 1 Save money; 2 Just get by; 3 Spent some savings and borrowed money; 4 Spent savings and borrowed money; -1 Don't know; -2 No answer.

- Educational attainment: 0 = primary school or less to 1 = university or more [X025 and X025A_01][A3] 1 Inadequately completed elementary education; 2 Completed (compulsory) elementary education; 3 Incomplete secondary school: technical/vocational type/(Compulsory) elementary education and basic vocational qualificat; 4 Complete secondary school: technical/vocational type/Secondary, intermediate vocational qualification; 5 Incomplete secondary: university-preparatory type/Secondary, intermediate general qualification; 6 Complete secondary: university-preparatory type/Full secondary, maturity level certificate; 7 Some university without degree/Higher education - lower-level tertiary

[A2]In waves 1 through 4, the question text also instructed respondents to count income before taxes and other deductions.

[A3]These education codes changed noticeably in Wave 7 (not listed here). For analysis, we collapse the education groups into the smallest yet not overlapping groups as possible.

certificate; 8 University with degree/Higher education - upper-level tertiary certificate; -5 Missing; Unknown; -4 Not asked in survey; -3 Not applicable; No formal education; -2 No answer; -1 Don't know.

- Cognitive vs. manual work tasks: 0=manual to 1=cognitive [X053][A4] Are the tasks you perform at work mostly manual or mostly cognitive? If you do not work currently, characterize your major work in the past. Use this scale where 1 means "mostly manual tasks" and 10 means "mostly cognitive tasks." 1 Mostly manual tasks to 10 Mostly non-manual tasks

- Supervising someone at work: 0=no to 1=yes [X031] Do you or did you supervise other people at work? 0 No; 1 Yes.

- Class: 0 = lower class to 1 = upper class [X045] People sometimes describe themselves as belonging to the working class, the middle class, or the upper or lower class. Would you describe yourself as belonging one of them? 1 Upper class; 2 Upper middle class; 3 Lower middle class; 4 Working class; 5 Lower class; -5 Missing or Unknown.

- Hard work brings success: 0 = disagreement to 1 = agreement [E040] Now I'd like you to tell me your views on various issues. How would you place your views on this scale? 1 means you agree completely with the statement on the left; 10 means you agree completely with the statement on the right; and if your views fall somewhere in between, you can choose any number in between. 1 In the long run, hard work usually brings a better life; 10 Hard work doesn't generally bring success - it's more a matter of luck and connections; -5 Missing or Unknown; -4 Not asked in survey; -3 Not applicable; -2 No answer; -1 Don't know.

- People are poor because of laziness: 0 = disagreement to 1 = agreement [E131] Why, in your opinion, are there people in this country who live in need? Here are two opinions: Which comes closest to your view? 1 Poor because of laziness and lack of will power; 2 Poor because society treats them unfairly; 3 Other answer; -1 Don't know; -2 No answer; -4 Not asked.

- People have a chance to escape poverty: 0 = disagreement to 1 = agreement [E132] In your opinion, do most poor people in this country have a chance of escaping from poverty, or is

[A4]Wave 5 used the word "cognitive" while wave 6 used the word "intellectual."

there very little of chance escaping? 1 They have a chance; 2 There is very little chance; 3 Other answer; -1 Don't know; -2 No answer; -4 Not asked.

- Humiliating to receive money without working for it: 0 = disagreement to 1 = agreement[C037][A5] Do you agree with "Humiliating to receive money without having to work for it"? 1 Strongly agree; 2 Agree; 3 Neither agree or disagree; 4 Disagree; 5 Strongly disagree; -1 Don't know; -2 No answer; -4 Not asked; -5 Missing or Unknown.

- Important to me to be very successful and have achievements recognized: 0 = disagreement to 1 = agreement [A194] Now I will briefly describe some people. Using this card, would you please indicate for each description whether that person is very much like you, like you, somewhat like you, not like you, or not at all like you? "Being very successful is important to this person; to have people recognize one's achievements." 1 Not at all like me; 2 Not like me; 3 A little like me; 4 Somewhat like me; 5 Like me; 6 Very much like me; -1 Don't know; -2 No answer; -4 Not asked; -5 Missing or Unknown.

- How important is work: 0 = not at all to 1 = very important [A005][A6] For each of the following aspects, indicate how important it is in your life. Would you say it is very important, rather important, not very important or not important at all: Work. 1 Very important; 2 Rather important; 3 Not very important; 4 Not at all important; -1 Don't know; -2 No answer; -4 Not asked; -5 Missing or Not available.

- Important for job to have good pay: 0 = disagreement to 1 = agreement [C011] Here are some aspects of a job that people say are important. Please look at them and tell me which ones you personally think are important in a job? Good pay. 0 Not mentioned; 1 Mentioned; -1 Don't know; -2 No answer; -4 Not asked; -5 Missing or Unknown; -10 multiple answers Mail; -9 no follow-up; -8 follow-up non response; -7 matrix not applied; -6 na (survey break-off).

- Important that a child saves money and things: 0 = not mentioned to 1 = important [A038][A7] Here is a list of qualities that children can be encouraged to learn at home. Which,

[A5]Wave 5 changed the wording to "It is humiliating to receive money without working for it."

[A6]In wave 2, work was put as the first of a list of five things that people could rate as important. The ordering changed for the following waves, such that work was listed towards the end.

[A7]Ordering and number of qualities changes throughout the waves.

if any, do you consider to be especially important? Please choose up to five. Thrift saving money and things. 0 Not mentioned; 1 Important; -1 Don't know; -2 No answer; -4 Not asked.

- Important to me to be rich: 0 = disagreement to 1 = agreement [A190] Now I will briefly describe some people. Using this card, would you please indicate for each description whether that person is very much like you, like you, somewhat like you, not like you, or not at all like you? "It is important to this person to be rich; to have a lot of money and expensive things." 1 Not at all like me; 2 Not like me; 3 A little like me; 4 Somewhat like me; 5 Like me; 6 Very much like me; -1 Don't know; -2 No answer; -4 Not asked; -5 Missing or Unknown.

- Work is a duty toward society: 0 = disagreement to 1 = agreement [C039] Do you agree or disagree with the following statements? Work is a duty towards society. 1 Strongly agree; 2 Agree; 3 Neither agree or disagree; 4 Disagree; 5 Strongly disagree; -1 Don't know; -2 No answer; -4 Not asked; -5 Missing or Unknown.

- Competition is good: 0 = disagreement to 1 = agreement [E039][A8] Now I'd like you to tell me your views on various issues. How would you place your views on this scale? 1 means you agree completely with the statement on the left; 10 means you agree completely with the statement on the right; and if your views fall somewhere in between, you can choose any number in between. Competition, good or harmful? 1 Competition is good. It stimulates people to work hard and develop new ideas; 10 Competition is harmful. It brings out the worst in people.; -5 Missing or Unknown; -4 Not asked in survey; -3 Not applicable; -2 No answer; -1 Don't know.

- How satisfied are you with your life: 1 = completely dissatisfied to 10 = completely satisfied [A170] How satisfied are you with the financial situation of your household? If "1" means you are completely dissatisfied on this scale, and "10" means you are completely satisfied, where would you put your satisfaction with your household's financial situation? 1 Dissatisfied; 10 Satisfied; -1 Don't know; -2 No answer; -4 Not asked; -5 Missing or Unknown.

[A8] Wave 7 changes the wording to only "competition is good" and "competition is harmful."

- How happy are you: 0 = Not at all happy to 1 = very happy [A008] Taking all things together, would you say you are: 1 Very happy; 2 Quite happy; 3 Not very happy; 4 Not at all happy; -1 Don't know; -2 No answer; -4 Not asked; -5 Missing or Not available.

- How satisfied are you with the financial situation of your household: 1 = completely dissatisfied to 10 = completely satisfied [C006] How satisfied are you with the financial situation of your household? If "1" means you are completely dissatisfied on this scale, and "10" means you are completely satisfied, where would you put your satisfaction with your household's financial situation? 1 Dissatisfied; 10 Satisfied; -1 Don't know; -2 No answer; -4 Not asked; -5 Missing or Unknown.

Appendix D. Tables and Figures

Table A1: Religions in the WVS 'other' category

Religion	**N**
Bahai	10
Cao Dai	11
Essid	4
Jain	55
Other	2,557
Other: Brasil: Espirit,candomblé,umbanda	3
Other: Oriental	12
Other: Philippines (less 0.5%)	19
Sikh	49
Spiritista	33
Spiritualists	4
Zoroastrian	8
Yiguan Dao	39
Total	2,804