The Role of Passionate Individuals in Economic Development

Roman Zakharenko*

July 11, 2011

Abstract

This paper combines two theories – that of "passionate individuals" by Gumilev (2009(1989)) and Memetics by Dawkins (1976) – to develop a growth theory that associates higher social development with higher individual intrinsic motivation to solve problems of social importance (i.e. make "cultural contributions"). Individuals derive utility from the number of surviving children and from cultural fitness, defined as the amount of appreciation ("honor") of one's cultural contribution by future generations. To make a contribution, one must study/honor contributions of the past, which leads to multiple steady states. In the *survival* steady state, individuals expect no future appreciation of their contribution, which makes them allocate all energy onto family and care little about past contributions. In the *passionate* steady state, individuals expect high appreciation of their contribution and spend on it a lot of energy, which makes them highly appreciate contributions of the past. Empirical implications of the theory are also discussed.

Keywords: passionate individuals, human values, poverty traps, memetics, economic growth

JEL codes: O11, O49, Z13

*International College of Economics and Finance, Moscow, Russia. Email: rzakharenko@hse.ru. Web: www.rzak.ru.

A monument, unforged, I for myself erected.
A common path to it will not be ever lost,
And its unheedful head reigns higher than
respected,
The known Alexandrian Post.
I shall not die a whole, but in the tokened lyre
My soul will outlive my flesh and won't decay.
I will be honored till in underlunar sphere
Lives my like who has much to say.

Alexander Pushkin, *Exegi Monumentum.*
Translation by Boris Leyvi

1 Introduction

There are two major theoretical paradigms of human lifetime objectives. In Economics, it is typically assumed that humans maximize a private-consumption-based utility function; in some applications, consumption of children is included (Becker, Murphy, and Tamura 1990), while in others, humans are concerned not only about the absolute level of consumption but also about relative to that of one's contemporaries (Robson 1992). In theoretical biology, it is assumed that humans, along with all other living organisms, should be concerned about their reproductive success which is (approximately) equal to the number of surviving children. At the level of the household, the two paradigms produce very similar predictions about behavior.

Yet, many individuals who have made a major impact on the development of their societies do not seem to have followed any of the two paradigms. What was the motivation of Peter the Great of Russia? He was certainly not concerned about genetic fitness, as he imprisoned his own son who opposed Peter's methods of governance. What was the motivation of the authors of the American Declaration of Independence? Upon signing, one of the coauthors, Benjamin Franklin, said to the others (Malone 1975): "we must indeed all hang together, or most assuredly we shall all hang separately", hence the authors were perfectly aware that their effort to change the course of history reduces their own life expectancy without adding much to wealth or genetic success. What was the motivation of the members of the Decembrist movement who attempted to turn the Russian monarchy into the republic? They were some of the most respected and prosperous members of the society, and could

hardly enjoy any additional economic benefits out of their life-threatening effort. What was the motivation of Martin Luther King, the American civil rights activist? His discounted sum of lifetime consumption could have been higher had he not had a dream.

These, and many other, individuals seem to have made a large social impact by changing, or attempting to change, the social order because making such an impact was their ultimate goal rather than a method of achieving other goals; the traditional consumption- and genetic-based incentives seem to have played a limited role in their decision making process.

On the other hand, members of societies with inefficient/underdeveloped social orders are often described as following consumption-based or genetic-based incentives too closely. Banfield (1958), for example, views the roots of Southern Italy underdevelopment in the "amoral familism" of the local population, which he defines as the pursuit of the following objective function:

> Maximize the material, short-run advantage of the nuclear family; assume that all others will do likewise.

The above definition seems to be a near-perfect match to the human objectives assumed by mainstream economists, as well as by theoretical biologists.[1] Banfield also emphasizes that in the society of "amoral familists", any large-scale project of social importance is bound to fail, as it requires a large amount of non-material and unselfish (i.e. not leading to increased well-being of own family) motivation. Moreover, a person who undertakes a project of social importance is likely to face distrust and scepticism of the community members (page 20):

> When an interviewer explained to a young teacher [what] a "public-spirited" person is..., the teacher said: "No one in town is animated by the desire to do good for all of the population. Even if sometimes there is someone apparently animated by this desire, in reality he is interested in his own welfare and he does his own business."

Tabellini (2008) is a recent attempt to formalize the dichotomy between "amoral familists" and prosocial behavior, with the latter leading to higher wealth.

Another account of the fact that people in less developed societies are more inclined to follow the objectives prescribed by theoretical biology is Caldwell and Caldwell (1987). In their study of the causes of very high fertility in Sub-Saharan Africa, which is viewed to be one of the main causes of poverty in the region, the authors discover that parents choose to

[1] The match would be perfect is the term "short-run" was removed

have as many children as they can because family extinction is the worst religious fear that they have, and that even four or five children are believed to be insufficient to guarantee survival of the family. These beliefs, therefore, are shaped to fit the standard theoretical-biology objective of maximizing one's genetic success; citizens of the modern highly developed societies, on the other hand, especially those mentioned earlier in this paper, seem to pursue or have pursued very different objectives.

In this paper, I propose a formal growth theory that states that societies become more economically developed when their members depart from their biological instincts of maximizing genetic fitness, and when they invest their time and effort into solving problems that have social value without the aim to improve own [biological] well-being. Much of the intuition and terminology of the proposed theory is borrowed from a popular among Russian scholars theory of *passionate individuals* by the historian Lev Gumilev (Gumilev 2009(1989)), relevant parts of which are described in the paragraphs that follow.

1.1 Gumilev's theory of passionate individuals

Gumilev stated that individuals may differ in the extent to which they are passionate, that is, in the amount of their intrinsic motivation to achieve goals of social importance. Gumilev has proposed several levels of passionate behavior, with the highest being the willingness to achieve a goal even at the cost of one's life and/or lives of other people; as examples of such behavior, he proposes Alexander the Great and Jeanne d'Arc who seemingly were not particularly concerned about own physical well-being. The lowest level of passionate behavior, or "zero" level, according to Gumilev, is the level of individuals who fully accommodate to the existing environment and show no effort to improve it; the "amoral familism" described by Banfield (1958) is a good illustration.

Gumilev states that the proportion of individuals in a particular society showing passionate effort may differ considerably, both across societies and over time. He also emphasizes that the amount of passionate effort in a particular society may increase considerably over short periods of time and for no apparent reason, which he refers to as the *passionate push*.[2] The passionate push leads to major changes in the political and/or religious institutions of the respective societies; it can also lead to long-distance migrations and military conquests. European Renaissance, the Arabic conquests in the 7th and 8th centuries, the empire of the Huns in the 4th century – all these serve as examples of Gumilev's passionate push. All these

[2]Gumilev also stressed that the passionate push often occurs in several societies simultaneously; I do not pursue this idea in my research

are also examples of rapid increases in the degree of cooperation and coordination between people, leading to improvements in the levels of social development.

The idea of the passionate push seems to be closely related, both in its labeling and content, to the theory of the *big push* originally proposed by Rosenstein-Rodan (1943) and formalized by Murphy, Shleifer, and Vishny (1989). According to the theory, an economic system may rest in two self-sustainable equilibria – less efficient "traditional" and a more efficient "modern;" a considerable external effort is required to move the system from one equilibrium to another. A logical extension of this intuition is that observed changes in the economic system may be rare but large and long-lasting, which is also true about Gumilev's intuition of the "passionate push". In the formal theory outlined below, I borrow the intuition of multiple equilibria to model Gumilev's insights about the roots of development and underdevelopment.

Gumilev did not address the most studied by the Economists instance of the big push, the British industrial revolution. However, a recent study by Mokyr (2010) argues that the industrial revolution could have occurred due to changes in people's beliefs and values, in particular, due to popularization of the Enlightenment movement in Great Britain. Thus, the British industrial big push might also be a passionate push.

Having established that passionate individuals do not follow conventional genetic- or consumption-based incentives, for a formal theory of passionate behavior, we need to make credible assumptions about their objectives. Gumilev only mentions that the modes of passionate behavior may be different and may include the desire for power, desire for glory, vanity, greed, etc. Thus, Gumilev's own insights about the microfoundations of the passionate behavior are somewhat vague; for a more "rigorous" formulation, I refer to another theory, which has been seemingly developed independently from that of Gumilev's, but which overlaps in many respects.

1.2 Memetics and the microfoundations of passionate behavior

In the Chapter 11 of his book, Dawkins (1976) introduces the concept of the *meme*, or a "virus of the mind," which may be passed from one human brain to another, much like genes are copied from one living organism to the next. Blackmore (2000) argues that the memes may alter the behavior of their human hosts in such a way that humans spread their memes (or maximize their "memetic success") instead of maximizing their genetic success. As an example of "memetic" behavior, Dawkins (1976) mentions Socrates who insisted on his philosophic views even at the cost of his life. As Dawkins states, "Socrates may or may

not have a gene or two alive in the world today, ... [but his memes] are still going strong". In other words, Socrates' decision to choose death over life was rational if he derived utility from the expectation that his name will be honored more than two millenia later.

The above story seems to be a close match with the Gumilev's story of passionate individuals; the behavior of Socrates fits well into the Gumilev's definition of passionate behavior. On the other hand, Gumilev's examples of passionate behavior – Alexander the Great and Jeanne d'Arc – could be equally used by Dawkins to motivate his theory.

Neither Dawkins nor his followers discussed the implications of their theory to Development Economics. It should be noted, however, that Dawkins's motivating example — Socrates — lived in the most developed, for its time, society in the world. Hence, the two theories are quite well-aligned again.

Memetics was criticized for lack of empirical evidence of the existence of the "viruses of the mind"; for this reason, it was not recognized as a science. But, as elaborated above, its intuition may be useful in the analysis of the passionate behavior. In the formal analysis that follows, I borrow "memetic" intuition to model human objectives. To avoid criticisms of the "pure" memetics, I do not claim the existence of the memes and assume that one's cultural success, along with genetic success, enters the objective function of humans themselves. A related theory is developed by Bisin and Verdier (2001) who assume that parents derive utility from their cultural traits being absorbed by children.

1.3 History versus expectations

In dynamic models with multiple steady states, there are two forces that drive the formation of such steady states. One is *history* – i.e. an economy that was in a "bad" state yesterday has inherited some characteristics that drive the economy into the bad state today; an economy that started in a good state inherits other characteristics that enable it to remain in a good state. The story of *expectations* is relevant when agents' well-being depends on future decisions (those of their successors, or those of their contemporaries in the future periods); if agents expect that future decisions will be "bad", they undertake bad decisions today, which makes expectations self-fulfilling. Krugman (1991) is an excellent discussion of the dichotomy.

Which of the two – history or expectations – is relevant for an explanation of the multiple steady states of passionate behavior? Dawkins' explanation of the behavior of Socrates points to the expectations story: he behaved the way he behaved because he correctly *expected* that his memes will be "going strong" for a long time. An additional motivation comes from

another case study of a passionate behavior, namely Alexander Pushkin's poem used as the epigraph to this paper. The last two lines state "I will be honored till in underlunar sphere lives my like who has much to say", in other words Pushkin was motivated to write his passionate poems by the correct expectation that there will be other poets in the future who will admire Pushkin's work. Hence, in the formal model that follows we pursue the story of self-fulfilling expectations.

2 The model

2.1 Setup

Consider an infinite-time-horizon dynamic environment, in which each of the discrete generations is populated by a continuum of individuals. Individuals live for one period of time; the set of individuals of a generation t is labeled as G_t. Although it will be assumed that each individual is concerned about the number of surviving offspring, endogenizing the population size is not the goal of this paper. Hence, we assume that the mass of individuals within each generation is unity (e.g. it can be constrained by the amount of time-invariant resources such as land).

Individuals are endowed with T units of time, which they divide between two types of activities: passionate effort,[3] labeled $e(j)$ for individual $j \in G_t$, and survival effort $T - e(j)$. For the purposes of this paper, passionate effort can be defined as the effort to solve problems of social importance without the aim to improve own genetic fitness. Conducting research (especially by those whose income is fixed), writing poems, making inventions, volunteering, conducting political reforms, and leading armies could serve as examples of passionate effort. The survival effort is the effort to solve problems of family importance, such as procuring food, wealth, and shelter for oneself and one's family. Organizing a public fund is an example of passionate effort; stripping from a public fund is an example of survival effort. Note that effort in this paper is measured in the units of time.

The two types of effort result in two types of output. The passionate effort results in the *cultural contribution* $c(j)$, measured in terms of the number of research articles or poems written, inventions or political reforms made; in the language of Alexander Pushkin, $c(j)$ is the height of the "unforged monument to oneself". The survival effort results in the *biological*

[3]Gumilev (p.68) used the term "passionarnoye napryazhenie," which is a close match to "passionate effort".

energy output $b(j)$, which is the total amount of energy allocated onto well-being of one's family.

One unit of survival effort produces A_t units of biological energy output, where A_t is the total factor productivity at time t; hence, $b(j) \equiv A_t(T - e(j))$. The total factor productivity is assumed to be equal to the integral of all cultural contributions of the past:

$$A_t \equiv c_0 + \sum_{n=1}^{t-1} \int_{i \in G_n} c(i) di \tag{1}$$

where $c_0 > 0$ is "pre-existing" stock of culture at the beginning of the first period.[4] The production function of the cultural contribution is more complex and requires acquisition of knowledge about cultural contributions of past generations. For example, Alexander Pushkin, prior to writing his passionate poem, had to learn ancient Roman poetry in general and Horace in particular. For mathematical tractability, I assume that studying cultural contributions of the past and production of own cultural contribution occur simultaneously:[5]

$$c(j)_{(j \in G_t)} \equiv \left(\sum_{n=1}^{t-1} \int_{i \in G_n} c(i)^{\beta} y(i,j)^{\alpha} di + c_0^{\beta} y(0,j)^{\alpha} \right)^{\frac{1}{\beta}} \tag{2}$$

where $y(i,j)$ is the intensity of learning of person j from i (e.g. the extent to which Pushkin has studied the art of Horace), $\alpha \in (0,1)$ and $\beta \in (0,1)$ are the parameters that govern the extent to which cultural contributions of the past can be substituted between each other while producing own cultural contribution. The intensity $y(i,j)$ is the choice of j; one unit of such learning intensity incurs a learning time cost of $\tau(i,j)$ (e.g. a lower τ means an easier accessibility of Horace's works for Pushkin). The time spent studying all past contributions

[4]The assumed production function of A_t has a number of important limitations. First, not every passionate effort results in a positive cultural contribution. The most notorious counterexample is Adolf Hitler who was indeed showing a high passionate effort but who's contribution is evaluated by most as highly negative. To account for the fact, the model could be generalized to cultural contribution being a stochastic function of passionate effort. Second, not every positive cultural contribution leads to a technological advancement, for example paintings produced during the Renaissance did not improve people's physical well-being. To account for this fact, the model can be generalized to multiple types of cultural contributions, with some of them leading to TFP growth and others being "neutral". Then, there might be multiple types of the passionate push, with some of them leading to technological growth, and others leading to development of arts.

[5]Alternatively, one could assume Leontief production function of cultural contribution, with passionate effort *per se* and time spent on learning about past cultural contributions being the two inputs of production

must add up to the time allocated onto the passionate effort:

$$\sum_{n=1}^{t-1} \int_{i \in G_n} \tau(i,j) y(i,j) di + \tau(0,j) y(0,j) \leq e(j) \tag{3}$$

Finally, we complete the model by defining the objective function of the decision makers. It is assumed that they derive utility from a combination of *genetic fitness* and *cultural fitness*. The genetic fitness, denoted x_B, by complete analogy with theoretical biology is the share of one's genes in the next generation; we assume it is proportional to one's biological energy output and is inversely related to the biological energy output of others:

$$x_B(j)_{(j \in G_t)} \equiv \frac{b(j)}{\int_{j' \in G_t} b(j') dj'} \tag{4}$$

The cultural fitness, denoted x_C, is the extent to which one's cultural contribution has been studied by subsequent generations:

$$x_C(j)_{(j \in G_t)} \equiv \sum_{n=t+1}^{\infty} \int_{k \in G_n} y(j,k) dk \tag{5}$$

In the language of Alexander Pushkin, $x_C(j)$ may also be viewed as the amount of honor that one has received for his/her cultural output.

Intuitively, genetic fitness is essential for one's well-being, as the vast majority of people have or desire to have children; cultural fitness, on the other hand, is not essential because, as discussed in the introduction of this paper, members of some societies seem to be concerned only about genetic success. The simplest utility function that captures the above intuition is the following:

$$U(x_B(j), x_C(j)) \equiv u(x_B(j)) + x_C(j) \tag{6}$$

where $u(\cdot)$ satisfies the Inada conditions (increasing, concave, has infinite slope at zero). Specifically, I choose the following function: $u(x) = x^\gamma, \gamma \in (0,1)$, for reasons that will be apparent on page 12.

2.2 Analysis

We begin the analysis by calculating the optimal learning intensities $y(i,j)$, taking one's passionate effort $e(j)$ as given. The optimal choice of j depends on how j's cultural con-

tribution is expected to affect his cultural fitness. While there may be many equilibria in this environment, we analyze the "focal" equilibrium in which a higher cultural contribution means a higher cultural fitness. As will be shown by (7), this property is recursive: if it is true for all members of all generations succeeding t, it must also be true for all members of generation t and, by inverse induction, for all generations preceding t, for arbitrary t.

With this assumption, optimal learning intensities can be calculated by maximizing (2) with respect to $y(i,j)$ subject to (3). Solving a constrained optimization problem yields that an optimal learning intensity $y(i,j)$ is proportional to $c(i)^{\frac{\beta}{1-\alpha}}\tau(i,j)^{-\frac{1}{1-\alpha}}$. To satisfy the time constraint (3), the learning intensity must be equal to

$$y(i,j)_{(i\in G_{t'},j\in G_t)} = \frac{e(j)}{L(j)}c(i)^{\frac{\beta}{1-\alpha}}\tau(i,j)^{-\frac{1}{1-\alpha}} \tag{7}$$

$$L(j) \equiv c_0^{\frac{\beta}{1-\alpha}}\tau(0,j)^{-\frac{\alpha}{1-\alpha}} + \sum_{n=1}^{t-1}\int_{i'\in G_n} c(i')^{\frac{\beta}{1-\alpha}}\tau(i',j)^{-\frac{\alpha}{1-\alpha}}di' \tag{8}$$

The parameter $L(j)$ is labeled as the *learning environment* of the individual j; it represents the ease of access to the knowledge about the cultural contributions of the past. With a better learning environment, a decision maker demands less of a cultural contribution of a particular individual from the past, due to better access to the alternatives.

With these learning intensities, the maximal cultural contribution one can make is

$$\begin{aligned} c(j) &= \left(\frac{e(j)}{L(j)}\right)^{\frac{\alpha}{\beta}}\left(c_0^{\frac{\beta}{1-\alpha}}\tau(0,j)^{-\frac{\alpha}{1-\alpha}} + \sum_{n=1}^{t-1}\int_{i\in G_n} c(i)^{\frac{\beta}{1-\alpha}}\tau(i,j)^{-\frac{\alpha}{1-\alpha}}\right)^{\frac{1}{\beta}} = \left(\frac{e(j)}{L(j)}\right)^{\frac{\alpha}{\beta}} L(j)^{\frac{1}{\beta}} \\ &= e(j)^{\frac{\alpha}{\beta}}L(j)^{\frac{1-\alpha}{\beta}} \end{aligned} \tag{9}$$

From (7), we can also calculate the cultural fitness of a particular individual $j \in G_t$:

$$\begin{aligned} x_C(j) &= c(j)^{\frac{\beta}{1-\alpha}}\sum_{n=t+1}^{\infty}\int_{k\in G_n}\frac{1}{L(k)}e(k)\tau(j,k)^{-\frac{1}{1-\alpha}}dk \\ &= e(j)^{\frac{\alpha}{1-\alpha}}L(j)\sum_{n=t+1}^{\infty}\int_{k\in G_n}\frac{e(k)}{L(k)}\tau(j,k)^{-\frac{1}{1-\alpha}}dk \end{aligned} \tag{10}$$

while the genetic fitness is

$$x_B(j) = \frac{A_t(T-e(j))}{A_t\int_{j'\in G_t}(T-e(j'))dj'} = \frac{T-e(j)}{T-\int_{j'\in G_t}e(j')dj'} \tag{11}$$

We end up with a unidimensional optimization problem in which individuals choose their optimal passionate effort $e(j)$.

For mathematical tractability of the analysis that follows, we assume a specific form of the learning costs: $\tau(i,j)_{(i\in G_n, j\in G_t)} = \tau^{t-n}$, with $\tau > 1$. Intuitively, learning about cultural contributions of individuals from a more distant past is more difficult. Additionally, we introduce the following notation:

$$\begin{aligned} \overline{e}_t &\equiv \int_{j'\in G_t} e(j')dj' \\ \overline{e^{\frac{\alpha}{1-\alpha}}}_t &\equiv \int_{j'\in G_t} e(j')^{\frac{\alpha}{1-\alpha}}dj' \end{aligned}$$

Given the assumed structure of the learning costs, the learning environments of all members of a given generation t are the same and are denoted by L_t; (8) can be transformed into

$$L_t = c_0^{\frac{\beta}{1-\alpha}}\tau^{-t\frac{\alpha}{1-\alpha}} + \sum_{n=1}^{t-1} L_n \overline{e^{\frac{\alpha}{1-\alpha}}}_n \tau^{-(t-n)\frac{\alpha}{1-\alpha}} = c_0^{\frac{\beta}{1-\alpha}}\tau^{-t\frac{\alpha}{1-\alpha}} \prod_{n=1}^{t-1}\left(1+\overline{e^{\frac{\alpha}{1-\alpha}}}_n\right) \tag{12}$$

The optimization problem of $j \in G_t$, given (6), (10), and (11), becomes

$$\max_z U(z, \overline{e}_t, V_t) \tag{13}$$

where

$$U(z, \overline{e}_t, V_t) \equiv u\left(\frac{T-z}{T-\overline{e}_t}\right) + z^{\frac{\alpha}{1-\alpha}}V_t \tag{14}$$

and where V_t is the *honor return to passionate effort*:

$$\begin{aligned} V_t \equiv V(\overline{e}_{t+1}, \overline{e}_{t+2}, ...; \overline{e^{\frac{\alpha}{1-\alpha}}}_t, \overline{e^{\frac{\alpha}{1-\alpha}}}_{t+1}, ...) &\equiv L_t \sum_{n=t+1}^{\infty} \frac{1}{L_n}\tau^{-(n-t)\frac{1}{1-\alpha}}\overline{e}_n = \sum_{n=t+1}^{\infty} \frac{\overline{e}_n \tau^{-(n-t)}}{\prod_{s=t}^{n-1}\left(1+\overline{e^{\frac{\alpha}{1-\alpha}}}_s\right)} \\ &= \frac{\overline{e}_{t+1} + V_{t+1}}{\tau\left(1+\overline{e^{\frac{\alpha}{1-\alpha}}}_t\right)} \end{aligned} \tag{15}$$

Intuitively, the honor return to passionate effort is a measure of the expected intensity of appreciation of one's cultural contribution by future generations. It does not depend on the decisions of the past, which considerably simplifies the analysis.

For mathematical tractability of the analysis that follows, we constrain ourselves to the case $\alpha = \frac{1}{2}$. Note that in this case $\overline{e^{\frac{\alpha}{1-\alpha}}}_t = \overline{e}_t, \forall t$. The optimal passionate effort $e(j) =$

$\arg\max_z U(z, \overline{e}_t, V_t)$ can then be found from the first-order condition of (13):

$$U_z(e(j), \overline{e}_t, V_t) \equiv -u'\left(\frac{T-e(j)}{T-\overline{e}_t}\right)\frac{1}{T-\overline{e}_t} + V_t \begin{cases} = 0 & , e(j) > 0 \\ \leq 0 & , e(j) = 0 \end{cases} \tag{16}$$

The second derivative of $U(z, \overline{e}_t, V_t)$ with respect to z is globally negative and hence there exists a unique optimal passionate effort. It is positive if and only if the honor return to such effort V_t exceeds a certain positive threshold.

Formally, the problem outlined above is the problem of finding equilibria in a game with a continuum of players divided between an infinite number of discrete generations, in which each player chooses his level of passionate effort. We analyze the game in two steps: first, we fix the decisions of players from all generations except t, and calculate the best response of a $j \in G_t$ as a function of the decisions of his contemporaries; second, we use the results of the first step to analyze the full game.

2.2.1 Best response to decisions of contemporaries

Proposition 1 *Suppose $\alpha = \frac{1}{2}$. Then, for any person $j \in G_t, \forall t$, when an arbitrary subset of j's contemporaries increase their passionate effort by an arbitrary positive amount, the optimal passionate effort of j strictly decreases if initially positive, and remains equal to zero if initially zero.*

Proof. From (16), the optimal passionate effort of j, $e(j)$, depends only on the mean of the distribution of passionate efforts of his contemporaries, through two channels. First, $\overline{e}_t$ affects j's genetic fitness $b(j)$; second, it affects the honor return to j's passionate effort V_t by improving the learning environments of the future generations $L_n, n = t+1, t+2, ...$ Since the mean passionate effort increases when an arbitrary subset of G_t increase their passionate effort by an arbitrary amount, it is sufficient to prove that j responds to increases in $\overline{e}_t$ by decreasing $e(j)$. For that, in turn, it is sufficient to show that the cross-derivative $\frac{d^2U(z,\overline{e}_t,V_t)}{dzd\overline{e}_t}$ is strictly negative. Recall that the utility (14) consists of two components, $u\left(\frac{T-z}{T-\overline{e}_t}\right)$ and $zV(\overline{e}_t, \overline{e}_{t+1}, ...)$, which we analyze separately.

$$\begin{aligned} \frac{\partial^2 u\left(\frac{T-z}{T-\overline{e}_t}\right)}{\partial z \partial \overline{e}_t} &= -\frac{u''\left(\frac{T-z}{T-\overline{e}_t}\right)\frac{T-z}{T-\overline{e}_t} + u'\left(\frac{T-z}{T-\overline{e}_t}\right)}{\left(T-\overline{e}_t\right)^2} < 0 \\ \frac{\partial^2 zV(\overline{e}_t, \overline{e}_{t+1}, ...)}{\partial z \partial \overline{e}_t} &= \frac{\partial V(\overline{e}_t, \overline{e}_{t+1}, ...)}{\partial \overline{e}_t} = -\frac{\overline{e}_{t+1} + V_{t+1}}{\tau\left(1+\overline{e}_t\right)^2} < 0 \end{aligned}$$

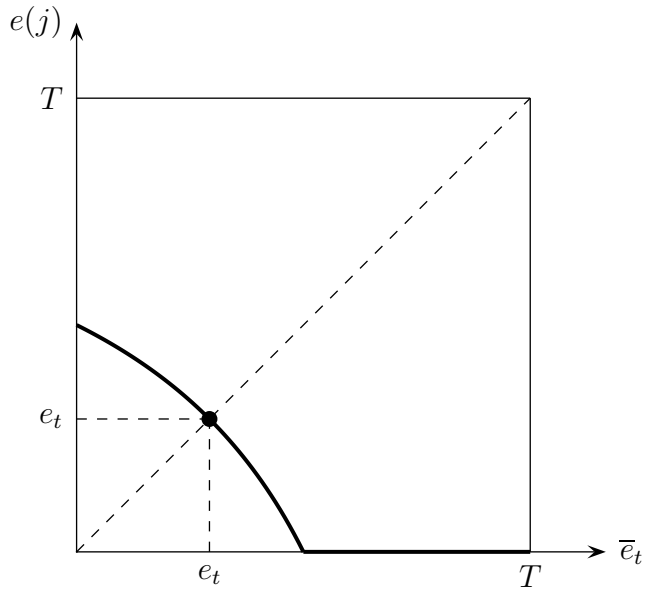

Figure 1: Optimal passionate effort of $j \in G_t$ as a function of mean passionate effort of contemporaries

The former inequality is due to the fact that u is a constant relative risk aversion function with less-than-unity coefficient of risk aversion. ■

Proposition 1, combined with the symmetry of individuals within a generation, yields the following

Corollary 1 *Assuming $\alpha = \frac{1}{2}$ and given the strategies of the future generations $e(k), \forall k \in G_n, \forall n > t$, there exists a unique equilibrium level e_t of passionate effort of those in G_t.*

Proof. Symmetry of the equilibrium strategies of those in G_t follows from the symmetry of players. The fact that the equilibrium strategies are pure follows from strict concavity of the optimization problem (13). The uniqueness of the equilibrium follows from Proposition 1. ■

Figure 1 illustrates the above results. Additionally, we have that in equilibrium $\overline{e}_t = e_t$. With these results, the equilibrium genetic fitness of an individual is equal to unity, and the best response first order condition (16) boils down to

$$-u'(1)\frac{1}{T-e_t} + V_t \begin{cases} = 0 & , e_t > 0 \\ \leq 0 & , e_t = 0 \end{cases}$$

which results in a closed-form solution for e_t:

$$e_t = \begin{cases} T - \frac{u'(1)}{V_t} & , V_t \geq \frac{u'(1)}{T} \\ 0 & , V_t < \frac{u'(1)}{T} \end{cases} \tag{17}$$

2.2.2 Best response to decisions of future generations

The time path of passionate effort is fully characterized by (17) and by the evolution of V_t (cf.(15)):

$$V_t = \frac{e_{t+1} + V_{t+1}}{\tau (1 + e_t)} \tag{18}$$

Define $W_t \equiv e_t + V_t$; then, substituting (17) into (18) and solving for V_t, we obtain:

$$\begin{aligned} V_t &= \begin{cases} \frac{u'(1)}{1+T} + \frac{W_{t+1}}{\tau(1+T)} & , W_{t+1} \geq \frac{\tau u'(1)}{T} \\ \frac{W_{t+1}}{\tau} & , W_{t+1} < \frac{\tau u'(1)}{T} \end{cases} \\ W_t &= \begin{cases} \frac{u'(1)}{1+T} + \frac{W_{t+1}}{\tau(1+T)} + T - \frac{u'(1)\tau(1+T)}{u'(1)\tau + W_{t+1}} & , W_{t+1} \geq \frac{\tau u'(1)}{T} \\ \frac{W_{t+1}}{\tau} & , W_{t+1} < \frac{\tau u'(1)}{T} \end{cases} \end{aligned} \tag{19}$$

The equation (19) describes the evolution of W_t, which is illustrated in Figure 2.

With the appropriate parameters of the model, there are two stable steady states. In the first steady state, individuals exert zero passionate effort because the honor return to such effort is zero. Since they do not exert a passionate effort, they are also not interested in the cultural contributions of the past and allocate all of their energy to survival of their households, in accordance with the standard theoretical biology models of behavior of living organisms. For this reason, the honor return to passionate effort of their ancestors is also zero. In this steady state, the amount of cultural contribution produced by each generation is zero, hence the total factor productivity does not change over time; in other words, economic stagnation takes place. I refer to this steady state as the *survival* steady state.

In the other steady state, individuals show a strictly positive passionate effort, because they expect that there will be passionate individuals in the future who will demand ("honor") their cultural contributions. To make a cultural contribution, individuals also have to study/honor contributions of the past, which ensures a high honor return to passionate effort of the previous generation. This steady state is referred to as *passionate*; the level of passionate effort e^* in such steady state can be found by solving the system of equations $e^* + V^* = W^*$ and (cf.(17)) $e^* = T - \frac{u'(1)}{V^*}$ for e^* and V^*; the parameter W^* in this system, in turn, can be found by solving (cf.(19)) $W^* = \frac{u'(1)}{1+T} + \frac{W^*}{\tau(1+T)} + T - \frac{u'(1)\tau(1+T)}{u'(1)\tau + W^*}$ and choosing

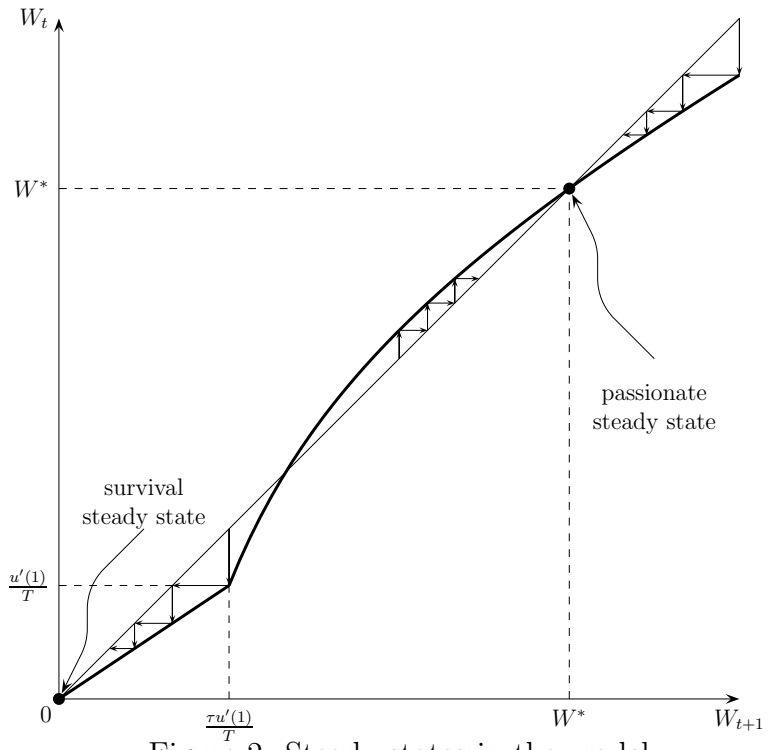

Figure 2: Steady states in the model

the larger solution.

The evolution of the total factor productivity in the passionate steady state is characterized by (from (1), (9), and (12)):

$$A_t = c_0 + c_0 \left(\frac{e^*}{\tau}\right)^{\frac{1}{2\beta}} \sum_{n=1}^{t-1} \left(\frac{1+e^*}{\tau}\right)^{\frac{n-1}{2\beta}} = c_0 + c_0 \left(\frac{e^*}{\tau}\right)^{\frac{1}{2\beta}} \frac{\left(\frac{1+e^*}{\tau}\right)^{\frac{t-1}{2\beta}} - 1}{\left(\frac{1+e^*}{\tau}\right)^{\frac{1}{2\beta}} - 1} \tag{20}$$

The asymptotic net growth rate of the TFP is then $\left(\frac{1+e^*}{\tau}\right)^{\frac{1}{2\beta}} - 1$, which is greater than zero for a sufficiently small learning cost τ. Hence, the passionate steady state is characterized by economic growth.

Also note that genetic fitness of the decision makers is equal to unity in both steady states; cultural fitness is zero in the survival steady state and is strictly positive in the passionate steady state. Hence, the passionate steady state Pareto-dominates.

3 The empirical content of the theory

As a measure of passionate incentives, I propose to use the survival vs. self-expression index originally proposed by Inglehart and Baker (2000). The index is one of the two principal components of human values across the world, as measured by the World Values Survey. The very labeling of the index ("survival" versus "self-expression") seems to be a close match to the concept of the two steady states proposed in this paper. In the survival steady state, individuals allocate all their energy onto survival of their households, and thus their objectives are not any different from the objectives of all living organisms, as defined by theoretical biology. On the other hand, there is nothing like "self-expression" in the theoretical biology textbooks; such incentives seems to be unique to humans only, and they seem to be related to the desire to make an impact on the minds of others. At the same time, Dawkins (1976) emphasizes that "memetic" behavior is possible among humans only, due to their unprecedented ability for cultural transmission. Hence, the concept of self-expression values seems to be well-aligned with the concept of "memetic" incentives and with the passionate steady state defined in this paper.

Moreover, many of the correlates of the survival vs. self-expression values (see table 1) have the same genetic vs. "memetic" interpretation. People that maximize genetic fitness must have values centered exclusively on their children; the opinion that "a woman has to have children in order to be fulfilled" has a 83% correlation with a measure of survival values, while "a child needs a home with both a father and a mother to grow up happily" has a 73% correlation with the same measure. A person which cares only about genetic success should not invest any effort into improving things outside of his/her household; people with survival values do not recycle things to protect the environment (76% correlation), do not attend meetings or sign petitions to protect the environment (75%), when seeking a job care only about income and safety (74%), do not take part in boycotts (56%) and oppose sending aid to other countries (42%). For a person maximizing genetic success, his/her degree of altruism towards other people must be proportional to the degree of proximity of their genotypes ("inclusive fitness" hypothesis, Hamilton (1964)), hence such a person prefers neighbors of the same ethnicity; genetic success maximizers should also be hostile to homosexual neighbors, because such neighbors may pass their low-fertility cultural traits onto one's close relatives (81% correlation).

On the other hand, individuals living in a passionate steady state shift their objectives away from family towards cultural fitness, and hence are more likely to have another attitude to the above mentioned issues.

Item	Correlation
SURVIVAL VALUES EMPHASIZE THE FOLLOWING:	
Men make better political leaders than women.	.86
Respondent is dissatisfied with financial situation of his/her household.	.83
A woman has to have children in order to be fulfilled.	.83
Respondent rejects foreigners, homosexuals, and people with AIDS as neighbors.[a]	.81
Respondent favors more emphasis on the development of technology.	.78
Respondent has not recycled things to protect the environment.	.76
Respondent has not attended meeting or signed petition to protect the environment.	.75
When seeking a job, a good income and safe job are more important than a feeling of accomplishment and working with people you like.[b]	.74
Respondent is relatively favorable to state ownership of business and industry.	.74
A child needs a home with both a father and mother to grow up happily.	.73
Respondent does not describe own health as very good.	.73
One must always love and respect one's parents regardless of their behavior.	.71
When jobs are scarce, men have more right to a job than women.	.69
Prostitution is never justifiable.	.69
Government should take more responsibility to ensure that everyone is provided for.	.68
Respondent does not have much free choice or control over his/her life.	.67
A university education is more important for a boy than for a girl.	.67
Respondent does not favor less emphasis on money and material possessions.	.66
Respondent rejects people with criminal records as neighbors.	.66
Respondent rejects heavy drinkers as neighbors.	.64
Hard work is one of the most important things to teach a child.	.65
Imagination is *not* one of the most important things to teach a child.	.62
Tolerance and respect for others are *not* the most important things to teach a child.	.62
Scientific discoveries will help, rather than harm, humanity.	.60
Leisure is not very important in life.	.60
Friends are not very important in life.	.56
Having a strong leader who does not have to bother with parliament and elections would be a good form of government.	.58
Respondent has not taken part and would not take part in a boycott.	.56
Government ownership of business and industry should be increased.	.55
Democracy is not necessarily the best form of government.	.45
Respondent opposes sending economic aid to poorer countries.	.42
(SELF-EXPRESSION VALUES EMPHASIZE THE OPPOSITE)	

Table 1: Correlation of the World Values Survey Items with the Survival/Self-Expression Tradeoff.

Source: Inglehart and Baker (2000)

Survival vs. self-expression tradeoff is also strongly correlated with development. Inglehart and Baker (2000), Table 4, show a positive and significant correlation between this tradeoff and GDP per capita – not only in the whole sample, but also in each of eight cultural clusters of countries identified by the authors. Whether self-expression values are the cause or the consequence of economic development? Inglehart and Baker (2000) interpret the correlation as growing income being the cause of self-expression "passionate" values, but there are historic counterexamples. The Ancient Greek society did not make use of electricity or combustion engine, and therefore must have been very poor by modern standards, but nevertheless was (anecdotally) quite passionate and made many cultural contributions.

Additionally, Inglehart and Welzel (2005) study the relationship between values and democratic institutions, and discover that

- "Self-expression values prove to be more strongly linked with democracy than any other factor, including variables that figure prominently in the literature on democratization, such as interpersonal trust, associational membership, and per capita GDP" (p.4), and
- the causality flows from self-expression values to democracy rather than the other way around (chapter 8).

In the language of this paper, these results can be interpreted as follows: democracy is only feasible in the passionate steady state, because creation and maintenance of democratic institutions requires large amounts of passionate effort.

4 Conclusion

The growth theory of this paper can be summarized as follows: the world changes as long as there are people that are willing to change the world, whom I label, following the historian Lev Gumilev, as passionate individuals. Passionate effort of the society has contributed to the abolition of slavery in the United States and of serfdom in Russia, to numerous economic reforms throughout the globe, and to protection of wildlife. If Adam Smith cared only about the wealth of his household, he would not have time for "The Wealth of Nations". There would be no Yosemite National Park if John Muir cared only about the revenues of his ranch.

Underdeveloped societies, on the other hand, are underdeveloped due to lack of passionate individuals and because the members of such societies follow primarily their genetic instinct of maximizing their family well-being.

The paper develops a formal multiple-steady-state model of passionate behavior, and discusses its empirical implications.

On the normative side, the theory suggests that commitments to commemorate passionate efforts of the past may be growth-enhancing, as they increase the honor return to such efforts. Freedom of speech and freedom of convention may have the same effect, as they decrease the cost of cultural transmission between people. Mathematically, a lower value of parameter τ induced by these policies squeezes the basin of attraction of the survival steady state (see figure 2), thus making the "passionate push" more likely; it also increases the amount of passionate effort in the passionate steady state.

It should be noted however that policy makers should use caution in their efforts to elicit people's ambition for honor, as such ambitions have not always been socially productive. The German experience of the 1930s is a stark example of a negative effect.

References

Banfield, E. C. (1958): *The Moral Basis of a Backward Society*. The Free Press.

Becker, G. S., K. M. Murphy, and R. Tamura (1990): "Human Capital, Fertility, and Economic Growth," *The Journal of Political Economy*, 98(5), S12–S37.

Bisin, A., and T. Verdier (2001): "The Economics of Cultural Transmission and the Dynamics of Preferences," *Journal of Economic Theory*, 97(2), 298 – 319.

Blackmore, S. (2000): *The meme machine*. Oxford University Press.

Caldwell, J. C., and P. Caldwell (1987): "The Cultural Context of High Fertility in sub-Saharan Africa," *Population and Development Review*, 13(3), pp. 409–437.

Dawkins, R. (1976): *The Selfish Gene*. Oxford University Press.

Gumilev, L. (2009(1989)): *The End and the Beginning Again*. Ayris Press, In Russian.

Hamilton, W. D. (1964): "The genetical evolution of social behaviour, I," *Journal of Theoretical Biology*, 7(1), 1 – 16.

Inglehart, R., and W. E. Baker (2000): "Modernization, Cultural Change, and the Persistence of Tranditional Values.," *American Sociological Review*, 65(1), 19 – 51.

Inglehart, R., and C. Welzel (2005): *Modernization, Cultural Change, and Democracy*. Cambridge University Press.

Krugman, P. (1991): "History Versus Expectations," *The Quarterly Journal of Economics*, 106(2), pp. 651–667.

Malone, D. (1975): *The Story of the Declaration of Independence*. Oxford University Press.

Mokyr, J. (2010): *The Enlightened Economy*. Yale University Press.

Murphy, K. M., A. Shleifer, and R. W. Vishny (1989): "Industrialization and the Big Push," *The Journal of Political Economy*, 97(5), pp. 1003–1026.

Newson, L., and P. J. Richerson (2009): "Why Do People Become Modern? A Darwinian Explanation," *Population and Development Review*, 35(1), 117–158.

Robson, A. J. (1992): "Status, the Distribution of Wealth, Private and Social Attitudes to Risk," *Econometrica*, 60(4), 837–857.

Rosenstein-Rodan, P. N. (1943): "Problems of Industrialisation of Eastern and South-Eastern Europe," *The Economic Journal*, 53(210/211), pp. 202–211.

Stark, O. (1999): *Altruism and Beyond*, Cambridge Books. Cambridge University Press.

Tabellini, G. (2008): "The Scope of Cooperation: Values and Incentives," *Quarterly Journal of Economics*, 123(3), 905–950.

World Values Survey Association (2009): *World Values Survey 1981-2008*.Official aggregate v.20090901 edn.

Zakharenko, R. (2010): "Children Versus Ideas: an "Influential" Theory of Demographic Transition," *mimeo*.