The Culture of Entrepreneurship*

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Abstract

This paper studies the cultural process through which a society inculcates an entrepreneurial spirit. People either work for a guaranteed wage or operate riskier businesses. Paternalistic parents prefer their offspring to choose occupations like theirs and accordingly indoctrinate them into their types. Specifically, having themselves developed business acumen, entrepreneurial parents try to endow their children with that human capital. Biological indoctrination may not be successful, in which case children take cultural cues from society at large. Cultural offspring may also choose an occupation different from the one they have been indoctrinated in. We examine the effect of family background on occupational choice and how society’s appetite for risk-taking is shaped by culture and institution. A focus on safe occupations, possibly due to colonial and post-colonial policies, results in stagnation where entrepreneurs do not upgrade technology because of their proficiency in existing methods. Sudden access to disruptive technologies, due to liberalization for instance, sees the emergence of new entrepreneurial lines who overtake established ones, spurring growth.

Keywords: entrepreneurship, culture, economic development, endogenous preference

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1 Introduction

Industrialization, which entails risk-taking on a large scale, is at the heart of economic prosperity. The incentives for economic development are consequently tied to the incentives for entrepreneurship. But innovating entrepreneurs do not emerge uniformly from all cultures or randomly from a society. History is replete with instances of small communities – the Huguenots in seventeenth and eighteenth century France, Parsis in western India, Chinese traders in south-east Asia – spearheading industry and trade far out of proportion to their numbers (Hagen, 1975, Bisin and Verdier, 2000). The empirical evidence shows a robust positive correlation between family background and occupational choice (Hout and Rosen, 2000, and Constant and Zimmermann, 2003, for example). Parental risk aversion and schooling have been found to affect children's risk attitudes (Hyrshko et al, 2011) and evidence from psychology shows that risk-taking differences across culture are associated with differences in the perception of its benefits (Weber et al, 2002). There is good reason to believe then that non-economic attributes of societies like cultural values can determine their risk tolerance and economic progress.

This paper connects entrepreneurship with culture using a dynamic model of inter-generationally linked households. People are of two types, workers or entrepreneurs. The former work for a guaranteed wage, the latter engage in riskier business activities. Individuals are neutral with respect to income risk but expected business earnings depend on their understanding of the prevailing technology, an expertise that can be accumulated over time (Jovanovic and Nyarko, 1996). People differ in skills for and subjective biases (preference) over the two occupations. These are acquired through upbringing, socialization and occupational experience (Bisin and Verdier, 2000). Parents prefer their offspring to choose occupations similar to theirs and, accordingly, try to imbue them with occupation-specific human capital. For example, entrepreneurial parents perceive entrepreneurship to be more rewarding and, having acquired expertise in their line of work, attempt to pass on that human capital to their children. Similarly, wage-working parents may endow their children with human capital that predisposes them toward low risk wage-work.

Such within-family cultural indoctrination is imperfect. When it fails, the child adopts the trait of a randomly chosen member of the active population. Either way, children's comparative advantage in the two occupations is determined by the time they become economically active. They then choose whether or not to engage in the occupation they have been indoctrinated in. The interplay of the cultural transmission of human capital and values, the accumulation of business expertise in entrepreneurial lines and the introduction of new technologies generate several possibilities.

We show that a focus on safe production eventually results in stagnation where entrepreneurs do not upgrade technology. In this equilibrium, workers receive wages above what they can expect from entrepreneurship, entrepreneurs receive rewards greater than wages. Entrepreneurs do not upgrade their technology because they perceive it to be riskier, dominated by their considerable
proficiency – accumulated over generations – with existing methods. This persistent, no-growth equilibrium is analogous to some colonial and post-colonial regimes in which wage-work or government employment was highly valued, the pursuit of profits frowned upon and businesses too insular to be dynamic.

We shock this equilibrium in one of two ways. In the first, the economy is shocked by an increase in overall productivity, causing existing entrepreneurial lines to start upgrading. The result is top-down growth without socio-economic mobility: existing businesses retain their dominant position, the growth of their businesses pulling up the rest of the economy. Alternatively, the stagnant equilibrium can be shocked by a sharp change in the human capital requirement of new technologies, a “disruptive change”. Existing business lines find themselves ill-suited to adopt these new methods since their expertise does not transfer as easily. Some indoctrinated wage workers, on the other hand, become first generation entrepreneurs by adopting the new technologies as they are not invested in previous methods of production. Overtaking results, with the entrant lines becoming more productive than incumbents who eventually abandon entrepreneurship to become wage workers. In the long-run equilibrium, the newly emerged class of entrepreneurs keep upgrading their technologies leading to steady-state growth. We relate these broad predictions to the experience of colonial Africa and countries like South Korea, Japan and India.

The notion that culture could matter for economic growth is not new. It goes back at least to Weber’s (1930) thesis that cultural change, the Calvinist Reformation in particular, was vital to the development of capitalism and its institutions. While some have extended that view to cultural attributes such as openness to new ideas and a scientific temperament (Landes, 1998), others have seen virtue in the West’s individualism (Lal, 1999, and references therein). Despite this abiding historical interest and an emerging one in empirical development economics (for instance Tabellini, 2010, Durante, 2010, Gorodnichenko and Roland, 2013), culture has received little formal treatment in modern growth theory. In large measure this reflects the widespread notion among growth economists that development is only limited by the availability of opportunities and technologies: if incentives are strong enough, culture would change to accommodate economic interests.\footnote{Also influential has been an earlier debate in the profession between those who proposed culture-based non-rationality as an explanation for agricultural backwardness in traditional societies and those who took the “poor but efficient” view of peasant agriculture, a debate that Schultz’ Transforming Traditional Agriculture (1963) resolved convincingly in favor of the latter (Ruttan, 1988).}

While our work is sympathetic to this point of view – in the model culture does not limit growth as long as the economy is productive or technological change disruptive enough – we show that culture matters still for the income level.

Culture has two interpretations in this paper. Hofstede (1991, p. 5) defines it as “the collective programming of the mind which distinguishes the members of one group or category of people from those of another”. In our model, this has the specific interpretation of a willingness to engage in high return-high risk occupations depending on one’s family background. This willingness
evolves through cultural transmission, “transmission from one generation to the next, via teaching and imitation, of knowledge, values, and other factors that influence behavior” (Boyd and Richerson, 1985). Besides perceived economic benefits, parents are compelled by their own occupational biases in what knowledge they transmit to their children.

We build on the literature that studies cultural transmission over time, particularly Boyd and Richerson (1985), Bisin and Verdier (2000, 2001) and Hauk and Saez-Marti (2002). In a departure from that literature, culture here is occupation-specific and tied to endogenous economic payoffs. We also extend that literature by introducing choice, that is, allowing agents to rationally discard their cultural “types” should it be in their economic interest. Our focus on occupation-specific cultural bias is related to Corneo and Jeanne’s (2010) work where individuals value the social esteem associated with certain occupations. Here that perception is the product of one’s own experience.

Less studied is the cultural development of entrepreneurship. Kumar and Matsusaka’s (2009) model of culturally transmitted local and market capital can be related to entrepreneurship though that is not the authors’ focus. More closely aligned are Hassler and Mora (2000) and Doepke and Zilibotti (2013). The former use Jovanovic and Nyarko’s (1996) learning-by-doing technologies similar to us. Agents choose to be either entrepreneurs or workers and have two principal assets, parental knowledge about production and innate intelligence. There is no relationship between parental class and child intelligence, or parental and child intelligence. The choice to make larger technological improvements in their model leads to social information (passed from parents) being less important, resulting in intergenerational churning: children of workers end up being new entrepreneurs if they have high cognitive ability, children of old entrepreneurs end up being workers if they do not. There is no scope for cultural indoctrination within or outside the family in this intergenerational mobility unlike our paper. Cultural inertia hence plays no role in technological and economic change.

Doepke and Zilibotti (2013) relate patience and risk aversion to the Romer endogenous growth framework. Entrepreneurial work entails upfront human capital investment and risky rewards. Parents transmit an automatic level of their own social values to their children so that a child’s risk aversion is linked to the parent’s. Parents may also voluntarily invest in making their children less risk averse or more patient. This within-family cultural transmission is similar to ours, the difference being there is no possibility of cultural versus purely biological transmission or for intergenerational mobility or for entrepreneurs to be become less well suited to entrepreneurship. While individuals are risk-neutral in our setup and risk-averse in Doepke and Zilibotti’s, in both entrepreneurship depends on a tradeoff between risk and return.

A very different mechanism – Darwinian selection – is at the heart of Galor and Michalopoulos’ (2012) theory of entrepreneurship. In their model people are either risk-neutral or risk-averse, the former’s economic advantage in early history giving way to the latter’s as children get relatively costlier, inducing differential fertility behavior in the two groups. More generally our paper is re-

A benchmark model of occupational choice and cultural transmission is developed in the next section under the assumption that entrepreneurs are locked into a particular technology. Technological upgrading is studied in section 3. We show that the constant-technology model is a special case of this general structure and characterize the various dynamic equilibria. Section 4 discusses how the model explains entrepreneurship and development in parts of the world. Section 5 concludes.

2 The Baseline Model

Childhood and adulthood are the two periods of life in an overlapping generations economy. In any period \( t = 1, 2, \ldots, \infty \) a set \( \mathcal{H} \) of agents of measure one are economically active in either of two occupations, wage-work and entrepreneurship. Each agent is endowed with a unit time and gives birth to one offspring during this period, dying at the end. An offspring born in \( t \) does not become economically active until \( t + 1 \).

2.1 Occupation and Production

Entrepreneurs engage in production through risky and imperfectly understood technologies while wage-work entails a steady risk-free income, for instance, supplying labor on a competitive market in the public sector.³ People differ in how they subjectively value the two occupations and in their human capital. We treat this human capital as one dimensional – business expertise – that in the model takes the form of subjective beliefs about the riskiness of production technologies.

At the beginning of each period, an active agent must decide whether to become an entrepreneur or work for entrepreneurs at the market wage; we conjecture later how public sector employment alters this choice. Comparative advantage in entrepreneurship and the broader macroeconomic environment determine this choice.⁴ We assume no unemployment or withdrawal from the labor force.

²A complementary and somewhat older literature on (ability, risk preference) heterogeneity and credit market imperfections is surveyed in Parker (2009).

³The alternative occupation can also be low-scale self-employment with lower risks. In other words, here entrepreneurship is not synonymous with self-employment. Rather, an entrepreneur is someone willing to take big risks and innovate. This distinction is important to keep in mind as a lot of empirical work proxies entrepreneurship with self-employment which is widespread in developing countries, in many cases exceeding rates in industrialized countries. For this and related concerns with using self-employment data see Parker (2009, Ch. 1).

⁴Implicitly the labor productivity of all individuals is being normalized to unity. It is easy to introduce heterogeneous human capital specific to wage work and allow wage-working parents to transfer their skills to their offspring and build on them. As long as there is no market imperfection preventing the efficient level of such within-family investment and human capital accumulation is subject to diminishing returns, all wage-working families will eventually converge to the same skill level. What matters in that setup, as here, is an individual’s comparative advantage in the two occupations. Hence cultural and occupational decisions would be analogous to those we analyze below.
force. Individuals care about their expected income $y$ which is either profit income $\pi$ or wage income $w$. In other words, individuals indivisibly supply their labor to wage-work or in managing their business. The latter is preferred as long as it yields a higher expected income.

Let $E_t$ denote the subset of agents who become entrepreneurs at $t$ and $\mathcal{H}\setminus E_t$ the subset of individuals who work for a wage. Product and input markets are perfectly competitive. All workers are hired by entrepreneurs at the market wage rate $w_t$ and all entrepreneurs produce the same homogeneous good $\{Y_k\}_{k \in E}$ using a CRS technology.\(^5\) Aggregate output is simply

$$Y_t = \sum_{k \in E_t} Y^k_t.$$  

The price of each good is normalized to one. Entrepreneur (capitalist) $k$ uses two inputs, labor $L^k_t$ hired in the competitive market and his own input that we call business capital $z^k_t$:

$$Y^k_t = (z^k_t)^{1-\beta} (L^k_t)^{\beta}, \beta \in (0, 1). \quad (1)$$

Business capital is \textit{ex ante} uncertain. It depends on the technology used to produce it, the entrepreneur's understanding of it and entrepreneurial decisions $\phi$ taken before the business goes into production by hiring workers. The capital thus produced is an inalienable part of entrepreneur $k$'s business venture and is not transferable to other businesses. We solve for entrepreneur $k$'s decision problem backwards. Given $z^k_t$, profit maximization leads to the labor demand

$$\beta \left( \frac{z^k_t}{L^k_t} \right)^{1-\beta} = w_t \quad (2)$$

with more productive entrepreneurs – those with higher business capital – hiring more. Using this in equation (1), the entrepreneur's expected profit at the beginning of $t$ becomes

$$\pi^k_t = (1 - \beta) \left( \frac{\beta}{w_t} \right)^{\beta/(1-\beta)} z^k_t \equiv \kappa_t z^k_t \quad (3)$$

which he maximizes by choosing $z^k_t$ prior to going into production.

Denote the technology at the entrepreneur's disposal by some arbitrary $n$. Entrepreneur $k$ takes a decision $\phi^k_t$ that determines his business capital according to a stochastic production function similar to Jovanovic and Nyarko (1996):

$$\tilde{z}^k_{nt} = a^n \left[ 1 - \left( q_{nt} - \phi^k_{nt} \right)^2 \right], \quad a > 1. \quad (4)$$

\(^5\)While $k$ represents a particular entrepreneur, we later use $b$ to tag variables for the entire set $E_t$.  

Here

\[ q_{nt} = \theta_n + v_{nt} \quad (5) \]

is a random target that fluctuates around a grade-specific parameter \( \theta_n \) and \( v_{nt} \) is an iid shock drawn from a normal distribution with mean zero and variance \( \sigma_n^2 \). The same technology is used by all entrepreneurs and for all \( t \geq 1 \). Later we allow them to choose from several grades of technology, indexed by \( n \in [0, \infty) \), with a higher \( n \) corresponding to a riskier but higher return technology.

The entrepreneur knows \( a \) and the distribution of \( v_{nt} \). What he does not know is the mean target output \( \theta_n \) about which he has some belief (prior). One way to interpret \( \phi \) is as effort devoted towards fine-tuning some machinery that yields a stochastic output, based partly on how effectively it is employed in production. Alternatively and closer to the spirit of the model, think of the entrepreneur as entering a market or innovating a product for which he needs to determine the optimal scale of operation \( q_{nt} \) without having full information about market conditions. The quadratic loss function embedded in (4) says that he can lose out from both over- or under-supply of business capital, a reduced-form specification of having to sell below cost in case he overestimates market demand or forgoing profit opportunities because of underproduction.

Denote by \( E_t^k(\theta_n) \) the conditional expectation and \( x_{nt}^k = V_t^k(\theta_n) \) the conditional variance for entrepreneur \( k \). The cumulative distribution of priors over \( q_{nt} \) for the \( n \)-th grade technology in the population at \( t \) is denoted by \( G_t(x_{nt}) \). The population is endowed with \( G_1(x_{n1}) \) in the initial period; subsequently \( G_t \) is the outcome of cultural indoctrination and occupational choice.

Business capital is higher the closer is the entrepreneur’s decision \( \phi_{nt}^k \) to the target output level \( q_{nt} \). From (3), (4) and (5), it follows that the optimal decision that maximizes expected business capital is

\[ \phi_{nt}^k = E_t^k(\theta_n). \quad (6) \]

This yields expected business capital

\[ z_{nt}^k = E_t^k(\bar{z}_{nt}^k) = a^n \left[ 1 - \sigma_n^2 - x_{nt}^k \right]. \quad (7) \]

Equation (7) shows that the entrepreneur’s belief about \( \theta_n \) is a form of human capital or expertise. Agents with more informed beliefs – smaller \( x_{nt}^k \) – expect to earn a higher return from entrepreneurship. In observing \( q_{nt} \) during his lifetime running the business, the agent learns about the technology and updates his belief about \( \theta_n \). That is, he acquires additional expertise through learning-by-doing. He may then choose to impart this knowledge to his cultural offspring who, in turn, will be able to make a more informed decision \( \phi_{nt+1}^k \) should he become an entrepreneur. This means if entrepreneurial human capital is transmitted via cultural transmission and socialization, business expertise specific to an entrepreneurial line does not disappear.\(^6\) As will be shown

\(^6\)There is no mean reversion in intergenerational ability unlike Caselli and Gennaioli’s (2013) model of dynastic
later, the learning process is bounded for a given technology: sticking with a grade $n$ along an entrepreneurial line allows agents to eventually learn $\theta_n$ completely. Consequently, expected business capital converges to $a^n(1 - \sigma_v^2)$ in the limit, with expected business profit converging to

$$
\pi_t^k = \kappa_t a^n [1 - \sigma_v^2],
$$

identical for all entrepreneurs since it is independent of initial beliefs.

### 2.2 Preferences

Children are not born with pre-determined preferences about or innate skills in the two occupations. These develop instead through cultural transmission at home (vertical transmission), socialization outside (oblique transmission) and work experience. Parents are paternalistic in that they believe they know better which occupation would best suit their children as in Bisin and Verdier (2000). Their altruism payoff $V$ depends on their children's future well being which they evaluate through their own experience. Moreover, over their working lives parents acquire a subjective bias towards their own occupation and they dislike the prospect of their children going into an occupation different from theirs. In imparting values suitable to his occupation, a parent weights the potential utility of his offspring by using his payoff matrix as if it were the child’s.

Not all such vertical transmission is successful since children also socialize and absorb ideas outside of home. Higher parental effort $\tau \in (0, 1)$ towards cultural education raises the likelihood of the offspring being similar to the parent. But due to socialization outside, such education may fail and the offspring picks up human capital from a randomly matched (cultural) parent who may well be in an occupation different from his biological parent’s. We shall refer to this process of vertical and oblique transmission as cultural indoctrination.

The expected lifetime utility of an economically active individual at time $t$

$$
U_t = y_t + V_t - \psi(\tau_t)
$$

depends on his expected lifetime income, $y_t \in \{w_t, \pi_t\}$, the perceived welfare of his offspring, $V_t$, and socialization cost $\psi(\tau_t)$.

### 2.3 Socialization and Cultural Transmission

Even though socialization, whether through vertical or oblique transmission, imparts to the cultural offspring parental parental human capital in the two occupations, the offspring may choose firms. Of course, neither do we have dynastic firms. As will be clear shortly, what we call an entrepreneurial line is a series of entrepreneurs – some biologically related, some culturally – who are linked through their human capital.
not to follow his cultural parent’s occupation. To keep track of this we denote the culturally indoctrinated fraction of wage workers in the population by \( m \) and their actually frequency by \( \mu \). We introduce two definitions.

**Definition 1.** Cultural indoctrination is **persistent** if a cultural offspring does not choose an occupation different from that in which he has been indoctrinated.

**Definition 2.** Cultural indoctrination is **dynamically persistent** if it is persistent for all agents and all \( t \geq 1 \).

In the remainder of this section we focus on an intertemporal equilibrium path that is dynamically persistent, that is, \( m_t = \mu_t \) for all \( t \geq 1 \). Hence the dynamics of \( m \) is the same as that of \( \mu \).

A parent educates his naive biological child with the socialization effort \( \tau \). With probability equal to this effort, vertical transmission is successful and the child acquires the biological parent’s type (Hauk and Saez-Marti, 2002). That is, the child of an entrepreneurial parent picks up the parent’s posterior belief about technologies as his own prior and a child of a wage-working parent likewise acquires his parent’s uninformed belief regarding how to operate businesses. If vertical transmission fails, the child remains naive and gets randomly matched with somebody else whose occupation-specific human capital he acquires. Recall that business capital is stochastic and an inalienable part of an entrepreneur’s venture. Though it is not possible to acquire business expertise simply by observing one entrepreneur’s success (which could be due to luck), we assume that naive children may be able to acquire it from repeatedly observing enough such successes, a proxy for which is the frequency of entrepreneurs in the population \( 1 - \mu \).

Let \( p_{ij}^t \) denote the probability that a child of a type \( i \) parent will be of type \( j \) where \( i, j \in \{ k, w \} \), \( k \) denoting an entrepreneurial and \( w \) a wage-working individual. We have

\[
p_{t}^{ww} = \tau_{i}^{w} + (1 - \tau_{i}^{w}) \mu_{t} \tag{9}
\]

\[
p_{t}^{wk} = (1 - \tau_{i}^{w}) (1 - \mu_{t}) \tag{10}
\]

where \( \mu_{t} \) is the proportion of pro-wage agents at date \( t \). Similarly, for an entrepreneurial parent we have

\[
p_{t}^{kk} = \tau_{i}^{k} + (1 - \tau_{i}^{k}) (1 - \mu_{t}) \tag{11}
\]

\[
p_{t}^{kw} = (1 - \tau_{i}^{k}) \mu_{t} \tag{12}
\]

where \( \tau_{i}^{k} \) is the entrepreneurial parent’s effort on social education. While all wage working parents are identical, entrepreneurial parents differ in their human capital. Consequently, the socialization effort chosen by entrepreneurial parents will differ depending on their perception of the benefits of that occupational choice.
The cost of socialization effort $\psi(\tau)$ satisfies $\psi' \geq 0$, $\psi'' > 0$, $\psi(0) = \psi'(0) = 0$ and $\psi \in [0, 1]$. Let $V^{ij}$ denote the utility a type $i$ parent derives from his child being type $j$. Parental altruism is paternalistic in the sense that the parent uses his own payoff matrix to evaluate this utility. Hence given the parent’s expected returns $y_t$, each parent of type $i \in \{w, k\}$ chooses the social education effort $\tau$ to maximize

$$p_i^i V^{ii}(y_i^i) + p_i^j V^{ij}(y_i^j) - \psi(\tau_i).$$

(13)

Substituting (9)–(12) into the first order condition for an interior optimum

$$\frac{\partial \psi(\tau_t)}{\partial \tau_t} = \frac{dp_t^{ii}}{d\tau_t} V^{ii}(y_t^i) + \frac{dp_t^{ij}}{d\tau_t} V^{ij}(y_t^j)$$

leads to

$$\frac{\partial \psi(\tau^w_t)}{\partial \tau^w_t} = \left[ V^{ww}(y_t^i) - V^{wk}(y_t^i) \right] (1 - \mu_t),$$

(14)

$$\frac{\partial \psi(\tau^k_t)}{\partial \tau^k_t} = \left[ V^{kk}(y_t^i) - V^{kw}(y_t^i) \right] \mu_t.$$  

(15)

It follows that the optimal socialization effort is

$$\tau^i_t = \tau \left[ \mu_t, V^{ii}(y_t^i) - V^{ij}(y_t^j) \right], i, j \in \{k, w\}$$

(16)

with $\partial \tau^w / \partial \mu < 0$ and $\partial \tau^k / \partial \mu > 0$. Parents have less incentive to educate their children the more frequent is their type in the population.

It remains to specify how parental utility depends on the offspring’s occupation. As mentioned above paternalistic parents base this on their own payoffs. An entrepreneurial parent’s human capital is his belief $x^k_{nt}$. Conversely, a wage-working parent lacks human capital specific to entrepreneurial activities which results in a more dispersed prior of $\bar{x}_n$ (see below). Based on these, we specify parental utilities as

$$V^{ww}_t = \ln w_t,$$

$$V^{wk}_t = \ln \left( \pi^k_t | \bar{x}_n \right) - \ln \delta_w = \ln \left[ \kappa_t a^n (1 - \sigma^2_v - x_{nt}) \right] - \ln \delta_w,$$

$$V^{kk}_t = \ln \left( \pi^k_t | x_{nt} \right) = \ln \left[ \kappa_t a^n (1 - \sigma^2_v - x_{nt}) \right],$$

$$V^{kw}_t = \ln w_t - \ln \delta_b.$$ 

(17)

The parameters $\delta_w$ and $\delta_b$ denote the subjective dissatisfaction that a type $i$ parent feels when his child ends up in type $j$ occupation. These biases do not affect a parent’s choice of or utility from his own occupation, only his cultural indoctrination effort. It is useful to think of $(x^i_n, \delta_b, \delta_w)$ as the

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7The curvature is to ensure the existence of a balanced growth path when we later allow technology to be upgraded.
“cultural endowments” of this economy (Hayami and Ruttan, 1985). These embody those aspects of preferences and skills that have an impact on the cultural transmission of attitudes. Importantly, cultural endowments have an economic significance here since they shape individuals’ perception of the return from each type of activity (Weber et al., 2002).

Example 1. Suppose $\psi(\tau) = \tau^2/2 \in (0, 1/2)$. Then optimal socialization efforts are

$$
\tau^w_t = (1 - \mu_t) \ln \left( \frac{\delta w w_t^{1/(1-\beta)}}{(1-\beta)\beta^{1/(1-\beta)} a^n (1 - \sigma_v^2 - \bar{x}_n)} \right),
$$

$$
\tau^b_t = \mu_t \ln \left( \frac{\delta_b (1-\beta) \beta^{1/(1-\beta)} a^n (1 - \sigma_v^2 - x^k_{nt})}{w_t^{1/(1-\beta)}} \right),
$$

increasing in own occupational bias and payoff, decreasing in the frequency of and payoff from the alternative occupation. Occupational biases are absent if $\delta_b = \delta_w = 1$. If in addition occupational incomes are equalized, for example if business knowledge is alienable and easily acquired, neither wage-working nor entrepreneurial parents would indoctrinate their offspring, $\tau^w = \tau^b = 0$.

2.4 Occupational Income and Choice

An entrepreneur $k$ who works with the technology $n$ at $t$, starts with a belief about the distribution of $\theta_n$ which is, as specified above, normal with variance $x^k_{nt}$. During the course of his lifetime, the accumulated experience of observing $q_{nt}$ leads him to update this belief. His posterior variance of $\theta_n$ becomes, as a result of Bayesian updating,

$$
x^k_{nt+1} = F(x^k_{nt}) = \frac{\sigma_v^2 x^k_{nt}}{\sigma_v^2 + x^k_{nt}}.
$$

This posterior belief is then transferred, due to cultural indoctrination, as the cultural offspring’s prior. Since $F$ is increasing and concave with $F(0) = 0 = F'(0)$, it has a unique fixed point at $x^*_n = 0$. Hence the learning process along an entrepreneurial line – each generation of entrepreneur passing on his accumulated human capital to his cultural offspring – generates a sequence of variances $\{x^k_{nt}\}_{t=1}^{\infty}$ that converges monotonically to zero. In this sense, the entrepreneurial line eventually achieves full proficiency and maximal earnings if it were to stay with technology $n$ forever.

From each entrepreneur’s labor demand

$$
w_t = \beta \left[ \frac{x^k_{nt}}{L^k_{nt}} \right]^{1-\beta}
$$

it follows that aggregate labor demand is $L^D_{nt} = \sum_k L^k_{nt} = \beta^{1/(1-\beta)} Z_{nt} / w_t^{1/(1-\beta)}$ where $Z_{nt} \equiv \sum_k z^k_{nt}$ is aggregate business capital. Since each worker supplies a unit time, aggregate labor supply is
\( L^S_t = \mu_t \), using which we get the market-clearing wage rate

\[
w_t = \beta \left( \frac{Z_{nt}}{\mu_t} \right)^{1-\beta}.
\]

The equilibrium wage is decreasing in \( \mu_t \) because a higher \( \mu \) lowers the supply of business capital and raises the supply of labor. As a result, expected business profit \( \pi_n \) – see (3) – is increasing in \( \mu \). In other words, the culturally indoctrinated share of the population determines the relative attractiveness of the two occupations and, thus, occupational choice.

To study occupational allocations and the dynamics of cultural indoctrination we proceed in steps. First we restrict the parameter space, under the assumption that the dynamics exhibits monotonic convergence, such that indoctrination is dynamically persistent and offspring choose the occupation their cultural parent intended. We then establish that under that restriction, the dynamics is characterized by monotonic convergence to a steady state with an inefficiently low supply of entrepreneurs.

Begin by considering an individual at \( t \) who comes from the entrepreneurial line \( k \), having been indoctrinated by his cultural/biological parent \( k \) at \( t - 1 \). Given his human capital \( x^k_{nt} \) he will choose his parent’s occupation as long as his expected business profit exceeds the wage rate

\[
x^k_{nt} \pi_n > w_t \Rightarrow (1-\beta)\beta^{\beta/(1-\beta)}z^k_{nt} > w_t^{1/(1-\beta)}.
\]

We study conditions under which this is true for all entrepreneurial offsprings, that is, we solve for an equilibrium where no offspring indoctrinated into entrepreneurial activity abandons his cultural parent’s occupation, choosing to become a wage worker instead. Using (19) in (20), this requires

\[
\frac{z^k_{nt}}{Z_{nt}} > \frac{\beta}{1-\beta} \frac{1}{\mu_t} \quad \forall k \in \mathcal{E}_t.
\]

To identify an equilibrium path along which indoctrination is persistent, we start with the plausible scenario that there is an initial scarcity of (culturally indoctrinated) entrepreneurs, that is,

\[
\mu_1 > \mu^* \quad (22)
\]

where \( \mu^* \) is the steady-state share of wage-workers in the population (to be established). We anticipate that along the equilibrium path the economy monotonically converges to \( \mu^* \) from above.

For analytical convenience we assume that the initial distribution of priors is discrete. Specifically it takes two values \( x_{n1} \in \{\overline{x}_n, \underline{x}_n\} \) with \( \overline{x}_n > \underline{x}_n \) and \( \Pr[x_{n1} = \overline{x}_n] = G_1(\overline{x}_n) \) and \( \Pr[x_{n1} = \underline{x}_n] = 1 - G_1(\overline{x}_n) \) fractions of the population with these priors respectively. When agents with the more diffuse prior \( \overline{x}_n \) become wage workers and those with the prior \( \underline{x}_n \) entrepreneurs in \( t = 1 \), we have \( m_1 = \mu_1 = 1 - G_1(\overline{x}_n) \). For this, none of the potential workers should unilaterally want to become
an entrepreneur, that is, \( w_1 > \pi(\bar{x}_n) \). Using (3) and (19) this becomes

\[
\frac{z(\bar{x}_n)}{z(\bar{x}_n)} \frac{1 - G_1(x_n)}{G_1(x_n)} < \frac{\beta}{1 - \beta}.
\] (23)

A similar restriction for the entrepreneurs, inequality (21), requires that

\[ \mu_1 = 1 - G_1(\bar{x}_n) > \beta. \]

Combining the two inequalities we get a restriction on the initial distribution

\[ \beta < 1 - G_1(\bar{x}_n) < \beta \left[ \frac{1}{\beta + (1 - \beta)\lambda_n} \right] \] (A1)

where \( \lambda_n = \frac{(1 - \sigma_v^2 - \bar{x}_n)}{(1 - \sigma_v^2 - \bar{x}_n)} < 1 \). We assume henceforth that (A1) holds. It ensures that the initial share of wage workers exceeds the efficient allocation but the share is not so high that it depresses wages below expected business income even for informed agents, those with a prior of \( \bar{x}_n \). The latter requires that \( \lambda_n \) be small enough, that is, agents indoctrinated in entrepreneurship acquire a sufficiently strong comparative advantage in it.

Finally we need to ensure that cultural indoctrination is dynamically persistent for all \( t \) for which (A1) is not sufficient. Since entrepreneurs are identical in their business expertise and learn at the same rate, \( z_{nt}^k / Z_{nt} = 1/(1 - \mu_t) \). Hence (21) simplifies to \( \mu_t > \beta \) for which it is sufficient that

\[ \mu^* > \beta \] (A2)

if \( \mu_t \) converges to \( \mu^* \) from above as we have conjectured. Using an example later we illustrate what parametric restrictions ensure (A2). Finally, note that in steady state, all entrepreneurial lines have asymptotically converged to the same level of business capital \( a^n [1 - \sigma_v^2] \) while aggregate business capital has converged to \( (1 - \mu^*) a^n [1 - \sigma_v^2] \).

To summarize this discussion, Figure 1 illustrates occupational allocation at \( t \) using the relationship between expected business income and the wage rate from equation (20) above: entrepreneurial expected income is monotonically falling in how diffuse the prior \( x \) is. Since cultural indoctrination is persistent, the wage working prior stays stuck at \( \bar{x}_n \) while the entrepreneurial prior converges asymptotically to zero. In other words, the distribution of priors in the population remains discrete at all points in time. As depicted in Fig 1, \( \bar{x}_{nt} \) is the prior of all culturally indoctrinated entrepreneurs at \( t \), less than their initial prior \( \bar{x}_n \) due to learning-by-doing over time. For priors lower than \( \hat{x}_{nt} \), entrepreneurs have sufficiently high expertise that they can expect a higher income than wage work. If the prior exceeds \( \hat{x}_{nt} \), on the other hand, wage work dominates. This leads to the following Proposition.
**Proposition 1.** Under (A1) and (A2), at any $t$, agents with a prior lower than some $\hat{x}_{nt} \in (0, \overline{x}_n)$ become an entrepreneur and choose the socialization effort $\tau^k_t$ given by (16) for $i = k$. Conversely, any agent with prior higher than $\hat{x}_{nt}$ will choose to become a wage worker and the socialization effort $\tau^w_t$ given by (16) for $i = w$.

\[
(1 - \beta)\beta^{\beta/(1-\beta)}a^n \left[1 - \sigma^2 - \hat{x}_{nt}^k\right]
\]

\[
\mu_t \equiv 1 - G_t(\overline{x}_n).
\]

The proportion of wage workers in the $t + 1$-th generation is comprised of three groups. First are the children of wage working parents from the $t$-th generation for whom the social education effort was successful,

\[
\tau^w_t \Pr\{x_{nt} = \overline{x}_n\} = \tau^w_t \mu_t
\]

The second group consists of those offspring for whom the socialization effort was unsuccessful but who were subsequently matched with a wage working cultural parent. The proportion of these agents is

\[
\mu_t(1 - \tau^w_t) \Pr\{x_{nt} = \overline{x}_n\} = (1 - \tau^w_t)\mu_t^2.
\]

Future wage-workers are also drawn from the children of entrepreneurial parents for whom the socialization effort was unsuccessful and who were subsequently matched with a wage working cultural parent.

\[
\mu_t(1 - \tau^w_t) \Pr\{x_{nt} = \overline{x}_n\} = (1 - \tau^w_t)\mu_t^2.
\]
cultural parent:

\[ \mu_t (1 - \bar{\tau}_t^b) \Pr[x_{nt} = x_{nt}] = (1 - \bar{\tau}_t^b) \mu_t (1 - \mu_t) \]

where

\[ \bar{\tau}_t^b \equiv \frac{\tau_{t}^k \Pr[x_{nt} = x_n]}{1 - \mu_t} = \tau_{t}^k \]

is the average socialization effort among entrepreneurial families, the same for all \( k \) under the assumption \( x_{n0} \) takes only two values.

The evolution of \( \mu \) is then governed by

\[ \mu_{t+1} = \tau_{t}^w \mu_t + (1 - \tau_{t}^w) \mu_t^2 + (1 - \bar{\tau}_t^b) \mu_t (1 - \mu_t) \]

or,

\[ \Delta \mu_t \equiv \mu_{t+1} - \mu_t = \left( \tau_{t}^w - \bar{\tau}_t^b \right) \mu_t (1 - \mu_t) \] \hspace{1cm} (24)

where the educational efforts depend on occupation- and belief-specific payoffs and \( \mu \) from equations (16) and (17) above. In steady state, \( V_{t}^{ww} - V_{t}^{wk} = V_{t}^{ww} - V_{t}^{wk} \) and \( V_{t}^{kk} - V_{t}^{kw} = V_{t}^{kk} - V_{t}^{kw} \) for all \( t \). Equation (24) has three steady states, zero, one and \( \mu^* \) given by

\[ \mu^* = \frac{V_{t}^{ww} - V_{t}^{wk}}{(V_{t}^{kk} - V_{t}^{kw}) + (V_{t}^{ww} - V_{t}^{wk})} \] \hspace{1cm} (25)

where both types of parents make the same socialization investment

\[ \tau_{t}^w \left( \mu^*, V_{t}^{ww} - V_{t}^{wk} \right) = \tau_{t}^k \left( \mu^*, V_{t}^{kk} - V_{t}^{kw} \right) \].

The following proposition establishes the stability of this steady state and Figure 2 provides an intuitive justification (see Bisin and Verdier, 2000, for details).

**Proposition 2.** Under A1 and A2, \( \mu_t \) monotonically converges to \( \mu^* \) from above.

Aggregate output, given the technology \( n \), is maximized when \( \mu_t = \beta \) and entrepreneurs and workers earn the same expected income. This efficient outcome does not occur here even in steady state except when subjective occupational biases are absent and incomes are equalized (see example below). Typically we would expect \( \mu^* > \beta \), that is, an undersupply of entrepreneurship and depressed aggregate output for three reasons. In the first place, entrepreneurship requires business-specific expertise that is private knowledge. This restricts entry into entrepreneurship. On top of this are two distortions related to the cultural process. Parents prefer their children to be like them (occupationally) and impart those values through successful socialization. These take the form of business expertise and occupation-specific biases. Moreover, parental indoctrination is not always successful. Even if almost all parents were to be entrepreneurial, not all their biological offspring
\[ \Delta \mu_t = \mu_t (1 - \mu_t) \left( \tau_t^w - \tau_t^b \right) \]

Figure 2: Dynamics of Occupational Type

would be. If wage-working parents have a stronger bias (\( \delta_w >> \delta_b \)) and are relatively uninformed about running a business (\( \overline{x}_n >> \overline{x}_e \)), their indoctrination effort will strongly dominate those of entrepreneurial families. This would intensify the first distortion, restricting even more the supply of entrepreneurship. The following example and comparative statics highlight these margins.

**Example 2.** Under the functional form for \( \psi(\tau) \) and socialization efforts from Example 1, and the equilibrium wage from (19), the steady-state supply of wage-workers \( \mu^* \) implicitly solves:

\[
\ln \left( \frac{1 - \mu^*}{\mu^*} \right) = \ln \left( \frac{1 - \beta}{\beta} \right) + \mu^* \ln \delta_b - (1 - \mu^*) \ln \left[ \delta_w \left( \frac{1 - \sigma_v^2}{1 - \sigma_v^2 - \overline{x}_n} \right) \right].
\]

Fig 3 shows, for \( \beta = 0.5, \delta_w = 2, \delta_b = 2, \sigma_v = 0.1, \overline{x}_n = 0.2, \) this is increasing in wage worker bias, decreasing in entrepreneurial bias and business expertise. If occupational biases were absent, that is \( \delta_b = \delta_w = 1, \) and business expertise were alienable, the efficient outcome \( \mu^* = \beta \) obtains.

From the equation above, \( \mu^* > \beta \) requires that \( \mu^* \ln \delta_b < (1 - \mu^*) \ln \left[ \delta_w (1 - \sigma_v^2)/(1 - \sigma_v^2 - \overline{x}_n) \right], \) a sufficient condition for which is

\[
\delta_b < \left[ \delta_w \left( \frac{1 - \sigma_v^2}{1 - \sigma_v^2 - \overline{x}_n} \right) \right]^{(1-\beta)/\beta}.
\]

For a given vector \((\delta_b, \delta_w, \beta)\), this is satisfied as long as \( \overline{x}_n \) is high enough. More generally, it is likelier when the entrepreneur-specific subjective bias \( \delta_b \) is weaker compared to the worker-specific bias.
(δ_w), entrepreneurship requires substantial human capital (relatively diffuse \( \bar{x}_n \)) and labor’s share of output (\( \beta \)) is relatively low.\(^8\)

We contend in section 4 below that the resistance to large-scale risk-taking in developing countries often stemmed from colonial-era bureaucracies and education policies geared towards training the local workforce in the colonial mission. Public-sector employment was subsequently broadened, further luring people away from entrepreneurship. The model can be readily modified to include this. Suppose that the government hires an \( f \) fraction of the population to provide a public good \( g \) that is perfectly substitutable with private consumption and is linearly produced using labor alone. If the government has no wage-setting power, it hires these workers at the market wage \( w \), paid out of lump-sum taxes on labor and business income. This modifies the supply of labor to firms to \((1 - f) \mu_t\), wage-workers being indifferent between working for firms versus the public sector. This leaves much of the analysis from above unchanged, with public sector employment intensifying the cultural bias against risk-taking as the competition for workers drives up the wage rate and down the return from entrepreneurship. Of course, in many developing countries, the government does have wage setting power, offering remuneration to skilled workers more generous than the private sector. This only worsens the inefficiency: by attracting some of the more talented and educated workers (a margin absent in our model), the public sector can significantly lower the relative return from entrepreneurship. On top, if a better-paid public sector job is viewed as a sign of status, it creates another bias away from entrepreneurship.

\(^8\)That the allocation is inefficient even with \( \delta_w = \delta_b = 1 \) is partly due to culture. Suppose, for example, that the frequency of each type in the population depended on Darwinian replicator dynamics: more become entrepreneurial type instead of wage-worker type as long as the expected return from entrepreneurship is higher. In steady state, with no net inflow into wage-work or entrepreneurship, the returns from the two occupations have to equalize. That is, the efficient outcome would obtain. This is mechanical of course, but shows that inefficiency occurs due to purposeful within-family indoctrination – the cultural transmission of human capital – besides the inalienability of business capital.
3 Upgrading Technologies

The constant technology model from section 2 does not entertain growth in the long run or the possibility that newer entrepreneurs emerge from non-entrepreneurial families. We extend the previous environment to allow these.

First, potential entrepreneurs can choose from a menu of technologies (business activities) instead of a fixed and arbitrary $n$. In this we closely follow Jovanovic and Nyarko (1996). There is no direct cost of switching to a different technology and, as before, no cost to adjusting $x$. Each $n$ is associated with the same technology as equations (4) and (5) and different technologies are imperfectly related. Specifically the parameters $\theta_n$ and $\theta_{n+s}$ for any $n$ and $s \geq 0$ are linked by

$$\theta_{n+s} = \alpha^s \theta_n + \eta_s,$$

where $\eta_s \sim N(0, \sigma_{\eta}^2)$, $\alpha \in (0, 1)$,

and $\theta_n$ and $\eta_s$ are independent. Observe that if $\alpha = 1$ and $\sigma_{\eta}^2 = 0$, then $\theta_{n+s} = \theta_n \forall s$ which means any precision about $\theta_n$ can be transferred to $\theta_{n+s}$, though even if an entrepreneur were to have learned $\theta_n$ entirely, he would still face uncertainty regarding $\theta_{n+s}$. This suggests we can think of $\alpha$ as a measure of the specificity of human capital – how well knowledge of one business venture or technology helps in the next. We assume that entrepreneurs cannot skip intermediate technologies when switching, that is, upgrading to $n + 2$ is possible only via $n + 1$ and not directly from $n$ to $n + 2$. Finally note that $\alpha > 1$ ensures that, for the same level of business expertise on different technologies, a higher one yields higher expected profits.

The preference side is similar to the benchmark model. We maintain the assumption of discrete initial priors but modify below the uninformed prior to be consistent with technology upgrading. For cultural indoctrination, it is necessary to specify which grade of technology is used to evaluate an offspring’s payoff from entrepreneurship. We assume this depends on the growth regime: if technology is being upgraded regularly, even wage working parents will anticipate their offspring doing so. Otherwise, they anticipate their offspring using the current technology. In either case, wage working parents still evaluate their offspring’s payoff under their own diffuse prior. Parents also take into account the growth of wages should technology be upgraded regularly.

3.1 Updating and Upgrading

We begin by studying what an entrepreneur learns if he were to upgrade his technology compared to the one his entrepreneurial parent used. Recall from the previous section that continuous updating of information without changing the technology will lead to perfect mastery of that technology. In the presence of a menu of technologies distinguished by (26), upgrading to the next one causes posteriors to become more dispersed, business expertise to be diluted, because the prior
for vintage $n + 1$ is $\alpha x_n + \sigma_n^2$.

First consider a hypothetical scenario of constant upgrading-without-updating. If this were to be repeated over time, the diffuse prior – which does not get sharpened through updating – evolves according to

$$x_{n+1,t+1} = \mathcal{H}(x_{nt}) \equiv \alpha x_{nt} + \sigma_n^2.$$  \hfill (27)

$\alpha \in (0,1)$ ensures that the fixed point of this mapping is a well defined $x' = \sigma_n^2/(1 - \alpha) > 0$, independent of $n$. The greater the uncertainty surrounding new technologies, that is the higher is $\sigma_n^2$, the more diffuse is this long-run value. The absence of updating ensures that expertise remains weak. We assign this fixed point to be the diffuse prior of wage-workers, analogous to $\bar{x}_n$ in the baseline model. In other words, we are endowing wage workers with the “best of the worst” possible priors when a menu of technologies is available.\footnote{Assuming that the diffuse prior takes this particular value is not essential. All that is needed is for the prior to be sufficiently diffuse, above $x^{**}$ (Lemma 1) and below $1 - \sigma_n^2$, the latter opening up the possibility for indoctrination to be non-persistent.} We also assume that the economy starts in $t = 1$ with technology $n$ in use and a population endowed with the discrete priors $x'$ and $\underline{x}_n < x'$.

$G_1(\underline{x}_n)$ fraction of the initial population is indoctrinated as entrepreneurs, $1 - G_1(\underline{x}_n)$ fraction as wage workers.

When an entrepreneurial line is updating priors as well as upgrading technologies, the evolution of entrepreneurial human capital is described by

$$x_{n+1,t+1} = \mathcal{F}(\mathcal{H}(x_{nt})) = \mathcal{F}\left(\alpha x_{nt} + \sigma_n^2\right)$$  \hfill (28)

the fixed point of which, $x^{**}$, is the positive root of $\alpha x^2 + \left[(1 - \alpha)\sigma_n^2 + \sigma_n^2\right] x - \sigma_n^2 \sigma_n^2 = 0$. It is easy to show that $x' > x^{**}$. Lemma 1 below summarizes these results and will be important in establishing results later. Changes in the three fixed points referenced there or their relationship to other critical values of $x$ drive the decisions that agents make on whether or not to work in accordance with their indoctrination and, as entrepreneurs, whether or not to upgrade technologies.

**Lemma 1.** The fixed points of the mappings $\mathcal{F}$, $\mathcal{F}(\mathcal{H})$ and $\mathcal{H}$ are 0, $x^{**}$ and $x'$ respectively such that $0 < x^{**} < x'$.

This model can generate a steady state where advanced businesses do not innovate, resulting in stagnation. The model of section 2 is therefore a special case of this one if we take $\bar{x}_n = x'$. This equilibrium can be shocked by changes in $a$, the rate of technological change or TFP, and $\alpha$, the human capital specificity of different technologies. When this happens, existing entrepreneurs may start adopting more productive technologies or a new generation of entrepreneurs may do so and leap-frog over existing ones. Either way the economy moves from stagnation to endogenous growth.
To understand these results it will help to keep in mind four cases – Figures 4 and 5 – depending on parameter values. The gray line in each figure indicates the equilibrium wage rate which strictly exceeds the payoff from entrepreneurship under the diffuse prior \( x' \). For simplicity, the decision whether or not to upgrade is shown for the entire range of \( x \).

![Figure 4: Technology Choice when \( \Pi_k(0) < \pi_k(0) \)](image)

### 3.2 Long-run Stagnation

For an individual who has been culturally indoctrinated by the entrepreneurial line \( k \), define \( \Pi^k(x) \) as the expected payoff to switching to \( n + 1 \) based on the expertise \( x \) that he has over technology \( n \). Similarly, let \( \pi^k(x) \) be the expected payoff to staying with \( n \), similar to before.

\[
\Pi^k_t(x) \equiv \mathbb{E}(\tilde{\pi}^k_{nt} | x^k_{nt} = x) = \kappa_t a^{n+1}(1 - \sigma^2_n - \sigma^2_v - \alpha x) \\
\pi^k_t(x) \equiv \mathbb{E}(\tilde{\pi}^k_{t,n+1} | x^k_{nt} = x) = \kappa_t a^n(1 - \sigma^2_v - x)
\]

Because \( \Pi^k(x) \) and \( \pi^k(x) \) represent the expected payoffs to choosing technologies \( n + 1 \) and \( n \) respectively, their ranking determines whether entrepreneur \( k \) will upgrade or not.

Long-run stagnation can occur in two scenarios, both illustrated in Figure 4 and formalized in the proposition below. This happens when the productivity gain from switching \( a \) is relatively small and the optimum scale of a new technology is not easy to learn based on the old one (high \( \sigma_\eta \)). The two cases differ in whether a new technology requires expertise sufficiently different from the old one \( (\alpha) \) which determines whether or not upgrading is worthwhile at any level of business expertise.

**Proposition 3.** Suppose that \( \Pi^k_t(0) < \pi^k_t(0) \), that is \((1 - \sigma^2_v) > (1 - \sigma^2_v - \sigma^2_\eta)\alpha \).
(i) If $\alpha a > 1$, $\Pi^k_t(x) < \pi^k_t(x)$ for all $x \geq 0$,

(ii) If $\alpha a < 1$, then for some $\tilde{x} \in (0, (1 - \sigma^2_n - \sigma^2_v)/\alpha)$, $\Pi^k_t(\tilde{x}) = \pi^k_t(\tilde{x})$ such that $\Pi^k_t(x) < \pi^k_t(x)$ whenever $x < \tilde{x}$ and vice versa.

Fig 4(a) illustrates the case for Proposition 3(i): no matter what an entrepreneur's expertise (belief) is, the prevailing technology always dominates. No entrepreneur has any incentive to upgrade technologies which means the economy stays with $n$ forever.

Suppose instead, as in Fig 4(b), we have $\alpha a < 1$, that is a lower value of $\alpha$ than above. Here an entrepreneur's expertise determines whether or not he is better off upgrading. An entrepreneur with a very low $x$, that is, a lot of expertise in technology $n$, will not want to upgrade because his substantial expertise in $n$ does not readily transfer to $n+1$. The threshold $\tilde{x}$ is given by

$$\tilde{x} = \frac{a\sigma^2_n - (a - 1)(1 - \sigma^2_v)}{1 - \alpha a}$$

which is positive since $\Pi^k_t(0) < \pi^k_t(0)$ and independent of time. Whereas for low values of $x$ technology $n$ dominates expected earnings, for a high value (still low enough to yield positive expected returns over wage work) $n+1$ dominates. This means, if all entrepreneurs start off with minimally dispersed priors (low values for $x$), it is possible that all entrepreneurial lines keep using the vintage $n$ without ever upgrading. Formally this requires, following the equilibrium outlined in section 2, that entrepreneurs start with a prior $\bar{x}_n \leq \tilde{x}$ corresponding to the initial technology $n$, and that a modified version of (A1) holds

$$\beta < 1 - G_1(\bar{x}_n) \leq \beta \left[ \frac{1}{\beta + (1 - \beta)\gamma} \right]$$

(A3)

to allow for more than one technologies, where $\gamma \equiv a(1 - \sigma^2_v - \sigma^2_n - ax')/(1 - \sigma^2_v)$. If (A3) holds, all businesses will continuously update as in section 2 without ever upgrading their technologies.

The outcomes from Fig 4(a) and Fig 4(b) under $\bar{x}_n \leq \tilde{x}$ and (A3) are the same: no entrepreneur ever switches to a more productive technology than $n$. This means the economy converges to the stationary equilibrium of section 2 where aggregate output is constant, indoctrination is dynamically persistent (see section 3.4 below for details) and the supply of entrepreneurs is $1 - \mu^*$.

### 3.3 Top-Down Development

Depending on parameter values, it is possible to have a long-run equilibrium where well-established entrepreneurial lines spur growth by constantly upgrading their technology.

**Proposition 4.** Suppose that $\Pi^k_t(0) > \pi^k_t(0)$, that is, $(1 - \sigma^2_v) < (1 - \sigma^2_v - \sigma^2_n) a$. 

(i) If \( \alpha a < 1 \), \( \Pi_k^t(x) > \pi_k^t(x) \) for all \( x \geq 0 \),

(ii) If \( \alpha a > 1 \), then for some \( \tilde{x}' \in (0, 1 - \sigma_n^2) \), \( \Pi_k^t(\tilde{x}') = \pi_k^t(\tilde{x}') \) such that \( \Pi_k^t(x) > \pi_k^t(x) \) whenever \( x < \tilde{x}' \) and vice versa.

**Figure 5: Technology Choice when \( \Pi_k^t(0) > \pi_k^t(0) \)**

In Fig 5(a), corresponding to Proposition 4(i), the payoff from a new technology always exceeds that from the existing one no matter how precise or diffuse the entrepreneur’s prior is. In this case, all entrepreneurs always upgrade. This scenario is more likely when the productivity gain from switching \((a)\) is large enough, the optimum scale of the new technology is easy to learn based on the old one (low \( \sigma_n \)) and, at the same time, the new technology requires expertise sufficiently different from the old one (low \( \alpha \)). To see the last point, note that both \( \Pi \) and \( \pi \) decline monotonically with \( x \). Since \( \partial \Pi_k^t(x)/\partial x = -\alpha \kappa_t a^{n+1} \) while \( \partial \pi_k^t(x)/\partial x = -\kappa_t a^n \), so long as \( a\alpha < 1 \), the returns to using a new technology will fall at a lower rate when \( x \) rises than returns to the old one.

In contrast, for a sufficiently high value of \( a \) as in Fig 5(b) and Proposition 4(ii), it is an entrepreneur with a lot of business expertise, \( x < \tilde{x}' \), who has an incentive to upgrade, where \[
\tilde{x}' = \frac{(a - 1)(1 - \sigma_n^2) - a\sigma^2}{aa - 1}.\]

Recall that entrepreneurs are endowed with the prior \( x_n \) at \( t = 1 \). If \( x_n > \tilde{x}' \), no entrepreneur is sufficiently good at business for upgrading to be worthwhile – the economy would stagnate as in section 3.2 above. If instead \( x_n < \tilde{x}' \), similar to Fig 5(a) all entrepreneurs keep upgrading their technology.

Given the higher level of business knowledge available to incumbents and the tendency of developing countries to be far from the technological frontier, it is useful to understand what might unleash technological catchup and growth in our model. A natural candidate is an exogenous
shock, a sharp change in technological or market access, that improves overall productivity $a$. This raises entrepreneurial returns from both existing and new technologies. Starting from the no-growth stationary equilibrium described by Fig 4(a), if $a$ were to increase sufficiently such that $(1 - \sigma_v^2) < a(1 - \sigma_v^2 - \sigma_\eta^2)$, then $\Pi^k_t(0) > \pi^k_t(0)$ and, as in Fig 5(b), entrepreneurial lines would now prefer to upgrade rather than stay with their existing technology. Further, because this increase in $a$ increases the marginal cost of diffuse priors, wage worker cultural lines prefer not to enter the business world. With all old businesses simultaneously switching from $n$ to $n+1$, economic growth takes off without the creation of any new business lines. In this sense, culture ceases to be a constraint on economic growth: a sufficiently large change that improves overall productivity can tip the economy from stasis towards rapid change. In another respect, however, culture remains a drag as we explain below.

For Fig 5(a) and for Fig 5(b) when $\bar{x}_n < \bar{x}'$, constant updating and upgrading of technologies sees all entrepreneurs’ priors converging to $x^{**}$ over time. Each generation sees technologies upgraded by one step, so that if technology $r > n$ was being used in $t$, technology $r + 1$ will be used in $t + 1$. This means, along such a balanced growth path, expected business capital for each entrepreneur at $t$ is

$$z^k_t = a^r [1 - \sigma_v^2 - x^{**}]$$

which grows at the (gross) rate $a$ between any successive generations. In order for this to be a stationary equilibrium, cultural indoctrination should also reach a steady state. This requires, from section 2, that the difference $V^{ii} - V^{ij}$ for $i, j \in \{k, w\}$ be constant. From (17) this means the wage rate will be growing at the same rate as expected entrepreneurial income whether at the informed ($x^{**}$) or uninformed ($x'$) prior. Expected entrepreneurial income for any $x$ is

$$\pi^k_{rt}(x) = a^r (1 - \beta) \left( \frac{\beta}{w_t} \right)^{\beta/(1 - \beta)} [1 - \sigma_v^2 - x].$$

For the ratio

$$\frac{\pi^k_{rt}(x)}{w_t} = \frac{a^r (1 - \beta) \beta^{\beta/(1 - \beta)}}{w_t^{1/(1 - \beta)}} \left[ 1 - \sigma_v^2 - x \right], \quad x \in \{x', x^{**}\}$$

to be constant, the growth factor of wages must be $a^{1 - \beta} > 1$, equal to the growth factor of expected entrepreneurial income. With relative payoffs remaining stationary, indoctrination efforts are again given by equation (16) evaluated at these new relative payoffs, leading to a steady-state indoctrination rate of $\bar{\mu}$ analogous to equation (25). The example below provides conditions under which this steady state is inefficient.

**Example 3.** Using an approach similar to Examples 1 and 2 above, the steady-state $\bar{\mu}$ when en-
trepreneurs constantly upgrade technologies implicitly solves

$$\ln \left( \frac{1 - \bar{\mu}}{\mu} \right) = \ln \left( \frac{1 - \beta}{\beta} \right) + \bar{\mu} \ln \delta_b - (1 - \bar{\mu}) \ln \left[ \delta_w \left( \frac{1 - \sigma_v^2 - x^{**}}{1 - \sigma_v^2} \right) \right].$$

This is inefficient when

$$\delta_b < \left[ \delta_w \left( \frac{1 - \sigma_v^2 - x^{**}}{1 - \sigma_v^2} \right) \right]^{(1-\beta)/\beta}.$$

Setting $\bar{x}_n = x'$ in Example 2 implies $\bar{\mu} < \mu^*$: the upgrading-updating steady state is closer to the efficient outcome than the stagnation steady state.

In this steady state, aggregate output (and output per capita)

$$Y_t = \sum_k Y^k_t = \bar{\mu} (1 - \bar{\mu}) \ln \left[ a^f (1 - \sigma_v^2 - x^{**}) \right]^{1-\beta}$$

also grows at the growth factor $a^{1-\beta}$ and the economy is in a balanced growth path (BGP). This growth rate is independent of cultural factors. Indeed it is the maximal growth rate possible when entrepreneurs can upgrade only one-step ahead. But a static inefficiency remains from $\bar{\mu} > \beta$, with a higher cultural bias lowering the BGP.

3.4 Overtaking

A more interesting growth takeoff is also possible, one associated with social mobility and the emergence of a new economic elite. Start again with the no-growth stationary equilibrium described in section 3.2 with dynamically persistent cultural indoctrination. Since the economy is in steady-state, there is a single entrepreneurial prior of $x_n = 0$ and a single wage-worker prior of $x'$ and the wage rate exceeds expected business returns at $x'$. Dynamic persistence in the no-growth steady state requires that wages be greater than the expected returns of an entrant who uses the current technology. Here, however, the potential entrant can use technology $n+1$ besides $n$. Dynamic persistence therefore requires that $w(\mu^*) > \max \{ \pi^k(x', \mu^*), \Pi^k(x', \mu^*) \} = \Pi^k(x', \mu^*)$ since $x' < x'$. Earlier we defined $\gamma$ as the expected entrepreneurial return from upgrading under a prior of $x'$ relative to the expected return from staying with the existing technology for a prior of zero: $\gamma(\alpha) = a(1 - \sigma_v^2 - \sigma_h^2 - \alpha x')/(1 - \sigma_v^2)$. Hence for dynamic persistence we must have

$$\gamma(\alpha) \frac{\mu^*}{1 - \mu^*} < \frac{\beta}{1 - \beta}. \quad (31)$$

Suppose now that the economy is shocked by a change in technology access or regulatory environment. Instead of raising $a$, the shock lowers the value of $\alpha$, how easily expertise in one line of
business can be transferred into other lines.\textsuperscript{10} Lowering $\alpha$ lowers the magnitude of $\partial \pi(x) / \partial x$ while $\partial \Pi(x) / \partial x$ is unchanged. The key values of business expertise are $x^{**}$, the fixed point for continual upgrading and updating and $\tilde{x}$, the level of business expertise at which payoffs to $n$ and $n + 1$ are identical.\textsuperscript{11} That the marginal cost of a more diffuse prior falls when $\alpha$ falls means that (31) may be overturned. To have a meaningful impact, we assume that the decrease in $\alpha$ to $\alpha'$ is large enough so that

$$\gamma(\alpha') > \frac{\beta(1 - \mu^*)}{\mu^*(1 - \beta)}.$$ 

Larger the cultural inertia, that is further above $\beta$ is $\mu^*$, the greater the $\alpha$ shock necessary to make this happen. After the shock, individuals culturally indoctrinated to be wage workers are better off if they were to become entrepreneurs despite their lack of business expertise. The ranking of $\pi_n(0)$ and $\Pi_n(0)$ is not changed by the change in $\alpha$, so only the occupational choices of wage workers will be initially effected. By Lemma 1 and Proposition 3, when $\alpha$ is lowered, the following ordinal ranking $\tilde{x} < x^{**} < x'$ (see sections 3.1 and 3.2) is maintained. Because only their ranking determines occupational decisions – as opposed to decisions about parental investment which is determined by cardinal measures – this means that it is optimal for wage workers to want to become entrepreneurs.

If within-family indoctrination were perfect, we would be assured of overtaking as these wage workers ended up upgrading and updating in each period until their priors equalled $x^{**}$ at which point their productivity would increase by $a$ with each generation. Eventually these newly emerged entrepreneurial lines become more productive than incumbent businesses despite the latter’s significant advantage in the technologies they have specialized in. Upgrading will keep occurring because the priors of these new business entrants will be such that $\pi(x) < \Pi(x)$ for all vintages and, since $\tilde{x} < x^{**}$, they will reach the steady-state level of expertise $x^{**}$ before this ceases to be true. That is, entrant entrepreneurial families always keep updating, never in a position to have learned enough about an existing vintage for updating not to be worthwhile.

In the presence of imperfect within-family indoctrination, however, we also have to consider the socialization effort of different families. For expositional clarity, we separate occupational choices and cultural indoctrination of the first generation from subsequent ones.

\textsuperscript{10}Of course in practice such a policy shock may also raise $a$. The BGP implications are similar, the difference being both incumbent and entrant lines may upgrade depending on parameter values.

\textsuperscript{11}Since $x' = \sigma_0^2/(1 - \alpha)$, it also falls. We adopted $x'$ as the completely naive prior but we keep the naive prior unchanged for two reasons. First, the shock to $\alpha$ occurs after cultural indoctrination, that is, after $x$ has been acquired from the cultural parent. Secondly, changing $x'$ requires a theory how the naive prior actually adjusts to the new reality. The analysis below is robust to letting the naive prior change with $\alpha$.
First Generation

Let, as before, the fraction of generation \( t \) who were culturally indoctrinated in wage work be \( m_t \) and the fraction who become workers be \( \mu_t \).

Start with Fig 4(b) and suppose that \( \alpha \) falls to \( \alpha' \) at the beginning of \( t = T \) when indoctrination has already occurred but people are yet to make an occupational choice. The post-shock economy, before equilibrium is restored, is shown in Fig 6(a). The dashed line represents the new \( \Pi^k_t \) line corresponding to \( \alpha' \). At the uninformed prior \( x' \), wages were strictly higher than both \( \pi_t \) and \( \Pi_t \), so that none of the workers would have preferred entrepreneurship as (31) indicates. Now at \( x' \), expected entrepreneurial income from upgrading \( \Pi^k_t \) exceeds the wage rate but expected entrepreneurial income from the prevailing technology \( \pi_t^k \) does not.\(^{12}\)

![Diagram](https://via.placeholder.com/150)

(a) Post-indoctrination, Pre-Occupational Choice  
(b) Post-Occupational Choice Equilibrium

Figure 6: The period-\( T \) problem when \( \alpha \) falls to \( \alpha' \)

This creates, for the first time, a separation between an agent’s cultural line and his occupational choice. As culturally indoctrinated wage workers opt for entrepreneurship, it will drive up labor demand and drive down labor supply. This increases the wage rate \( w_T \) and decreases the expected entrepreneurial returns for both of the \( n \) and \( n + 1 \) technologies. Fig 6(b) shows – pre-equilibrium relationships are in gray, equilibrium ones in black – that an occupational equilibrium is restored at point \( A \) where enough such people have opted for entrepreneurship using \( n + 1 \) that the remaining workers are indifferent between the two occupations, that is, the wage rate and expected profits of entrant entrepreneurs are equalized. None of the culturally indoctrinated entrepreneurs switch to wage-work since they acquired perfect mastery over \( n \) from their cultural parents.

Denote the first-generation entrepreneurs, the entrants, by the set \( E^F_t \). Using their labor demand function from (2) and the arbitrage condition that \( w_T = \pi_{n+1,T}(x') \), these entrepreneurs

\(^{12}\)Fig 6 identifies \( x'(\alpha') = \sigma_n^2/(1 - \alpha') \) to illustrate that if the uninformed prior were to change to \( x'(\alpha') \), the implications are similar.
employ
\[ L_T^k = \frac{\beta}{1 - \beta} \forall k \in \mathcal{E}_T^E \]  
units of labor. The relative return between an incumbent and entrant’s businesses, \( \gamma_t \), is
\[ \gamma_t(x_t) = a^{T-t+1}(1 - \sigma_\gamma^2 - \sigma_\eta^2 - \alpha x_t) \frac{1 - \sigma_\gamma^2}{1 - \sigma_\nu^2} \text{ for } t \geq T \]  
where we use the result that along the transition path entrant entrepreneurial lines will keep updating their technology. Incumbent entrepreneurial lines who were employing \( \mu^*/(1 - \mu^*) \) units of labor before the shock, now hire
\[ L_T^k = \frac{\beta}{(1 - \beta)\gamma_T} \forall k \in \mathcal{E}_T \setminus \mathcal{E}_T^E. \]  
This labor demand is lower than before, since the entry of first-generation entrepreneurs raises the wage rate. The end result of this post-shock equilibrium is \( \mu_T < \mu_T \), a decline in business returns for existing entrepreneurial lines and the rise of a new class of entrepreneurs who are, initially, no better off than wage workers.

By the end of \( T \), three groups of people have emerged: those indoctrinated as workers and chose to be so, those indoctrinated as workers but chose to venture into entrepreneurship and those indoctrinated as entrepreneurs who chose to be so. We will refer to the last group, that is, those culturally indoctrinated and choosing to be entrepreneurs with priors \( x_n = 0 \), as incumbents. Denote by \( i_t \) the fraction of the population indoctrinated into incumbent entrepreneurship and by \( \iota_t \) the fraction who choose to be (incumbent) entrepreneurs. Refer to the other group of entrepreneurs and their progeny (those emerging from first-generation entrepreneurs) as entrants even though by \( T + 1 \) they are no longer first-generation entrepreneurs. Denote the fraction of the population culturally indoctrinated in entrant entrepreneurship as \( e_t \), while the actual number of entrants who choose to be entrepreneurs is \( \epsilon_t \). As before, \( m_t \) denotes the population fraction indoctrinated into wage work and \( \mu_t \) the fraction actually involved in it.

Using these definitions, we can describe the proportions of each of the three types in \( T \) using \( \mu^* \) and \( \gamma \) as
\[ i_T = i_T = 1 - \mu^*, \]
\[ \epsilon_T = \mu^* - (1 - \mu^*) \left( \frac{\beta}{1 - \beta} \right) \frac{1}{\gamma_T}, \]
\[ \mu_T = \mu^* - \epsilon_T. \]  

We proceed to show that for \( t > T \), culturally indoctrinated wage workers do not become entrepreneurs. This generates three kinds of priors in the population. Incumbents culturally pass along priors of \( x_n = 0 \) to every generation (\( \tilde{x} > 0 \) still holds), entrants culturally pass along \( x_{n+t} \)
moving from $x'$ to $x^{**}$ through constant upgrading and updating, and wage workers culturally transmit their prior $x'$.

**Second Generation and Beyond**

Since wages and expected entrepreneurial income for entrants are equalized in $t = T$, a wage worker will behave (from paternalism bias) as if his child on becoming a first-time entrepreneur will see no change in expected income and likewise a first-generation entrepreneur parent will surmise that their child becoming a wage worker will not alter their income. Both types of parents therefore indoctrinate their children based only on their occupational biases, $\delta_w$ and $\delta_b$. This results in a low level of parental investment from these groups. On the other hand, despite seeing their business returns drop, incumbent cultural lines will still view any movement towards wage work as a drop in their offspring’s income. They will invest more intensively in cultural indoctrination than the other groups (indoctrination effort, though, will be lower than before because of lower business earnings), thereby increasing the frequency of their cultural trait in the population. This will result in $m_t < m_T$, $e_t < e_T$ and $i_t > i_T$ for $t > T$. As wages rise further due to lower labor supply, the children of some entrants may become wage workers. This results in $\mu_t > m_t$ and $e_t < e_T$ in these periods, with the differences logically being of equal magnitudes. However, there will still be at least some entrant lines maintained (who will be upgrading and updating) in each period $t$ so long as the number of incumbents is sufficiently small or $\gamma_t$ is sufficiently high:

$$
t_t < \frac{(1-\beta)\gamma_t}{(1-\beta)\gamma_t + \beta} \text{ for } t > T.
$$

(36)

If (36) does not hold, the number of cultural incumbents is driven sufficiently high that wages are pushed above the expected income an entrant business line obtains. The result is that all entrant business lines are wiped out as their cultural offspring become wage workers.

So long as (36) holds, some entrant entrepreneurial lines may disappear but on the whole entrepreneurship will come to be dominated by the first-generation entrants. This is because cultural indoctrination alone cannot wipe out the entire cultural line of a group, only diminish it by some fraction in each generation. Moreover, under (36), the discrete priors for population will be maintained. This is because there are no wage workers becoming new entrepreneurs after the first generation, as the original shift of wage workers towards business will force equation (31) to be true once again. Although the demographics based on indoctrination and occupational choice are complex, we conclude that so long as entrant lines are not wiped out under (36), they will eventually have higher business earnings than incumbents. This leads to the following proposition.

**Proposition 5.** Since $a > 1$ and $\bar{x} < x^{**} < x'$, after sufficient technology upgrading and updating, new technologies will yield higher expected earnings than $n$. As entrants’ priors fall with each up-
grade and update, their productivity rises faster than that of incumbents. Their indoctrination effort will come to dominate that of incumbents' and wages will rise such that at some \( t = T' > T \), \( w_{T'} = \pi^k_{T'}(0) \). For \( t > T' \), incumbent cultural lines are wiped out as their offspring choose to become wage workers.

The BGP characteristics of this economy are similar to that of the previous section: growth is driven by continuous technology upgrading and the fraction of wage workers is equal to \( \bar{\mu} \). So long as assumptions (A2) and (A3) hold for \( \bar{\mu} \), the result will be a monotonic, dynamically persistent movement toward \( \bar{\mu} \) after \( T' \), with discrete priors \( x_{n+t} = x^{**} \) for entrepreneurs and \( x' \) for wage workers. The key difference from before is that growth here is driven entirely by entrant entrepreneurial lines.\(^{13}\)

4 Discussion

Our model of culture and entrepreneurship, while relatively simple in its broad classification of occupations and the cultural determination of preferences, can inform how culture has shaped the development path of several societies in recent history. We present three examples. The first, on Japan and South Korea, shows the scope of top-down development arising from forced cultural and economic change. The discussion on India that follows highlights a growth takeoff fueled partly by cultural change and the emergence of a new class of entrepreneurs. We also consider how colonial policies in India biased the population towards safer occupations, an argument extended to colonial Africa in the third example.

Japan and South Korea

Japanese society before the Meiji era is an interesting instance of stagnation, a focus on stability and wealth accumulation solely from population growth. According to the historian E. Herbert Norman, this Tokugawa period was “one of the most conscious attempts in history to freeze society in a rigid hierarchical mold” (Norman, 1940, cited in Lockwood, 1968, p. 5). Landes (1998) describes the prevailing climate similarly: “Japan had had enough of discovery and innovation [...] The aim now: freeze the social order, fix relations of social and political hierarchy” (p. 356). Infanticide was widely practiced for family planning and this was opposed vociferously by the daimyo on expressly amoral grounds because growth of the peasant population was a major source of wealth creation and preservation for the nobility (Honjo, 1935). The Shogunate did away with the procedure of taking land from feudal lords who died without a male heir, sacrificing enormous future land transfers, in order to do away with ronin, masterless samurai who were a source of significant

\(^{13}\)It follows that if entrant entrepreneurial lines are wiped out, there is no growth in steady-state as incumbent entrepreneurial lines never have any incentive to upgrade.
political dislocation (Landes, 1998). Along with proscriptions against foreign interactions, there were significant prohibitions on the use of high-quality soil for the production of cash crops and for villagers seeking non-agricultural work. All of this can be understood in our framework as an attempt to maintain and master existing methods of production and create wealth for incumbents without potentially upsetting their privileges. It is easy to see that in the model, the only way for incumbents to become richer in a stagnating economy is for the working population to procreate faster.

After Commodore Perry opened up Japan, the country embraced a deep cultural revolution. The existing elite were driven by a perception of the military necessity of economic reform, and a society accustomed to and proficient in existing technologies was confronted by a regime in which competition and innovation were extolled, embodied by the slogan *Fukoku kyohei*, “enrich the economy to strengthen the army” (Smith, 1988, p 259). During the Meiji era, economic growth was spurred by agricultural liberalization that allowed for the introduction of new techniques and the use of existing land for crops other than rice. The system of privilege by which merchants and high-ranking samurai attained wealth during the Tokugawa era was also ended (Macpherson, 1995). Silk and other cash crops were grown on land which had previously been employed to produce rice. This transformation was largely due to the Land Tax Reform of 1873 which overturned the idea that cash was to be kept out of the hands of all save merchants (best exemplified by the slogan *kikoku-senkin*, “revere grain, despise money”) and allowed transactions to be carried out in cash for the permanent transfer of land. Land transfers allowed plots that had been divided up into five or fewer acres, ideal for rice cultivation, to be expanded for activities such as sericulture. At the same time, the introduction of Western technology brought the application of phosphate fertilizers.

As Macpherson (1995, p. 71) points out, this agricultural revolution was the primary source of financing for subsequent industrialization, and provided a wellspring of entrepreneurs as well as financing. This growth was characterized by the outsized role that the existing elites (samurai and merchants) played, with some scholars going so far as to describe this as an aristocratic revolution in response to the new opportunities (Smith, 1988, p. 135). Landes (1998) describes it thus:

“In a society that valued nothing higher than personal loyalty, disaffected elites could set higher authority – the emperor (Tenno) and the nation – above their lord and the shogun above him, without being disloyal. They could make a revolution without being revolutionaries.” (p. 372)

The elites had direct contact with Western technology because of the large number of diplomatic missions at that time. After failing to extract a diplomatic concession from Western powers, “the delegation swallowed their pride and went about their calls, visiting factories and forges, shipyards...”  

14 “...a village could be punished for failing to get the maximum amount of production from its land, planting commercial crops on land assessed as taxable rice land [all land which had been under cultivation during the last tax assessment], or neglecting farming in favor of other occupations” (Jansen, 1980, Ch. 9).
and armories, railways and canals, not returning until September 1873, almost two years later, laden with the spoils of learning.” (Landes, 1998, p 375). Within our model, we can understand these changes as either changing the degree of human capital specificity (by lowering the power of rank and privilege) or by increasing the returns to newer technologies. In the case of the reduction in the power of privilege, a reduction in the need to cultivate government contacts to be permitted to engage in commercial activity would make commercial activity easier for all potential entrants, and give less of an edge to incumbents with the most experience and, therefore, the most contacts. In either case, a shift from stagnation to long run growth will occur. That the elites were the ones to have led Japan towards modernization suggests that the second channel was more instrumental.

Korean society before Japanese colonization (1910-1945) was in many ways similar to Tokugawa-era Japan, with a strong focus on the status quo (Jones and Sakong, 1980) and pressure from the nobility to expand population countered by a large farmer class who responded with strict family planning to control populations and maintain their standard of living (Song, 1994). Under the Japanese colonial government, most opportunities were limited to the Japanese. This structure gave way, in the post-independence years, to an economy with little economic growth or entrepreneurship until the Park regime. One of General Park’s first major actions on the domestic front was to imprison business leaders, allegedly for corruption. They were all eventually released after agreeing to Park’s economic plans.15

The growth that followed was spurred in large part by Park’s demands that businesses engage in new activities that were deemed to be of industrial importance. Originally, this growth was autocratically demanded from the top down, and firms received explicit or implicit subsidies. As time went on, however, firms were successfully weaned and began engaging in new ventures without state request. This growth was primarily driven by firms like Samsung that were led by entrepreneurs who had explicitly agreed to Park’s industrial strategies. Indeed, Korean entrepreneurs and major businesses during this period were predominantly descendants of the elites of previous eras (Jones and Sakong, 1980). Within our model, we understand this to be a forced movement from technology $n$ to $n+1$, a movement that would not have been privately optimal had it not been for the threat of political retribution. Subsequently, as Korean businesses gathered sufficient expertise, technology upgrading would have been in their strict economic interest.16

The Long Shadow of Colonialism

The diverse development paths taken by former European colonies in Africa, North America and Australasia have attracted much research in recent years. A compelling line of work highlights

15The founder of Samsung, Lee Byung Chull, who was abroad at the time of the arrests had to commit to Park’s economic program to avoid imprisonment on his return.
16This explanation is at best incomplete – many other countries that followed a top-down approach to economic policy floundered. See Rodrik (1995) for an interpretation based on coordination failures.
the extractive nature of some colonies. It is argued that the effects of colonization have persisted in the form of inferior political and economic institutions long after the departure of the colonists (Acemoglu and Robinson, 2012).

Not all countries fit this general pattern and the appropriateness of specific institutions can be hard to identify \textit{ex ante}. A feature common to most former colonies, excepting the western offshoots, is the pursuit of state-led development soon after independence. In part, the Soviet Union's rapid industrialization was seen as a model worth emulating by many of these countries. The policy choice also reflected in part a deep distrust of the forces of capitalism. Whether consciously or as a by-product of global trade, colonization had often led to the decimation of local industries, voracious resource extraction and non-development of domestic industries with local entrepreneurs confined to trade and commerce. The decision to pursue state-led development stemmed from a perception that market-based development would be rapacious and ill suited to societies suffering from chronic poverty.

The model provides some insight into how the cultural impact of colonization, complementing the effect on political institutions, shaped national identities and economic development. Take the case of India, whose independence from Great Britain in 1947 was embraced with much focus on nation-building, the creation of a pan-Indian identity, and a development strategy implemented through five year plans. After an initial spurt, growth of output per capita faltered, averaging only 1.7\% per year during 1950-80 even as Asian economies like Japan, South Korea and Taiwan were showing much dynamism. The institutionalist argument for this is weak: “in 1980, India's level of income was about one-fourth of what it should have been, given the strength of its economic institutions. On the other hand, if political institutions are the true long-run determinants of income, India's income is about 15 percent of what it should be” (Rodrik and Subramanian, 2005, p 219).

Even though India's economic policies were not explicitly socialist in the early decades after independence – liberal even compared to the overtly restrictive policies that were to follow from the mid-1960s – the overarching theme was state-led development via directed investment (especially in heavy industries) and manipulated prices (Panagariya, 2008). The task of administering a large country fell on the shoulders of the administrative service, a carryover from the British era civil service. Public servants were also necessary for the expansion of the public sector. Soon the government was providing employment not just to the educated and skilled but also the relatively less skilled workforce in public sector enterprises and in the form of a retinue of support staff to federal, state and local bureaucracies. By 1961 the public sector accounted for close to 58 percent of the total organized sector employment, a number that increased to 68 percent by 1981 before reversing in the 1990s (India Labour Market Report, 2008).

One way to understand India's colonial legacy is to recognize that out of necessity the British promoted certain kinds of educational training and role models. In this framework, entrepreneurs, by engaging in uncoordinated activity, created unaccounted and uncontrolled wealth, whereas a
bureaucratic system of production lent itself optimally to administration and control. In creating an employment and social structure dedicated to bureaucracy, the British created a value system among the “natives” where securing a government job – rather than striking out on one’s own – was perceived as success and ensured membership in an emerging educated elite. That remunerative public sector jobs – public sector wages often increased faster than the inflation rate or private sector wages – were secure made it a great attraction for college graduates and the less skilled. The breadth of the state’s involvement shrunk the space for private enterprise. From mid-1960s, this turned to active discouragement when restrictive licensing policies were used to give preferential credit and foreign exchange access to large-scale enterprises, many in the public sector, and labor market regulations that stifled a more entrepreneurial base of smaller industries from diversifying and growing. Entry into formal sector manufacturing was heavily regulated and biased in favor of big players: entrepreneurship would have been less attractive on those margins too. Lal (1999) connects this industrial policy to an underlying cultural bias that goes beyond the impact of colonization:

“The contempt in which merchants and markets have traditionally been held in Hindu society was given a new garb by Fabian socialism which appealed to the newly westernized but traditional literary castes of India” (p 36).

The resulting high $\delta_w$ would have meant a sizable fraction of the population locked into safer occupations, many in the public sector. That was no doubt worsened by a high $\alpha$ implied by preferential access granted to insiders and the bureaucratized, centrally coordinated nature of production.

Beyond this intensification of cultural biases and its growth implications, our model is particularly useful to understand India’s growth recovery. Contrary to popular perception, this recovery does not start with the 1991-92 liberalization necessitated by a balance-of-payments crisis, but predates it to the piecemeal reforms initiated during the 1980s (Rodrik and Subramanian, 2005, Panagariya, 2008). Rodrik and Subramanian (2005) empirically distinguish between the two periods: while the growth recovery of the 1980s was due to a pro-business “attitudinal shift” that favored the interests of existing businesses, as in the case of South Korea following General Park’s takeover, the reforms of the 1990s are seen as pro-market, making possible the emergence of new, dynamic firms. By 1999, 8 of the top 10 Indian billionaires were first generation entrepreneurs, and 6 of the top 10 had made their fortunes in knowledge industries (Das, 2000). Indeed, post-liberalization, “middle class” entrepreneurs have often entered sectors and industries that were made possible by liberalization (information, biotechnology) or that were relatively untouched by existing ones (travel and hospitality).

Following the discussion in the previous section there are two ways to interpret a “liberalization shock” in our model: as an exogenous increase in the TFP parameter $a$ for all technologies, or as an increase in the same accompanied by a reduction in the human capital specificity parameter
\( \alpha \). Viewed this way, while the earlier liberalization of the 1980s was mainly about favoring existing businesses—higher \( \alpha \) alone—that raised growth without seeing the birth of a new generation of entrepreneurs, that of the 1990s was more disruptive, forcing the economy to confront the global economy and making available new entrepreneurial opportunities. This interpretation may also explain why the liberalization of 1991 has remained robust—making way as it has to shared prosperity by the middle class and the established elite—contrary to an earlier episode in 1966 that was soon reversed (Srinivasan, 2005).

The essential contours of this story—the slant towards public sector jobs and a cultural bias away from entrepreneurship—apply to colonial Africa too. Indirect rule, which the British perfected in India, was extensively applied to its African colonies. Lacking a sufficient number of British officials to adequately administer the colonies, the British relied on Africans who were either traditionally-recognized leaders such as chiefs or newly-trained technocrats who would work as middle men. The system created a set of native administrators, public education systems and easily identifiable characteristics such as western education, Christianity and western attire that set apart the educated African. That educated African was not only aiding the colonial enterprise in his capacity as a government clerk, a teacher or an administrator, he was also projecting a modernization for the rest of society to value and emulate. Ekeh (1975) articulates a further cultural impact:

“… central to the ideological promotion of the legitimacy of the colonizers in Africa, is the pervasive emphasis on the distinction between ‘natives’ (that is Africans who have no Western education) and Western educated Africans…. To become a Western educated African in the colonial situation was for many an avenue for escaping hard work…. To send one’s son to school was to hope that he would escape the boredom of hard work.” (p 99)

This value system was actively encouraged by both the British and the French, achieving “maximum expression” in the former’s doctrine of indirect rule.\(^{17}\) Given the demands of empire, these educated Africans faced certain and attractive employment in government administration versus very uncertain private business opportunities, and these government employment opportunities for aspiring Africans helped shape their post-colonial value systems.

Somewhat differently from the Indian case, on the other side of the equation was the colonial attitude towards African workers. While the British had traditionally encouraged a “practice oriented” education in its African colonies, its education policy became more proactive from 1947 when the Colonial Office “firmly committed itself to a modernist project: focusing on educated

\(^{17}\)While indirect rule was an explicit part of British colonial policy, the French practiced direct rule. Even so, the latter’s administrative presence was quite thin: 1:27,000 ratio of colonial administrators to the population in French West Africa and 1:35,000 in the Congo compared to 1:19,000 in British Kenya (Kirk-Greene, 1980).
Africans, bringing them into local government and involving them in development projects, using them as the key agents to bring social change to rural areas” (Cooper, 1996, p 214). Concurrently there was a push towards developing an urban working class in British as well as French Africa, the attitude being “workers had to be socialized into their new roles and had to be paid enough to encourage stability in the job and to bring up a new generation of workers in a suitable physical and cultural milieu” (Cooper, 1996, p 453).

It is clear that entrepreneurship was far from the colonialist’s mind as entrepreneurial Africans would have been less likely to be controlled, not just less essential to the colonial enterprise. These attitudes, as they percolated into the cultural consciousness over time, would have made wage work and public employment relatively more attractive and given the workforce tied in relatively low risk administrative jobs a comparative advantage vis-a-vis entrepreneurship. We can think of this post-colonial situation as one in which the colonialist endeavor created a status quo bias: a population dedicated to the safe use of a well-worn technology and a working class that sees little gain from entering into entrepreneurship. The result is an economy – with little growth of income or entrepreneurship – created simultaneously by policies that make entry into entrepreneurship difficult (high $\alpha$) and the successful mastery of current technologies whose growth potential has been exhausted. Only a shock to total factor productivity ($\alpha$) or to the human capital specificity of technology ($\alpha$) can nudge the economy towards growth.

5 Conclusion

Using a model of intergenerational cultural transmission, this paper has studied the evolution of risk-taking and economic development. Risk-neutral individuals work in one of two occupations, operating a risky business whose expected return depends on business expertise or working for a riskless wage. Parental comparative advantage in entrepreneurship is culturally transmitted to children through costly, but imperfect, intra-family education. This human capital determines occupational choice. Experience in a particular occupation also imparts an occupational bias that affects the intergenerational transmission of human capital.

Our paper can explain the strong and persistent positive correlation observed in the data between occupational choice and family background without appealing to market imperfections. Depending on technological characteristics it can also generate various patterns of economic development, from long-run stagnation to sustained growth to leap-frogging in economic status. Culture – occupational biases and the intra-family transmission of human capital – can lead to stagnation in the long run when productivity growth is relatively small or past policies were geared towards low-risk occupations. For sufficiently high productivity gains from technological change or sufficiently low human capital specificity of new technologies, culture becomes irrelevant for long-run growth though it is still associated with static inefficiency. In this the model’s implica-
tions are similar to Krugman (1991) where history turns out to be decisive only when the rate of inter-sectoral adjustment, and hence economic growth, are slow.

There are three directions in which the present work may be extended. While occupational biases are taken to be immutable, they may be endogenous to the economic fortune of different sectors. Allowing parents to indoctrinate their children in an occupation different from their own and to alter their own biases depending on market outcomes would be one way to study how the social esteem with which certain occupations are held changes over time. Secondly, there are likely complementarities between entrepreneurship and the pace of technological progress. An innovation or adoption process that endogenies the productivity gain from new technologies, for example if technologies can be upgraded by more than one step, could yield significantly different implications for the growth rate which, at present, is independent of culture in a growing economy. In yet another respect culture may be more deterministic than the positive growth equilibrium suggests. Our model of entrepreneurship does not include credit frictions that discourage risk-taking and entry of productive businesses. By creating additional barriers for workers seeking to become entrepreneurs, credit market imperfections will only worsen the cultural inertia that slows economic progress.
References


