Occupational Choice and the Spirit of Capitalism

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Abstract

The British Industrial Revolution triggered a reversal in the social order of society whereby the landed elite was replaced by industrial capitalists rising from the middle classes as the economically dominant group. Many observers have linked this transformation to the contrast in values between a hard-working and frugal middle class and an upper class imbued with disdain for work. We propose an economic theory of preference formation where both the divergence of attitudes across social classes and the ensuing reversal of economic fortunes are equilibrium outcomes. In our theory, parents shape their children's preferences in response to economic incentives. This results in the stratification of society along occupational lines. Middle-class families in occupations that require effort, skill, and experience develop patience and work ethics, whereas upper-class families relying on rental income cultivate a refined taste for leisure. These class-specific attitudes, which are rooted in the nature of pre-industrial professions, become key determinants of success once industrialization transforms the economic landscape.

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1 Introduction

The Industrial Revolution was more than capital accumulation and growth. It also set off a social and political transformation that redefined hierarchies in society and reshaped the distribution of income and wealth. Before the onset of industrialization in eighteenth-century Britain, wealth and political power were associated with the possession of land. Over the course of the nineteenth century, a new class of entrepreneurs and businessmen emerged as the economic elite. For the most part, the members of this class rose from humble beginnings and had their social origin in the urban middle classes. The landed elite of old was left behind, and eventually lost its political and economic predominance.

Many observers of the time linked this reversal in economic fortunes to differences in values, attitudes, and ultimately preferences across social classes. There are countless examples, both in scholarly and fictional writing, of portrayals of members of the landowning class as averse to work, unwilling to save, ill-disposed to commercial activity, and unable to consider money as something to be profitably invested. In contrast, the new industrialists are described as frugal, thrifty, and hard-working.[1]

The role of values and culture as determinants of socio-economic change is the subject of a long-standing debate in the social sciences. Karl Marx regarded economic relationships as the "base of society," and viewed culture, religion and ideology (the "superstructure") as mere reflections of the material interests of the class in control of the means of production. Max Weber reversed Marx's perspective, and argued culture and religion to be key driving forces of the process of industrialization in the nineteenth century. In both Marx's and Weber's view there is a one-way relationship between economic conditions and culture, albeit in opposite directions.

In this paper, we develop a theory of preference formation that is rooted in the rational choice paradigm, and ask whether such a theory can help explain the socioeconomic transformation that accompanied the Industrial Revolution. In our theory, the link between economic conditions and cultural values (or, more precisely, class-specific prefer-

[1] Adam Smith 1776 writes, for instance: "A merchant is accustomed to employ his money chiefly in profitable projects; whereas a mere country gentleman is accustomed to employ it chiefly in expense. The one often sees his money go from him and return to him again with a profit: the other, when once he parts with it, very seldom expects to see any more of it" (p. 432). In a study of early industrialists, Crouzet (1985) cites accounts of the time relating that Mancunian manufacturers of the late eighteenth century "... commenced their careers in business with but slender capitals. ... Patience, industry and perseverance was their principal stock" (p. 37).

ences) runs both ways. Like Weber, we argue that heterogeneity in preferences is a key determinant of social change. However, preferences and values are themselves shaped by the economic conditions that the members of different social classes face.

In our theory, altruistic parents strive to shape their children's preferences in a way that best fits with their future material circumstances. We focus on two key aspects of preferences: the rate of time preference (patience) and the taste for leisure (or, conversely, work ethic). Parental investments in patience interact with the steepness of lifetime income profiles. Lifetime earnings are relatively flat in some professions, while high returns are achieved only late in life in others, in particular those requiring the acquisition of skills. A parent's incentive for investing in a child's patience increases in the steepness of the child's future income profile. Conversely, a child endowed with high patience will be more likely to enter professions entailing the accumulation of skill and, hence, the delay of material rewards. Parental investments in their children's taste for leisure hinge on the role of labor effort. Parents who expect their children to be wholly reliant on labor income will tend to instill them with a strong work ethic, i.e., a tolerance for hard work and a reduced taste for leisure. In contrast, parents who anticipate their children to be rentiers with ample free time will teach them to appreciate refined leisure activities, from performing classical music to fox hunting.

The two complementarities in our theory (between patience and steep income profiles and between the taste for leisure and low work effort) imply that within a given dynasty, the choices of a specific occupation and of preferences suitable for that occupation are mutually reinforcing over time. As a consequence, even if the population is initially homogeneous, preferences gradually diverge across the members of different occupations. Hence, the society is endogenously stratified into "social classes" defined by occupations and their associated preferences and values.

The theory can account for the reversal in the economic fortunes of different social classes at the time of the Industrial Revolution. For centuries, members of the preindustrial middle class—artisans, craftsmen, and merchants —had to sacrifice consumption and leisure in their youths to acquire skills. Artisans, for instance, could become prosperous masters of their professions only after undergoing lengthy stages of apprenticeship and journeymanship. We argue that in response to this economic environment, the middle classes developed a system of values and preferences centered around parsimony, work ethics, and delay of gratification. For the landed upper class, in contrast, neither work ethics nor patience were particularly valuable, because the members of this class could rely on fairly stable rental incomes from their estates. As a result, the landowning elite cultivated refined tastes for leisure and grew less future-oriented. In an otherwise stationary society, such differences in preferences and values had limited consequences. However, patience and work ethics became a key asset—a "spirit of capitalism"—when opportunities of economic advancement through entrepreneurship and investment arose at the outset of the Industrial Revolution. In an already stratified society, it was members of the patient, hard-working middle class who made the most of the new opportunities and ultimately gained economic ascendency over the landed elite.

Although we do not focus explicitly on religion, our theory is related to Weber's view that the spirit of capitalism derived from the values of the protestant reformation. Protestant values, and especially Puritanism, were widespread among the urban upper-middle classes and may have been instrumental in their economic advancement. Our theory would suggest that Puritanism was successful among certain groups precisely because Puritan values were compatible with their economic conditions. In addition, religious instruction may have been one of the tools used to transmit economically advantageous values from one generation to the next.[2]

Our theory predicts the triumph of the thrifty and hard-working bourgeoisie at the outset of the Industrial Revolution. However, this success carries the seed of its own destruction. Whereas first-generation entrepreneurs started out poor, their descendants inherited the family business. The founders' children and grandchildren could thus rely on considerable capital income, making them less dependent on their own labor income. Just as for the landowners, this creates an incentive to invest in the appreciation of leisure: the industrial dynasties ultimately mimic the tastes of the old elite. In the extreme, this effect can lead to the downfall of a dynasty (the "Buddenbrooks" effect); at a minimum, the descendants will achieve less growth than the founders.[3]

The theory also implies that the cultural divergence across social classes is related to financial development. If people are able to borrow and lend in perfect credit markets

[2]Max Weber describes the effects of Puritan values on capital accumulation as follows: "When the limitation of consumption is combined with this release of acquisitive activity, the inevitable practical result is obvious: accumulation of capital through ascetic compulsion to save. The restraints which were imposed upon the consumption of wealth naturally served to increase it by making possible the productive investment of capital" (p.172).

[3]The increasing leisure taste is counteracted by increasing patience, because investing in a family business steepens intra- and intergenerational consumption profiles. If only the taste for leisure was endogenous, the ultimate downfall of an industrial dynasty would be unavoidable. Endogenous patience is therefore central for explaining the reversal of fortunes between the middle and upper classes.

to smooth consumption, the link between occupational choices and consumption profiles is severed. Thus, divergence in patience across classes only emerges when financial markets are shallow, while financial development leads to more homogeneous societies. This prediction accords with the broad observation that class differences are less accentuated in modern industrial economies than in traditional societies.

In the following section, we relate our work to the existing literature. In Section 3 we analyze the decision problem at the heart of our theory in partial equilibrium. In Section 4, we embed the choice problem in a general-equilibrium model of a pre-industrial economy. The Industrial Revolution arrives in Section 5 in the form of a technology shock that opens new investment opportunities. Historical evidence and alternative theories are discussed in Sections 6 and 7, and Section 8 concludes. All proofs are contained in the mathematical appendix.

2 Related Literature

Our work contributes to the recent literature on the economics of the Industrial Revolution (see Galor and Weil 2000, Hansen and Prescott 2002, and Doepke 2004). Within this literature, a few authors emphasize the role of preference formation for long-run development, but rely on genetic selection rather than conscious investment as the mechanism (Galor and Moav 2002, Clark and Hamilton 2004, and Galor and Michalopoulos 2006). We view the selection and investment approaches to endogenous preference formation as complementary, because they operate on different time scales and lead to distinct implications. The evolutionary literature is concerned with changes in the composition of genetic traits that affect entire populations and take place over long time horizons. For example, Galor and Moav (2002) argue that selection pressures which generated preferences favorable for economic growth have been operating at least since the Neolithic Revolution nearly 10,000 years ago. In contrast, our focus is on the divergence of preferences across social classes, and our mechanism operates at a time scale from two or three generations (the "Buddenbrooks" effect) to at most a few centuries.

Our paper provides a new perspective of the effects of wealth inequality on development in the face of financial market imperfections. A number of existing theories point out that if financial markets are absent, poor individuals may be unable to finance otherwise profitable investment projects, and are therefore forced to enter less productive professions (see Banerjee and Newman 1993, Galor and Zeira 1993, and Matsuyama

2006). A common feature of this literature is that the rich, who are least constrained by credit market imperfections, generally do best and are the first beneficiaries of new investment opportunities. Therefore, these theories cannot explain how a new class of entrepreneurs rose from humble beginnings to leapfrog over the landed pre-industrial elite, at a time when wealth inequality was quite extreme and financial markets shallow by modern standards.

Our theory is also related to a recent literature on the effects of religious values on economic performance and the income distribution. Using international survey data, Barro and McCleary (2003) find that economic growth responds positively to the beliefs in hell and heaven. One interpretation of this finding is that a habit of contemplating the distant future generates individual behavior favorable for economic performance. Similar findings are documented by Guiso, Sapienza, and Zingales (2003).[4] In a different vein, Botticini and Eckstein (2005, 2006a, and 2006b) argue that Jews originally specialized in artisanship, trade, and finance because of religious reforms that fostered literacy among Jewish farmers. After the reforms, Jews progressively migrated to towns to exploit their comparative advantage in education in skilled urban occupations. Thus, as in our theory, group-specific values and attitudes have long-lasting effects on economic decisions. However, the impetus in Botticini and Eckstein is a cultural shock to a particular group (a reform in the Jewish religion), while our mechanism relies entirely on economic incentives faced by an initially homogeneous population.

The notion of patience as an asset that agents can invest in was first introduced in the economic literature by Becker and Mulligan (1997), who consider the problem of a consumer who lives for a finite number of periods and makes a one-time choice of a discount factor. In contrast, we embed the choice of patience in a dynamic model of preference formation with the additional dimensions of choosing an occupation and investing into the taste for leisure. Moreover, we analyze the evolution of preferences in an environment with imperfect capital markets, which is a key factor for our results on the stratification of preferences as well as the application of the model to the Industrial Revolution.[5] An alternative mechanism of preference transmission is advocated by

[4] However, according to the calibration analysis of Cavalcanti, Parente, and Zhao (2003), differences in religious affiliation alone cannot explain differences in the timing and diffusion of the Industrial Revolution across countries.

[5] Also related are Mulligan (1997), where parents choose their own level of altruism towards their children, and Haaparanta and Puhakka (2003), where agents invest in their own patience and in health. Lindbeck and Nyberg (2006) focus on the negative effects of public transfers on parents incentives to instill a work ethic in their children. The macroeconomic consequences of inherited (as opposed to chosen)

the literature on cultural transmission (see Bisin and Verdier 2000 and 2001, Fernández, Fogli, and Olivetti 2004, Hauk and Saez-Marti 2002, and Saez-Marti and Zenou 2006). As in our work, parents' incentives for forming their children's preferences depend on economic conditions. However, parents invest because they desire to make their children's behavior conform with their own wishes. In our model, in line with mainstream dynastic models, parents do not judge their children's choices other than through the children's own eyes; preference formation is a gift that altruistic parents pass on to their children.

If patience and the work ethic are accumulated and transmitted within dynasties, parents' and children's propensities to save and invest should be positively correlated. This implication is confirmed by Knowles and Postlewaite (2004), who show that in the PSID parental savings behavior is an important determinant of their children's education and savings choices, after controlling for a variety of individual characteristics. Moreover, the correlation is stronger between children and mothers, who are usually more involved in a in child's upbringing than fathers. Our theory also posits that agents with steeper income profiles are more patient. This is consistent with the results of a field experiment conducted on Danish households by Harrison, Lau, and Williams (2002) showing that time discount rates of highly educated adults (who tend to have steeper income profiles) are about one third lower than those of adults with less education.[6]

A recent empirical literature highlights the role of patience, work ethics, and other non-cognitive skills for determining how well people can focus on long-term tasks and exert self-restraint (see Mischel, Shoda, and Rodriguez 1992, Heckman and Rubinstein 2001, Heckman, Hsee, and Rubinstein 2003, Segal 2004, and Heckman, Stixrud, and Urzua 2006). Similarly, Coleman and Hoffer (1983) argue that the emphasis on patience and self-discipline is the key to the effectiveness of Catholic schools in the United States. The literature also shows that non-cognitive skills depend on nurture and family upbringing.[7]

preferences have been examined by de la Croix and Michel (1999, 2001) and Artige, Camacho, and de la Croix (2004). In the latter paper, inherited consumption habits can lead to the downfall of a temporarily wealthy country or region.

[6]Other evidence of a positive correlation between steep income profiles and patience includes Carroll and Summers (1991), who document that in both Japan and the United States consumption-age profiles are steeper when economic growth is high, and Becker and Mulligan (1997), who show that consumption growth is high for adults who either have income themselves (which is associated with steep income profiles) or who had rich parents.

[7]See in particular Heckman (2000) and Carneiro and Heckman (2003), who review the evidence from a large number of programs targeting disadvantaged children. Similar conclusions are reached by studies in

3 A Model of Occupational Choice and Endogenous Preference Formation

In this section, we develop a theory of endogenous preference formation that is driven by parents' desire to instill certain tastes into their children. The parents' efforts in raising their children respond to economic incentives; as a consequence, preference formation interacts with other economic decisions taken by both parent and child. Our particular focus is on the question of how preferences both determine and depend on the choice of an occupation.

We concentrate on two dimensions of preferences, the taste for leisure and patience. Investments in the taste for leisure comprise all parental efforts that cultivate a child's ability to enjoy free (non-working) time. Examples are teaching one's child to swim, to play a sport, to ride a horse, or to play a musical instrument. Since a high appreciation of leisure raises the opportunity cost of working, parental efforts in the opposite direction (those that lower the taste for leisure) can be interpreted as increasing a child's tolerance for hard work. Parents may achieve this objective by preaching the virtues of an austere life.[8] Investments in patience determine the weight that a child attaches, in adult age, to utility late in life relative to the present. Instilling parsimony and thrift into children are examples of this type of investment. Religious ideas stressing the value of frugality and industry—the "protestant ethics" of Max Weber—can also be regarded as vehicles for the accumulation of patience and the work ethic.

We first describe the model, and then analyze the dynamic individual choice problem. We model patience and the taste for leisure as state variables for the members of a dynasty. We show that, unlike in standard models, the value functions are convex in the state variables. This is due to choice complementarities between investments in preferences and occupational choices as well as labor supply decisions. Despite the convexity of the value functions, we can characterize the solution of the choice problem through a recursive formulation with well-defined policy functions.

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child development psychology such as Goleman (1995), Shonkoff and Philips (2000), and Taylor, McGue, and Iacono (2000). Dohmen, Falk, Huffman, and Sunde (2006) document strong evidence (based on the German Socio-Economic Panel) that trust and risk attitudes are transmitted from parents to children.

[8]Formally, we only model parental investments in a child's taste for leisure; a parent who wishes to improve a child's work ethic would simply do little or none of this investment.

3.1 Preferences, Timing, and Occupations

Our model economy is populated by overlapping generations of altruistic people who live for four periods, two as children and two as adults. People work throughout both adult periods (young and old), and their earnings may vary over time. Agents consume and make economic decisions only when they are adult. At the beginning of adulthood, every agent gives birth to a single child.

All adults have the same basic preferences. However, two aspects of the preferences are endogenous, namely patience (the relative weight of old versus young adult consumption in utility) and the taste for leisure (the marginal utility of free time). These taste parameters are determined during an agent's childhood; more specifically, parents instill specific tastes into their children through a child-rearing effort. Once an agent reaches adulthood, preferences no longer change. An adult therefore takes her own preferences as given, but gets to shape her child's tastes.

An adult's lifetime utility depends on her consumption, leisure, and child-rearing effort. Agents are altruistic, hence an adult also cares about her child's utility. Agents choose their labor supply and their child-rearing effort in both adult periods (see the time line in Figure 1). More formally, a young adult's lifetime utility is given by:

$$(1-B)\left(\log\left(c_1\right)+A\left(1-n_1\right)-l_{A,1}-l_{B,1}\right)+B\left(\log\left(c_2\right)+A\left(1-n_2\right)-l_{A,2}-l_{B,2}\right) \\ +z\,V_{child}(A'(l_A,A),B'(l_B,B)). \quad (1)$$

Here A denotes the taste for leisure, and B is the relative weight attached to old-age consumption, i.e., patience. Both A and B depend on the agent's upbringing and are predetermined for each adult. The first row of (1) is the adult's felicity: c_1 and c_2 denote the consumption choices in the two adult periods, n_1 and n_2 denote labor supply, and $l_{A,1}$, $l_{A,2}$, $l_{B,1}$, and $l_{B,2}$ are the effort choices for investing in the child's taste for leisure and patience. To simplify the analysis, we assume that the investments in preferences are only productive if sustained at the same level over the two adult periods. Parents will thus always choose $l_{A,1}=l_{A,2}=l_A$ and $l_{B,1}=l_{B,2}=l_B$.

The second row of (1) is the altruistic component: V_{child} represents the child's maximized utility as a function of its preference parameters, as chosen by the parent. $A'(l_A,A)$ and

$B'(l_B, B)$ are the "production functions" for the child's preferences, which take the form:

$$A'(l_A, A) = \psi \bar{A} + (1 - \psi) A + g(l_A), \tag{2}$$

$$B'(l_B, B) = \psi \bar{B} + (1 - \psi) B + f(l_B), \tag{3}$$

where $\psi \in (0, 1]$ is a constant depreciation rate (assumed, for simplicity, to be the same for the two state variables), and f and g are non-negative increasing functions. $\bar{A}$ and $\bar{B}$ represent the natural levels of the taste for leisure and patience, i.e., the steady states of A and B in the absence of any investment. The intergenerational persistence of preferences captures the notion that to some extent children learn by imitating parental attitudes. Thus, part of the parents' preferences are transmitted effortlessly to the child. The parental effort is bounded, $l_A \in [0, \bar{l}_A]$ and $l_B \in [0, \bar{l}_B]$. Also, we normalize the time endowment to unity, $n_1 \in [0, 1]$ and $n_2 \in [0, 1]$ and impose the following restrictions.[9]

Assumption 1 *The function $f : [\mathbf{0}, \bar{\mathbf{l}}_B] \to \mathbf{R}^+$ is continuous, differentiable, strictly increasing, and weakly concave, and $g : [\mathbf{0}, \bar{\mathbf{l}}_A] \to \mathbf{R}^+$ is continuous, differentiable, strictly increasing, and strictly concave. Moreover, $g(0) = f(0) = 0$ and $f(\bar{l}_B) \le \psi \left(1 - \bar{B}\right)$. The parameters z and ψ satisfy $0 < z < 1$ and $0 < \psi < 1$.*

The assumptions imply the upper bounds for the preference parameters $A_{\max} \equiv \bar{A} + g(\bar{l}_A)/\psi$ and $B_{\max} \equiv \bar{B} + f(\bar{l}_B)/\psi \le 1$.

In addition to the choice of labor supply and investments in preferences, the third main element of the young adult's decision problem is the choice of an occupation. An occupation i is characterized by a wage (or labor productivity) profile $\{w_{1,i}, w_{2,i}\}$, where $w_{1,i}$ and $w_{2,i}$ are strictly positive and $w_{2,i} \ge w_{1,i}$ (due to a premium to experience and human capital). There is a finite number I of occupations to choose from. Occupations are indexed by $i \in \{1, 2, ..., I\}$, and ordered according to the steepness of the wage profile (without loss of generality, we ignore occupations featuring a dominated profile):

Assumption 2 *The productivity profiles satisfy $w_{2,i} \ge w_{1,i} > 0$ for all i. Moreover, a higher index denotes a steeper productivity profile, i.e., $j > i$ implies $w_{1,j} < w_{1,i}$ and $w_{2,j} > w_{2,i}$.*

Adults choose their occupation, their labor supply, and their investments in their child's patience and taste for leisure to maximize utility. Since parents are altruistic towards

[9] Note that the investments l_A and l_B require effort, rather than an explicit time cost. The time endowment is only split between work and leisure. This is for analytical convenience; modeling investment costs in terms of time would be conceptually identical, but would make the analysis more complex.

their children and preferences are time consistent, the decision problem can be given a dynastic interpretation, where the head of the dynasty makes decisions for all subsequent generations.[10] We will start our analysis of the choice problem in partial equilibrium, meaning that the productivity profiles $\{w_{1,i}, w_{2,i}\}$ are taken as given and do not change over time. Later, we will extend the analysis to a general-equilibrium economy where the wage profiles are endogenously determined.

3.2 Outcomes with Missing Financial Markets

As will become clear below, the development of financial markets plays a key role in our analysis. We start under the stark assumption that financial markets are absent. In other words, households cannot borrow to smooth out consumption, nor can they bequeath physical assets to their children. Later, we will contrast the results to outcomes with more developed financial markets.

In this environment, consumption is equal to income in each period, $c_1 = w_{1,i}n_1$ and $c_2 = w_{2,i}n_2$, and the preference parameters A and B are the only state variables for a dynasty. A young adult's choice problem can be represented by the following Bellman equation:

$$\begin{aligned} V(A,B) = \max_{i \in I, l_A, l_B, n_1, n_2} \Big\{ & (1-B)\left(\log(w_{1,i}n_1) + A(1-n_1)\right) \\ & + B\left(\log(w_{2,i}n_2) + A(1-n_2)\right) - l_A - l_B + z\,V(A',B')\Big\} \end{aligned} \tag{4}$$

subject to (2) and (3). Our decision problem is therefore a dynamic programming problem with two state variables on the compact state space $[\bar{A}, A_{\max}] \times [\bar{B}, B_{\max}]$.[11] Standard recursive arguments imply that the Bellman equation (4) has a unique solution.

Since A is constant over an individual's life, the optimal choice of labor supply in (4) is constant as well, i.e., $n_1 = n_2 = n$. This observation leads to the first important result: the problems of investing in patience and in the taste for leisure are separable.

[10] Note that discounting across generations is not a choice variable and depends on the exogenous altruism parameter z. It could be argued that investments in patience also affect altruism (i.e., z may be endogenous). Such a model would lead to qualitatively similar results, but the change would come at the cost of a loss of analytical tractability.

[11] Alternatively, the choice problem can be represented in a sequential form by repeatedly substituting for V in (4). We will mostly work with the recursive formulation. The sequential version, which is sometimes useful for deriving first-order conditions, is written out in the mathematical appendix.

Proposition 1 *The value function V is additively separable in its arguments, $V(A,B) = v_A(A) + v_B(B)$ where:*

$$\begin{aligned} v_A(A) &= \max_{l_A,n} \{\log(n) + A(1-n) - l_A + z\, v_A(A')\}, & (5) \\ v_B(B) &= \max_{i\in I, l_B} \{(1-B)(\log(w_{1,i})) + B(\log(w_{2,i})) - l_B + z\, v_B(B')\}, & (6) \end{aligned}$$

subject to, respectively, (2) and (3).

The proof of this proposition is immediate and is therefore omitted. Proposition 1 shows that as long as wages are the only source of income, the occupational choice does not interact with the investment in the taste for leisure.[12] Using this result, we can analyze the problems of investing in patience and in the taste for leisure separately. We later extend the analysis to environments where the two choices are not separable.

3.2.1 Investment in Patience

We start by characterizing the value function $v_B(B)$, which reflects both the investment in patience and the choice of an occupation. The policy function for the investment in patience is denoted $l_B(B)$.

Proposition 2 *The value function v_B is non-decreasing and convex.*

The value and policy functions are visualized in Figure 2. That v_B is non-decreasing follows from the assumption that the wage profile is non-decreasing. In particular, if for sufficiently low patience all members of a dynasty choose an occupation with a flat income profile ($w_1 = w_2$), the value function is constant in that range. This corresponds to the interval $[\bar{B}, B_1]$ in Figure 2. Within this range, the value function is flat (upper panel), and agents do not invest in patience (lower panel). As soon as B is sufficiently large ($B > B_1$), a current or future member of the dynasty finds choosing a profession with $w_2 > w_1$ optimal, and the value function becomes strictly increasing in B.

The convexity of v_B follows from two key features of our decision problem. First, B enters utility linearly. Second, there is a complementarity between patience and the choice of steep income profiles. To gain intuition, consider first the decision problem

[12] The additive separability of the value function hinges on logarithmic utility. Since logarithmic utility is a common assumption in problems with endogenous labor supply, our analysis provides a useful tractable benchmark. The solution can be characterized under more general preferences if one abstracts from investment in the taste for leisure, see Doepke and Zilibotti (2005).

without an occupational choice, that is, with a fixed occupation $\{w_1, w_2\}$. If we vary the initial generation's B while holding the investment choice l_B constant over all generations, utility is a linear function of B (as depicted by the dotted line in the upper panel of Figure 2). The reason is that initial utility is a linear function of present and future patience, and initial patience has a linear effect on future patience via the depreciation factor $1-\psi$. Moreover, given the fixed income profile, choosing a constant l_B is optimal: the marginal return to investing in patience in a given period is given by $z \log(w_2/w_1)$, which does not depend on B. Generalizing from this observation, the value function is linear over any range of B such that it is optimal for the current and future members of a dynasty to hold the occupational choice constant.

In general, however, occupational choices are not fixed. Given that B is the relative weight on utility late in life, it is optimal to choose an occupation with a steep wage profile (large i) when B is high, and one yielding a flat profile when B is low. As we increase B, the slope of the value function increases discretely every time either a current or a future member of the dynasty finds switching into a profession with a steeper profile optimal. The optimal l_B increases at each step, because the marginal benefit of being patient increases with the steepness of the wage profile. Since there is only a finite set of occupations, the value function is piecewise linear, where the linear segments correspond to ranges of B for which the optimally chosen present and future income profiles are constant. In Figure 2, the true value function is therefore represented by the solid line; the points B_1 and B_2 are thresholds where either the current or a future occupation changes. At each of the kinks, some member of the dynasty is indifferent between (at least) two different profiles. Since the choice of l_B depends on the chosen income profile, there may be multiple optimal choices of l_B at a B where the value function has a kink, whereas in between kinks the optimal choice of l_B is unique. The next propositions summarize these results.

Proposition 3 *The solution to the program* (6) *has the following properties: (i) The steepness of the optimal wage profile, $w_{2,i}/w_{1,i}$, is non-decreasing in B; (ii) The optimal investment in patience $l_B = l_B(B)$ is non-decreasing in B.*

Proposition 4 *The state space $[\bar{B}, B_{\max}]$ can be subdivided into countably many closed intervals $[B_s, B_{s+1}]$ such that over the interior of any such interval the occupational choice of each member of the dynasty (i.e., parent, child, grandchild and so on) is constant and unique (though possibly different across generations), and $l_B(B)$ is constant and generically single-valued. The* *value function $v_B(B)$ is piece-wise linear, where each interval $[B_s, B_{s+1}]$ corresponds to a linear segment. Each kink in the value function corresponds to a switch to an occupation with a steeper income profile by a present or future member of the dynasty. At a kink, the optimal choices of occupation and l_B corresponding to both adjoining intervals are optimal (thus, the optimal policy function is not single-valued at a kink).*

The proposition implies that the optimal policy correspondence $l_B(B)$ is a non-decreasing step function, which takes multiple values only at a step. Propositions 3 and 4 allow us to characterize the equilibrium law of motion for patience. Since the policy correspondence $l_B(B)$ is monotone, the dynamics of B are also monotone and converge to a steady state from any initial condition.[13]

Proposition 5 *The law of motion of patience capital is described by the following difference equation:*

$$B' = \psi\bar{B} + (1-\psi)B + f(l_B(B)),$$

where $l_B(B)$ is a non-decreasing step function (as described in Proposition 4). Generically, for any initial condition B_0 the dynasty converges to a steady state with constant B where parents and children choose the same profession. Multiple steady states are possible.

Despite convergence in patience, the steady state does not have to be unique, even for a given B_0. For example, if the initial generation is indifferent between two different occupations, the steady state can depend on which one is chosen.

Up to this point, we have not made any use of differentiability assumptions. If the optimal choice of l_B is interior, it must satisfy a first-order condition, which allows us to characterize the decisions on patience more sharply. In particular, the first-order condition for an interior l_{B0} is given by:

$$1 = zf'(l_{B0})\sum_{t=0}^{\infty} z^t(1-\psi)^t \log\left(\frac{w_{2,t}}{w_{1,t}}\right).$$

The left-hand side is the marginal cost of providing patience (which is constant), and the right-hand side is the marginal benefit. Notice that the marginal benefit increases in the steepness of all subsequent generations' income profiles.

[13] If the production function for patience $f(l_B)$ is linear, in knife-edge economies (i.e., in a zero-measure subset of the parameter space) the policy correspondence is not single-valued even in between steps. Convergence in terms of occupational choice is still guaranteed, but dynasties may be indifferent between multiple patience levels. In generic economies, $l_B(B)$ is single valued even in the linear case.

Since B_t converges to a steady state, there must be a time T such that the occupational choice of all members of a dynasty is constant from T onwards. Denoting the constant wage profile from this time onwards as $\{w_1, w_2\}$, the steady-state investment in patience, l_{ss} must satisfy (if it is interior):

$$1 = f'(l_B^{ss}) \frac{z}{1 - z(1-\psi)} \log\left(\frac{w_2}{w_1}\right). \tag{7}$$

Equation (7) determines l_B^{ss} as an increasing function of the steepness of the steady-state income profile. The dynamics of B are particularly simple once the occupational choice is constant. Since the law of motion is given by $B_{t+1} = \psi\bar{B} + (1-\psi)B_t + f(l_B^{ss})$, patience converges to a steady state given by $B^{ss} = \bar{B} + f(l_B^{ss})/\psi$. Substituting back for $f(\bar{l}_B)$, we see that patience converges to this steady state at a constant rate:

$$B_{t+1} = \psi\left(\bar{B} + f(l_B^{ss})/\psi\right) + (1-\psi)B_t.$$

Similarly, if l_{ss} is at either corner, patience converges at a constant rate to one of the extreme values $\bar{B}$ or $B_{\max}$.

3.2.2 Investment in the Taste for Leisure

Consider, next, the problem of investing in the taste for leisure. Given the maximization problem (5), optimal labor supply is given by:

$$n = \min\{A^{-1}, 1\}. \tag{8}$$

Using this result, the following propositions characterize the value and policy functions $v_A(A)$ and $l_A(A)$.

Proposition 6 *The value function v_A is non-decreasing and convex.*

More specifically, the value function is strictly increasing over any range of A where leisure is positive, i.e., $n < 1$ or, given (8), $A > 1$. The convexity of the value function is once again due to a complementarity between preferences and economic decisions befitting these preferences. The value function would be linear in A if people could not adjust their labor supply when A changes. However, people do adjust n (they work less when A increases), rendering the value function convex. Unlike the choice of an occupation, n is a continuous variable, implying that the value function is strictly convex, except in ranges where the n is at a corner. The characterization of v_A leads to the following results regarding the policy function $l_A(A)$ and equilibrium law of motion.

Proposition 7 *The optimal investment in the taste for leisure, $l_A = l_A(A)$ is non-decreasing in A. The law of motion of the taste for leisure is described by the following difference equation:*

$$A' = \psi \bar{A} + (1-\psi) A + g(l_A(A)).$$

Given an initial condition A_0 the dynasty converges monotonically to a steady state with constant A such that either $A = \bar{A}$, $A = A_{\max}$, or:

$$A = \bar{A} + g\left((g')^{-1}\left(\frac{1}{z\left(1-\frac{1}{A}\right)}\right)\right)\frac{1}{\psi}. \tag{9}$$

Multiple steady states are possible, depending on the parameterization of g. However, cross-dynasty differences in the taste for leisure can only arise from differences in initial conditions. If all dynasties start with the same A, they remain identical along this preference dimension. If l_A is interior, it satisfies the following first-order condition:

$$1 = zg'(l_{A0})\sum_{t=0}^{\infty} z^t (1-\psi)^t \log(1-n_t). \tag{10}$$

Thus, the incentive to invest into the taste for leisure depends entirely on the amount of leisure enjoyed by future members of the dynasty.

3.2.3 Investment in the Taste for Leisure with Unearned Income

We now extend the analysis to income processes entailing an unearned component, i.e., non-labor income (such as rents or dividends). In general, the separation result of Proposition 1 does not hold in such an environment. However, there is a useful special case that remains tractable. Consider a dynasty that permanently works in an occupation with a flat wage profile $\{w, w\}$ and also derives a flat stream of unearned income $\{b, b\}$.[14] The budget constraints are then given by $c_1 = b + wn_1$ and $c_2 = b + wn_2$. Since the income profile is flat, optimal labor supply is constant, and the value function is independent of

[14] In the historical application discussed in section 4, landowners will be characterized by this type of income process; the unearned component b corresponds to income derived from renting out their estates.

B. The problem can be written as:

$$V(A,B) = v_A(A) = \max_{l_A,n}\{(\log(b+wn) + A(1-n)) - l_A + z\, v_A(A')\}, \tag{11}$$

subject to (2). The first-order condition with respect to l_A is the same as in (10). However, optimal labor supply is now given by:

$$n = \min\left\{A^{-1} - \frac{b}{w}, 1\right\}. \tag{12}$$

Thus, labor supply is decreasing (and leisure increasing) in the ratio of unearned income to the wage. Given the first-order condition (10), this feeds back into the investment decision: parents whose children have more time for leisure invest more in the children's taste for leisure. Over time, a dynasty earning a rent $b > 0$ will develop a higher appreciation for leisure than a dynasty that relies on labor income only. This intuition extends to the case of an increasing productivity profile ($w_1 < w_2$), although the analysis is more involved.

3.3 The Role of Missing Financial Markets

In the preceding analysis, we established that members of different professions face different incentives for investing in patience, provided that the steepness of income profiles differs across professions. A key assumption underlying this result is that access to financial markets is limited. The incentive to invest in patience is determined not by the income profile *per se*, but by the lifetime profile of period-by-period utilities. A steep income profile directly translates into a steep utility profile only if financial markets are absent or incomplete. We now make this point more precise by considering the opposite extreme in terms of assumptions on financial markets. Namely, we allow unrestricted borrowing and lending *within each cohort* at a fixed rate of return R.[15] We will see that in this setup, the interaction of patience and occupational choices can be severed or even reverted.

We first focus on the case where financial markets only allow the smoothing of goods consumption. Formally, we assume that the agent is restricted to supplying the same amount of labor in both adult periods, which was the equilibrium outcome in the previous section. With borrowing and lending, the Bellman equation describing the young

[15]The possibility of wealth transmission *across generations* is discussed in Section 5.

adult's decision problem becomes:

$$V(A,B) = \max_{i\in I,n,l_A,l_B,s} \{(1-B)\left(\log(w_{1,i}n - s) + A\,(1-n)\right) \\ + B\left(\log(w_{2,i}n + Rs) + A\,(1-n)\right) - l_A - l_B + z\,V(A',B')\}, \quad (13)$$

where the maximization is subject to (2) and (3). Solving for the optimal saving choice s and substituting back into the Bellman equation yields:

$$V(A,B) = \max_{n,l_A,l_B,s} \{\log\left(w_1 + \frac{w_2}{R}\right) + \log(n) + A\,(1-n) \\ + (1-B)\log(1-B) + B\log(B) - l_A - l_B + z\,V(A',B')\}.$$

Clearly, only occupations maximizing the present value of the lifetime wage profile ($w_1 + w_2/R$) are chosen in equilibrium. The household can freely allocate income among the two adult periods, so that the choice of a profession has no bearing on the incentives to invest in patience. More generally, the three problems of choosing an occupation, accumulating patience, and accumulating leisure preference are now fully separable, and their characterization via the methods discussed in the previous section is straightforward.

If we allow agents to choose separate labor supplies in the two adult periods, the impact of introducing financial markets becomes even more drastic. Given that the disutility from labor is linear, workers will choose to work in only one period (at least until they hit the upper bound on labor supply). An impatient worker (low B) would now prefer a profession with a steep wage profile, because then the worker could work only in the second period and enjoy leisure in the highly valued first period. Thus, the interaction of patience and occupations with different income profiles is reversed. However, this result is perhaps too extreme, as it is an artifact of the assumptions that wages in a given occupation are independent of the timing of labor supply and that the marginal utility of leisure is constant within each period.[16]

To summarize, at least some financial market imperfections are necessary for occupational choice and investments in patience to be interlinked. It is not necessary, however, to assume the complete absence of financial markets, as we did in the preceding section

[16]For someone in the real-world medical profession, for example, enjoying leisure until age 45 and then immediately receiving the high wages of a medical specialist would be infeasible. To the extent that these wages are a return on education and experience, they are high precisely because doctors tend to enjoy little leisure at young ages.

for analytical convenience. As long as the steepness of an income profile is at least partially transmitted to utility profiles, the basic mechanism is at work. A positive implication of this finding is that the degree of patience heterogeneity in a population depends on the development of financial markets. In an economy where financial markets are mostly absent, incentives to invest in patience vary widely across members of different professions, and consequently we would expect to observe a large corresponding variation in actual acquired preferences. These differences should be smaller in modern economies with less imperfect financial markets. For example, although engaging in a lengthy program of study (such as medical school) that leads to high future incomes may still require some patience and perseverance, today's students have access to educational loans and credit cards. Hence, the modern-day artisans are able to consume some of their future rewards already in the present, and consequently they (and their parents) face a smaller incentive to invest in specialized preferences.

4 General Equilibrium in a Pre-industrial Economy

Up to this point the level of income derived in each profession has been taken as exogenous. In this section, we introduce a simple mechanism to endogenize wages. The main new result is that general equilibrium forces can induce dynasties to sort into different professions even in an economy where initially everyone has the same preferences. If these professions differ in the steepness of their income profiles, divergence in patience necessarily follows. This outcome naturally occurs if the income derived in a given profession declines with the number of members of the profession, i.e., if there are decreasing returns.

We illustrate this finding within a two-sector economy that also underlies the application of our model to the Industrial Revolution in Section 5. For now, the economy is still at the pre-industrial stage, and relies on two modes of production: agriculture and artisanship. Agricultural output Y_F and the artisans' production Y_M are perfect substitutes, so that total output is given by $Y = Y_F + Y_M$. The two technologies differ in terms of the inputs used. The agricultural technology uses unskilled labor L and land Z, and is described by the following production function:

$$Y_F = L^{\alpha} Z^{1-\alpha}, \tag{14}$$

where $\alpha \in (0, 1)$. The artisan technology is linear in skilled labor H:

$$Y_M = qH, \tag{15}$$

where q is a productivity parameter. Both sectors are competitive, so that factors are paid their marginal product. The total amount of land is fixed at $Z = 1$. Land is not traded and is owned by a fixed measure of dynasties, each of whom owns an equal share of land. Each landowner bequeaths the land he owns to his child when he passes away. Land is only productive if the owner monitors production (the monitoring technology is discussed below). There is no occupational mobility between landowners and the other classes. The mass of landless labor-market participants (workers and artisans) is equal to one in every period.

The main difference between skilled and unskilled labor is the lifetime income profile. Recall that in equilibrium, all individuals relying only on labor income supply the same amount of labor n in both periods of their lives. An unskilled worker is equally efficient at young and at old age, and therefore supplies an equal number n of units of unskilled labor in both adult periods. Skilled workers (i.e., artisans), in contrast, use some of the young adult period to acquire skills and experience. Their effective labor supply is given by n units of skilled labor in the first adult period and by γn units in the second adult period, where $\gamma > 1$. Hence, artisans have a steep lifetime income profile, whereas the workers' profile is flat.

4.1 The Landless: Artisans and Workers

We start out by focusing on the lower classes, who, unlike the landowners, have to choose a profession. Since our goal is to show that preference stratification necessarily arises even if all dynasties originally have the same preferences, a natural initial condition is a situation where the productivity q of artisanship is so low that only the agricultural technology is used. As a consequence, all landless agents are workers with flat income profiles. Patience is not a valuable asset in such an economy, and remains at the natural level $\bar{B}$ (see Section 3.2.1), whereas the taste for leisure is given by (9). Now assume that at time $t = 0$ the productivity of artisanship q increases unexpectedly. The increase is assumed to be sufficiently large such that all workers remaining in agriculture cannot be an equilibrium, because everyone would prefer artisanship at the going wage. But neither can the equilibrium feature everyone switching to artisanship, because the wage of agricultural workers tends to infinity as the number of workers tends to zero. Thus, adults will endogenously divide between the two occupations, and wages will adjust to make everyone just indifferent between being a worker and being an artisan.

The preferences of the cohorts turning adult at times $t = 0$ and $t = 1$ were formed before the (unforeseen) increase in q took place. Hence, these cohorts are still endowed with the natural patience level $\bar{B}$. The parents of the cohort turning adult at time $t = 2$, however, can condition their investment in patience on the occupational choice of the child: those who expect their children to be artisans will invest in patience, while those expect their children to be workers will not. Once again, in equilibrium there must be both workers and artisans. Thus, wages in period $t = 2$ will adjust to make parents just indifferent between investing in patience (inducing their children to be artisans) and not investing (inducing their children to be agricultural workers).

Once the population has endogenously split into groups of workers and artisans, further stratification in preferences across social classes necessarily follows. In general, the transition can be complicated with changing fractions of workers and artisans (and hence wages) over time. To keep the analysis tractable, we now focus on the case where, after the initial sorting (i.e., from period $t = 2$ onwards), the number of workers and artisans remains constant. This implies, in turn, time-invariant wages. More formally, let μ be the aggregate labor supply in agriculture (that is, the fraction of workers among the landless adults multiplied by individual labor supply) from $t = 2$ onwards. Workers then earn a wage equal to $w_F = \alpha\mu^{\alpha-1}$ in both periods, whereas artisans earn q in the first and γq in the second period. Under these time-invariant wages the analysis of the preceding section applies directly to the decision problem in our general-equilibrium economy.

The following proposition introduces assumptions guaranteeing that such an equilibrium exists, and derives the implications for occupational choices and the evolution of preferences. The key assumption is that the production function for patience is linear.[17]

Proposition 8 *Assume f to be of the form $f(l_B) = \xi l_B$, where ξ satisfies:*

$$\frac{1 - z(1-\psi)}{z} \leq \xi \log(\gamma) \leq \frac{1 - z(1-\psi)}{z} \frac{1}{z(1-\psi)}. \tag{16}$$

[17](16) guarantees that all members of the investing dynasties choose artisanship for $t \geq 2$, whereas all others prefer to be workers. Under this assumption, the occupational transition occurs in one generation. It is possible to characterize equilibria involving longer transitions under weaker parameter restrictions, but this is omitted for simplicity.

Suppose that the economy starts out with everyone having the natural patience $B_0 = \bar{B}$ and the steady-state taste for leisure A, as given in (9). Then for sufficiently large $q > 0$ there exists an equilibrium such that for all $t \geq 2$ the proportion of workers and artisans in the population is constant, and the agricultural wage is given by:

$$\log w_F = \log\left(\alpha\mu^{\alpha-1}\right) = \log(q) + \bar{B}\log(\gamma) - \frac{\bar{l}_B}{z} + \frac{\xi\bar{l}_B\log(\gamma)}{1 - z\,(1-\psi)}. \tag{17}$$

The equilibrium is characterized by occupational segregation, i.e., from $t \geq 2$ onwards, parents and children in the same dynasty choose the same profession. The taste for leisure remains constant in all dynasties. Worker dynasties do not invest in patience ($l_B = 0$), whereas artisan dynasties invest the maximum amount ($l_B = \bar{l}_B$). The distribution of patience converges to a steady state where the patience of all workers remains at the natural level $\bar{B}$, whereas the patience of all artisans converges to the maximum $B_M = \bar{B} + \xi\bar{l}_B/\psi$.

The main feature of this equilibrium is that occupational segregation triggers divergence in patience across worker and artisan dynasties. Initially, all families are indifferent between investing and not investing in patience. The initial generation's indifference condition pins down the equilibrium wage and the associated fractions of workers and artisans. After the investment choice of the first generation, all members of the artisans dynasties are more patient than workers and strictly prefer to be artisans.

Under a concave production function for patience $f(l_B)$, there is a motive for smoothing investment over multiple periods, which can lead to more complicated transitions. However, the basic forces leading to preference stratification are the same. In Section 5 we numerically solve a model with a concave production function for patience.

The taste for leisure is not affected by the occupational choice, because the members of both occupations continue to rely exclusively on labor income. Thus, the theory predicts no sorting across workers and artisans along this dimension of preferences, and both groups continue to work the same number of hours.[18]

4.2 The Landowners

Unlike the landless, the landowners in our economy do not have to choose an occupation, because their income is provided by inherited land. However, they still have to

[18]This is consistent with the evidence presented by Voth (2000), who documents that the number of hours worked by workers and artisans in the pre-industrial era were approximately the same. See also the discussion in Section 6.

make decisions on patience and leisure preference. We now characterize how the economic conditions faced by the landowning class affect their incentives for forming their children's preferences.

Landowners earn rents from land. We denote the rent accruing per unit of land by r, and amount of land owned by a given landowner by x. In order to appropriate the entire rent, landowners have to monitor the workers on their land. The landowners' income process is

$$y_{1L} = \underline{r}x + (r - \underline{r})\, xn_1 \text{ and } y_{2L} = \underline{r}x + (r - \underline{r})\, xn_2,$$

where n_1 and n_2 denote the monitoring effort (in units of time) in the two periods. Even without monitoring (the proverbial "absent landlord"), the landowner owns a minimum return $\underline{r}$ on the land. Note that, by setting $n = 1$, landowners can appropriate the entire rent. Enjoying leisure entails a linear income loss. The return to monitoring is a reduced-form representation of moral hazard problems, such as the possibility that administrators steal a part of the rent. The key feature of this income process is that total income is less elastic with respect to labor effort than the income of artisans and workers.

Setting $b \equiv \underline{r}x$ and $w \equiv (r - \underline{r})\, x$, the analysis of Section 3.2.2 (see equation (11)) applies, establishing the following proposition (proof omitted).

Proposition 9 *In an equilibrium with constant employment shares, landowners do not invest in patience, and converge to the natural patience $\bar{B}$. However, landowners invest more than artisans and workers in the taste for leisure, and (conditional on a common initial A) their taste for leisure converges to a higher steady state.*

The incentives for landlords to invest in patience and the taste for leisure do not depend on the size of their estate x: in steady state the entire class of landowners will have identical preferences.

To summarize, the members of the three occupations in our pre-industrial economy all end up with different preferences, shaped in each case by the economic conditions characterizing the profession. Both workers and artisans are hard-working, because they rely exclusively on labor income. Artisans are more patient than workers, however, because they also face a steep lifetime income profile. The landowners face an income profile that is equally flat as that of the workers, and they consequently have the same low patience. Unlike the workers, the landowners derive their income mostly from land instead of labor. As a consequence, the landowners develop a higher taste for leisure (or conversely a greater aversion to work) than the landless classes.

In the pre-industrial economy, the stratification of preferences across classes is only important to the extent that it determines occupational choices. We now turn to the question how the fate of the different classes in our economy evolves when technological change alters the economic landscape.

5 From Artisan to Capitalist

In this section, we introduce a physical investment technology into the pre-industrial economy. The new technology becomes unexpectedly available after preferences have already diverged across classes. The class-specific preferences, which were formed in response to economic conditions in the pre-industrial period, also turn out to determine the extent to which members of different classes make use of the new technology. The basic result is unsurprising in the light of standard economic theory: the most patient and hardest-working classes, i.e., the artisans, are the first to take advantage of the new opportunity—they possess the "spirit of capitalism." The artisans leapfrog over the landowning class, and replace them as the economic elite. However, preferences continue to evolve after the introduction of the new technology. To some extent, this process can mitigate the subsequent divergence of wealth across classes. In particular, as the new industrialists accumulate wealth, they also start accumulating a taste for leisure. As a result, the children and grandchildren of the first industrialists are less economically successful as the founding generation.

5.1 The Capitalist Technology

After the introduction of the new technology, each dynasty faces a decision problem with three state variables: leisure taste A, patience B, and capital K. We interpret the capital variable as a family-owned enterprise. Young adults decide how much of their first-period income to consume and how much to invest into the family business. Investments in the business are assumed to be irreversible: agents can consume the output of the investment technology (as well as their labor and land-rent income), but the capital stock itself cannot be liquidated and turned into consumption. The capital owned by an old agent is bequeathed—up to depreciation—to her child.[19] We continue to assume

[19]Dynastic enterprises were common in the early days of the Industrial Revolution. Caselli and Gennaioli (2003) argue that this was due to the underdevelopment of financial markets: it was unprofitable

that agents cannot borrow.

The capital stock of the family business depreciates at the rate δ. The rate of return on capital depends on labor effort and is denoted by $R(n)$. Here the return is increasing in n, i.e., a hard-working entrepreneur earns a higher return than a passive owner. This captures the role of managerial effort and monitoring in a business and is parallel to our treatment of rental income from land. The return is given by:

$$R(n) = \underline{R} + (\overline{R} - \underline{R})n^{\eta},$$

where $\overline{R} > \underline{R} > 0$ and $0 < \eta < 1$.[20] We also assume that the business activity is run in addition to one of the existing professions. Thus, a young entrepreneur can derive additional labor income as a worker or artisan, or in the case of landowners, entrepreneurship can be combined with rental income from land. This feature, realistically, allows businesses to be started at a small scale on top of other activities. In particular, we want to allow aristocrats to earn rents from their land and invest the proceeds in a capital market, so as to not exclude them from investment from the outset. For simplicity, we assume that a single effort choice determines labor or rental income as well as the return on the family business (separating these choice variables would complicate the notation without changing the main results).

Let $K \geq 0$ denote the bequest of capital received by a young adult. The budget constraints and the irreversibility constraint are given by:

$$c_1 + K' = (1 - \delta + R(n_{1,i}))K + y_1, \tag{18}$$

$$c_2 = R(n_{2,i})K' + y_2, \tag{19}$$

$$K' \geq (1 - \delta)\, K. \tag{20}$$

Here y_1 and y_2 denote income derived outside the family business. For workers and artisans, this consists of labor income ($y_1 = w_{1,i}n_{1,i}$ and $y_2 = w_{2,i}n_{2,i}$), whereas aristocrats receive the rents from their land x as a function of their monitoring effort ($y_1 = \underline{r}x + (r - \underline{r})\, xn_1$ and $y_2 = \underline{r}x + (r - \underline{r})\, xn_2$, see Section 4.2). In the budget constraint (18) for

for parents to liquidate their business instead of leaving it to the children. In our model, the irreversibility constraint implies that differences in investment across families lead to different initial assets for the next generation. Under reversible investment, similar results could be obtained if the altruism parameter z (the intergenerational discount factor) was an increasing function of patience B (the intragenerational discount factor).

[20] The curvature in the return function is not essential for the results, but is useful to generate a smooth relationship between state variables and the entrepreneurial return in the simulations below.

the first adult period, total income consists of y_1 plus capital income $(1-\delta+R(n_{1,i}))K$. Because of the irreversibility constraint (20), consumption cannot exceed the sum of current output and labor income: $c_1 \leq R(n_{1,i})K$. In the second-period budget constraint (19), the agent earns y_2 plus capital income $R(n_{2,i})K'$. Since the capital stock cannot be liquidated, the agent bequeaths the remaining capital $(1-\delta)K'$ to her child. [21]

The recursive representation of the decision problem of a young adult with leisure preference A, patience B, and inherited capital stock K is given by the following Bellman equation:

$$V(A,B,K) = \max_{c_1,c_2,l_A,l_B,n_1,n_2} \Big\{ (1-B)\left(\log(c_1) + A(1-n_1)\right) + B\left(\log(c_2) + A(1-n_2)\right) \\ - l_A - l_B + z\, V(A', B', (1-\delta)K') \Big\}$$

where the maximization is subject to the laws of motion for A and B (2) and (3), and the budget and irreversibility constraints (18), (19), and (20). Moreover, the choice variables are bounded by $c_1, c_2 \geq 0$, $0 \leq n_1 \leq 1$, $0 \leq n_2 \leq 1$, $0 \leq l_A \leq \bar{l}_A$, and $0 \leq l_B \leq \bar{l}_B$.

The separation result of Proposition 1 no longer applies in the presence of capital, and the equilibrium law of motion of A B and K are interdependent. This prevents a full analytical characterization, and the model must be solved numerically. Nevertheless, the basic tradeoffs that determine investment in preferences are still the same, so that, at least qualitatively, the interaction of capital accumulation and preference formulation is easily understood.

First, consider how preferences determine the investment choice. Here a standard Euler equation applies: a young adult invests if future marginal utilities weighted by the appropriate time discount factors and investment returns exceed the cost of investing, i.e., current marginal utility. Thus, unsurprisingly, more patient agents have a higher propensity to invest. In addition, agents with a low taste for leisure also tend to invest more, since by working harder they earn a higher return on their investment. If we apply these findings to our economic environment, it follows that the artisans are, at least initially, the ideal investors, because they are both patient and hard-working. The other

[21] In principle, parents could bequeath additional resources to their offspring. However, we focus on economies where the irreversibility of the capital stock is a binding constraint for the old adults. Namely, in the last period of their lives agents would like to liquidate part of the capital stock and consume it, but they are instead forced to leave it to their children as an involuntary bequest. Agents clearly do not leave any additional bequests in such economies. Formally, this outcome can be guaranteed by choosing the altruism factor z appropriately.

classes either invest less (relative to their income) or not at all. The latter would occur if an agent would borrow rather than save at the rate of return provided by the investment technology.

Once a family has entered entrepreneurship, this will feed back into the further evolution of preferences within the dynasty. Here the interactions with leisure preferences and patience are opposites of each other. In the case of patience, the fact that a dynasty starts investing will increase the investment in patience, which amplifies the original drive to invest. The reason is that investment endogenously steepens utility profiles both within and across generations, i.e., utility drops during the early investment period and increases in the later return periods. As we determined earlier, steep utility profiles lead to increased investment in patience, which leads to even more investment. Thus, if patience were the only endogenous aspect of preferences, we would expect to observe further divergence in preferences across dynasties of entrepreneurs and others, as well as accelerating wealth accumulation over time within entrepreneurial dynasties.

However, this effect will be mitigated or even reversed by the endogeneity of the taste for leisure. The optimality conditions for labor supply and investing in leisure are unchanged; thus, labor supply depends on leisure preference as well as the elasticity of consumption with respect to labor effort, and investment in the taste for leisure depends on future labor effort. Initially, an artisan or worker dynasty entering entrepreneurship has little appreciation for leisure and is therefore hard working, as historically these dynasties relied on labor income alone. However, the descendants of the initial entrepreneurs inherit the family firm. Thus, just as the landowners', their consumption derives increasingly from capital income and becomes less elastic with respect to labor effort. As a consequence, the founders' children and grandchildren work less hard than their forefathers and develop the same fine tastes for leisure that the land-owning class already possesses. Of course, the drop in labor effort also lowers the return on investment, which can lead to a slowdown or even reversal in accumulation. Thus, the model verifies the "Carnegie conjecture:" the initial success of a dynasty can lay the seed for its ultimate downfall. Whether this effect dominates the increased accumulation of patience depends on parameters. This "Buddenbrooks" effect will be particularly strong if investment in the taste for leisure is highly elastic and labor effort has a large effect on entrepreneurial success, i.e., $\overline{R} - \underline{R}$ is large.

There are two different possibilities for a dynasty that initially chooses not to invest. The first is that the dynasty's preferences are sufficiently tilted against investing to permanently exclude the family from entrepreneurship. The second is that a future member of the dynasty will eventually become an entrepreneur. In this case, in anticipation of the future change the dynasty will first invest in the appropriate preferences and then accumulate capital as a second step.

5.2 A Computed Transition

We now provide a numerical illustration of the equilibrium dynamics of our model after the introduction of a capitalist technology. Table 1 summarizes the parameter values used for the simulation. The functional forms for investing in the taste for leisure and patience are given by $g(l_A) = \phi_A l_A^{\xi_A}$ and $g(l_B) = \phi_B l_B^{\xi_B}$. As described in Section 4, the economy starts out under uniform preferences in the pre-industrial period long before the capitalist technology becomes available. Then people sort into professions, and over time preferences approach occupation-specific steady states. In this pre-industrial steady state, artisans earn a wage of 1.0 in the first and 2.0 in the second period, whereas workers earn a wage of $w \approx \sqrt{2}$ in each period. Workers and landowners are at the natural patience of $\underline{B} = 0.4$, while artisans have a higher patience of $B \approx 0.6$. Finally, landowners converge to a high taste for leisure of $A \approx 2$, while workers and artisans are less leisure-oriented with $A \approx 1.5$.

Figure 3 displays the dynamics of capital and patience for members of the three occupations. The economy is still in the pre-industrial steady state in period 0; in period 1, the capitalist technology is introduced unexpectedly. Recall that initially, the artisans are most likely to invest, the workers less so (they are less patient), and the landowners are the least likely (they are not just impatient, but also lazy). Given our choices for the returns of the investment technology, in the case displayed in Figure 3 for the workers nothing changes: the dynasties do not invest, and patience remains at the steady state. The artisans, however, are sufficiently patient to find investment in capital attractive right away. Investment in capital increases the incentive for investing in patience, so that both the artisan's patience and their growth rate of capital increase for a few periods.

Figure 4 displays the dynamics of the taste for leisure during this transition. Once again, workers remain in steady state. In contrast, as the artisan-turned-capitalist dynasties grow richer, their work ethic deteriorates. The new capitalists turn from captains of industry into rentiers, and start investing into their children's appreciation of the virtues of leisure. After a few periods, the tastes of the new capitalists are just as refined as those of the landowners. In Figure 3, the capitalists' deteriorating work ethic contributes to a slow-down in the growth rate of capital. In the new balanced growth path, the wealth of the former artisans continues to grow, but at a slower rate as during the first few generations.

Given that the workers do not invest, the landowners *a fortiori* do not do so either. They have the same flat income profile (although possibly a higher income level) and the same low patience as the workers, but additionally a higher appreciation for leisure. At the return offered by the new technology, the landowners would actually want to borrow, but they cannot do that due to the borrowing constraint. They therefore continue to live off their land rents, and are soon overtaken by the rising class of capitalists as the economically dominant group in society.[22]

An interesting feature of the model is that the same pattern of catch-up and overtaking can also be generated in an environment where the investment technology is available from the outset, instead of being introduced later on. If all dynasties start out sufficiently impatient, initially the investment technology is not used. Some dynasties, however, sort into artisanship, and start to accumulate patience. After a few generations, the patience of the artisans reaches a critical level, at which they start to use the investment technology and turn into capitalists. In this version of the model, it is not the surprise appearance of a new technology, but the endogenous accumulation of patience capital that triggers the Industrial Revolution. Arguably, this sequence of events is closer in spirit to Weber's original hypothesis.

The outcome displayed in Figures 3 and 4 is extreme in that two classes are entirely excluded from entrepreneurship and wealth inequality grows indefinitely. Clearly, other long-run patterns are possible depending on the parameters of the production function. For very low returns on capital, not even the artisans would want to use the new technology. An interesting outcome arises if the return on capital is slightly higher than what is displayed in Table 1. In this case, workers also start to invest in the new technology, albeit at a lower rate due to their impatience. Thus, former artisans accumulate wealth more quickly. However, the differences across worker and artisan dynasties diminish over time, because the artisans acquire more leisure taste at earlier dates. If the slowdown due to an increasing leisure preference is particularly severe, the initial en-

[22]In the model, all landowners are identical, so that there is not a single landowning investor. The separation of classes is less sharp if one adds preference shocks to the model. Then a few patient landowners can emerge who decide to utilize the new accumulation opportunity. These landowners would become quite rich, since they can earn income from both the industry and agriculture.

trepreneurial dynasties may ultimately stagnate or regress and be themselves overtaken by workers-turned-capitalists.

As far as the first periods after the introduction of the technology are concerned, the predictions of the theory are quite robust: the most patient and hard-working groups will be the first to make use of a new investment opportunity. Thus, even if the environment were such that ultimately even landowners invest, we would still expect the middle class to get a head start, and possibly overtake the landowning class in the process. To examine these predictions in more detail, we now turn to the historical circumstances that accompanied the changing economic fortunes of different social classes during the British Industrial Revolution.

6 The Historical Context

In this section we document the basic historical facts underlying our theory, starting with the social origin of the first industrialists. In a study of founders of large industrial undertakings in Britain between 1750 and 1850, Crouzet (1985) concludes that "neither the upper class nor the lower orders made a large contribution to the recruitment of industrialists" (p. 68). The only class that was significantly over-represented among the industrialists was the middle class.[23] Similarly, Jeremy (1990) documents that in a sample of founders of large British business, among those born before 1870, the majority had "left school in their mid-teens or earlier and then started to learn a trade, most frequently by an apprenticeship" (p. 347). The minor involvement of landowners not only in the establishment, but also in the financing of new enterprises is surprising, given the extreme concentration of wealth in the hands of the landowning elite at the

[23] In the sample analyzed in this study, only 2.3 percent of the industrialists came from peerage and gentry (see Crouzet's Table 5). In contrast, 85 percent of the new industrialists had a middle-class background. The professions represented in this class range from bankers and rich merchants at the upper end to small artisans and tenant farmers at the lower end. As many as 27 percent of the men who entered large-scale industry and 39 percent of the fathers of industrialists came from the lower ranks of the middle class: "shopkeepers, self-employed craftsmen and artisans, cultivators of various kind" (Crouzet 1985, p. 127). The contribution of the working class (about 70 percent of the population) was moderate; no more than 12 percent of the industrialists came from this class. Part of the explanation for the small number of upper-class entrepreneurs is, of course, that there were few aristocrats to begin with. But the differences in numbers do not explain the extent of the under-representation of the upper classes. At the beginning of the nineteenth century, peerage and gentry accounted for about 1.4 percent of the population, while the middle class made up slightly less than 30 percent. Thus, a much larger share of the middle class than of the peerage and gentry ended up as entrepreneurs. If we relate the participation of the upper class to their share of wealth owned instead of their share of the population, their representation is surprisingly thin.

time. As late as in 1880, less than 5000 landowners still owned more than 50 percent of all land (Cannadine 1990, see also Lindert (1981, p. 378). Given their enormous advantage in wealth, the aristocrats should have been well placed to profit from new technologies that were ultimately based on capital investment.

The new class of industrialists progressively replaced the landed elite as the economically dominant group in society, as reflected, with some lag, in changes in the wealth distribution. In the first half of the nineteenth century, large fortunes were still by and large associated with land ownership. Rubinstein (1981) reports that among the 189 individuals who died between 1809 and 1858 with a fortune exceeding one million pounds, 95 percent were wealthy landowners. However, merchants and industrial capitalists were already catching up. Lindert (1986, Table 1) documents that in 1810 the average estate of living gentlemen was more than three times larger than that of merchants and industrial capitalists, whereas in 1875 it was 16 percent smaller. Soon thereafter, landowners no longer featured prominently among the wealthiest families in the country. Between 1900 and 1939, only 7 percent of the 273 individuals who died as millionaires belonged to the landed elite (Rubinstein 1981, Tables 3.2 to 3.4.). Among the non-landed millionaires, about half of the new fortunes were generated in the manufacturing sector, with most of the rest accounted for by commerce and finance.

Our explanation for these patterns relies on differences in preferences which in turn were shaped by the economic conditions faced by different social classes in the pre-industrial period. There is indeed ample evidence that artisans and craftsmen, the typical professions of the pre-industrial middle classes, were required to make large human capital investments, and consequently had steep lifetime income profiles. In most of Europe, an artisan's career advanced through three stages: apprenticeship, journeymanship, and mastership.[24] Apprenticeship would on average take 5–6 years, but in some professions one would remain an apprentice for up to 12 years (Epstein 1991). After apprenticeship, artisans would become journeymen and travel around European cities, serving as employees at some master's shop. This wandering period would last for a minimum of 3–4 years (Friedrichs 1995). Savings and frugality were essential for journeymen who hoped to become a master one day. "Unless he was able to count on substantial inheritance or fortunate marriage, a journeyman's primary interest was to

[24]The life of an apprentice was not glamorous. "Upon payment of a placement fee, apprentices took their place in their master's household, agreeing to obey and respect him as a father. ... Not all apprentices reached mastership, but this does not gainsay the fact that the purpose of apprenticeship was selection and the goal a direct route to mastership" (Farr 2000, p. 33).

amass capital for opening their shop or business" (Epstein 1991, p. 115). Having completed his time on the road, the journeyman could apply for admission to mastership, which was in itself an expensive process.[25] Only at that point, if successful, could the journeyman become a master and a new guild member, and open a shop at his own expense. These accounts suggest that the life of an artisan was investment-intensive, and the consumption profile very steep (see Phelps Brown and Hopkins 1957, Munro 2004 and Farr 2000 for additional evidence).

In contrast, the age-earnings profiles of agricultural workers and landowners were relatively flat. Burnette (2002) documents that the wages of English farm workers in the early nineteenth century varied little between the ages of 20 and 60. As far as the landed gentry is concerned, the available evidence suggests that their income and consumption profiles were fairly flat as well. This class derived its income mostly from owning land and, to a smaller extent, from mining projects (Beckett 1986). Annual variation in a landowners' income stems from two dominant sources: fluctuation in land rental rates, and changes in the size of the estate through land sales or purchases. While there were always some economically successful families who were able to increase the size of their holdings, most aristocratic landowners merely aspired to preserve the estate, so as to ultimately pass to the next generation just as much as they once inherited. In periods of rising land rental rates, the income of landowners as a class would increase as well; but given that rents tended to change only slowly over time, these movements would not generate the steep lifetime income profiles that were typical for artisans and craftsmen.[26]

In our theory, the different economic conditions characterizing the various social classes ultimately manifest themselves in class-specific preferences. And indeed, the stark contrast of the new entrepreneurs' thrift and work ethic with the landed aristocracy's free-spending habits and leisurely lifestyle has long been part of the conventional wisdom on

[25] The applicants owed the payment of a series of fees, the completion of a masterpiece according to the guild regulations, and the outlay (if the masterpiece was accepted) for a luxurious banquet for the masters he hoped to join. In addition, he had to submit the name of a proposed bride, whom the guild was supposed to examine and approve.

[26] In principle, a flat profile for overall family income need not imply that individual consumption profiles were flat as well. In particular, one might imagine that aristocrats started to consume heavily only after inheriting their estates, while living frugally during their younger years. However, the available evidence suggests that, if anything, the opposite was true. Young aristocrats typically did not work during their childhood and young adulthood and were supported by their parents. These family support payments tended to be large, and contributed to aristocratic indebtedness: "family payments were not the only cause of aristocratic indebtedness, but contemporaries usually regard them as playing a crucial role" (Beckett 1986, p. 298). Thus, aristocrats usually lived in some comfort during their entire lives and did not experience the stark contrast of a sober adolescence with relative prosperity during adulthood that was typical for urban artisans and craftsmen.

the Industrial Revolution.[27] The leisure orientation of the pre-industrial upper class was in fact one of its defining characteristics, as evidenced by the observation that the term "gentleman" traditionally signified a man who did not need to work.[28] One indication for low patience among the landed elite during the time of the Industrial Revolution is the lack of savings that could have been channeled towards financing industrial enterprises. Given the absence of a contribution from the wealthy upper class, a large share of the new enterprises had to rely on personal savings and retained earnings to grow. For instance, Davis and Gallman (2001) note: "It may well have been true, as Postan noted, that at least two fifteenth-century families could have provided all the finance required to fund the entire Industrial Revolution. However, those (and other elite) families chose not to redirect their existing portfolios to meet either the relatively small demands of the manufacturing sector—demands that were met largely out of retained earnings—or much more importantly, the demands for supporting investment in infrastructure, particularly canal construction" (p. 50).

More generally, if the members of the upper class were truly lacking in patience, they should have been unwilling to invest not only in industrial enterprises, but in other kinds of financial assets as well. The historical evidence supports this implication. Well before the Industrial Revolution, the British government became a major borrower, with multiple bond issues (mostly for war finance) throughout the seventeenth and eighteenth centuries. These bonds were mostly purchased by the urban middle classes, whereas the contribution of the landed classes was insignificant (Dickson 1967, p. 302). The financing of early public companies follows the same pattern. Bowen (1989) documents that most stockholders of the East India Company between 1756 and 1791 were "clergymen, bankers, military and naval personnel, officials, brokers, merchants large and small, and retailers," whereas "beyond doubt there was no large-scale investment in the [East India] Company by the landed interest or aristocracy" (p. 195). The pre-industrial elite thus played a surprisingly minor role in financing government borrowing and private enterprise well before the Industrial Revolution, despite being far wealthier than the middle class. This stands in marked contrast to the wealth elites in modern

[27] For instance, von Mises (1963) writes: "The early industrialists were for the most part men who had their origin in the same social strata from which their workers came. They lived very modestly, spent only a fraction of their earnings for their households and put the rest back into the business" (p. 622).

[28] The available data show that the differences in work and leisure time between upper and lower classes were quantitatively large. Voth (2000) documents that in a sample of Londoners in 1760 and 1800 the involvement of the elite in leisure activities was three to five times as large as that of other social groups, whereas there were no significant differences between the lower and the middle classes (Tables 3.23 and 3.24, p. 112–13).

industrial countries, who generally own disproportionate shares of most types of assets, including government debt and public stock (see Carroll 2001 for evidence on the United States).[29]

Rather than investing the rents derived from their estates, many landowners used their land as collateral to borrow money. The scale of this borrowing substantially increased when long-term mortgage loans where introduced after the Glorious Revolution of 1688. Beckett (1986) reports that by the mid-eighteenth century "many families already had an accumulation [of debt] several generations old" (p. 300).[30] Most of this debt was taken on not to improve existing estates or to buy more land, but resulted from a failure to match expenditure to income: "Rents and royalties were apparently being sucked into conspicuous consumption and frittered away in spiraling marriage contracts; and the gap between getting and spending was filled not by offloading assets such as land, but by borrowing from—in effect—the commercial, industrial and shopkeeping members of the populace" (Beckett 1986, p. 316. See also Devine 1971, Kindleberger 1993 (p.175) and Porter 1982). Aristocratic indebtedness grew severely during the nineteenth century, and a 1847 writer claimed that "between half and two-thirds of English land was encumbered (i.e. mortgaged)" (Beckett 1986, p. 315). Cannadine (1994) summarizes the situation as follows: "Whatever might have been the financial state of individual families, it seems clear that the landed aristocracy *as a class* was in debt through the first three-quarters of the nineteenth century" (p. 49).[31]

Given our hypothesis of a low propensity to invest among the upper classes, one might wonder why the aristocracy did not simply sell land to middle-class buyers. A large part of the answer is that the land market in Britain was subject to pervasive legal restrictions

[29]A possible caveat is that if investments in agricultural estates carried a higher return than financial assets, the upper classes may have merely held a different (and possibly more profitable) portfolio than the middle classes, rather than having other preferences. However, there is little evidence of widespread active involvement of landowners in agricultural investment. Thompson (1994) documents that ever since 1700, the landowners progressively withdrew from day-to-day involvement in the management of their estates. The investments and technical innovations in agriculture during the eighteenth and early nineteenth centuries, which played an important role in the British Industrial Revolution, were carried out almost entirely by tenant farmers. Also notice that our theory does not posit that landowners were always impatient; in fact, the first aristocrats in a dynasty, who initially acquired title and estate, may have plausibly been particularly patient.

[30]See also Temin and Voth (2004).

[31]While some of this debt was raised for investment in non-agricultural ventures, according again to Cannadine (1994), "the first [category] was spending which had its objective the enhancement of the social prestige and the fulfillment of the traditional responsibilities of the landowner. ... To the extent that such self-indulgent activities were financed from middle- and working-class savings, ... this definitely amounted to a 'haemorrhage of capital,' a 'misallocation of resources,' as funds from urban and industrial Britain were diverted to underpin the indulgence of the landed order" (p. 48–49).

that made selling land costly or even impossible. Most large estates were entailed, meaning that they could neither be split nor sold by the owner.[32] Mortgaging their land to merchants and banks was therefore the only way in which, *de facto*, landowners could run down their assets. Eventually, after statutory reforms and changes in the common law eased the restrictions on land sales, many families overburdened by debt did sell off parts or all of their estates. By that time, the economic problems of the upper classes had become so pressing that land sales reached a massive scope. Cannadine (1990) summarizes the dismantling of aristocratic landownership during the first part of the twentieth century as follows: "The scale of this territorial transfer was rivaled only by two other landed revolutions in Britain this Millennium: The Norman Conquest and the Dissolution of the Monasteries" (p. 89). While other factors (taxation, decline of land rents) contributed to this final outcome, a clear thread links the chronic indebtedness of the landed aristocracy over centuries with its eventual decline and inability to hold on to the land.

A final implication of our theory is that once accumulated wealth becomes a major source of income for the economically successful middle classes, we should observe a change in attitudes towards leisure, and ultimately a decline in work effort and entrepreneurial success. Consistent with these predictions, Cunningham (1980) documents an explosion in the demand for leisure by the enriched bourgeois middle class in the second half of the 1800. Bailey (1989) writes: "One indisputable feature of the period before 1914 was the much greater proportionate expansion of leisure among the wealthier class. At mid-century the Victorian middle class had been suspicious of the moral temptations of a beckoning leisure world, but had rapidly learned to assimilate it to their culture. . . . By the end of the century prescriptions had become more permissive—from 'Be virtuous and you will be happy' to 'Be happy and you will be virtuous'—and middle class leisure grew more expansive and assured" (p.110). Among entrepreneurial dynasties, such an increase in leisure—according to our theory—should go hand-in-hand with a waning of entrepreneurial success as family firms are passed on from the founding fathers to subsequent generations (the "Buddenbrooks effect"). In an empirical study of 1149 British business leaders born between 1789 and 1937, Nicholas (1999b) documents strong evidence in support of this prediction. In particular, he finds that "there is a comparatively low lifetime rate of wealth accumulation for firm inheritors. The older the dynasty, the lower is the rate of return. Third-generation entrepreneurs clearly under-

[32] Through the institution of entail, an aristocratic landowner could prevent his descendants from selling part or all of the estate.

performed relative to firm founders or managers"(p. 706–7). This observation is at odds with a purely genetic view of entrepreneurial skills and preference transmission.[33]

7 Discussion of Alternative Hypotheses

The mechanism outlined in this paper is not the only possible explanation of the changing fortunes of different social classes throughout the Industrial Revolution. A first alternative hypothesis is that the upper classes were excluded from industrialization because urban workers possessed skills that were essential for industrial activities, while the landowners did not. For certain sectors and activities, there is indeed strong evidence showing that prior experience was important in determining who would become an entrepreneur.[34] However, the evidence also suggests that differences in skills cannot be the only or main explanation. A significant share of the new industrialists had not previously been involved in any form of manufacturing. For instance, as many as 22 percent of the industrialists' fathers were yeomen and farmers, groups with no experience in industrial activity (Crouzet 1985). Moreover, there is evidence of substantial mobility across industrial sectors. Crouzet reports that no more than 40 percent of the fathers of the industrialists in his sample worked either in the same industry or in an industry or trade with forward or backward linkages with the branch in which they set up (Table 8, p.152). Landowners were therefore not at a particular disadvantage in terms of their skills relative to many of the middle-class entrepreneurs. In fact, a number of key sectors during industrialization (such as mining, railways, and canals) required land as a major input. In these sectors, if anything, the landowners should have had an advantage over middle-class city dwellers.

A related argument is that the landowners, busy managing their rural estates, may have lacked the time and opportunity to enter industrial activities, which mostly took place in or near cities. However, many landowners did not actively manage their estates. Even more telling, it was not only the heirs of estates who shunned business activity; second and third sons of landowners did so as well. These younger sons had no choice but to

[33]This is echoed by Alfred Marshall (1890) who writes: "It would … at first sight seem likely that business men should constitute a sort of caste; … But the actual state of things is very different. … [W]hen a man has got together a great business, his descendants often fail, in spite of their great advantage, to develop the high abilities and special turn of mind and temperament required for carrying it on with equal success. … When a full generation has passed … then the business almost invariably falls to pieces. …" (pp. 299-300).

[34]Skills and experience in related activities were particularly important in the textile industry (see Crouzet 1985, ch. 8, pp. 116-125, and also footnote 79, p.206).

enter some activity other than landowning, and were therefore not held back by their obligations to an existing estate. Nevertheless, they did not enter business in any larger numbers than their landowning fathers. For instance, consider Table 2, which reports the occupational choices of Cambridge graduates during the period 1750–1899. The vast majority of students at Cambridge during this period were sons of the landowning class, so their occupational choices (other than landowning) give us some idea of which professions younger sons entered.[35] Strikingly, until 1850, not a single graduate got involved in banking or business (widely defined as any "profit-oriented activity"), and even after 1850 the percentage remains surprisingly low. This evidence is corroborated by the study of Crouzet (1985), who documents that few of the new industrialists' fathers were landowners (see footnote 23).

The arguments discussed so far do not rely on group-specific preferences. We now turn to explanations that do involve heterogeneity in preferences, but of a different nature than in our model. The most prominent of these theories, which is advocated by historians of the Victorian period such as Cain and Hopkins (1993), is that a social norm against the involvement in entrepreneurial activities excluded the British aristocracy from industrial capitalism: "A gentleman required income, and preferably sizeable wealth, but was not to be sullied by the acquisitive process" (p. 23). To the extent to which this exclusion was a matter of personal preference and (possibly acquired) taste, this thesis coincides with our explanation. However, as the classical theory of Veblen (1899) suggests, social norms may have also served as an instrument of social exclusion. A gentleman violating the norm would lose the recognition of his peers, with potentially grave consequences for social standing and access to aristocratic privileges. In this case, the enforcement would be partly extrinsic: even a gentleman enjoying hard work in principle may prefer to shun work in practice to avoid social sanctions.

It is difficult to empirically distinguish the individual-preference and social-norm approaches to class-specific preferences, because the implications for individual behavior are similar. One indication for the importance of individual preferences is that the "gentlemanly values" of the upper class persisted even after the aristocracy lost its predominance. If social norms had no function other than serving as an instrument of social exclusion, we would expect these norms to disappear once aristocratic privileges lost their value. The historical evidence suggests that aristocratic norms not only persisted,

[35] One group missing here is those choosing the military career, who would attend a military academy instead of Oxford or Cambridge.

but even spread to other social classes throughout the nineteenth century.[36] This observation is inconsistent with an explanation for class-specific preferences based on social exclusion alone, because members of lower classes could not have gained access to social and economic privileges by merely imitating the tastes of the upper class.[37]

From a theoretical perspective, we regard the two explanations as complementary, because they mutually reinforce each other.[38] If we introduced a social norm in our model that imposed social or economic sanctions on hard-working landowners, a landowning dynasty's incentives for investing in the taste for leisure would increase even further; thus, the imposition of a social norm would generate individual preferences in accordance with the norm. Likewise, when the social norms first arose, the aristocracy may have chosen to emphasize leisure and refined tastes as an instrument of social exclusion precisely because their income process granted them abundant free time, whereas members of other classes had no choice but to work. As Veblen put it, "abstention from labour is the conventional evidence of wealth and is therefore the conventional mark of social standing; and this insistence on the meritoriousness of wealth leads to a more strenuous insistence on leisure" (p. 26). Thus, the social norm may have its roots in the same economic conditions that generate class-specific preferences in our theory.

A last possibility is that aspects of preferences other than patience and leisure appreciation were driving the economic decisions of different social classes during the Industrial Revolution. For example, risk aversion or attitudes towards innovation may have also been relevant for the emergence of a spirit of capitalism, although these traits would apply mainly to entrepreneurship narrowly conceived rather than to the general attitude towards investments. Extending the analysis to these additional aspects of preferences may provide further insights. For instance, similar to the case of patience, financial development would tend to equalize the attitudes towards risk across dynasties engaged

[36] When Britain went into economic decline relative to competitors such as Germany and the United States after 1870, much of the blame was placed on the British education system (in particular the public schools and Oxbridge) for spreading aristocratic anti-business and anti-industrial attitudes to the upper middle classes; see the extensive discussion in Rubinstein (1993).

[37] Whereas the industrial elite ultimately started to appreciate leisure, for the most part it did not acquire the main prerequisites of aristocratic privilege, i.e., land and titles. For instance, Nicholas (1999a) notes that "those who made fortunes in business ... did not purchase or inherit land on large scale. This was despite the fact that their wealth gave them an unprecedented opportunity for land acquisition." Indeed, many preferred renting land for their leisure's sake, but did not bother with buying it. This suggests that leisure had intrinsic appeal to them, rather than being enjoyed solely for the purpose of social advancement (see also Rubinstein 1981, 1996).

[38] However, formally embedding social norms of this type in our theory is a non-trivial task and is left to future research.

in different professions. However, it may induce parents to encourage risk-taking behavior in their children, contrary to the analysis of patience in this paper, where financial development reduces the incentive to invest in patience.

8 Conclusions

The modern theory of economic growth focuses on changes in material conditions and standards of living, while ignoring, with few exceptions, the role of culture. This approach is legitimate as long as culture, while possibly being shaped by economic conditions, does not feed back into economic decisions. Recently, however, a number of economists have uncovered growing evidence that preferences, culture, and religion are important determinants of economic decisions and outcomes.

In this paper, we have developed a theory where economic conditions and culture are mutually interlinked. The theory is consistent with a number of observations about the British Industrial Revolution, such as the emergence of a spirit of capitalism among the urban middle class, as well as the subsequent replacement of the landed aristocracy by industrial capitalists as the socio-economic elite. The theory also predicts that the economic success of the bourgeoisie should lead to a cultural transformation of this class. Starting from a value system that emphasized hard work and disdain for leisure, the rising role of capital income results in a heightened appreciation of leisure among the industrial elite. This change in preferences can contribute to explaining the substandard economic performance of owners of inherited firms relative to the founders of industrial enterprises.

The theory shows that stratification of preferences across occupations may occur even in an initially homogeneous society. In reality, historical accidents may have fostered the stratification process. For instance, the political and religious forces behind the success of the protestant reformation may have contributed to the formation and transmission of preferences conducive to hard work and wealth accumulation. Likewise, demographic changes such as increasing longevity may have also played a role. A longer life horizon would tend to increase an agent's propensity to accumulate human capital and material wealth, reinforcing the effects of technological shocks at the time of the Industrial Revolution.

Although the analysis targets a specific historical episode, we expect the theory developed in this paper to be applicable to other open questions in macroeconomics and economic growth. For instance, a recent macroeconomic literature argues that heterogeneity in discount factors is key for explaining portfolio choices and the dynamics of the wealth distribution in modern economies (see Krusell and Smith, Jr. 1998, Gourinchas and Parker 2002, Samwick 1998, Browning, Hansen, and Heckman 1999, Ameriks, Caplin, and Leahy 2002, and De Nardi 2004). Our theory provides a new mechanism for the emergence and transmission of heterogeneous preferences. The theory also offers a new perspective on the impact of financial development on economic development. These and other aspects of endogenous preference formation are left to future research.

A Mathematical Appendix

Sequential Formulation of the Decision Problem: The sequential decision problem corresponding to (4) is given by:

$$V^{\star}(A_0, B_0) = \max \Big\{ \sum_{t=0}^{\infty} z^t \big[(1-B_t) \log(w_{1,i\,t}\, n_{1\,t}) + A_t\,(1-n_{1\,t}) + B_t \log(w_{2,i\,t}\, n_{2\,t}) + A_t\,(1-n_{1\,t}) - l_{A\,t} - l_{B\,t} \big] \Big\} \tag{21}$$

subject to $i_t \in I$ $n_{1\,t} \in [0,1]$ $n_{2\,t} \in [0,1]$ $l_{A\,t} \in [0, \bar{l}_{At}]$ $l_{B\,t} \in [0, \bar{l}_B]$ $A_{t+1} = \psi \bar{A} + (1-\psi) A_t + g(l_{A\,t})$ and $B_{t+1} = \psi \bar{B} + (1-\psi) B_t + f(l_{B\,t})$.

Proof of Proposition 2: The proof is an application of Corollary 1 to Theorem 3.2 in Stokey and Lucas (1989). The Bellman equation (6) defines a mapping T on the space of bounded continuous functions on the interval $[\bar{B}, B_{\max}]$, endowed with the sup norm, where the mapping is given by:

$$T v_B(B) = \sup_{i \in I, 0 \le l_B \le \bar{l}_B} \left\{ (1-B) \log(w_{1,i}) + B \log(w_{2,i}) - l_B + z\, v_B(\psi \bar{B} + (1-\psi) B + f(l_B)) \right\}. \tag{22}$$

Since we assume $0 < z < 1$, Blackwell's sufficient conditions for a contraction are met, and hence T has a unique fixed point by the Contraction Mapping Theorem. Using Corollary 1, we can now establish that the value function (i.e., the fixed point of the mapping T) is non-decreasing and weakly convex by establishing that the operator T preserves these properties.

To establish that the value function is non-decreasing, let v_B be a non-decreasing bounded continuous function. We need to show that $T v_B$ is non-decreasing as well. Choose two points $B_h > B_l$ from the interval $[\bar{B}, B_{\max}]$,. We want to establish that $T v_B(B_h) \ge T v_B(B_l)$. Since the right-hand side of (22) is the maximization of a continuous function over a compact set, the maximum is attained. Let $\underline{l}$ and $\{\underline{w}_1, \underline{w}_2\}$ be choices attaining the maximum for B_l. We then have:

$$\begin{aligned} T v_B(B_h) &\ge (1-B_h) \log(\underline{w}_1) + B_h \log(\underline{w}_2) - \underline{l} + z\, v_B(\psi \bar{B} + (1-\psi) B_h + f(\underline{l})) \\ &\ge (1-B_l) \log(\underline{w}_1) + B_l \log(\underline{w}_2) - \underline{l} + z\, v_B(\psi \bar{B} + (1-\psi) B_l + f(\underline{l})) = T v_B(B_l), \end{aligned}$$

which is the desired result. Here the first inequality follows because the choices $\underline{l}, \{\underline{w}_1, \underline{w}_2\}$ may not be maximizing at B_h, and the second inequality follows because v_B is assumed to be increasing, and we have that $(1 - B_h)\log(\underline{w}_1) + B_h \log(\underline{w}_2) \geq (1 - B_l)\log(\underline{w}_1) + B_l \log(\underline{w}_2)$ since $\underline{w}_2 \geq \underline{w}_1$.

To establish that the value function is convex, let v_B be a (weakly) convex bounded continuous function. We need to establish that Tv_B is also a convex function. To show this, choose a number θ such that $0 < \theta < 1$, let $B_h > B_l$, and let $B = \theta B_h + (1 - \theta)B_l$. We now need to show that $\theta T v_B(B_h) + (1 - \theta)Tv_B(B_l) \geq Tv_B(B)$. Let l and $\{w_1 w_2\}$ be choices attaining the maximum for B. Since these are feasible, but not necessarily optimal choices at B_h and B_l, we have:

$$\begin{aligned} Tv_B(B_h) &\geq (1 - B_h)\log(w_1) + B_h \log(w_2) - l + z\, v_B(\psi \bar{B} + (1 - \psi)B_h + f(l)), \\ Tv_B(B_l) &\geq (1 - B_l)\log(w_1) + B_l \log(w_2) - l + z\, v_B(\psi \bar{B} + (1 - \psi)B_l + f(l)). \end{aligned}$$

Using these results, we have:

$$\begin{aligned} &\theta\, Tv_B(B_h) + (1 - \theta)\, Tv_B(B_l) \\ &\qquad \geq \theta \left[(1 - B_h)\log(w_1) + B_h \log(w_2) - l + z\, v_B(\psi \bar{B} + (1 - \psi)B_h + f(l))\right] \\ &\qquad\quad + (1 - \theta) \left[(1 - B_l)\log(w_1) + B_l \log(w_2) - l + z\, v_B(\psi \bar{B} + (1 - \psi)B_l + f(l))\right] \\ &\qquad = (1 - B)\log(w_1) + B \log(w_2) - l \\ &\qquad\quad + z \left[\theta v_B((1 - \psi)B_h + f(l)) + (1 - \theta)v_B(\psi \bar{B} + (1 - \psi)B_l + f(l))\right] \\ &\qquad \geq (1 - B)\log(w_1) + B \log(w_2) - l + z\, v_B(\psi \bar{B} + (1 - \psi)B + f(l)) = Tv_B(B), \end{aligned}$$

which is the desired condition. Here, the last inequality follows from the assumed convexity of v_B. The operator T therefore preserves convexity, and thus the fixed point must also be convex. Q.E.D.

Proof of Proposition 3: Choose two patience levels $B_h > B_l$, and let the corresponding optimal choices be $\bar{l}, \overline{w}_1, \overline{w}_2$ and $\underline{l}, \underline{w}_1, \underline{w}_2$. We want to prove that $\bar{l} \geq \underline{l}$ and $\overline{w}_2/\overline{w}_1 \geq \underline{w}_2/\underline{w}_1$. We proceed in two steps. (a) We show, by deriving a contradiction, that we cannot have simultaneously $\overline{w}_2/\overline{w}_1 < \underline{w}_2/\underline{w}_1$ and $\bar{l} < \underline{l}$. (b) We show that the solution must feature either (i) $\bar{l} \geq \underline{l}$ and $\overline{w}_2/\overline{w}_1 \geq \underline{w}_2/\underline{w}_1$ or (ii) $\bar{l} < \underline{l}$ and $\overline{w}_2/\overline{w}_1 < \underline{w}_2/\underline{w}_1$. Hence, (a) and (b) establish the desired result.

(a): Since the choices are optimal given B_l and B_h, the following inequalities must be satisfied:

$$\begin{aligned} &(1 - B_h)\log(\overline{w}_1) + B_h \log(\overline{w}_2) - \bar{l} + z\, v_B(\psi \bar{B} + (1 - \psi)B_h + f(\bar{l})) \\ &\qquad \geq (1 - B_h)\log(\underline{w}_1) + B_h \log(\underline{w}_2) - \underline{l} + z\, v_B(\psi \bar{B} + (1 - \psi)B_h + f(\underline{l})), \end{aligned} \tag{23}$$

$$\begin{aligned} &(1 - B_l)\log(\overline{w}_1) + B_l \log(\overline{w}_2) - \bar{l} + z\, v_B(\psi \bar{B} + (1 - \psi)B_l + f(\bar{l})) \\ &\qquad \leq (1 - B_l)\log(\underline{w}_1) + B_l \log(\underline{w}_2) - \underline{l} + z\, v_B(\psi \bar{B} + (1 - \psi)B_l + f(\underline{l})), \end{aligned} \tag{24}$$

where the first inequality follows from optimization at B_h and the second from optimization at B_l. Subtracting (24) from (23) on both sides, we obtain the following condition:

$$(B_h - B_l)\left[\log\left(\frac{\overline{w}_2}{\overline{w}_1}\right) - \log\left(\frac{\underline{w}_2}{\underline{w}_1}\right)\right] \geq \Phi\left(B_h, B_l, \bar{l}, \underline{l}\right) \tag{25}$$

where:

$$\Phi\left(B_h, B_l, \bar{l}, \underline{l}\right) \equiv z\left[v_B(\psi\bar{B} + (1-\psi)B_h + f(\underline{l})) - v_B(\psi\bar{B} + (1-\psi)B_l + f(\underline{l}))\right] \\ - z\left[v_B(\psi\bar{B} + (1-\psi)B_h + f(\bar{l})) - v_B(\psi\bar{B} + (1-\psi)B_l + f(\bar{l}))\right].$$

Due to the convexity of v_B and the fact that f is increasing, $\Phi\left(B_h, B_l, \bar{l}, \underline{l}\right) \geq 0$ if $\bar{l} \leq \underline{l}$, and $\Phi\left(B_h, B_l, \bar{l}, \underline{l}\right) \leq 0$ if $\bar{l} \geq \underline{l}$. The sign of the left-hand side is equal to the sign of $\overline{w}_2/\overline{w}_1 - \underline{w}_2/\underline{w}_1$. Suppose, now, to derive a contradiction, that $\overline{w}_2/\overline{w}_1 < \underline{w}_2/\underline{w}_1$ and $\bar{l} < \underline{l}$. Then, the left hand-side of (25) would be negative and the right-hand side of (25) would be non-negative, violating the inequality. Thus, it is impossible that both $\overline{w}_2/\overline{w}_1 < \underline{w}_2/\underline{w}_1$ and $\bar{l} < \underline{l}$.

(b): Optimization in the choice of the income profile implies the following inequalities:

$$(1-B_h)\log(\overline{w}_1) + B_h\log(\overline{w}_2) - \bar{l} \geq (1-B_l)\log(\underline{y}_1) + B_h\log(\underline{y}_2) - \bar{l}, \tag{26}$$
$$(1-B_l)\log(\overline{w}_1) + B_l\log(\overline{w}_2) - \underline{l} \leq (1-B_l)\log(\underline{y}_1) + B_h\log(\underline{y}_2) - \underline{l}.$$

Subtracting the two equations as before, we get:

$$(B_h - B_l)\left[\log\left(\frac{\overline{w}_2}{\overline{w}_1}\right) - \log\left(\frac{\underline{y}_2}{\underline{y}_1}\right)\right] \geq \bar{l} - \underline{l}, \tag{27}$$

which implies that either (i) $\bar{l} \geq \underline{l}$ and $\overline{w}_2/\overline{w}_1 \geq \underline{w}_2/\underline{w}_1$ or (ii) $\bar{l} < \underline{l}$ and $\overline{w}_2/\overline{w}_1 < \underline{w}_2/\underline{w}_1$. However, the possibility that $\bar{l} < \underline{l}$ and $\overline{w}_2/\overline{w}_1 < \underline{w}_2/\underline{w}_1$ has already been ruled out in (a). Therefore, we must conclude that $\bar{l} \geq \underline{l}$ and $\overline{w}_2/\overline{w}_1 \geq \underline{w}_2/\underline{w}_1$. Q.E.D.

Proof of Proposition 4: In Proposition 3, we established that the steepness of the optimal income profile w_2/w_1 is increasing in B, and that the optimal choice of investment in patience $l_B(B)$ is also increasing in B. It then follows that the patience as well as the steepness of the income profiles of all future members of a dynasty (child, grandchild etc.) are increasing in the patience of the current member of a dynasty.

Since there are only finitely many occupations, we can subdivide the state space $[0, B_{\max}]$ into finitely many closed intervals (they are closed because of our continuity assumptions in Assumption 1), where each interval corresponds to the choice of a given occupation i. The agent is just indifferent between two occupations at the boundary of two such intervals, and strictly prefers a given occupation in the interior of such an interval. The intervals can be further subdivided according to the occupational choice of the child. Since $l_B(B)$ may not be singled valued, there may be multiple optimal B' corresponding to a given B today. Nevertheless, since the B' are strictly increasing in B (because of Proposition 3 and $\psi < 1$) and given that there are only finitely many occupations, we can once again subdivide today's state space in finitely many close intervals, each one corresponding to a specific occupational choice of the child, such that the intervals overlap only at their boundary points. Continuing this way, the state space $[\bar{B}, B_{\max}]$ can be divided into a countable number of closed intervals (there is a finite number of possible occupations in each of the countably many future generations), where each interval corresponds to a specific occupational choice of each generation. Let $[B_k, B_{k+1}]$ be such an interval. We want to establish that the value function is linear over this interval, and that the optimal choice of patience $l(B)$ is single-valued and constant over the interior of this interval.

It is useful to consider the sequential formulation (21) of the decision problem. Taking the present and future occupational choices i_t as given, we can substitute for B_t and write the remaining decision problem over the l_{Bt} on the interval $[B_k, B_{k+1}]$ as:

$$v_B(B) = \max\left\{ \log(w_{1,i_0}) + B\log\left(\frac{w_{2,i_0}}{w_{1,i_0}}\right) - l_0 \right.$$
$$\left. + \sum_{t=1}^{\infty} z^t \left[\log(w_{1,i_t}) + \left(\psi^t \bar{B} + (1-\psi)^t B + \sum_{s=0}^{t}(1-\psi)^{t-s-1} f(l_s)\right)\log\left(\frac{w_{2,i_t}}{w_{1,i_t}}\right) - l_t \right] \right\}. \quad (28)$$

For given current and future income profiles, (28) is concave in l_t for all t, since f is concave. Moreover, patience B and all expressions involving l_{Bt} appear in separate terms in the sum. If f is strictly concave, it follows that, given the optimal income profiles, for all t the optimal l_t is unique, and independent of B. Since on the interior of $[B_k, B_{k+1}]$ the current and future optimal income profiles are unique, the optimal policy correspondence $l_B(B)$ is single-valued. At the boundary between two intervals there are (by construction of the intervals) at least two different optimal income profiles for at least one generation, hence $l_B(B)$ may take on more than one optimal value, one corresponding to each optimal set of income profiles. If f (or a segment of f) is linear, $l_B(B)$ is still generically single-valued on the interior of each interval, as exact indifference only occurs on a zero-measure subset of the parameter space.

The optimal value function v_B over the interval $[B_k, B_{k+1}]$ is given by (28) with income profiles i_t and investment in patience l_t fixed at their optimal (and constant) values. (28) is linear in B; it therefore follows that the value function is piece-wise linear, with each kink corresponding to the boundary between two of our intervals. Q.E.D.

Proof of Proposition 5: The law of motion for B, $f : [\bar{B}, B_{\max}] \to [\bar{B}, B_{\max}]$, is given by:

$$\Theta(B) = \psi\bar{B} + (1-\psi)\,B + f\left(l_B\left(B\right)\right),$$

where $l_B\left(B\right)$ is generically a non-decreasing step function (as described in Proposition 4). Since f is an increasing function and we assume that $\psi < 1$, the law of motion $\Theta(B)$ is strictly increasing in B. Notice that $\Theta(B)$ may fail to be single-valued for some B. Strictly increasing here means that $B_h < B_l$ implies $B'_h < B'_l$ for all $B'_h \in \Theta(B_h)$ and $B'_l \in \Theta(B_l)$, even if $\Theta(B_h)$ or $\Theta(B_l)$ is a set. For a given B_0, the law of motion Θ defines (potentially multiple) optimal sequences of patience $\{B_t\}_{t=0}^{\infty}$. Any such sequence is a monotone sequence on the compact set $[\bar{B}, B_{\max}]$, and must therefore converge. Notice, however, that since $l(B)$ is not single-valued everywhere, different steady states can be reached even from the same initial B_0. If f (or a segment of f) is linear, the same results still apply generically, i.e., outside a zero-measure subset of the parameter space. Q.E.D.

Proof of Proposition 6: The strategy is analogous to the proof of Proposition 2. The Bellman equation (5) defines a mapping T on the space of bounded continuous functions on the interval $[\bar{A}, A_{\max}]$, endowed with the sup norm, where the mapping is given by:

$$Tv_A(A) = \sup_{l_A, n}\left\{\log(n) + A(1-n) - l_A + z\, v_A(A')\right\}, \quad (29)$$

where $A' = \psi\bar{A} + (1-\psi)A + g(l_A)$. Since we assume $0 < z < 1$, this mapping is a contraction by Blackwell's sufficient conditions, and it therefore has a unique fixed point by the Contraction Mapping Theorem.

To establish that the value function is increasing, let v_A be a non-decreasing bounded continuous function. We need to show that Th is a non-decreasing function. Choose $A_h > A_l$. We want to establish that $Tv_B(A_h) > Tv_B(A_l)$. Since the right-hand side of (29) is the maximization of a continuous function over a compact set, the maximum is attained. Let $\underline{l}$ and $\underline{n}$ be the choices attaining the maximum for A_l. We have:

$$\begin{aligned} Tv_A(A_h) &\geq \log(\underline{n}) + A_h(1-\underline{n}) - \underline{l} + z\, v_A(\psi\bar{A} + (1-\psi)A_h + g(\underline{l})) \\ &\geq \log(\underline{n}) + A_l\,(1-\underline{n}) - \underline{l} + z\, v_A(\psi\bar{A} + (1-\psi)A_l\, + g(\underline{l})) = Tv_A(A_l), \end{aligned}$$

which is the desired result. Here the first inequality follows because the choice $\underline{l}$ may not be maximizing at A_h, and the second inequality follows because $A_h > A_l$ and v_A is assumed to be non-decreasing.

To prove that the value function is (weakly) convex, we establish that the operator T preserves convexity. Let v_A be a convex bounded continuous function. We need to establish that Th is also convex. Choose a number θ such that $0 < \theta < 1$, let $A_h > A_l$, and let $A = \theta A_h + (1-\theta)A_l$. We want to show that $\theta Tv_A(A_h) + (1-\theta)Tv_A(A_l) \geq Tv_A(A)$. Let l and n be choices attaining the maximum for A. Since these are feasible, but not necessarily optimal choices at A_h and A_l, we have:

$$\begin{aligned} Tv_A(A_h) &\geq \log(n) + A_h(1-n) - l + z\, v_A(\psi\bar{A} + (1-\psi)A_h + g(l)), \\ Tv_A(A_l) &\geq \log(n) + A_l(1-n) - l + z\, v_A(\psi\bar{A} + (1-\psi)A_l + g(l)). \end{aligned}$$

Using these inequalities, we have:

$$\begin{aligned} &\theta Tv_A(A_h) + (1-\theta)Tv_A(A_l) \\ &\qquad \geq \theta\left[\log(n) + A_h(1-n) - l + z\, v_A(\psi\bar{A} + (1-\psi)A_h + g(l))\right] \\ &\qquad\quad + (1-\theta)\left[\log(n) + A_l(1-n) - l + z\, v_A(\psi\bar{A} + (1-\psi)A_l + g(l))\right] \\ &\qquad = \log(n) + A(1-n) - l \\ &\qquad\quad + z\left[\theta v_A(\psi\bar{A} + (1-\psi)A_h + g(l)) + (1-\theta)v_A(\psi\bar{A} + (1-\psi)A_l + g(l))\right] \\ &\qquad \geq \log(n) + A(1-n) - l + z\, v_A(\bar{A} + (1-\psi)\left(A - \bar{A}\right) + g(l)) = Tv_A(A), \end{aligned}$$

which is the required condition. The last inequality follows from the assumed convexity of v_A. The operator T therefore preserves convexity, and thus the fixed point must also be convex. Q.E.D.

Proof of Proposition 7: To prove that $l_A(A)$ is a non-decreasing function of A, write first the program as

$$v_A(A) = \sup_{l_A}\left\{-\log(A) + A - 1 - l_A + z\, v_A(\bar{A} + (1-\psi)\left(A - \bar{A}\right) + g(l_A))\right\}.$$

Next, let $l_0 = l_A(A_0)$ and $l_1 = l_A(A_1)$, where $A_1 > A_0$. We want to prove that $l_1 \geq l_0$. To this aim, observe that

$$
\begin{aligned}
-l_0 + z\, v_A(\bar{A} + (1-\psi)\left(A_0 - \bar{A}\right) + g(l_0)) &\geq -l_0 + z\, v_A(\bar{A} + (1-\psi)\left(A_0 - \bar{A}\right) + g(l_1)) \\
-l_1 + z\, v_A(\bar{A} + (1-\psi)\left(A_1 - \bar{A}\right) + g(l_0)) &\leq -l_1 + z\, v_A(\bar{A} + (1-\psi)\left(A_1 - \bar{A}\right) + g(l_1))
\end{aligned}
$$

Subtracting the two equations as before, we get:

$$
\begin{aligned}
l_1 - l_0 \geq\ & \left(z\, v_A(\bar{A} + (1-\psi)\left(A_0 - \bar{A}\right) + g(l_1)) - z\, v_A(\bar{A} + (1-\psi)\left(A_0 - \bar{A}\right) + g(l_0))\right) \\
& - \left(z\, v_A(\bar{A} + (1-\psi)\left(A_1 - \bar{A}\right) + g(l_1)) - z\, v_A(\bar{A} + (1-\psi)\left(A_1 - \bar{A}\right) + g(l_0))\right)
\end{aligned} \tag{30}
$$

(30) implies that $l_1 \geq l_0$. To see why, suppose, to derive a contradiction, that $l_1 < l_0$. Then, the left hand-side would be negative, while the right hand-side would be positive, since v_A is increasing and convex. This would contradict the inequality in (30). Therefore, we must have that $l_1 \geq l_0$. Hence, $l_A(A)$ must be non-decreasing in A.

The proof of convergence to the steady state is analogous to the proof of Proposition 5. Consider the equilibrium law of motion $A' = \Gamma(A)$ where

$$
\Gamma(A) = \psi \bar{A} + (1-\psi) A + g(l_A(A)).
$$

Since g is increasing and l_A is non-decreasing, $\Gamma(A)$ is strictly increasing in A. For a given A_0, the law of motion Γ defines (potentially multiple) optimal sequences of patience $\{A_t\}_{t=0}^{\infty}$. Any such sequence is a monotone sequence on the compact set $[\bar{A}, A_{\max}]$, and must therefore converge. The steady-state expression follows immediately from setting $A = \Gamma(A)$. Q.E.D.

Proof of Proposition 8: The proposed equilibrium satisfies the following conditions: A positive fraction of the young adults at time $t = 0$ invest in patience (at the level $l_B = \bar{l}_B$) in expectation of their children becoming artisans (at time $t = 2$); the remaining young adults do not invest and set $l_B = 0$; the agricultural wage is constant from time $t = 2$ onwards and adjusts so as to equalize the ex-ante utility of all young adults at time zero; from period $t = 2$ onwards, preferences diverge, and the members of the dynasties that did not invest in the first period prefer to be workers and not to invest in patience, while the members of dynasties that did invest in the first period prefer to be artisans and to invest in patience at the maximum level $l_B = \bar{l}_B$.

We construct the equilibrium in two steps. (i) We derive the equilibrium labor supply μ in agriculture from $t = 2$ onwards (and the corresponding wage) that makes the initial generation just indifferent between investing and not investing, provided that the equilibrium takes the prescribed form. (ii) We show that condition (16) implies that the prescribed occupational choices from period $t = 2$ onwards are indeed optimal.

(i) First notice that since f is linear, conditional on $l_B > 0$ it is (at least weakly) optimal to invest the maximum amount $l_B = \bar{l}_B$. When comparing the utility derived from investing and not investing, we can disregard the utility that the initial generation derives from consumption and leisure because of the separable utility function (this component of utility is the same for all first-generation families). Then, the value of not investing in patience (under the expectation that all future members of the dynasty will choose to be workers) is given by:

$$
\tilde{v}_{B,F}\left(\bar{B}\right) = \frac{z}{1-z} \log\left(\alpha \mu^{\alpha-1}\right). \tag{31}
$$

This is simply the discounted utility derived from receiving the worker's wage $w_F = \alpha\mu^{\alpha-1}$ from the next generation on. In contrast, the value of investing in patience (under the expectation that all future members of the dynasty will choose to be artisans) is:

$$\tilde{v}_{B,M}\left(\bar{B}\right) = -\bar{l}_B + z\, v_{B,M}\left(\bar{B} + \xi\bar{l}_B\right), \tag{32}$$

where:

$$v_{B,M}\left(B\right) = \log(q) + B\log(\gamma) - \bar{l}_B + z\, v_{B,M}\left(\psi\bar{B} + (1-\psi)B + \xi\bar{l}_B\right).$$

Notice that the artisan's utility depends not just on consumption, but also on the cost of investing $\bar{l}_B$. Solving for $v_{B,M}\left(B\right)$ yields:

$$v_{B,M}\left(B\right) = \frac{\log(q) - \bar{l}_B}{1-z} + \frac{z}{1-z}\frac{\left(\psi\bar{B} + \xi\bar{l}_B\right)\log(\gamma)}{\left(1 - z\left(1-\psi\right)\right)} + \frac{\log\left(\gamma\right)}{1 - z\left(1-\psi\right)}B.$$

Hence,

$$v_{B,M}\left(\bar{B} + \xi\bar{l}_B\right) = \frac{1}{1-z}\left(\log(q) - \bar{l}_B + \frac{\xi\bar{l}_B\log(\gamma)}{1 - z\left(1-\psi\right)} + \log\left(\gamma\right)\bar{B}\right),$$

which can be substituted into (32) to yield:

$$\tilde{v}_{B,M}\left(\bar{B}\right) = -\bar{l}_B + \frac{1}{1-z}\left(\log(q) - \bar{l}_B + \frac{\xi\bar{l}_B\log(\gamma)}{1 - z\left(1-\psi\right)} + \log\left(\gamma\right)B\right).$$

For the first generation to be indifferent between investing and not investing, we must have $\tilde{v_{BA}}\left(\bar{B}\right) = \tilde{v}_{B,M}\left(\bar{B}\right)$, which in turn implies (after standard algebra) condition (17) as stated in the proposition:

$$\log(w_F) = \log\left(\alpha\mu^{\alpha-1}\right) = \log(q) + \bar{B}\log(\gamma) - \frac{\bar{l}_B}{z} + \frac{\xi\bar{l}_B\log(\gamma)}{1 - z\left(1-\psi\right)}.$$

In addition, the corresponding μ has to satisfy $\mu < n$ (where n is equilibrium labor supply), so that there is a positive fraction of artisans. This condition can always be met by choosing q sufficiently large.

(ii) We need to ensure that a young adult in period two who is endowed with patience $\bar{B} + \xi\bar{l}_B$ prefers being an artisan to working in agriculture at the flat wage w_F, while the opposite is true for an adult with patience $\bar{B}$. More formally,

$$\log(q) + \bar{B}\log\left(\gamma\right) - \frac{\bar{l}_B}{z} + \frac{\xi\bar{l}_B\log(\gamma)}{1 - z\left(1-\psi\right)} \leq \log(q) + \left(\bar{B} + \xi\bar{l}_B\right)\log(\gamma),$$
$$\log(q) + \bar{B}\log\left(\gamma\right) - \frac{\bar{l}_B}{z} + \frac{\xi\bar{l}_B\log(\gamma)}{1 - z\left(1-\psi\right)} \geq \log(q) + \bar{B}\log(\gamma).$$

These inequalities holds if and only if assumption (16) is satisfied. If these inequalities are satisfied, they hold *a fortiori* for all subsequent generations, because patience increases over time in artisan dynasties. Q.E.D.

References

Ameriks, John, Andrew Caplin, and John Leahy. 2002. "Wealth Accumulation and the Propensity to Plan." NBER Working Paper No. 8920.

Artige, Lionel, Carmen Camacho, and David de la Croix. 2004. "Wealth Breeds Decline: Reversals of Leadership and Consumption Habits." *Journal of Economic Growth* 9 (4): 423–49.

Bailey, Peter. 1989. "Leisure, Culture and the Historian: Reviewing the First Generation of Leisure Historiography in Britain." *Leisure Studies* 8 (2): 107–27.

Banerjee, Abhijit V. and Andrew F. Newman. 1993. "Occupational Choice and the Process of Development." *Journal of Political Economy* 101 (2): 274–98.

Barro, Robert J. and Rachel M. McCleary. 2003. "Religion and Economic Growth." NBER Working Paper 9682.

Becker, Gary S. and Casey B. Mulligan. 1997. "The Endogenous Determination of Time Preference." *Quarterly Journal of Economics* 112 (3): 729–58.

Beckett, John V. 1986. *The Aristocracy in England: 1660–1914*. New York: Blackwell.

Bisin, Alberto and Thierry Verdier. 2000. "Beyond the Melting Pot: Cultural Transmission, Marriage, and the Evolution of Ethnic and Religious Traits." *Quarterly Journal of Economics* 115 (3): 955–88.

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

Botticini, Maristella and Zvi Eckstein. 2005. "Jewish Occupational Selection: Education, Restrictions, or Minorities?" *Journal of Economic History* 65 (4): 922–48.

———. 2006a. "From Farmers to Merchants, Voluntary Conversions and Diaspora: A Human Capital Interpretation of Jewish History." Forthcoming, Journal of the European Economic Association.

———. 2006b. "Path Dependence and Occupations." Forthcoming in New Palgrave Dictionary of Economics, edited by Steven N. Durlauf and Lawrence Blume.

Bowen, H.V. 1989. "Investment and Empire in the Later Eighteenth Century: East India Stockholding, 1756–1791." *Economic History Review* 42 (2): 186–206.

Browning, Martin, Lars P. Hansen, and James J. Heckman. 1999. "Micro Data and General Equilibrium Models." Chapter 8 of *Handbook of Macroeconomics Volume 1A*, edited by John B. Taylor and Michael Woodford. Amsterdam: Elsevier.

Burnette, Joyce. 2002. "How Skilled Were English Agricultural Laborers? Wage Profiles from the 1830s and 1840s." Unpublished Manuscript, Wabash College.

Cain, Peter J. and Anthony G. Hopkins. 1993. *British Imperialism: Innovation and Expansion 1688–1914*. London: Longman.

Cannadine, David. 1990. *Decline and Fall of the British Aristocracy*. New Haven: Yale University Press.

———. 1994. *Beyond the Country House: Aspects of Aristocracy in Modern Britain*. New Haven: Yale University Press.

Carneiro, Pedro and James J. Heckman. 2003. "Human Capital Policy." In *Inequality in America: What Role for Human Capital Policies*, edited by James J. Heckman and Alan B. Krueger, 77–240. Cambridge: MIT Press.

Carroll, Christopher D. 2001. "Portfolios of the Rich." In *Household Portfolios: Theory and Evidence*, edited by Luigi Guiso, Michael Haliassos, and Tullio Jappelli. Cambridge: MIT Press.

Carroll, Christopher D. and Lawrence H. Summers. 1991. "Consumption Growth Parallels Income Growth: Some New Evidence." In *National Saving and Economic Performance*, edited by B. Douglas Bernheim and John B. Shaven, 305–43. Chicago: University of Chicago Press.

Caselli, Franceso and Nicola Gennaioli. 2003. "Dynastic Management." NBER Working Paper No. 9442.

Cavalcanti, Tiago V., Stephen L. Parente, and Rui Zhao. 2003. "Religion in Macroeconomics: A Quantitative Analysis of Weber's Thesis." Unpublished Manuscript, University of Illinois.

Clark, Gregory and Gillian Hamilton. 2004. "Can Institutions Shape Preferences? The Long Run Implications of Property Rights in the Malthusian Era." Unpublished Manuscript, University of California, Davis.

Coleman, James and Thomas Hoffer. 1983. *Public and Private High Schools*. New York: Basic Books.

Crouzet, François. 1985. *The First Industrialists*. Cambridge University Press.

Cunningham, Hugh. 1980. *Leisure in the Industrial Revolution c. 1780–c.1880*. London: Croom Helm.

Davis, Lance E. and Robert E. Gallman. 2001. *Evolving Financial Markets and International Capital Flows: Britain, the Americas, and Australia, 1865-1914*. Cambridge: Cambridge University Press.

de la Croix, David and Philippe Michel. 1999. "Optimal Growth when Tastes are Inherited." *Journal of Economic Dynamics and Control* 23 (4): 519–37.

———. 2001. "Altruism and Self-Restraint." *Annales d'Économie et de Statistique* 63–64:233–59.

De Nardi, Mariacristina. 2004. "Wealth Inequality and Intergenerational Links." *Review of Economic Studies* 71 (3): 743–68.

Devine, T. M. 1971. "Glasgow Colonial Merchants and Land, 1770–1815." Chapter 6 of *Land and Industry: The Landed Estate and the Industrial Revolution*, edited by J. T. Ward and R. G. Wilson. Newton Abbot: David & Charles.

Dickson, Peter G.M. 1967. *The Financial Revolution in England: A Study in the Development of Public Credit, 1688–1756*. New York: St. Martin's Press.

Doepke, Matthias. 2004. "Accounting for Fertility Decline During the Transition to Growth." *Journal of Economic Growth* 9 (3): 347–83.

Doepke, Matthias and Fabrizio Zilibotti. 2005. "Patience Capital and the Demise of the Aristocracy." CEPR Discussion Paper 5106.

Dohmen, Thomas, Armin Falk, David Huffman, and Uwe Sunde. 2006. "The Intergenerational Transmission of Risk and Trust Attitudes." IZA Discussion Paper No. 2380.

Epstein, Steven A. 1991. *Wage Labor and Guilds in Medieval Europe*. Chapel Hill: University of North Carolina Press.

Farr, James R. 2000. *Artisans in Europe, 1300-1914*. Cambridge University Press.

Fernández, Raquel, Alessandra Fogli, and Claudia Olivetti. 2004. "Mothers and Sons: Preference Formation and Female Labor Force Dynamics." *Quarterly Journal of Economics* 119 (4): 1249–99.

Friedrichs, Christopher R. 1995. *The Early Modern City 1450-1750*. New York: Longman.

Galor, Oded and Stelios Michalopoulos. 2006. "Darwinian Evolution of Entrepreneurial Spirit and the Process of Development." Working Paper 2006-12, Brown University.

Galor, Oded and Omer Moav. 2002. "Natural Selection and the Origin of Economic Growth." *Quarterly Journal of Economics* 117 (4): 1133–91.

Galor, Oded and David N. Weil. 2000. "Population, Technology, and Growth: From Malthusian Stagnation to the Demographic Transition and Beyond." *American Economic Review* 90 (4): 806–28.

Galor, Oded and Joseph Zeira. 1993. "Income Distribution and Macroeconomics." *Review of Economic Studies* 60 (1): 35–52.

Goleman, Daniel. 1995. *Emotional Intelligence: Why It Can Matter More Than IQ*. New York: Bantam Books.

Gourinchas, Pierre-Olivier and Jonathan A. Parker. 2002. "Consumption Over the Life Cycle." *Econometrica* 70 (1): 47–89.

Guiso, Luigi, Paola Sapienza, and Luigi Zingales. 2003. "People's Opium? Religion and Economic Attitudes." *Journal of Monetary Economics* 50 (1): 225–82.

Haaparanta, Pertti and Mikko Puhakka. 2003. "Endogenous Time Preference with Investment and Development Traps." Unpublished Manuscript, Helsinki School of Economics.

Hansen, Gary D. and Edward C. Prescott. 2002. "Malthus to Solow." *American Economic Review* 92 (4): 1205–17.

Harrison, Glenn W., Morten I. Lau, and Melonie B. Williams. 2002. "Estimating Individual Discount Rates in Denmark: A Field Experiment." *American Economic Review* 92 (5): 1606–17.

Hauk, Esther and Maria Saez-Marti. 2002. "On the Cultural Transmission of Corruption." *Journal of Economic Theory* 107 (2): 311–35.

Heckman, James J. 2000. "Policies to Foster Human Capital." *Research in Economics* 54 (1): 3–56.

Heckman, James J. and Yona Rubinstein. 2001. "The Importance of Noncognitive Skills: Lessons from the GED Testing Program." *American Economic Review* 91 (2): 145–9.

Heckman, James J., Jingjing Hsee, and Yona Rubinstein. 2003. "The GED is a Mixed Signal: The Effect of Cognitive Skills and Personality Skills on Human Capital and Labor Market Outcomes." Unpublished Manuscript, University of Chicago.

Heckman, James J., Jora Stixrud, and Sergio Urzua. 2006. "The Effects of Cognitive and Noncognitive Abilities on Labor Market Outcomes and Social Behavior." *Journal of Labor Economics* 24 (3): 411–82.

Jenkins, Hester and D. Caradog Jones. 1950. "Social Class of Cambridge University Graduates of the 18th and 19th Centuries." *British Journal of Sociology* 1 (2): 93–116.

Jeremy, David J. 1990. "Anatomy of the British Elite, 1860–1980." In *Capital, Entrepreneurs and Profits*, edited by Richard P. T. Davenport-Hines, 341–61. London: Frank Cass.

Kindleberger, Charles P. 1993. *A Financial History of Western Europe*. 2d ed. Oxford: Oxford University Press.

Knowles, John A. and Andrew Postlewaite. 2004. "Do Children Learn to Save from their Parents?" Unpublished Manuscript, University of Pennsylvania.

Krusell, Per and Anthony A. Smith, Jr. 1998. "Income and Wealth Heterogeneity in the Macroeconomy." *Journal of Political Economy* 106 (5): 867–896.

Lindbeck, Assar and Sten Nyberg. 2006. "Raising Children to Work Hard: Altruism, Work Norms, and Social Insurance." *Quarterly Journal of Economics* 121 (4): 1473–503.

Lindert, Peter H. 1981. "Unequal Living Standards." In *The Economic History of Britain Since 1700*, edited by Roderick Floud and Donald McCloskey, Volume 1, 356–86. Cambridge: Cambridge University Press.

——— 1986. "Unequal English Wealth Since 1670." *Journal of Political Economy* 94 (6): 1127–62.

Marshall, Alfred. 1890. *Principles of Economics*. 8th Edition. London: MacMillan, 1920, Reprinted 1946.

Matsuyama, Kiminori. 2006. "The 2005 Lawrence R. Klein Lecture: Emergent Class Structure." *International Economic Review* 47 (2): 327–60.

Mischel, Walter, Yuichi Shoda, and Monica L. Rodriguez. 1992. "Delay of Gratification in Children." Chapter 6 of *Choice Over Time*, edited by George Loewenstein and Jon Elster. New York: Russell Sage Foundation.

Mulligan, Casey B. 1997. *Parental Priorities and Economic Inequality*. University of Chicago Press.

Munro, John H. 2004. "Builders Wages in Southern England and the Southern Low Countries, 1346-1500: A Comparative Study of Trends in and Levels of Human Capital." University of Toronto Department of Economics and Institute for Policy Analysis Working Paper No. 21.

Nicholas, Tom. 1999a. "Businessmen and Land Ownership in the Late Nineteenth Century." *Economic History Review* 52 (1): 27–44.

———. 1999b. "Clogs to Clogs in Three Generations? Explaining Entrepreneurial Performance in Britain Since 1850." *Journal of Economic History* 59 (3): 688–713.

Phelps Brown, E.H. and Sheila V. Hopkins. 1957. "Wage Rates and Prices: Evidence for Population Pressure in the Sixteenth Century." *Economica* 24 (96): 289–306.

Porter, Roy. 1982. *English Society in the Eighteenth Century*. New York: Penguin Books.

Rubinstein, William D. 1981. *Men of Property: The Very Wealthy in Britain Since the Industrial Revolution*. London: Croom Helm.

——— 1993. *Capitalism, Culture, and Decline in Britain 1750–1990*. London: Routledge.

——— 1996. "Businessmen into Landowners: The Question Revisted." In *Land and Society in Britain 1700-1914: Essays in Honor of F. M. L. Thompson*, edited by Negley Harte and Roland Quinault, 90–118. Manchester: Manchester University Press.

Saez-Marti, Maria and Yves Zenou. 2006. "Cultural Transmission and Discrimination." Unpublished Manuscript, University of Zurich.

Samwick, Andrew A. 1998. "Discount Rate Heterogeneity and Social Security Reform." *Journal of Development Economics* 57:117–46.

Segal, Carmit. 2004. "Misbehavior, Education, and Labor Market Outcomes." Unpublished Manuscript, Stanford University.

Shonkoff, Jack and Deborah Philips, eds. 2000. *From Neurons to Neighborhoods: The Science of Early Childhood Development*. Washington, D.C.: National Academy Press.

Smith, Adam. 1776. *An Inquiry into the Nature and Causes of the Wealth of Nations*. Edited by Edwin Cannan. The University of Chicago Press, 1976.

Stokey, Nancy L. and Robert E. Lucas, Jr. 1989. *Recursive Methods in Economic Dynamics*. Cambridge: Harvard University Press.

Taylor, J., M. McGue, and W. G. Iacono. 2000. "Sex Differences, Assortative Mating, and Cultural Transmission Effects on Adolescent Delinquency: A Twin Family Study." *Journal of Child Psychology and Psychiatry* 41 (4): 433–40.

Temin, Peter and Hans-Joachim Voth. 2004. "The Speed of the Financial Revolution: Evidence from Hoare's Bank." MIT Department of Economics Working Paper 04-12.

Thompson, F. M. L., ed. 1994. *Landowners, Capitalists, and Entrepreneurs: Essays for Sir John Habakkuk*. Clarendon Press: Oxford.

Veblen, Thorstein. 1899. *The Theory of the Leisure Class*. New York: Dover, 1994.

von Mises, Ludwig. 1963. *Human Action: A Treatise on Economics*. 2d ed. New Haven: Yale University Press.

Voth, Hans-Joachim. 2000. *Time and Work in England 1750-1830*. Oxford: Clarendon Press.

Parameter	Interpretation	Value
z	Intergenerational Altruism	0.5
$\underline{A}$	Natural Leisure Appreciation	1.0
ϕ_A	Level Parameter for Leisure Appreciation	1.5
ξ_A	Curvature Parameter for Leisure Appreciation	0.5
$\underline{B}$	Natural Patience	0.4
ϕ_B	Level Parameter for Patience	0.66
ξ_B	Curvature Parameter for Patience	0.5
ψ	Depreciation of Preferences	0.5
γ	Steepness of Artisan Income Profile	2.0
$\underline{R}$	Minimum Return of Capitalist Technology	0.35
$\overline{R}$	Maximum Return of Capitalist Technology	0.42
η	Elasticity of Entrepreneurial Return	0.5
δ	Depreciation of Capital	0.2

Table 1: Parameter Values for Simulated Economy

	1752–1799	1800–1849	1850–1899
Church	60	62	38
Land-Owning	14	14	7
Teaching	9	9	12
Law	6	9	14
Administration	3	1	6
Medicine	1	2	7
Banking	0	0	2
Business	0	0	5
Other	7	3	9

Source: Jenkins and Jones (1950), Table 1

Table 2: Professional Choices of Cambridge Graduates, in Percent

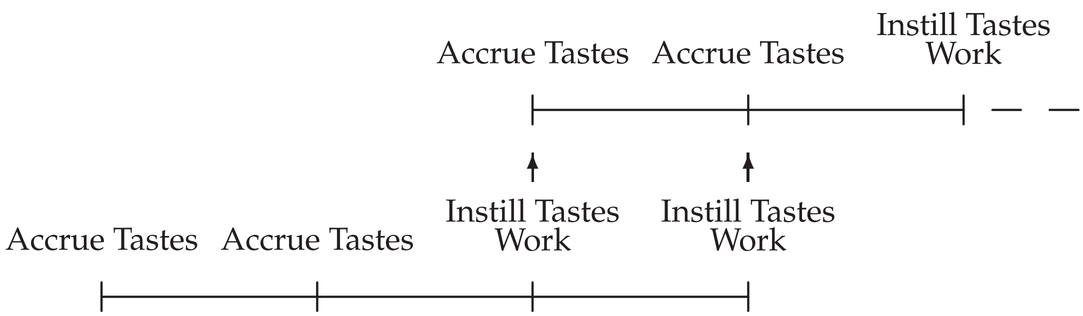

Figure 1: The Timing of Preference Formation and Labor Supply

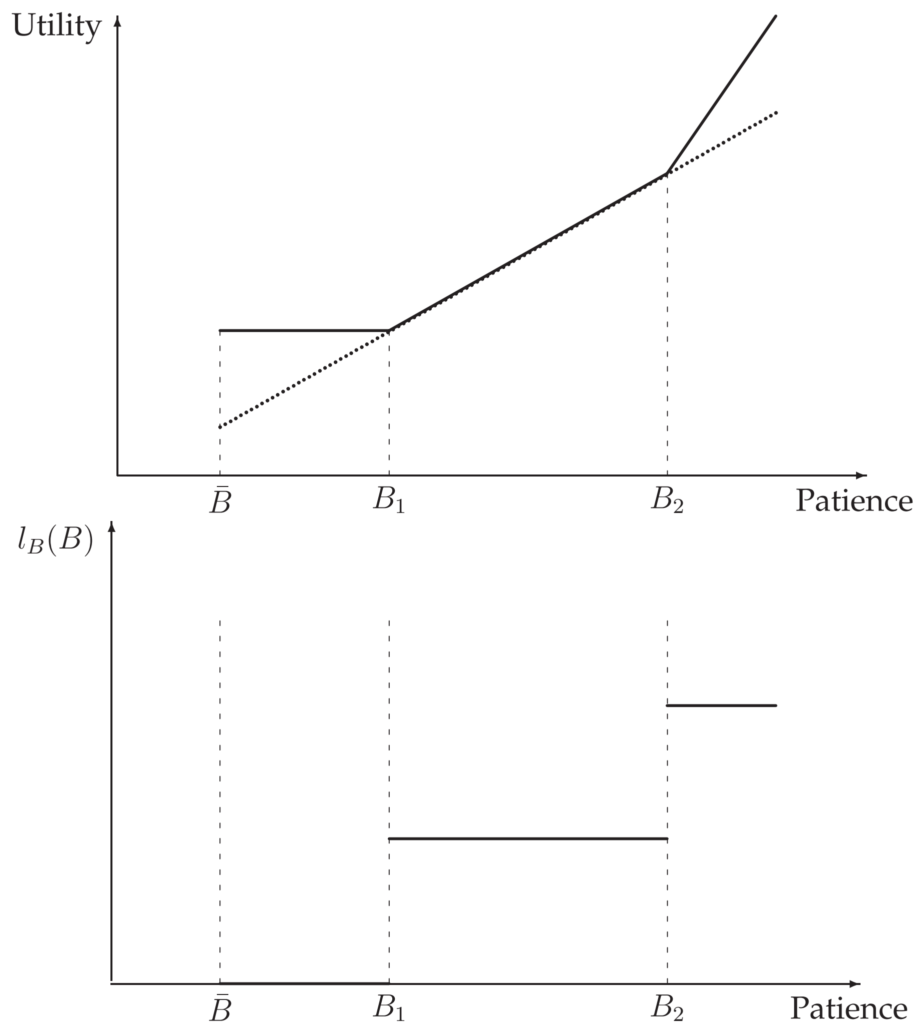

Figure 2: The Value Function for Patience $v_B(B)$ and Policy Function $l_B(B)$ for Investing in Patience

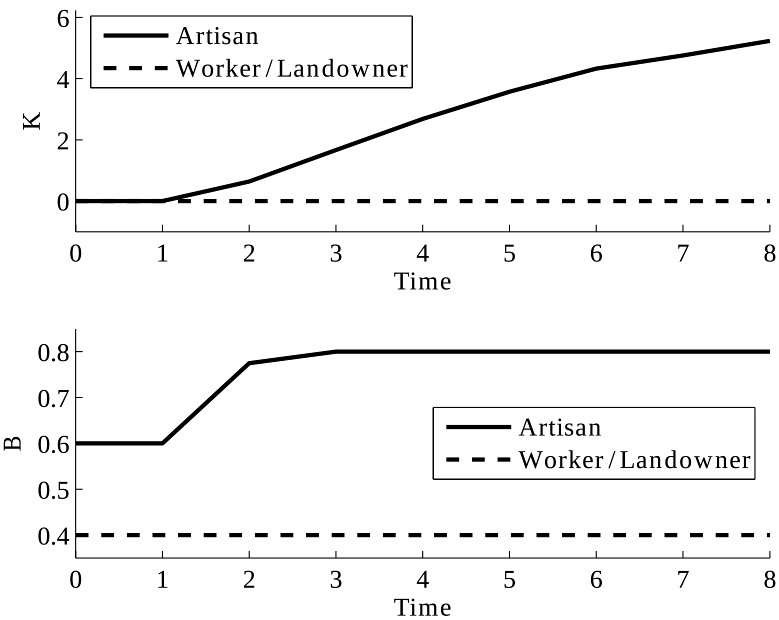

Figure 3: Capital Accumulation and the Evolution of Patience After the Introduction of a Capitalist Technology

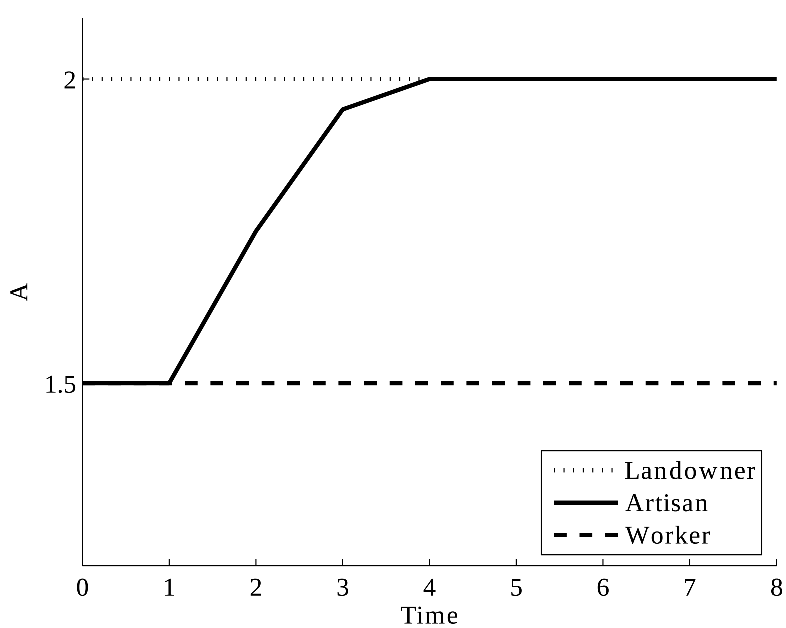

Figure 4: The Evolution of the Taste for Leisure After the Introduction of a Capitalist Technology