

LABOR HOURS IN THE UNITED STATES AND EUROPE: THE ROLE OF DIFFERENT LEISURE PREFERENCES

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Since 1900, annual working hours per worker have been generally declining in the United States and in the main European economies. During this simultaneous decline the Europeans initially worked fewer hours than their American counterparts, worked more than the Americans starting in the early 1930s, and once again worked less than the American from the early 1970s on. Using a two-country model, this article argues that this dynamic pattern can be brought about by differences in the valuation of leisure by individuals in the compared economies.

Keywords: Working Hours, Economic Growth

1. INTRODUCTION

Since 1900, working hours per worker have been generally decreasing in both the United States and the United Kingdom. During this simultaneous decline the working hours in the United Kingdom were initially below those in the United States, became higher in the early 1930s, and once again fell below those in the United States in the early 1970s. Figure 1 presents this dynamic pattern, which emerges, with similar intersection times, when the United States data are compared with those of almost any other major European economy.¹ This article presents a theoretical model in which differences in the preferences for leisure between two economies can generate this pattern in their simultaneous labor hours dynamics.

Several recent studies try to explain the recent intersection of the two. Prescott (2004), looking at 1970–1974 and then at 1993–1996, concludes that the differences between the United States labor hours and those of the European economies in those time periods can be almost fully explained by differences in marginal income tax rates. Criticizing Prescott's result, Blanchard (2004) and Alesina et al. (2005) claim that it relies on assumptions that lead to an unrealistically high elasticity of labor supply. In the next swing of this pendulum, Rogerson (2008), as well as several other related articles, incorporates home production into the

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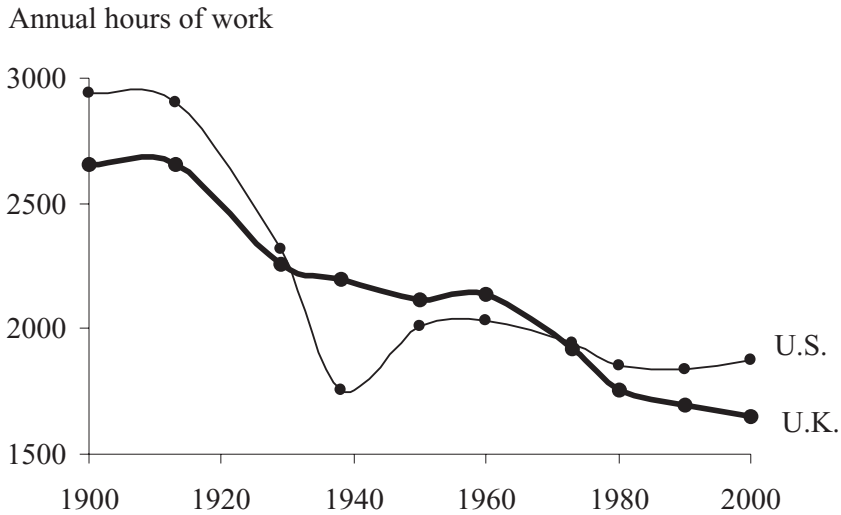


FIGURE 1. Working hours per worker in the United Kingdom and the United States, 1900–2000. *Data source:* Huberman and Minns (2007).

standard macroeconomic analysis and returns to the conclusion that cross-country differences in taxes play an important role in explaining the differences in labor hours between the United States and Europe. These recent articles, however, focus on cross-sectional differences and do not try to account for the above-described joint transitional dynamics of labor hours in the United States and Europe during the past few decades.²

Trying to account for that recent intersection without highlighting the role of taxes, Alesina et al. (2005) offer an explanation that rests on cross-country differences in union power. The unions' effect on labor hours is spread throughout the economy due to a social multiplier in preferences that makes people want to enjoy their leisure together. Blanchard (2004), in a related article, analyzes French and United States data and concludes that the decline in working hours in France springs from growth in productivity "with part of that increase allocated to increased income and part to increased leisure" (p. 5). In addressing the question of "how much of this change comes from preferences and increasing income and how much comes from increasing tax distortions" (p. 9), he claims that the data suggest a greater role for preferences. A similar approach is taken by Huberman and Minns (2007), who show that the simultaneous dynamics of United States and European working hours during recent decades have been repeating the same course they took more than 100 years ago. This leads them to the conclusion that the reasons for the observed cross-country differences are deep-seated and time-invariant factors such as religion, legal origin, or climate, rather than current cross-country differences in tax rates, union power, and other labor market institutions.

Motivated by the approach of the last two articles, this article offers a theoretical model in which a difference in preferences for leisure between economies indeed generates working hour dynamics of the pattern described above. Specifically, the model looks at two economies, identical in their initial period stocks and in all of their parameters except for a difference in the weight assigned to leisure in the utility function of their individuals. At first, due to identical initial conditions, the individuals in the country with the greater weight on leisure ("country A" henceforth) are consuming more leisure than those in the other country ("country B" henceforth). Because country B individuals work more, they have greater incomes and therefore invest more. This leads to a phase where the cross-country income gap is so large that country B individuals work less than their country A counterparts, despite the utility differences. However, although at a slower rate, country A is growing too, and at a certain stage the income gap between the two countries starts to narrow due to diminishing returns to investment in physical and human capital. Eventually, the income gap has diminished enough to make country A's greater weight on leisure regain its dominance over the income gap in determining which is the country with the lower working hours among the two.

To present these dynamics in the most efficient manner, I use here a version of the Diamond overlapping-generations model with just two necessary deviations from its highly simplified classic version. The first is incorporating into the model an endogenous choice of leisure and labor hours with leisure assumed a normal good, instead of an exogenous constant labor supply. As a vast literature has shown, this deviation from the classic model makes the mathematical analysis of the dynamics of the model rather complicated.³ Specifically, the convergence to the steady state of the model is not global but occurs along a saddle path, and for certain parameter values there could even be indeterminacy in the vicinity of the steady state. Because of that, the results of the model are presented using a numerical analysis.

The second deviation from the classic version of the Diamond model is the incorporation of investment in human capital into the model alongside investment in physical capital. Owing to the diminishing returns to investment in physical capital, having this additional investment channel in the model increases the desirability of saving and therefore magnifies the income differences created by the preference differences. As the numerical analysis of the model shows, this propagation mechanism is crucial for having a phase in which the income differences are large enough to dominate the preference differences (from which they spring) in determining which is the economy where people work longer hours.

According to the model, the country whose individuals put a lower weight on leisure in their utility is richer and more educated than the other country. These features of the model can indeed be observed when United States data are compared with those of the European countries. As Maddison (2006) shows, the per-capita GDP of the United States has been higher than that of almost any European country for more than 100 years now. Goldin (2001) shows that by the mid-1950s, secondary school enrollment was around 80% in the United States,

and less than 40% in any European country. In the model, diminishing returns to investment in education make the education gap shrink over time, and such narrowing has indeed occurred in reality. As the World Bank data show, by 2005 secondary school enrollment was above 90% in almost all OECD economies.

Accounting for different economic phenomena by the cultural differences between societies is an approach that dates back at least 100 years to Weber's 1904 classical study tying the spirit of capitalism to the Protestant ethic. Weil (2005) offers a detailed survey of the vast literature on the relations between economic growth and culture that has flourished since then. In the particular case of the choice between labor hours and leisure, this approach receives support from the existing time-use data, which show that much of the difference between the United States and Europe in time use at home springs from activities that contain a high cultural and even emotional added value. Thus for example, compared to Americans, Europeans spend much more of their weekly hours on personal child care and on home cooking and purchase much less market child-care and much fewer restaurant meals, as Tables 9 and 10 of Freeman and Schettkat (2005) show.

Section 2 presents the model and Section 3 uses the model to show how the desired dynamic pattern can emerge when the case of two countries that differ only in the weight their individuals put on utility from leisure is analyzed. Section 4 offers some concluding remarks.

2. THE MODEL

The model is based on incorporating endogenous leisure and education choices within a macroeconomic dynamic model in which growth stems from both physical and human capital accumulation. The model's overlapping-generations economy is closed and perfectly competitive. Time is infinite and discrete.

2.1. Production

In each period the economy produces a single good that can be used either for consumption or for investment. There are two factors of production in the economy: physical capital and efficiency units of labor. The production function is given by

$$Q_t = AK_t^\alpha L_t^{1-\alpha} = L_t Ak_t^\alpha, \quad (1)$$

where Q_t , K_t , and L_t are the period- t amounts of output, physical capital, and labor efficiency units in the economy, respectively, and $k_t \equiv K_t/L_t$. Owing to the competitive environment, production factors are paid their marginal productivity. Specifically, in each period t , the payments for each efficiency unit of labor and each unit of physical capital, denoted respectively by w_t and R_t , satisfy

$$w_t = (1 - \alpha)Ak_t^\alpha \quad (2)$$

and

$$R_t = \frac{\alpha A}{k_t^{1-\alpha}} \tag{3}$$

2.2. Individuals

In each period t a generation of individuals is born, which lives for three periods. The size of each generation is equal to 1. A generation born at a certain period $t - 1$ is denoted “generation t .” In each period each individual is endowed with a single time unit.

In their first life period ($t - 1$), the members of generation t are children. The parent of each such child allocates a fraction denoted by τ_{t-1} of the child’s time to schooling.

In their second life period (t), members of generation t are adults. They work, raise children, consume, and save. The amount of labor efficiency units that each such individual can supply in that period is denoted e_t and is an increasing function of the amount of schooling this individual has received as a child. Specifically,

$$e_t = (1 + b\tau_{t-1})^a, \tag{4}$$

where a and b are positive constants. Thus, allocating the entire time of period t to working rewards a member of generation t with the amount I_t , given by

$$I_t \equiv e_t w_t = (1 + b\tau_{t-1})^a w_t. \tag{5}$$

Each individual is assumed to have a single parent and a single child.⁴ In each period t each member of generation t pays an education cost for τ_t units of education for that child. This cost is assumed to be a positive function of I_t , thus reflecting both salaries for teachers and forgone parents’ income as they invest part of their time in the education process.⁵ Specifically, the education cost is assumed to be $\tau_t h I_t$ output units, where h is a positive constant.

In their final life period ($t + 1$), the members of generation t consume their savings.

As in Galor and Weil (2000), the motivation for investment in education springs from parents’ utility from their offspring’s potential income as adults. In addition, individuals are assumed to derive utility from consumption and leisure, where the term “leisure” captures all time-consuming activities other than participating in the formal production process. The preferences of each member of generation t are given by

$$U_t = \frac{1}{1 - \frac{1}{\rho}} C_t^{1 - \frac{1}{\rho}} + \frac{\beta}{1 - \frac{1}{\rho}} C_{t+1}^{1 - \frac{1}{\rho}} + \frac{\gamma}{1 - \frac{1}{\sigma}} I_t^{1 - \frac{1}{\sigma}} + \delta \ln I_{t+1}, \tag{6}$$

where C_t denotes period- t consumption, l_t is period- t leisure, and $\beta, \gamma, \delta, \rho,$ and σ are positive constants. The budget constraint on each member of generation t is

$$C_t + S_t + \tau_t h I_t = (1 - l_t) I_t, \tag{7}$$

where S_t denotes period- t savings, satisfying

$$C_{t+1} = R_{t+1} S_t. \tag{8}$$

2.3. Optimization

In each period t , each member of generation t chooses $C_t, S_t, l_t,$ and τ_t to maximize the utility captured by (6), given the values of $\tau_{t-1}, w_t, R_{t+1},$ and w_{t+1} and subject to (4), (5), (7), (8), $0 \leq l_t \leq 1,$ and $0 \leq \tau_t \leq 1.$ From standard optimization it follows that in the optimum $0 < l_t < 1$ and that the first-order conditions for an optimum lead to

$$C_t = \frac{I_t^\rho l_t^{\frac{\rho}{\sigma}}}{\gamma^\rho}, \tag{9}$$

$$S_t = \frac{\beta^\rho R_{t+1}^{\rho-1} I_t^\rho l_t^{\frac{\rho}{\sigma}}}{\gamma^\rho}, \tag{10}$$

and to the following relation between the optimal levels of l_t and τ_t :

$$\tau_t(l_t) = \begin{cases} 0 & \text{if } l_t < l^* \\ \frac{\delta a l_t^{\frac{1}{\sigma}}}{\gamma h} - \frac{1}{b} & \text{if } l^* \leq l_t \leq l^{**} \\ 1 & \text{if } l_t > l^{**} \end{cases}, \tag{11}$$

where $l^* \equiv (\gamma h / \delta a b)^\sigma$ and $l^{**} \equiv [\gamma h (1 + b) / \delta a b]^\sigma.$ Equation (11) does not imply that the optimal τ_t is independent of potential income $I_t.$ In fact, the optimal τ_t is positively related to I_t via the positive relation that (11) reveals between the optimal levels of τ_t and $l_t,$ taken together with the positive relation between the optimal levels of l_t and $I_t,$ a relation that will be established next.

Applying (9), (10), and (11) to (7) yields

$$\frac{l_t^{\frac{\rho}{\sigma}} (1 + \beta^\rho R_{t+1}^{\rho-1})}{\gamma^\rho I_t^{1-\rho}} + \tau_t(l_t) h + l_t - 1 = 0. \tag{12}$$

Equation (12) presents the optimal level of l_t as an implicit function of I_t and $R_{t+1}.$ Standard differentiation of the LHS of (12) shows that it is increasing in $l_t.$ In addition, the LHS of (12) equals -1 when $l_t = 0$ and, by (11), equals the positive term $\frac{1 + \beta^\rho R_{t+1}^{\rho-1}}{\gamma^\rho I_t^{1-\rho}} + 1$ when $l_t = 1.$ Thus, given I_t and $R_{t+1},$ there is a single level of l_t in the interval $[0,1]$ that solves (12).

By implicit differentiation of (12), the optimal level of l_t satisfies

$$\frac{dl_t}{dI_t} = \frac{l_t^{\frac{\rho}{\sigma}} (1 + \beta^\rho R_{t+1}^{\rho-1}) (1 - \rho) I_t^{\rho-2}}{\frac{(1 + \beta^\rho R_{t+1}^{\rho-1}) \frac{\rho}{\sigma} l_t^{\frac{\rho}{\sigma}-1}}{\gamma^\rho l_t^{1-\rho}} + \tau_t'(l_t) h + 1} \tag{13}$$

By (11), the denominator of (13) is positive. Thus, leisure is a normal good in the sense that $dl_t/dI_t > 0$ if and only if $\rho < 1$, an assumption that is made henceforth.

2.4. Dynamics

In this section, the equilibrium dynamics of the economy are presented. In each period $t - 1$, two stocks are created and handed over time to period t : the stock of physical capital K_t and a stock of human capital captured by τ_{t-1} . The values of these stocks in period 0, namely K_0 and τ_{-1} , impose the following restriction on the possibilities for (k_0, l_0) :

$$k_0 \equiv \frac{K_0}{L_0} = \frac{K_0}{(1 - l_0) (1 + b\tau_{-1})^a} \tag{14}$$

For the periods later than period 0, it is possible to describe the dynamics of the economy using the two-dimensional second-order system (k_t, l_t, l_{t-1}) . To see this, first note that based on the previous sections, if the set $\{k_t, l_t\}_{t=0}^\infty$ is obtained then the set $\{K_{t+1}, L_t, \tau_t, e_t, I_t, C_t, S_t, w_t, R_t\}_{t=0}^\infty$ of the other model variables is obtained too.

Next, note that k_{t+1} can be presented as a function of (k_t, l_t, l_{t-1}) by applying (3), evaluated at $t + 1$, in (12) and simplifying. This yields

$$k_{t+1} = \left[(\alpha A)^{\rho-1} \frac{\frac{[1 - \tau_t h - l_t] \gamma^\rho l_t^{1-\rho}}{l_t^{\frac{\rho}{\sigma}}} - 1}{\beta^\rho} \right]^{\frac{1}{(1-\alpha)(1-\rho)}} \tag{15}$$

where τ_t is a function of l_t by (11) and I_t is a function of k_t and l_{t-1} through (2), (5), and (11). To express l_{t+1} as a function of (k_t, l_t, l_{t-1}) , note that

$$k_{t+1} \equiv \frac{K_{t+1}}{L_{t+1}} = \frac{S_t}{(1 - l_{t+1}) (1 + b\tau_t)^a} = \frac{\beta^\rho R_{t+1}^{\rho-1} I_t^\rho l_t^{\frac{\rho}{\sigma}}}{\gamma^\rho (1 - l_{t+1}) (1 + b\tau_t)^a} \tag{16}$$

where the third equality follows from (10). Manipulating (16) yields

$$l_{t+1} = 1 - \frac{\beta^\rho R_{t+1}^{\rho-1} I_t^\rho l_t^{\frac{\rho}{\sigma}}}{\gamma^\rho k_{t+1} (1 + b\tau_t)^a} \tag{17}$$

where R_{t+1} is a function of (k_t, l_t, l_{t-1}) through (3) and (15), τ_t is a function of l_t by (11), and I_t is a function of k_t and l_{t-1} through (2), (5), and (11).

A further general analysis of the dynamics is technically complicated, so the main results of this article will be presented through a numerical analysis.

3. RESULTS

This section looks at two countries identical in all parameters and initial conditions, except for a difference in their levels of γ . The analysis shows a dynamic pattern in which in both countries the individual's leisure time is increasing over time, but the identity of the country with the lower leisure time is changing over time.

Let the two countries be named A and B and their levels of γ be denoted by γ^A and γ^B , respectively. In both countries the other parameters of the model are $A = 4$, $\alpha = 0.49$, $\delta = 0.5$, $\rho = 0.2$, $\sigma = 0.4$, $a = 0.9$, $b = 6$, $h = 0.15$, $\beta = 0.9$, $K_0 = 0.1$, and $\tau_{-1} = 0$. Country A's level of γ is $\gamma^A = 0.5$ and country B's level of γ is $\gamma^B = 0.3$.

In both countries, a numerical analysis based on (15), (17), and the constraint that K_0 and τ_{-1} impose on (k_0, l_0) through (14) reveals that each country has a single path that is consistent with rational expectations.⁶ The two paths are presented in Figure 2.

As the figure shows, each path is leading the relevant country to its unique steady state point. Country A's higher γ sets it on a path that leads to a steady state with less labor than in the steady state to which country B converges.⁷ In addition, country A's higher γ makes its individuals work less than the country B individuals in the initial periods of this scenario. However, due to working more in the initial phase, country B individuals become richer than those in A, and at a certain stage, this income difference make them enjoy more leisure than country A's individuals. This stage vanishes eventually because diminishing returns to investment in physical and human capital make the income gap lose its dominance over the preference difference in determining which country's individuals enjoy more leisure. Figure 3 shows the path that the potential income, I_t , takes over time in each country.

4. CONCLUDING REMARKS

This article has presented a model that looks at two economies identical under all initial conditions and in all parameters except for one. Yet this single difference can generate an intricate dynamic pattern with several important features. Specifically, it was assumed that the weight that the individuals in one of the countries (country A) are assigning to leisure in their utility is larger than that for individuals in the other country (country B). In the resulting dynamics, due to this single difference,

- (i) country A experiences slower per capita GDP growth than country B;
- (ii) physical capital accumulation in A is slower than in B;
- (iii) human capital accumulation in A is slower than in B;

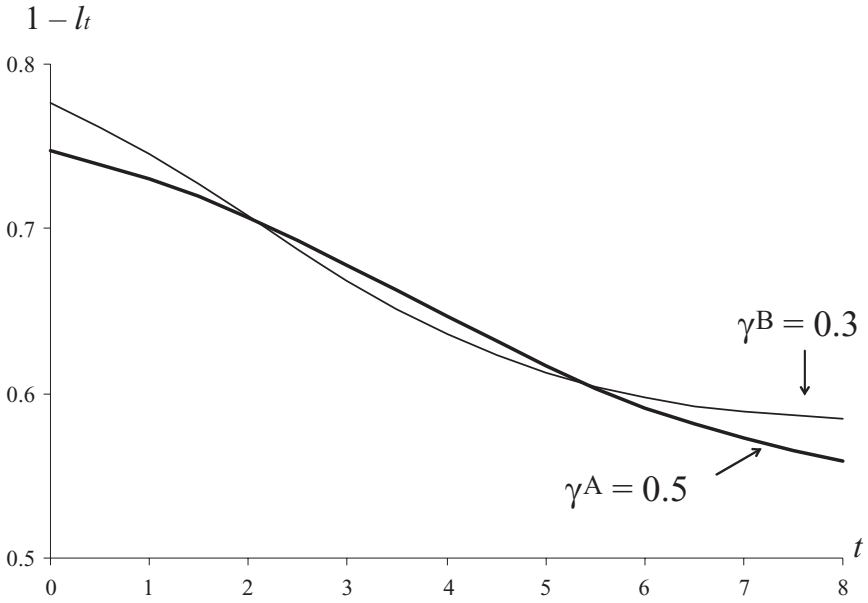


FIGURE 2. Labor over time in countries A and B.

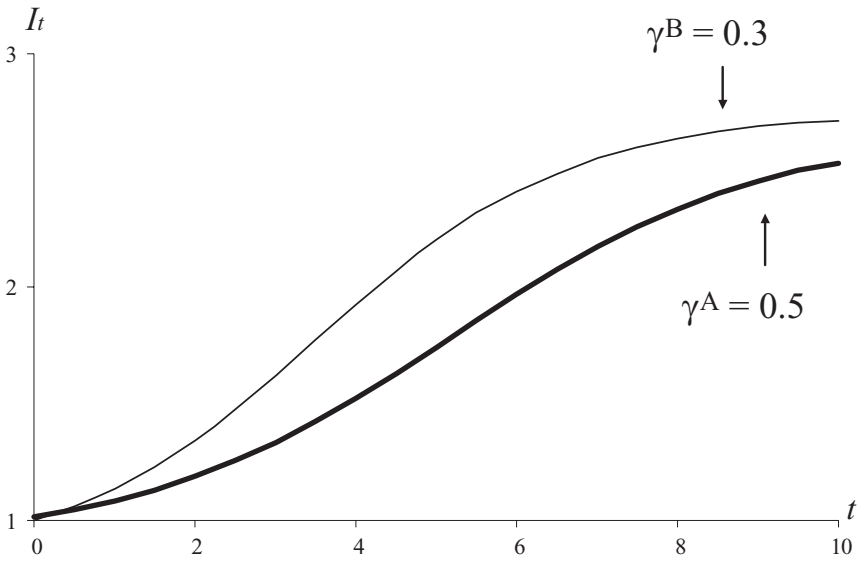


FIGURE 3. Potential income over time in countries A and B.

- (iv) at first, because incomes are still similar, the preferences of the country-A individuals make them work less than the country-B individuals;
- (v) later on, because of their lower income and despite their stronger preference for leisure, country-A individuals work more than those in country B;
- (vi) finally, as income in country A becomes sufficiently large, their stronger preference for leisure makes country-A individuals work less than those in B.

All of the elements of this dynamic pattern are observed when the simultaneous dynamics of the United States and the main European countries throughout the previous century are examined. The success of a single element in generating a dynamic pattern with so many characteristics of the actual data suggests that an explanation based on it might make a significant addition to the already existing explanations for the joint dynamics of working hours in the United States and Europe.

NOTES

1. When labor hours are measured by their annual total, this pattern is observed when the United States is paired with Belgium, Denmark, France, Germany, Ireland, the Netherlands, Spain, Sweden, Switzerland, and the United Kingdom. When labor hours are measured by the weekly labor hours of full-time workers (a measure much less sensitive to unemployment), Italy too joins this list. See Table 1 in Huberman and Minns (2007).

2. Specifically, Rogerson (2008) focuses on labor hours in the United States and in Europe in 1956 and 2003, but because the model he calibrates is static, he refrains from trying to account for the transitional dynamics of labor hours between these two years. Freeman and Schettkat (2005), Ragan (2005), and Olovsson (2009) only compare the cross-sectional differences between countries. Olovsson also tries to account for the transitional dynamics of Sweden, but refrains from trying to account for those of the United States and from trying to generate the observed intersection pattern of United States and Swedish simultaneous labor hours.

3. See, for example, Reichlin (1986), Duranton (2001), Cazzavillan and Pintus (2004), Fanti and Spataro (2006), and Nourry and Venditti (2006).

4. Endogenizing fertility in the model would not eliminate the effect that the offspring's labor income has on the investment in education. Specifically, the neutrality result formulated by Hazan and Zoabi (2006), in which, under endogenous fertility, the offspring's labor income does not affect parental investment in the offspring's education is not relevant here. Education in the Hazan and Zoabi (2006) model is in fact a positive function of offspring wages, once their model's assumptions of constant marginal labor productivity and multiplicative utility function are relaxed.

5. See Moav (2005) for a model that explicitly assumes that parents' time is an input in the offspring's education and for a survey on the validity of this assumption.

6. All the other paths lead to either a negative value of l_t or a negative value of k_t .

7. Specifically, country A converges to a steady state where leisure and education are constant at $l = 0.44$ and $\tau = 0.61$, whereas country B stabilizes at $l = 0.42$ and $\tau = 0.98$.

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