Labor Hours in the U.S. and Europe - the Role of Different Preferences Towards Leisure

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Abstract

Since 1950, the quantity of working hours has been decreasing over time both in the U.S. and in the main European economies. The European economies have started this mutual decline process with longer working hours than in the U.S., but have ended it with less working hours than the U.S. This article presents a model in which this dynamic pattern for the joint dynamics of their working hours is shared by two economies that differ only in the weight that their individuals put on leisure in their utility function and are identical in every other respect.

Keywords: Working hours, Economic Growth

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1. Introduction

Since 1950, working hours have been decreasing in both the U.S. and the U.K. During this mutual decline the working hours in the U.K., that initially were higher than in the U.S., have become lower than in the US. Figure 1 presents this "Backslanted X" dynamic pattern that prevails also when the U.S. is not paired with the U.K. but with almost each of the other main European economies.[1] In addition, this pattern is also robust to changes in the particular measures of working hours being used.

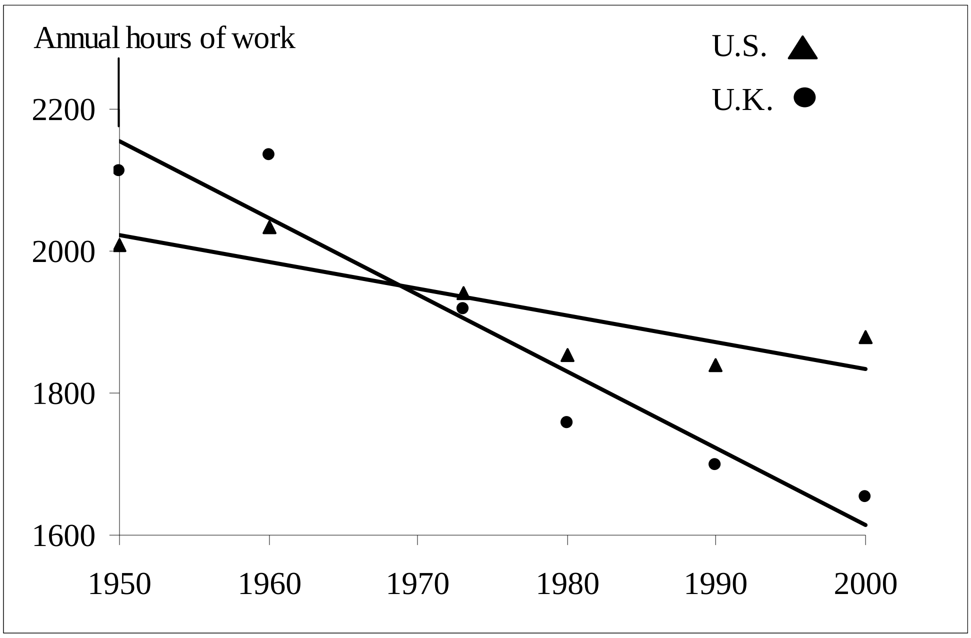

Figure 1: Working hours in the UK and the US., 1950-2000. Data sourse: ILO database.

Trying to account for this phenomenon, Prescott (2004) calibrates a dynamic model of investment and labor supply and concludes that the differences in the U.S. labor supply and those of the European economies can be almost fully explained by differences in marginal income tax rates. Alessina, Glaeser and Sacerdote (2005)

[1] Specifically, when labor hours are measured by their annual total this pattern is observed when the US is paired with Belgium, Denmark, France, Germany, Ireland, Netherlands, Spain, Sweden Switzerland and the U.K.. When working hours are measured by the weekly working hours of full-time workers (a measure much less sensitive to unemployment) Italy too joins this least. See Tables 1 in Huberman and Minns (2007).

criticize Prescott's result, and particularly its reliance on assumptions that lead to an unrealistically high elasticity of labor supply. They offer another explanation to the differences between U.S. and Europe's labor hours, one that builds on cross-country differences in unions power. The unions effect on hours is spread throughout the economy due to the existence of a social multiplier in preferences that makes people want to enjoy their leisure together. Another related article is Blanchard (2004) who analyzes France and U.S. data and concludes that the decline in working hours in France is the outcome of growth in productivity "with part of that increase allocated to increased income and part to increased leisure" (page 5). He too criticizes the high elasticity of labor supply in Prescott (2004) and in attending to the question of "how much of this change comes from preferences and increasing income and how much comes from increasing tax distortions," (page 9) he claims that the data suggests a greater importance for the role of preferences. A similar approach is taken by Huberman and Minns (2007). Looking at the evolution of labor hours in the U.S. and Europe not only in recent decades but since 1870, they show that during the recent decades the joint dynamics of the U.S. and Europe working hours have been repeating the same course they took more than a 100 years ago. This leads them to the conclusion that the underlying reasons for the observed cross-country differences are deep-seated and time invariant factors like 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 latter two articles, the purpose of this paper is to construct a theoretical model in which a difference in preferences towards leisure between economies indeed generates a "Backslanted X" pattern of their working hours dynamics. Specifically, the model is used to look 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 the identical initial conditions, the individuals in the country with the greater weight on leisure (“country A” henceforth) are enjoying more leisure than those in the other country (“country B” henceforth). However, country B individuals, who work more, are enjoying greater incomes and therefore are able to 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 the investment in physical and human capital. Eventually, the income gap is sufficiently narrowed to make the country A's greater weight on leisure regain its dominancy over the income gap in determining which is the country with the lower working hours among the two.

The dynamics described above do not contain just the “Backslanted X” shape from *figure 1*. In fact they also contain an initial stage in which labor time in country A is smaller than in B. Indeed, *figure 2* shows that already in 1870 labor hours in the U.K. were less in the U.S. This gap narrowed over time and in 1929 the labor hours in the U.S. fall below those of the U.K., a situation that prevails until the 1970s. As with *figure 1*, this dynamic pattern is also seen when the U.S. is paired with almost each of the other main European economies, and when different measures of working hours are used.

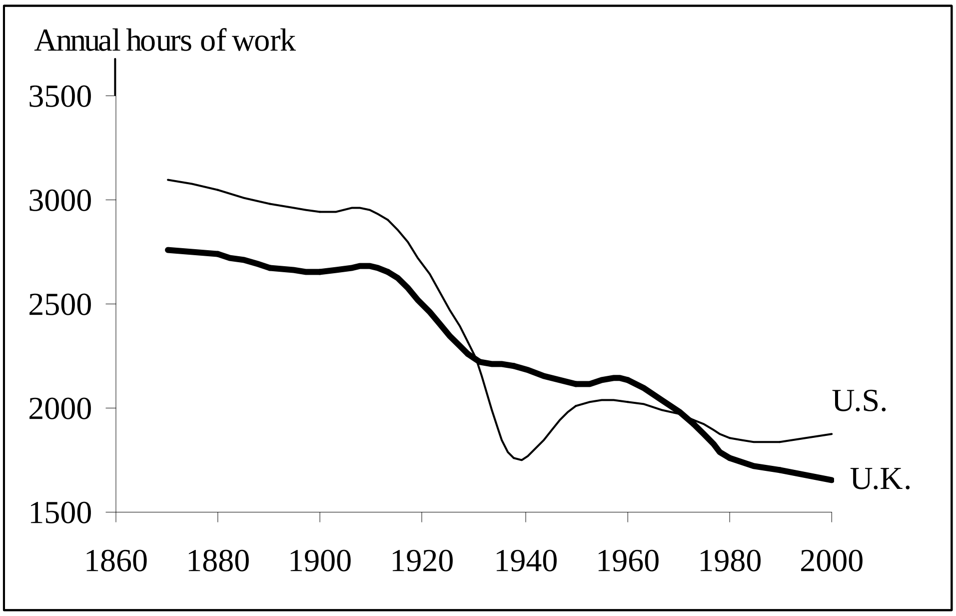

Figure 2: Working hours in the UK and the US., 1870-2000. Data sourse: ILO database.

According to the dynamics of the model, the country whose individuals put a lower weight on leisure in their utility, country B, is richer and has more educated than country A. These features of the model indeed have a hold in reality when the U.S. is compared with European countries. As Maddison (2006) shows, the Per-capita GDP of the U.S. was higher than any in European country for more than a 100 years now. Goldin (2001) Shows that in the mid-1950s secondary school enrollment was around 80% in the U.S., and less than 40% in each of the European countries.

Accounting for different economic outcomes by the cultural differences between societies is an approach that dates back at least a hundred years to Webber's 1904 classical study tying the spirit of capitalism to the Protestant ethic. Weil (2004) offers a detailed survey on the vast literature on the relations between economic growth and culture that has developed since then.

Section 2 presents the model and section 3 uses the model for showing how the desired dynamic pattern can emerge when two countries differ only in the weight their individuals put on the utility from leisure. Section 4 offers some concluding remarks.

2. The Model

The model is based on incorporating an endogenous leisure choice into a simplified version of the model of education choice presented by Hazan and Berdugo (2002). Consider a closed, perfectly competitive, overlapping-generations economy. Time is infinite and discrete.

2.1 Production

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

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

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 $k_t \equiv K_t/L_t$. Due 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:

$$w_t = (1 - \alpha)Ak_t^{\alpha} \qquad (2)$$

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 and lives for three periods. The size of each generation is equal to 1. Each individual has a single parent. Individuals within a generation are identical in their preferences. 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), the members of generation t are adults. They work, raise children, consume and save. Each individual is assumed to have exactly one child. Each such individual divides her time unit between leisure and working, where the term "leisure" captures time consuming activities other than participating in the production process. The amount of labor efficiency units each member of generation t has 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, $b > 0$. Thus, if a member of generation t allocates her entire period t time to working she will earn the amount I_t, given by:

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

In each period t each member of generation t pays an education cost for the τ_t units of education purchased for her offspring. This cost is assumed to be a positive function of I_t reflecting thus both salaries for teachers and forgone parent's income as they invest part of their time in the education process.[2] 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 assuming that parents derive utility from their offspring potential income as adults. In addition, individuals are assumed to derive utility from consumption and from their leisure. The preferences of each member of generation t are given by:

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

where C_t denotes period t consumption and l_t is period t leisure.[3] The budget constraint on each member of generation t is:

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

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

where S_t denotes period t savings, satisfying:

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

2.3 Optimization

In each period t each member of generation t chooses C_t, S_t, l_t and τ_t so as to maximize the utility captured by (6), given the values of w_t, R_{t+1} and I_t and subject to (4), (5), (7), (8), $0 \leq l_t \leq 1$ and $0 \leq \tau_t \leq 1$. By standard optimization 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 a the relation between the optimal levels of l_t and τ_t which is given by:

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

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

Applying (9), (10) and (11) in (7) yields:

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

(12) presents 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 RHS of (12) equals -1 when l_t = 0 and equal to the positive term $\frac{1+\beta^{\rho} R_{t+1}{}^{\rho-1}}{\gamma^{\rho} I_t{}^{1-\rho}} + \tau_t(l_t)$ 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:

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

By (11), the denominator of (13) is positive. Thus $\frac{dl_t}{dI_t} > 0$, making leisure a normal good in the sense that it depends positively on potential income, can occur if and only if $\rho < 1$, an assumption that is taken henceforth.

2.4 Dynamics

In this section the equilibrium dynamics of the economy are presented using the two-dimensional first order system (k_t, l_t). Based on the previous sections, if the set $\{(k_t, l_t)\}_{t=0}^{\infty}$ is obtained then the set $\{K_{t+1}, L_t, \tau_t, C_t, S_t, w_t, R_t\}_{t=0}^{\infty}$ of the other model variables is obtained too.

At 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 a restriction on the possibilities for (k_0, l_0). This restriction determines (k_0, l_0) and determines thus the entire path the economy takes from then on. Specifically this restriction is based upon:

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

k_{t+1} can be presented as a function of (k_t, l_t) by applying (3), evaluated at t+1, in (12) and simplifying, which yields:

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

where I_t is a function of k_t through (2) and (5) and $\tau_t(l_t)$ is based on (11). To present l_{t+1} as a function of (k_t, l_t) 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). Simplifying (16) yields:

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

where R_{t+1} is a function of k_{t+1} through (3), k_{t+1} is a function of (k_t, l_t) through (16), I_t is a function of k_t through (2) and (5) and $\tau_t(l_t)$ is based on (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 condition, 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 and the identity of the country with the lower leisure time is changing over time. Let the two countries names be 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, α=0.49,

δ=0.5, ρ=0.2, σ=0.4, a=0.9, b=6, h=0.15, β=0.9, K_0=0.1 and τ_{-1}=0. Country A's level of γ is γ^A=0.5 and country B's level of γ is γ^B=0.3.

In both countries' cases, a numerical analysis along 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 can be consistent with rational expectations.[4] The two paths are presented in figure 3.

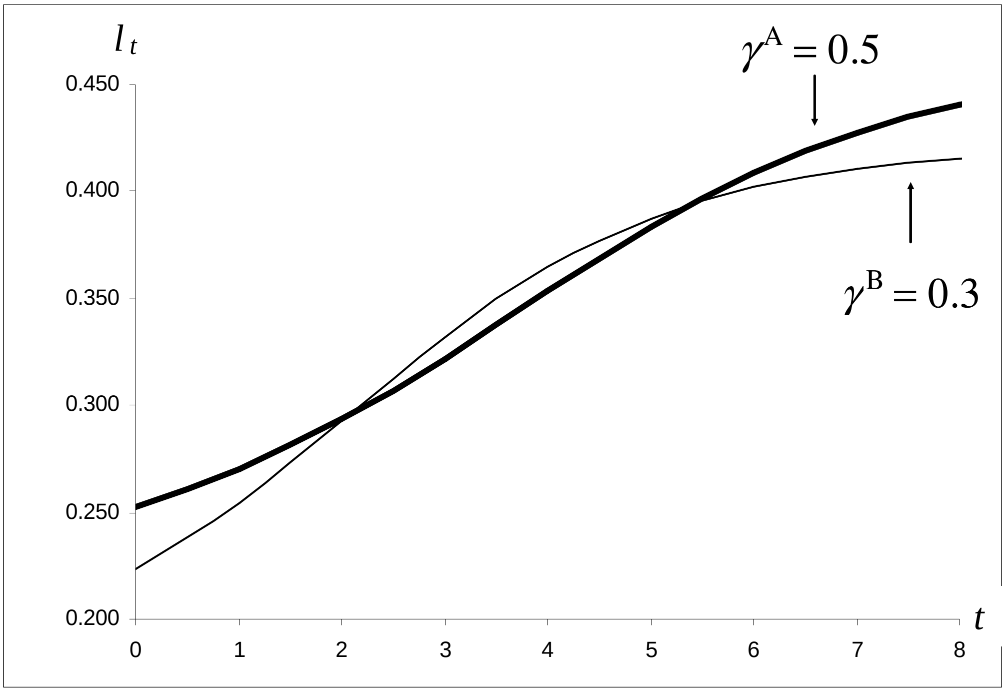

Figure 3: Leisure over time in countries A and B.

As the figure shows, each path is leading its country to its unique steady state point, where country A's higher γ sets it on a path that leads to a steady state with more leisure than in the steady state to which country B converges. In addition, country A's higher γ make its individuals enjoy more leisure than the country B individuals at the initial periods of this scenario too. However, their lower level of γ, which imply more labor, makes country B individuals richer than those in A and at a certain stage this income difference make them enjoy more leisure than the country A individuals. This

[4] All the other paths consistent with (14) lead to either a negative value of l_t or a negative value of k_t.

stage vanishes eventually because diminishing returns to investment in physical and human capital make the income gap lose its dominancy over the preference difference in determining which country's individuals enjoy more leisure. Figure 4 shows the path that the potential income, I_t, takes over time in each country.

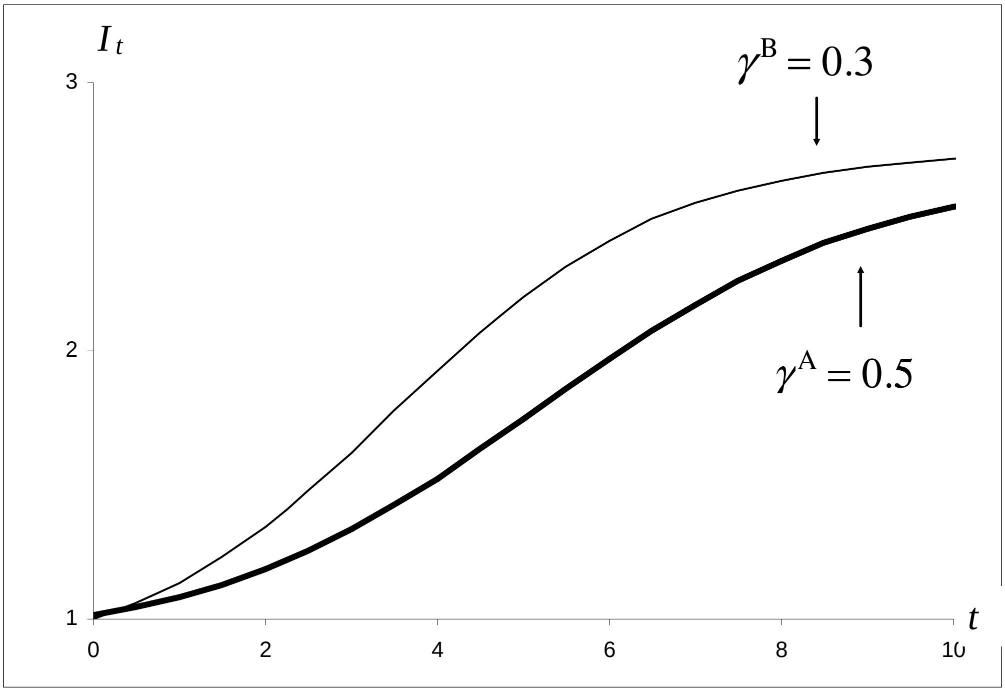

Figure 4: Potential income over time in countries A and B.

4. Concluding Remarks

This article has presented a model that looks at two economies identical in all initial conditions and all parameters except for one. Yet, this single difference has turned out to succeed in generating 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 a greater wealth to leisure in their utility, compared to the weight of leisure in the other country ("country B"). In the resulting dynamics, due to this single difference: (*i*) country A experiences a slower GDP growth compared to country B; (*ii*) Physical capital accumulation in A is slower than in B; (*iii*) human capital accumulation in A is slower than in B; (*iv*) at first, because of their lower income and despite their stronger preference for leisure – country A individuals work more than those in B; (*v*) later, 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 these characteristics of these dynamics are observed when comparing the U.S. to the main European countries over the past five decades. The success of a single element to generate a dynamic pattern with so many characteristics of the actual data suggests that an explanation based on it might have a significant contribution to the already existing explanations for the joint dynamics of working hours in the U.S. and Europe.

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