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SAVING BEHAVIOR AND THE INTERGENERATIONAL ALLOCATION OF LEISURE TIME

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Saving Behavior and the Intergenerational Allocation of Leisure Time

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Abstract
We study how the allocation of leisure time affects savings and working time. To do so, we consider a life-cycle model in which leisure and consumption are complementary and individuals decide on the intertemporal allocation of consumption, on leisure time and on its allocation among individuals of the same generation or of a different one. The latter decision margin determines the equilibrium utility services from leisure that individuals obtain in each life time period. We show that economies in which older individuals obtain higher leisure services have higher savings rates, higher stock of capital per worker and higher fraction of time worked. Using data from the World Value Survey, we provide empirical support to these findings.

Keywords: Preferences for leisure, Saving behavior, Time allocation, Overlapping generations.
Jel Classification: E21, E71, J22.

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1 Introduction

Savings rates are remarkably and persistently heterogeneous across countries. The economic factors determining cross-country differences in savings rates have been extensively studied, but, even after controlling for differences in these factors, a relevant part of the differences in savings rates across countries remains unexplained (Stierle and Rocher, 2015). Some recent works have shown that savings may also respond to cultural norms. While Carroll et al. (1994) find no evidence of cultural effects on savings, Costa-Font et al. (2018) find that cultural preferences are an important explanation for cross-country differences in saving behavior, and their relevance persists up to three generations. More recently, Fuchs-Schündeln et al. (2020) show that attitudes towards future, reaction to uncertainty and desire for accumulation are cultural traits that explain savings. In this paper, we contribute to this literature by introducing a novel channel through which cultural differences across countries, reflected by differences in the lifetime value of leisure, might explain heterogeneity in saving behavior, capital accumulation, and working hours across countries.

The mechanism linking the value of leisure and savings stems from three main assumptions. First, savings are motivated by life-cycle reasons (Ando and Modigliani, 1963). Second, the leisure utility services in a life-time period result from the decision to allocate leisure time with individuals of the same generation or of a different generation. And, third, we assume that consumption and leisure services are complements in the utility function. We introduce these assumptions in a version of the Overlapping Generations (OLG) model by Diamond (1965), in which we add an endogenous labor supply and we allow individuals from both generations to allocate their leisure time within or across generations. The introduction of this leisure time allocation is the novelty of this paper. We show that when the leisure-time allocation decision of young individuals results in younger individuals receiving lower leisure services at the equilibrium, their marginal utility of consumption decreases due to the complementarity between consumption and leisure. This leads to lower consumption when young and higher savings rates. Similarly, when the leisure-time allocation decision of old individuals results in higher leisure services of these old individuals at the equilibrium, their marginal utility of consumption increases and leads to a larger savings rate aimed to achieve a larger consumption when old.

We define the *intergenerational leisure gap* as the ratio between leisure services per unit of leisure time obtained by the elderly and those obtained by the young. As follows from the previous arguments, a large value of this gap implies that individuals are willing to postpone consumption to the last period of life, which results into large savings rates and fast accumulation of capital. Moreover, the latter results into high wages and low consumption when young in equilibrium, which leads to a high amount of working time.

The intergenerational leisure gap in equilibrium only depends on preference parameters. Therefore, according to the model, cross-country differences in this gap can only be explained as the consequence of cultural differences in preference parameters that end up affecting savings and employment patterns. Therefore, our model has some clear testable implications: economies where older generations place more value to leisure activities relative to younger generations (i.e. where the intergenerational leisure gap is relatively larger) exhibit higher savings rates and longer working hours. The empirical analysis in this paper aims to explore whether evidence supporting these implications can be found in the data. To this end, we resort to the World Values Survey, a global survey exploring people's values and beliefs, how they change over time, and their impact on social and political life. The information collected in the data set allows us to construct a measure of the intergenerational leisure gap.

We first provide evidence that while the correlation between income levels and working hours is negative and significant, the correlation between our measure of the intergenerational leisure gap and income levels is virtually zero. Additionally, we find that most variability in the intergenerational leisure gap occurs across countries rather than within countries over time. This suggests that cultural attributes, rather than economic factors, predominantly drive differences in leisure time allocation. We interpret these cultural attributes as cross-country preference differences.

Next, we test the main prediction of our theory. We regress the savings rates against the intergenerational leisure gap and obtain that the estimated coefficient remains positive and significant across several specifications, displaying remarkable stability. Even after accounting for common time trends across countries, the intergenerational leisure gap consistently emerges as a positive and significant predictor of the savings rate. This evidence supports the prediction according to which societies where older generations place more value to leisure activities relative to younger generations exhibit a higher propensity to save.

Finally, albeit less strongly, the empirical evidence broadly supports the prediction according to which working hours are higher in countries where the preference for leisure is relatively shifted towards the older rather than the younger generation: the coefficients of the regressions between working hours and the intergenerational leisure gap are positive and strongly significant, but only when common time trends are controlled for. While the empirical analysis supports our theory, it should not be considered conclusive due to the lack of causal identification. However, the robust evidence, stability of coefficients across various specifications and estimation methods, combined with the lack of evident alternative explanations, lend credibility to our mechanism as a significant driver of cross-country differences in saving behavior and working hours.

To keep the analysis of the model simple, we have assumed that individuals leisure services only depend on their leisure-time allocation decisions and not on the other's decisions. In the last part of the paper, we return to theory and extend our model by introducing both intra and intergenerational externalities in leisure activities in order to capture the idea that leisure activities are more enjoyable if they are done with others. We show that the main findings obtained in the benchmark model without externalities and discussed in the empirical section still hold when we consider a more sophisticated model in which individuals derive utility from the interaction between their leisure time and that of other individuals.

This paper contributes to two strands of the literature. First, it adds to the extensive literature on the determinants of saving behavior. The existing explanations include, among others, demographics (Cigno and Rosati, 1996, Tobing, 2012), differences in income and growth rates (Laitner, 2000), the characteristics of the social security and tax systems (Kotlikoff et al., 1989) and (Blau, 2016), financial liberalization (Bandiera et al., 2000) and genetics (Cronqvist and Siegel, 2015). To the best of our knowledge, this paper is the first that considers the interaction between consumption-leisure complementarity and the intergenerational allocation of leisure time as a determinant of savings. Secondly, our research intersects with the literature that examines the effect of cultural differences. This literature has used the World Value Survey to study how savings rates are affected by thrift, trust and religiosity (de Castro Campos et al., 2013) or by attitudes toward future, reaction to uncertainty and desire for accumulation (Fuchs-Schündeln et al., 2020). It has been also used the European Social Survey to study how preferences for leisure affect employment (Moriconi and Peri, 2019). We also use survey data and we study the effect on savings and employment of country differences in the preference for leisure of old relative to that of young individuals.

The rest of the paper is organized as follows. Section 2 presents the model and the main theoretical predictions. Section 3 reports the empirical evidence. Section 4 shows that the main results remain when leisure externalities are introduced. Section 5 concludes and some technical details are relegated to an appendix.

2 A life-cycle model of leisure decisions

2.1 Individuals

The economy is populated by finitely-lived individuals. In each period t, N_t individuals are born and they live for two periods. They are endowed with one unit of time in each period. In the first period of their life, individuals are young and supply a fraction $l_t \in (0,1)$ of his time endowment to work and the rest of time is devoted to leisure. Denoting by w_t the wage per unit of time, their labor income is then equal to $w_t l_t$. They allocate this income between current consumption c_t and savings s_t. In the second period, individuals are old, they retire and devote the entire time endowment to leisure. They use the return from savings, R_{t+1}, to consume d_{t+1}. Therefore, the intertemporal budget constraint is

$$w_t l_t = c_t + \frac{d_{t+1}}{R_{t+1}}. \tag{1}$$

An individual born at time t obtains utility from consumption when young and old, c_t and d_{t+1}, and also obtain utility from leisure services when young and old, s_t^y and s_{t+1}^o. More precisely, the utility function is

$$U_t = u\left(c_t, s_t^y\right) + \beta u\left(d_{t+1}, s_{t+1}^o\right). \tag{2}$$

We assume that the utility function (2) is strictly increasing in all its arguments, it is jointly concave and displays complementarity between consumption and leisure services when young and old; i.e. $u_{cs^y}, u_{ds^o} > 0$.[1] The assumption of complementarity plays a pivotal role in our analysis. It stipulates that the marginal utility derived from leisure increases with the level of consumption, which is a well established assumption on consumers behavior (see, for instance, King et al. 1988).

The novelty in the utility function is in the leisure services. We assume that the value of these

[1]The subscript indicates the variable with respect to which the derivative is computed.

services depends on the amount of time allocated to leisure activities and also on the allocation of this time between individuals of the same cohort and of different cohorts. In particular, we assume that

$$s_t^y\left(p_t^y, p_t^o\right) = \left(p_t^y\right)^{\sigma_y}\left(p_t^o\right)^{1-\sigma_y}, \tag{3}$$

and

$$s_{t+1}^o\left(q_{t+1}^o, q_{t+1}^y\right) = \left(q_{t+1}^o\right)^{\sigma_o}\left(q_{t+1}^y\right)^{1-\sigma_o}, \tag{4}$$

where $p_t^o \in [0,1]$ is the fraction of leisure time that a young individual devotes to perform activities with old individuals, $p_t^y \in [0,1]$ is the fraction of leisure time young individuals devote to perform leisure activities with other young individuals, $q_{t+1}^o \in [0,1]$ is the fraction of leisure time that an old individual devotes to perform leisure activities with other old individuals, $q_{t+1}^y \in [0,1]$ is the fraction of time that an old individual devotes to perform leisure activities with young individuals, $\sigma_i \in (0,1]$, $i = y, o$, measure the relative intensity of the preference towards spending time with individuals of the same generation.

The Cobb-Douglas specification of leisure services in (3) and (4) implies that these services increase as individuals increase the amount of time devoted to leisure and it also implies that if $\sigma_i < 1$ individuals will always choose to spend some leisure time with both individuals of the same generation and of a different generation; i.e. $p_t^i > 0$ and $q_t^i > 0$, $i = y, o$. In the limiting case with $\sigma_i = 1$, the model collapses to an economy with endogenous labor supply, but without a leisure time allocation decision.

We clarify that we do not impose that the amount of time young individuals spend in leisure activities with the previous cohort coincides with the amount of leisure time old individuals enjoy performing leisure activities with young individuals; i.e. $q_t^y \neq p_{t+1}^o$. As a result, leisure time devoted to someone else is not necessarily time spent together with someone else, as we also consider the time spent in organizing activities.[2]

We close the demand side of the model with the time constraints of young and old individuals.

[2]For instance, a parent may obtain utility from cooking for his/her children and this activity does not require the presence of the latters.

As young individuals split their leisure time between leisure activities and working, we obtain

$$p_t^y + p_t^o = 1 - l_t. \tag{5}$$

Similarly, old individuals split their leisure time only in leisure activities and, hence,

$$q_{t+1}^o + q_{t+1}^y = 1. \tag{6}$$

Individuals choose c_t, d_{t+1}, l_t, p_t^y, p_t^o, q_{t+1}^y and q_{t+1}^o in order to maximize utility (2) subject to leisure services, (3) and (4), time constraints, (5) and (6), and the budget constraint (1).[3] The solution to this problem determines the intergenerational allocation of leisure time as follows:

$$p_t^y = \sigma_y(1 - l_t), \tag{7}$$

$$p_t^o = (1 - \sigma_y)(1 - l_t), \tag{8}$$

$$q_{t+1}^o = \sigma_o, \tag{9}$$

$$q_{t+1}^y = 1 - \sigma_o. \tag{10}$$

Replacing the intergenerational allocation of leisure time in (3) and (4), we obtain that the equilibrium values of leisure services when young and old are, respectively,

$$s_t^y = (1 - l_t)\,\Sigma_y, \tag{11}$$

$$s_{t+1}^o = \Sigma_o, \tag{12}$$

where

$$\Sigma_y = (\sigma_y)^{\sigma_y}(1 - \sigma_y)^{1-\sigma_y}, \tag{13}$$

$$\Sigma_o = (\sigma_o)^{\sigma_o}(1 - \sigma_o)^{1-\sigma_o}. \tag{14}$$

Σ_y and Σ_o measure, respectively, the utility services generated by a unit of leisure time for young and old individuals. Notice that, since $\sigma_i \in (0,1)$, then $\Sigma_i \in (0.5, 1)$ for $i = y, o$.

The solution of the individual's problem also determines the intertemporal distribution of con-

[3] The solution of the individual's problem is detailed in the Appendix.

sumption along the life cycle and the labor supply from the following two equations:

$$\frac{u_{c_t}}{\beta u_{d_{t+1}}} = R_{t+1}, \tag{15}$$

$$\frac{\Sigma_y u_{s_t^y}}{u_{c_t}} = w_t. \tag{16}$$

Equation (15) equates the marginal rate of substitution between consumption when young and when old with the interest factor. It governs the intertemporal allocation of individual consumption across the life-cycle and, hence, it determines savings. In this model, the marginal rate of substitution between consumption levels over the life-cycle depends on leisure services. More precisely, because of the complementarity between leisure services and consumption, the marginal rate of substitution between consumption when young and old, u_c/u_d, increases when the young individuals obtain more leisure services than the old. As a result, consumption of the young increases and consumption of the old decreases, which leads to a reduction in savings and, hence, in the accumulation of capital.

The properties described above shape how the distribution of leisure services between young and old affects savings in this model. Leisure services depend on both the amount of leisure time ($(1-l)$ for the young and 1 for the old, a *level* effect) and on the choice between intra or inter-generational allocation of leisure time (Σ_y for the young and Σ_o for the old, a *composition* effect). Therefore, a small value of the ratio Σ_o/Σ_y implies that the distribution of leisure services shifts towards the young, which leads to a reduction in savings and in the accumulation of capital because of the complementarity between consumption and leisure. We denote this ratio as the *intergenerational leisure gap* and our analysis indicates that cross-country differences in this gap can explain part of the cross-country differences in the savings rates. Our empirical analysis aims to provide evidence of this mechanism.

Equation (16) equates the marginal rate of substitution between leisure time and consumption with the wage and it determines the labor supply. A larger Σ_y increases the leisure services obtained by the young, thereby directly increasing the denominator of (16), and, due to the complementarity, also increases the marginal utility of consumption when young, thereby increasing the numerator. As a result, the effect on the marginal rate of substitution and therefore on the labor supply is ambiguous and depends on the functional form of the utility function. For instance, when the utility function is Cobb-Douglas, these two effects precisely counterbalance each other.

2.2 Firms

There is a continuum of firms whose mass is normalized to 1. The representative firm production function is $Y_t = F(K_t, L_t)$,where $L_t = N_t l_t$ is the total amount of labor time supplied by young individuals at time t and K_t is the stock of productive capital. For the sake of simplicity, we assume complete depreciation after one period. We also assume constant returns to scale so that, defining $y_t = {}^{Y_t}/_{N_t l_t}$ and $k_t = {}^{K_t}/_{N_t l_t}$, per unit of time output is given by $y_t = f(k_t)$.

Firms operate in a competitive market so that wages and interest rate are equal to

$$R_t = 1 + r_t = f'(k_t), \tag{17}$$

$$w_t = f(k_t) - k_t f'(k_t), \tag{18}$$

where $R_t = 1 + r_t$ is the gross interest rate.

2.3 Equilibrium

We assume that capital totally depreciates after one period so that, in equilibrium, aggregate capital at $t+1$ is equal to total savings by the young, i.e. $K_{t+1} = (w_t l_t - c_t) N_t$. Using (18), this equation can be rewritten as

$$k_{t+1} = \frac{[f(k_t) - k_t f'(k_t)] l_t - c_t}{l_{t+1}(1+n)}. \tag{19}$$

We define the dynamic equilibrium as a path of $\{s_t^y, s_{t+1}^o, c_t, d_{t+1}, k_t, l_t, w_t, R_t\}_{t=1}^{\infty}$ that solves (1), (11), (12), (15), (16), (17), (18), and (19).

We are interested in analyzing the effects of differences in the intergenerational leisure gap on the steady state equilibrium, which is defined as an equilibrium path along which variables remain constant. We eliminate time subindexes in the variable to refer to the steady state value of the variable. As a first step, we characterize the steady state. To this end, we combine (1) and (19) to obtain

$$\frac{d}{1+n} = klf'(k), \tag{20}$$

$$c = \left[f(k) - kf'(k) - k(1+n)\right] l. \tag{21}$$

Notice that summing (20) and (21) we obtain the resource constraint. Using the resource constraint at the steady state and equations (11), (12), (15), (16), (17), (18), and (21), we obtain that the steady state of the market equilibrium is a tuple $\{s^y, s^o, c, d, k, l\}$ that solves:

$$\frac{u_c}{u_d} = \beta f'(k) \tag{22}$$

$$\frac{u_{s^y}}{u_c} = \frac{f(k) - kf'(k)}{\Sigma_y} \tag{23}$$

$$f(k)\, l - k(1+n)\, l = c + \frac{d}{1+n} \tag{24}$$

$$c = f(k)\, l - kf'(k)\, l - kl(1+n) \tag{25}$$

$$s^y = (1-l)\, \Sigma_y \tag{26}$$

$$s^o = \Sigma_o \tag{27}$$

To obtain clear-cut results, we consider the following production function in intensive form:

$$y_t = Ak_t^\alpha, \;\; \alpha \in (0,1) \tag{28}$$

and the following utility function:

$$U_t = u(c_t, s_t^y) + \beta u(d_{t+1}, s_{t+1}^o) = c_t^{1-\mu}(s_t^y)^\mu + \beta d_{t+1}^{1-\mu}(s_{t+1}^o)^\mu, \;\; \mu \in (0,1). \tag{29}$$

In the appendix, we use equations (22), (23), (24) and (25) to prove the following result:

Proposition 1. *If the production function satisfies (28) and the utility function satisfies (29), there exists a unique steady state equilibrium with $l \in (0,1)$ when*

$$\frac{\Sigma_o}{\Sigma_y} < \frac{\mu}{1-\mu}\frac{\alpha(1+n)}{1-\alpha}\left(\frac{(1-\alpha)}{\alpha\beta(1+n)}\right)^{\frac{1}{\mu}}. \tag{30}$$

Proof. See the appendix. □

Proposition 1 shows that a steady state exists and is unique if the intergenerational leisure gap between the old and the young, measured by Σ_o/Σ_y, is not too large. The next proposition states how capital, working time and the savings rate are affected by this gap.

Proposition 2. *If the production function satisfies (28) and the utility function satisfies (29), the steady-state capital stock , working time and savings rate increase with the intergenerational leisure gap,* Σ_0/Σ_y.

Proof. See the appendix. □

Proposition 2 implies that economies where Σ_o/Σ_y is larger accumulate more capital, work more and save a larger fraction of their income. The intuition relies on equations (15) and (16) and on the complementarity between leisure services and consumption, introduced by the utility function (29). First, we recall that when Σ_o/Σ_y is large, the old individuals obtain more utility from an additional unit of leisure time than the young individuals. Due to the complementarity, the marginal rate of substitution between consumption when young and when old is smaller when Σ_o/Σ_y is large. As follows from (15), the reduction in this marginal rate of substitution reduces consumption when young and increases consumption when old. Consequently, savings rate increases, which causes an increase in the stock of capital.

As for the effects of the intergenerational leisure gap on working time, this can be explained by looking at equation (16) which tells us that the labor supply is increasing in wages and, due to the complementarity, decreasing in consumption when young. According to the previous argument, a rise in Σ_o/Σ_y increases the savings rate (thereby reducing consumption when young) and increases capital (thereby increasing wages). By (16), both channels result in a larger fraction of time devoted to work.

3 Empirical evidence

The purpose of this section is to provide empirical support for the macroeconomic effects of leisure allocation decisions obtained in the previous section. To this end, we first construct a panel data set at the country level that includes a measure of the leisure gap. We after use this data set to analyze the effect of this leisure gap on savings and labor.

3.1 Data and methodology

In order to find a proxy for our main explanatory variable, Σ_o/Σ_y, we resort to the World Value Survey (WVS). The WVS collects representative national samples covering almost 100 countries and 6 waves spanning from 1990 to 2022 and, therefore, it is ideal for cross-cultural analysis. As for the savings rate, we collect data from two different sources: the World Bank indicators and the Penn World Table (PWT) 10.1. The latter is also the main data source for per capita income, working hours, labor income share, human capital index and TFP at the country level. In order to construct a proxy for the leisure gap between old and young individuals, Σ_o/Σ_y, we proceed as follows:

1. We split the individuals in each country between young (25-60 years) and old (>60 years).[4]

2. We focus on the responses to the question "Very important in life: Leisure", which has four main possible answers: "Very important", "Rather important", "Not very important", "Not at all important".

3. We compute a synthetic index for leisure services of the young and old individuals in each country using weights provided by the data set and we interpret these indexes as proxies for respectively Σ_y and Σ_o. Importantly, we guarantee that, as in the model, these indexes range between 0.5 and 1, by assigning the following values to the above 4 categories: 1, 0.83, 0.66, 0.5, where a larger value is associated to a larger importance of leisure.

4. We obtain the intergenerational leisure gap as the ratio between the synthetic index for leisure services of the old and that of the young.

We also consider a number of other dependent variables extracted from the PWT 10.1. They are mainly used as controls in the regressions and are the following: per-capita income (computed as the ratio between GDP in PPP at constant US dollars 2017, and population); labor share; human capital index (essentially average years of schooling); and a measure of TFP.

[4] There is of course a certain degree of arbitrariness in the distinction between young and old. The crucial elements that distinguishes the two groups in our model is that the former work, while the second do not. For this reason, and since the WVS provides information about employment status at the individual level, we have performed a robustness analysis where young individuals are those who are working at the date of the survey and old individuals are those who are retired. Results are in line with the main analysis and are available at request.

Variable	Mean	Std. Dev.			Obs	N. Countries
		Overall	Between	Within		
Intergenerational leisure gap	0.9706	0.0309	0.0310	0.0164	1234	88
Savings rate	0.2092	0.1344	0.1430	0.0576	1239	88
Fraction of Time Worked	0.3261	0.0434	0.0449	0.0991	778	47
Per-capita Income (log)	9.4926	0.9746	1.0475	0.2354	1239	88
Labor Share	0.5170	0.1109	0.1130	0.0369	1116	74
Human Capital Index	2.6713	0.6283	0.6340	0.1711	1159	81
TFP	0.9842	0.1544	0.1610	0.0884	1042	68

Table 1: Summary Statistics

In the following analysis, the primary dependent variables are the savings rate and the fraction of hours worked. We have chosen not to consider the level of capital stock, as it is influenced by a variety of factors not accounted for in our model. These include elements like foreign direct investments and technological advancements. The former element is particularly relevant for the numerous small open economies featured in the WVS data set.

The savings rate for each country is computed as one minus the share in GDP of household and government consumption at current PPPs and are taken from the PWT 10.01.[5]As for the fraction of hours worked, we follow Aguiar and Hurst (2007) and compute it as the ratio between the average annual hours worked by persons engaged (source: PWT 10.01) and $16 * 365$, which measures the average number of hours an individual devotes to extra-sleeping activities. Summary statistics of the variables involved in the analysis are reported in Table 1.[6]

We observe that the mean of the leisure gap is less than 1, meaning that - on average - leisure is relatively more important for young than for old. However, there are a relevant number of observations (country-year pair) where the value of this leisure gap is larger than 1. Additionally, the between-country standard deviation is twice as large as the within-country standard deviation.

[5]In the appendix we report the results using a different measure of savings rates, the variable "Gross savings (% of GDP)" from the World Bank national accounts data, and OECD National Accounts data files. Gross savings are here defined as "gross national income less total consumption, plus net transfers.". Results are in line with the analysis reported in the main text.

[6]The last column's values—reflecting the number of countries with available data—result from the overlap between the World Values Survey's country coverage (from which only the 'Intergenerational Gap for Leisure' variable is sourced) and the Penn World Table (PWT) 10.1. The apparent variation in missing data across variables is attributable to the PWT 10.1's inconsistent country data availability. This inconsistency is particularly pronounced for the 'Fraction of Time Worked,' which is documented for only 47 countries within the World Values Survey's scope. In contrast, the 'savings rate' is reported for 88 countries included in the World Values Survey.

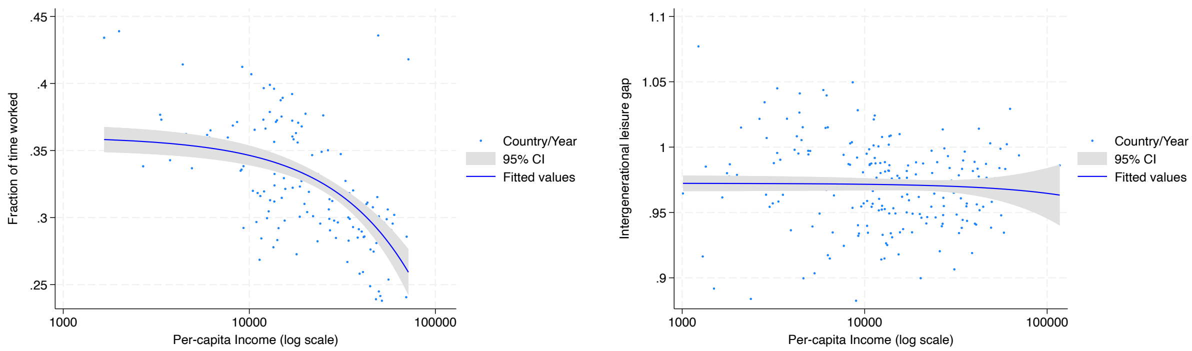

Figure 1: Left panel: Fraction of time devoted to work plotted against the per-capita income (log scale) by country-year. Right panel: intergenerational leisure gap plotted against the per-capita income (log scale) by country-year.

This suggests greater variability in the intergenerational leisure gap across countries compared to within countries over time. This aligns with our primary hypothesis that the gap reflects a cultural trait, thus varying more significantly across countries while changing more gradually over time.

3.2 Results

Our initial evidence points at strengthening a core implication of the model, specifically that the intergenerational preference gap for leisure is independent of income and can thereby be viewed as reflecting a cultural trait, rather than an economically influenced variable. In Figure 1, for each country and each year, we plot the fraction of time worked (left panel) and the intergenerational leisure gap, our proxy for Σ_o/Σ_y, against the per-capita income.

A striking pattern emerging from the simple plots of Figure 1 is the negative correlation between the labor supply and per-capita income joint with the virtually absent correlation between the intergenerational leisure gap and per-capita income. This pattern is confirmed by the two regressions below where the log of per-capita income is regressed against the labor supply (first-row) and then against the intergenerational leisure gap (second column).[7] The coefficient is negative and significant in the first case and very close to zero and insignificant in the second case. Also, the R-squared is 0.33 in the first case and just 0.01 in the second, meaning that in the second case

[7]The number of observations in our regression analysis significantly exceeds the data points shown in the plots, a discrepancy stemming from the structure of the World Value Survey (WVS). For instance, while WVS's Wave 2 covers 1990 to 1994, individuals in a country like Argentina were surveyed only in 1992. However, as our analysis also incorporates data from the Penn World Table (PWT) available for each year from 1990 to 1994, we have assigned the same value of the intergenerational leisure gap from the 1992 WVS data to all years within this wave for Argentina. This method ensures comprehensive utilization of the PWT data, aligning it with the periodic WVS insights.

Dependent variable	Fraction of time worked	Intergenerational leisure gap
Log per-capita Income	-0.029***	-0.004
	(0.006)	(0.003)
Constant	0.612***	1.007***
	(0.060)	(0.029)
R-sq	0.33	0.01
Obs.	778	1234

Table 2: Pooled OLS: per-capita income as predictor of labor supply and the intergenerational leisure gap

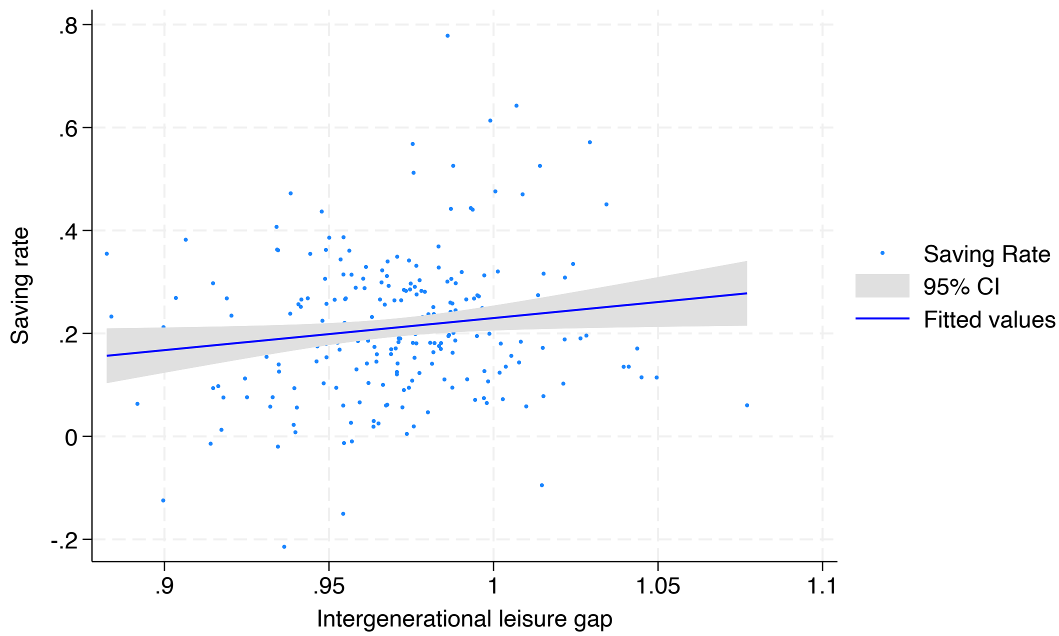

Figure 2: Intergenerational leisure gap and savings rates. Each dot represents a pair country/year.

the relation is capturing almost no variability. Thus, while per-capita income reliably predicts the average fraction of time worked, it fails to serve as an effective predictor for the intergenerational leisure gap. This lends credibility to our hypothesis that the latter is a cultural attribute, largely unaffected by income levels and relatively constant over time, as emerging from Table 1.

We next show some empirical evidence that we interpret as supportive of the theoretical predictions of the model according to which countries where young individuals enjoy leisure relatively less than old individuals tend to save a larger fraction of their income and work longer hours. We first focus on the savings rate, which, in Figure 2, is plotted against the intergenerational leisure gap.

Dependent Variable: savings rate	(1)	(2)	(3)	(4)	(5)
Intergenerational leisure gap	0.577***	0.841***	0.878***	0.583***	0.585***
	(0.123)	(0.108)	(0.118)	(0.118)	(0.118)
Log of per-capita income		0.0683***	0.0684***	0.113***	0.117***
		(0.00341)	(0.00373)	(0.00552)	(0.00623)
Labor share			-0.240***	-0.131***	-0.149***
			(0.0302)	(0.0321)	(0.0355)
Human capital index				-0.104***	-0.108***
				(0.00906)	(0.00949)
TFP					-0.0326
					(0.0272)
Constant	-0.350***	-1.256***	-1.167***	-1.078***	-1.062***
	(0.120)	(0.113)	(0.126)	(0.127)	(0.127)
Observations	1,234	1,234	1,111	1,041	1,037
R-squared	0.017	0.259	0.287	0.365	0.365
Fixed Effect	NO	NO	NO	NO	NO

Standard errors in parentheses
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table 3: Predictors of the savings rates - Pooled OLS

The figure reveals a positive and significant correlation between the two variables, aligning with Proposition 2. To address and mitigate potential endogeneity concerns, we conduct regression analysis, using the savings rate as the dependent variable and regressing it against the intergenerational leisure gap, along with additional control variables. Initially, we undertake a simple OLS regression, pooling data from all countries, with each observation representing a country/year pair.

Results are shown in Table 3, which presents results from five distinct specifications, progressively incorporating additional controls, including logarithm of per-capita income, labor share, human capital index, and TFP. Notably, the coefficient for the intergenerational leisure gap remains positive and significant across all specifications, displaying remarkable stability. This aligns with Proposition 2, indicating that economies where leisure is more valued by the older generation than the younger tend to exhibit higher savings rates. Furthermore, the control variables behave as expected: the savings rate is positively correlated with per-capita income and inversely related to human capital, supporting the notion that savings and human capital investments act as substitutes.

Dependent Variable: Savings rate	(1)	(2)	(3)	(4)	(5)
Intergenerational leisure gap	0.225**	0.372***	0.475***	0.513***	0.499***
	(0.103)	(0.0955)	(0.111)	(0.113)	(0.113)
Log of per-capita income		0.119***	0.114***	0.119***	0.149***
		(0.00816)	(0.00872)	(0.0100)	(0.0119)
Labor share			-0.267***	-0.225***	-0.296***
			(0.0444)	(0.0476)	(0.0498)
Human capital index				-0.0667***	-0.0950***
				(0.0153)	(0.0165)
TFP					-0.117***
					(0.0253)
Constant	-0.0180	-1.236***	-1.154***	-1.091***	-1.133***
	(0.102)	(0.125)	(0.147)	(0.147)	(0.147)
Within R-sq	0.075	0.210	0.213	0.169	0.194
Between R-sq	0.049	0.355	0.490	0.577	0.556
Observations	1,234	1,234	1,111	1,041	1,037
Number of country_num	88	88	74	68	68
Time Fixed Effect	YES	YES	YES	YES	YES

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 4: Predictors of the savings rates - Panel Time Fixed Effects

The initial specifications do not fully utilize the panel structure of our data set. Thus, in Table 4, we conduct a panel regression with time fixed effects, controlling for year-specific unobserved factors like global economic trends and technological advancements. We consciously omit country fixed effects to preserve the time-invariant national characteristics, such as cultural traits. Our rationale is that the intergenerational leisure gap, our primary explanatory variable, is likely a cultural trait and correlated with these country-specific fixed effects. Including them could reduce the observed impact of this variable, which we expect to vary more across countries than within them over time. Therefore, our regression coefficients are interpreted in terms of between-country variations, aligning with our main hypothesis, rather than within-country changes over time.

Even after accounting for uniform time trends across countries, the intergenerational leisure gap consistently emerges as a positive and significant predictor of the savings rate in all model variations. Interestingly, including these time trends does not significantly diminish this variable's

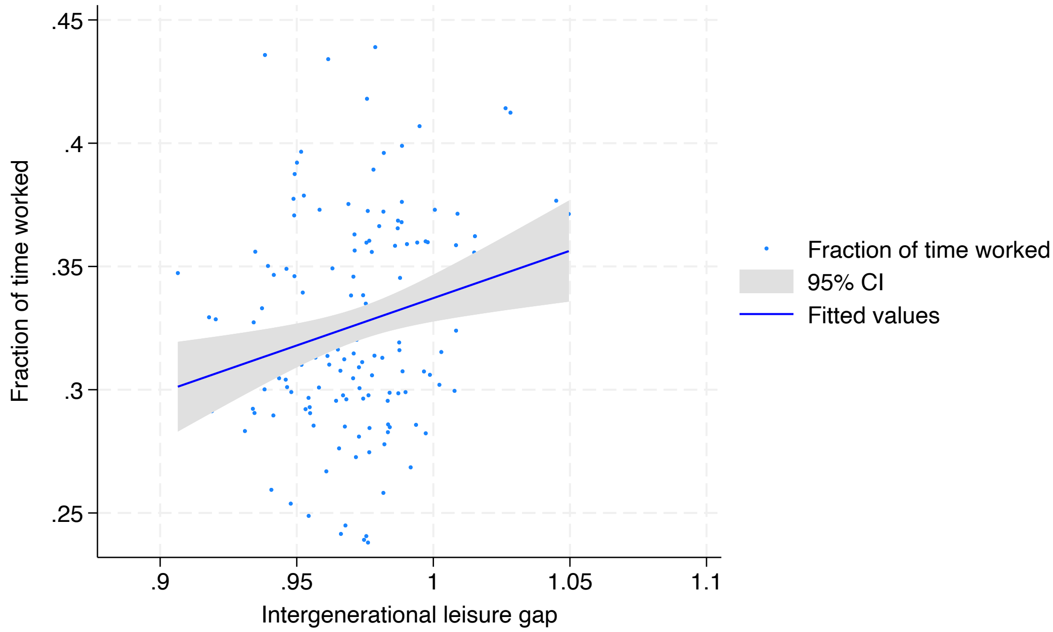

Figure 3: Intergenerational leisure gap and fraction of time worked

explanatory power. The coefficients remain stable and comparable to those from the pooled OLS regression. A notable finding is the consistently larger between R-squared compared to the within R-squared across most specifications, except the first. This indicates that the primary source of variability in the savings rate lies in differences across countries, rather than changes over time within countries. It reinforces the idea that the intergenerational leisure gap is more variable across different nations than it is over time within the same nation. Moreover, control variables continue to show expected signs, as observed in the previous analysis.

The latter part of this section focuses on the relation between the leisure gap and the fraction of hours worked. According to Proposition 2, in economies where this ratio is higher, we should also see a higher fraction of hours worked. The data presented below generally corroborates this hypothesis. Similar to our analysis of the savings rate, Figure 3 displays the relationship between the intergenerational leisure gap and the fraction of time worked.

The figure demonstrates a marked positive correlation, aligning with our model's predictions. To address clearly existing endogeneity issues, we replicate the analytical approach used for the savings rate. Initially, this involves conducting a simple pooled-OLS regression, with the results detailed in Table 5.

Dep. Var.: Fraction of time worked	(1)	(2)	(3)	(4)	(5)
Intergenerational leisure gap	0.382***	0.00881	0.0358	0.0391	0.0439
	(0.0597)	(0.0544)	(0.0540)	(0.0540)	(0.0540)
Log of per-capita income		-0.0291***	-0.0221***	-0.0192***	-0.0234***
		(0.00163)	(0.00180)	(0.00289)	(0.00340)
Labor share			-0.130***	-0.124***	-0.113***
			(0.0146)	(0.0153)	(0.0159)
Human capital index				-0.00577	-0.00126
				(0.00442)	(0.00482)
TFP					0.0329**
					(0.0151)
Constant	-0.0460	0.604***	0.577***	0.558***	0.544***
	(0.0581)	(0.0609)	(0.0610)	(0.0627)	(0.0631)
Observations	773	773	737	737	733
R-squared	0.050	0.330	0.324	0.325	0.330
Fixed Effect	NO	NO	NO	NO	NO

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 5: Predictors of the fraction of hours worked - Pooled OLS

Dep. Var.: Fraction of time worked	(1)	(2)	(3)	(4)	(5)
Intergenerational leisure gap	0.0854***	0.0919***	0.115***	0.119***	0.122***
	(0.0215)	(0.0211)	(0.0223)	(0.0215)	(0.0217)
Log of per-capita income		0.0153***	0.0198***	0.0243***	0.0276***
		(0.00245)	(0.00252)	(0.00251)	(0.00318)
Labor share			0.000648	0.00109	-0.00126
			(0.0111)	(0.0107)	(0.0109)
Human capital index				-0.0217***	-0.0240***
				(0.00315)	(0.00348)
TFP					-0.0105
					(0.00677)
Constant	0.249***	0.0982***	0.0248	0.0354	0.0184
	(0.0216)	(0.0320)	(0.0348)	(0.0337)	(0.0350)
Observations	773	773	737	737	733
Between R-squared	0.332	0.384	0.247	0.123	0.126
Within R-squared	0.001	0.400	0.394	0.426	0.430
Number of countries	47	47	44	44	44
Fixed Effect	Time	Time	Time	Time	Time

Standard errors in parentheses
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table 6: Predictors of the fraction of time worked - Panel Time Fixed Effects

We observe that a sizable, positive and significant relationship between fraction of time worked and leisure gap is only displayed in the first specifications where no controls are added. By contrast, the coefficient - while remaining positive - becomes very small and not significant when per-capita income is included in the regression. We also note that, consistently with Figure 1, the fraction of time worked is negatively and significantly affected by per-capita income.

Table 5 offers limited support for our model's predictions. This may be due, in part, to the fact that our analysis so far has not fully utilized the panel structure of our data set. Consequently, in Table 6, we implement a regression model incorporating time fixed effects to account for common time trends across countries. However, similar to our approach with the savings rates analysis, we refrain from including country fixed effects, adhering to the same rationale previously discussed.

Including time effects in the regression models yields a consistently positive and significant coefficient for the intergenerational leisure gap across all specifications, once again providing empirical support for our model predictions. Notably, once common time trends are controlled for, the coefficient for the log of per-capita income shifts from negative and significant to positive and significant. This indicates that, from a cross-country perspective, countries with higher per-capita incomes are those in which individuals work more.

4 Leisure externalities

When dealing with leisure, it is natural to introduce some form of externalities. As argued by Pintea (2010) among others, there is a lot of anecdotal evidence that many of the leisure activities are more enjoyable if they are done with others (sports, trips, shopping and even watching TV).[8] This is particularly evident in working hour's synchronization between spouses (Hamermesh (2002) and Hunt and Katz (1998)). The concentration of working hours between 9am and 5pm, Monday to Friday, and the tradition of European August vacation, despite the disadvantages due to crowded infrastructure, also show that people have a preference to rest when others rest and work when others work. Given that leisure externalities appear inherent, it is worth asking whether the effect of a larger intergenerational leisure gap obtained without externalities remain when externalities are taken into account. The aim of this section is to explore this question.

In this section, we extend our model by introducing both intra and intergenerational externalities in leisure activities. More precisely, in this section, leisure services are now described by the following expressions:

$$s_t^y\left(p_t^y, \overline{p}_t^y, l_t, q_t^y\right) = \left((p_t^y)^{1-\theta_y}(\overline{p}_t^y)^{\theta_y}\right)^{\sigma_y}\left((p_t^o)^{1-\eta_y}(\overline{q}_t^y)^{\eta_y}\right)^{1-\sigma_y} \tag{31}$$

$$s_{t+1}^o\left(q_{t+1}^o, \overline{q}_{t+1}^o, p_{t+1}^o\right) = \left((q_{t+1}^o)^{1-\theta_o}(\overline{q}_{t+1}^o)^{\theta_o}\right)^{\sigma_o}\left((q_{t+1}^y)^{1-\eta_o}(\overline{p}_{t+1}^o)^{\eta_o}\right)^{1-\sigma_o} \tag{32}$$

where $\overline{p}_t^y$ and $\overline{q}_{t+1}^o$ measure the average fraction of time devoted, respectively, by young and old individuals at time t and $t+1$ to *intra*generational leisure activities, i.e. with individuals of the same generation. Similarly, $\overline{p}_{t+1}^o$ and $\overline{q}_t^y$ measure the average fraction of time devoted, respectively, by young and old individuals at time $t+1$ and t to *inter*generational activities, i.e. with individuals of a different generation. For both young and old individuals, leisure services at time t are now

[8] Although Pintea (2010) also considers the case of negative externalities, the case of positive externalities seems the more compelling and empirical relevant one.

affected by two kinds of externalities: an intragenerational one and an intergenerational one. The economic intuition behind both kinds of externalities is that time devoted to leisure does not create utility if spent alone. Leisure time creates utility as long as other individuals, either belonging to the same generation (friends) or to a different generation (parents or children), decide to allocate leisure time to intragenerational and intergenerational leisure activities. The parameter $\sigma_i \in [0,1]$, $i = y, o$ measures the intensity of intragenerational versus intergenerational activities in utility services from leisure, $\theta_i \in [0,1]$, $i = y, o$, measures the strength of the intragenerational externality, whereas the parameter $\eta_i \in [0,1]$, $i = y, o$, measures the strength of the intergenerational externality.

This extended model is identical to the benchmark one for any other aspect. Therefore, individuals maximize the utility function (29) subject to the budget constraint and equations (31) and (32), taking as given the externalities.[9] The solution of the individual problem determines the allocation of leisure time

$$p_t^{ye} = \frac{(1-l_t^e)}{1+\Psi_y}, \tag{33}$$

$$p_t^{oe} = \frac{(1-l_t^e)\,\Psi_y}{1+\Psi_y}, \tag{34}$$

$$q_{t+1}^{oe} = \frac{1}{1+\Psi_o}, \tag{35}$$

$$q_{t+1}^{ye} = \frac{\Psi_o}{1+\Psi_o}, \tag{36}$$

where

$$\Psi_y = \frac{(1-\sigma_y)(1-\eta_y)}{\sigma_y(1-\theta_y)}, \Psi_o = \frac{(1-\sigma_o)(1-\eta_o)}{\sigma_o(1-\theta_o)}.$$

Notice that, as in the model without externalities, leisure activities for the old are still constant and leisure activities for the young are linear functions of equilibrium working time. The term Ψ_i increases with the ratio between the preference elasticity for intergenerational allocation of leisure and the preference elasticity for the intragenerational allocation of leisure of individual $i = y, o$. A society where Ψ_y is high is one where the representative young individual prefers to perform leisure activities with old individuals rather than with young individuals . On the other hand, a society where Ψ_o is high is a society where the representative old individual prefers to perform leisure activities with young individuals rather than with other old individuals.

[9] The solution to the problem of individuals is similar to the solution for the benchmark model without externalities that is solved in the appendix.

Replacing the equilibrium values for the four kinds of leisure activities in (31) and (32), we obtain that the leisure services in a symmetric equilibrium where $p_t^i = \overline{p}_t^i$ and $q_{t+1}^o = \overline{q}_{t+1}^o$ are

$$s_t^y\left(l_t^e\right) = \Omega_y\left(1 - l_t^e\right)^{\sigma_y + (1-\eta_y)(1-\sigma_y)} \tag{37}$$

$$s_{t+1}^o\left(l_{t+1}^e\right) = \Omega_o\left(1 - l_{t+1}^e\right)^{\eta_o(1-\sigma_o)} \tag{38}$$

where

$$\Omega_y = \left(\frac{\Psi_o^{\eta_y}\left(\Psi_y\right)^{(1-\eta_y)}}{\left(1+\Psi_o\right)^{\eta_y}\left(1+\Psi_y\right)^{\frac{\sigma_y}{1-\sigma_y}+(1-\eta_y)}}\right)^{(1-\sigma_y)},$$

$$\Omega_o = \left(\Psi_o\right)^{(1-\eta_o)(1-\sigma_o)}\left(\frac{1}{1+\Psi_o}\right)^{(1-\eta_o)(1-\sigma_o)+\sigma_o}\left(\frac{\Psi_y}{1+\Psi_y}\right)^{\eta_o(1-\sigma_o)}.$$

We note several relevant differences with respect to the model without externalities. First, leisure services of the old individuals depend (negatively) on the amount of time that young individuals devote to work. This effect clearly depends on the emergence of the intergenerational externality η_o. Second, leisure services when young are a concave function of their leisure time, as the exponent $\sigma_y + (1-\eta_y)(1-\sigma_y)$ is smaller than 1. Finally, the parameters Ω_y and Ω_o determine the leisure services obtained by young and old individuals and, therefore, have the same interpretation than Σ_y and Σ_o in the benchmark case without externalities. Accordingly, we define the intergenerational leisure gap with externalities as Ω_o/Ω_y.

The solution of the individual problem also implies

$$\frac{u_{c_t}}{u_{d_{t+1}}} = \beta R_{t+1}, \tag{39}$$

$$\frac{u_{s_t^y}}{u_{c_t}}\frac{\partial s_t^y}{\partial p_t^o} = w_t. \tag{40}$$

If we apply the equilibrium conditions, $p_t^y = \overline{p}_t^y$, and $q_{t+1}^o = \overline{q}_{t+1}^o$ and use (33), (34), (35) and (36) then (40) rewrites as

$$\frac{u_{s_t^y}}{u_{c_t}} = \Delta w_t\left(1 - l_t^e\right)^{\eta_y(1-\sigma_y)} \tag{41}$$

where

$$\Delta = \frac{1}{\left(\Psi_o^{\eta_y}\left(\Psi_y\right)^{(1-\eta_y)}\left(\frac{1+\Psi_y}{1+\Psi_o}\right)^{\eta_y}\right)^{(1-\sigma_y)}\sigma_y\left(1-\theta_y\right)}.$$

Since the firms problem and equation (19) are not modified by the introduction of externalities, we can proceed to define the equilibrium of this economy. This equilibrium is a path of $\{s_t^y, s_{t+1}^o, c_t, d_{t+1}, k_t, l_t, w_t, R_t\}_{t=1}^{\infty}$ that solves (1), (17), (18), (19), (37), (38), (39) and (41). In the appendix, we use these equations characterizing the equilibrium to obtain the steady state and prove the following result:

Proposition 3. *If the production function satisfies (28), the utility function satisfies (29), and* $\eta_y(1-\sigma_y)+\eta_o(1-\sigma_o)\in(0,1)$ *, there exists a unique steady state. At this steady state, the stock of capital, working time and savings rate increase with the intergenerational leisure gap, measured by the ratio* Ω_o/Ω_y*.*

Proof. See the appendix. □

The existence of a steady state depends on the introduction of intergenerational externalities. When these externalities are introduced and are not too large, a unique steady state exists. In contrast, when intergenerational externalities are not introduced, $\eta_y = \eta_o = 0$,the existence of a steady state depends on a condition that simplifies to condition (30) when $\theta_y = \theta_o = 0$.

The main takeaway from Proposition 3 is that a larger intergenerational leisure gap increases the steady state value of the savings rate, stock of capital and working time. Therefore, the main findings obtained in the benchmark model without externalities and discussed in the empirical section remain unchanged when we consider a more sophisticated model in which individuals derive utility from the interaction between their and others' leisure time.

More generally, including inter- and intragenerational leisure externalities provides new insights that are worth to be explored especially on the policy perspective. When including intergenerational leisure externalities, an increase in the labor supply of the young individuals reduces the leisure services of the young, but also that of the old individuals. As a result, any policy affecting labor supply would a-priori have ambiguous effects on savings. Finally, and under a more general perspective, any design of the optimal policy in this setting would not only face the typical inefficiency associated to over-accumulation, but also those inefficiencies associated to leisure externalities. We leave these interesting topics to future research.

5 Conclusions

This paper introduces a novel mechanism to explain how cross-country variations in the value placed on leisure by younger relative to older generations cause differences in savings rates, working hours, and capital accumulation. We extend an Overlapping Generations model to incorporate endogenous labor supply and allow individuals from both generations to allocate their leisure time either within their own cohort or across generations. Our model, hinging on the complementarity between consumption and leisure activities, posits that economies where the value placed on leisure by younger relative to older generations is lower exhibit higher savings rates, longer working hours and higher level of capital stock in the steady-state.

Using data from the World Value Survey, we test the main implications of the model. We first provide evidence suggesting that cultural attributes, rather than economic factors, predominantly drive differences in intergenerational allocation of leisure time. We interpret these cultural attributes as differences in cross-country preferences. Secondly, we provide evidence supporting the predictions of the model.

While the empirical analysis only provides correlations and lacks causal identification, its robust evidence and consistency across different specifications and estimation methods, combined with the absence of evident alternative explanations, lend credibility to our mechanism as a significant driver of cross-country differences in saving behavior and working hours.

References

Aguiar, M. and Hurst, E. (2007). Measuring Trends in Leisure: The Allocation of Time Over Five Decades. *The Quarterly Journal of Economics*, 122(3):969–1006.

Ando, A. and Modigliani, F. (1963). The "life cycle" hypothesis of saving: Aggregate implications and tests. *The American Economic Review*, 53(1):55–84.

Bandiera, O., Caprio, G., Honohan, P., and Schiantarelli, F. (2000). Does financial reform raise or reduce saving? *Review of Economics and statistics*, 82(2):239–263.

Blau, D. (2016). Pensions, household saving, and welfare: A dynamic analysis of crowd out. *Quantitative Economics*, 7(1):193–224.

Carroll, C. D., Rhee, B.-K., and Rhee, C. (1994). Are there cultural effects on saving? some cross-sectional evidence. *The Quarterly Journal of Economics*, 109(3):685–699.

Cigno, A. and Rosati, F. C. (1996). Jointly determined saving and fertility behaviour: Theory, and estimates for germany, italy, uk and usa. *European Economic Review*, 40(8):1561–1589.

Costa-Font, J., Giuliano, P., and Ozcan, B. (2018). The cultural origin of saving behavior. *PloS one*, 13(9):e0202290.

Cronqvist, H. and Siegel, S. (2015). The origins of savings behavior. *Journal of Political Economy*, 123(1):123–169.

de Castro Campos, M., Kool, C., and Muysken, J. (2013). Cross-country private saving heterogeneity and culture. *De Economist*, 161:101–120.

Diamond, P. A. (1965). National debt in a neoclassical growth model. *American Economic Review*, 55(5):1126–1150.

Fuchs-Schündeln, N., Masella, P., and Paule-Paludkiewicz, H. (2020). Cultural determinants of household saving behavior. *Journal of Money, Credit and Banking*, 52(5):1035–1070.

Hamermesh, D. (2002). Timing, togetherness and time windfalls. *Journal of Population Economics*, 15(4):601–623.

Hunt, J. and Katz, L. F. (1998). Hours reductions as work-sharing. *Brookings Papers on Economic Activity*, 1998(1):339–381.

King, R. G., Plosser, C. I., and Rebelo, S. T. (1988). Production, growth and business cycles: I. the basic neoclassical model. *Journal of Monetary Economics*, 21(2):195–232.

Kotlikoff, L. J. et al. (1989). What determines savings? *MIT Press Books*, 1.

Laitner, J. (2000). Structural change and economic growth. *The Review of Economic Studies*, 67(3):545–561.

Moriconi, S. and Peri, G. (2019). Country-specific preferences and employment rates in europe. *European Economic Review*, 116:1–27.

Pintea, M. (2010). Leisure externalities: Implications for growth and welfare. *Journal of Macroeconomics*, 32(4):1025–1040.

Stierle, M. H. and Rocher, S. (2015). Household saving rates in the eu: Why do they differ so much? Technical report, Directorate General Economic and Financial Affairs (DG ECFIN), European Commission.

Tobing, E. (2012). Demography and cross-country differences in savings rates: a new approach and evidence. *Journal of Population Economics*, 25:963–987.

A Solution of the individuals' problem

The individuals' problem is to choose c_t, d_{t+1}, l_t, p_t^y and q_{t+1}^y in order to maximize utility (2) subject to leisure services, (3) and (4), time constraints, (5) and (6), and the budget constraint

$$w_t l_t = c_t + \frac{d_{t+1}}{R_{t+1}}. \tag{42}$$

Let λ_t be the Lagrangian multiplier associated to the intertemporal budget constraint. Then, from the first order conditions, we obtain

$$\begin{aligned}
u_{c_t} &= \lambda_t && (43)\\
\beta u_{d_{t+1}} &= \frac{\lambda_t}{R_{t+1}} && (44)\\
u_{s^y}\left(1-\sigma_y\right)\left(p_t^y\right)^{\sigma_y}\left(p_t^o\right)^{-\sigma_y} &= \lambda_t w_t && (45)\\
u_{s^y}\left[\sigma_y\left(p_t^y\right)^{\sigma_y-1}\left(p_t^o\right)^{(1-\sigma_y)} - \left(1-\sigma_y\right)\left(p_t^y\right)^{\sigma_y}\left(p_t^o\right)^{-\sigma_y}\right] &= 0 && (46)\\
\beta u_{s^o}\left[-\sigma_o\left(q_{t+1}^o\right)^{\sigma_o-1}\left(q_{t+1}^y\right)^{(1-\sigma_o)} + \left(1-\sigma_o\right)\left(q_{t+1}^o\right)^{\sigma_o}\left(q_{t+1}^y\right)^{-\sigma_o}\right] &= 0 && (47)
\end{aligned}$$

Using (5), (6), (46) and (47) we obtain (7), (8), (9) and (10). Using (11) and (12), and the first order conditions (43), (44) and (45), we obtain (15) and (16).

B Proof of Proposition 1

Using the functions (28) and (29), we can combine equations (22), (23) and (24) to obtain labor and the two consumption levels as the following functions of the capital stock:

$$l(k) = \frac{1+\frac{\Sigma_o}{\Sigma_y}\frac{\left(\alpha\beta A k^{\alpha-1}\right)^{\frac{1}{\mu}}}{1+n}}{(1-\mu)(1-\alpha)A+\mu\left(A-(1+n)k^{1-\alpha}\right)}(1-\alpha)(1-\mu)A, \tag{48}$$

$$c(k) = \frac{(1-\alpha)(1-\mu)}{\mu}\left[1-l(k)\right]Ak^{\alpha}, \tag{49}$$

$$d(k) = \frac{\Sigma_o}{\Sigma_y}\frac{(1-\alpha)(1-\mu)}{\mu}\left(\alpha A\beta k^{\alpha-1}\right)^{\frac{1}{\mu}}Ak^{\alpha}. \tag{50}$$

The equilibrium steady state is characterized by equations (48), (49), (50) and (21). Using the Cobb-Douglas production function, equation (21) can be rewritten as

$$c^e(k) = k^{\alpha} l\left[A(1-\alpha)-k^{1-\alpha}(1+n)\right]. \tag{51}$$

Since $c(k)>0$, this equation implies that $k<k^1\equiv\left(\frac{(1-\alpha)A}{1+n}\right)^{\frac{1}{1-\alpha}}$. Equations (49) and (51) provide two expressions for the consumption when young that must be equal at the steady state. By equating them and solving for l, we obtain

$$l^e(k) = \frac{(1-\alpha)(1-\mu)A}{(1-\alpha)A-(1+n)\mu k^{1-\alpha}}. \tag{52}$$

Since $l^e(k)\in(0,1)$, we must introduce constraints on the value of capital. First, note that $k<k^1$ implies that $l^e(k)<1$. Second, $l^e(k)>0$ when $k<k^2\equiv\left(\frac{(1-\alpha)A}{(1+n)\mu}\right)^{\frac{1}{1-\alpha}}$. Thus, $l^e(k)\in(0,1)$ when $k<\min\{k^1,k^2\}=k^1$.

The steady state market equilibrium must satisfy $l^e(k)=l(k)$, where $l(k)$ is given by (48).

We now define the function $H(k) = l(k) - l^e(k) = G(k) F(k)$, with

$$\begin{aligned} G(k) &= \frac{(1-\alpha)(1-\mu)A}{\left[(1-\alpha)A - (1+n)\mu k^{1-\alpha}\right]\left[(1-\mu)(1-\alpha)A + \mu\left(A - (1+n)k^{1-\alpha}\right)\right]}, \\ F(k) &= \frac{\Sigma_o}{\Sigma_y}\left(\alpha\beta A k^{\alpha-1}\right)^{\frac{1}{\mu}}\left[\frac{(1-\alpha)A}{(1+n)} - \mu k^{1-\alpha}\right] - \mu\alpha A. \end{aligned} \tag{53}$$

The steady value of capital in the market equilibrium is a value k such that $H(k) = 0$. Since $k < k^1$ implies that $G(k) > 0$, k is such that $F(k) = 0$. It is quite immediate to see that $F'(k) < 0$ for $k < k^1$ and $F(0) = \infty$. It follows that a unique steady state exists when $F\left(k^1\right) < 0$, which requires that

$$F\left(k^1\right) = A\left(\frac{\Sigma_o}{\Sigma_y}\left(\frac{\alpha\beta(1+n)}{(1-\alpha)}\right)^{\frac{1}{\mu}}\frac{(1-\alpha)(1-\mu)}{(1+n)} - \mu\alpha\right) < 0.$$

This inequality holds when Condition (30) is satisfied.

C Proof of Proposition 2

To show that k is increasing in the ratio Σ_o/Σ_y, note that $F(k)$ defined in (53) is decreasing in k and increasing in the ratio Σ_o/Σ_y. As a consequence, the unique value of k, satisfying $F(k) = 0$, increases with Σ_o/Σ_y.

As for l, first we manipulate (52) to find

$$k^{1-\alpha} = \frac{\left[l - (1-\mu)\right](1-\alpha)A}{l\mu(1+n)},$$

which reveals that l must be larger than $1-\mu$ in order for k to be positive in the steady state. Now, we replace this value in (48) to find the implicit function $G(l)$ whose zeros define the steady state market equilibrium of l

$$G(l) \equiv l^{1-\frac{1}{\mu}}\left(l - (1-\mu)\right)^{\frac{1}{\mu}} - (1-\mu)\frac{\Sigma_o}{\Sigma_y}\beta^{\frac{1}{\mu}}\left(\frac{\alpha\mu(1+n)}{1-\alpha}\right)^{\frac{1}{\mu}-1} = 0$$

Since $G'(l) > 0$, and $G(l)$ decreases with Σ_o/Σ_y, the unique value of l satisfying $G(l) = 0$ increases when Σ_o/Σ_y increases.

Finally, the savings rate at the steady state is given by $k(1+n)/f(k) = k^{1-\alpha}(1+n)/A$. The savings rate is increasing in k and, therefore, it also increases with Σ_o/Σ_y.

D Proof of proposition 3

The steady state is obtained from substituting equations (17) and (18) into (39) and (41), and using the resource constraint and (19). We obtain the following system of equations:

$$\frac{u_c}{u_d} = \beta f'(k) \tag{54}$$

$$\frac{u_{s^y}}{u_c} = \left[f(k) - kf'(k)\right] \Delta (1-l)^{\eta_y(1-\sigma_y)} \tag{55}$$

$$c + \frac{d}{1+n} = \left[f(k) - k(1+n)\right] l \tag{56}$$

$$c = \left[f(k) - kf'(k) - k(1+n)\right] l \tag{57}$$

$$s^y = \Omega_y (1-l)^{\sigma_y + (1-\eta_y)(1-\sigma_y)} \tag{58}$$

$$s^o = \Omega_o (1-l)^{\eta_o(1-\sigma_o)} \tag{59}$$

Using (28), (29), (37), (38), $p^y = \overline{p}^y$ and $q^o = \overline{q}^o$, we can characterize the steady state with the following system of 4 equations:

$$(1-l)^{1-b} \frac{\Omega_y}{\Omega_o} \frac{d}{c} = (\alpha A \beta)^{\frac{1}{\mu}} k^{\frac{\alpha-1}{\mu}} \tag{60}$$

$$\frac{\mu}{1-\mu} \frac{1}{\Delta\Omega_y} \frac{c}{1-l} = (1-\alpha) A k^{\alpha} \tag{61}$$

$$c + \frac{d}{1+n} = \left[A k^{\alpha} - k(1+n)\right] l \tag{62}$$

$$c = \left[(1-\alpha) A k^{\alpha} - k(1+n)\right] l \tag{63}$$

where

$$b \equiv \eta_y (1-\sigma_y) + \eta_o (1-\sigma_o) > 0.$$

We next use these equations to study the existence and uniqueness of the steady state equilibrium and analyze the effects of a large intergenerational leisure gap.

First notice that the condition $c = \left[(1-\alpha) A k^{\alpha} - k(1+n)\right] l \geq 0$ sets an upper-bound for k

since

$$c \geq 0 \Rightarrow k < k_{\max} \equiv \left(\frac{(1-\alpha) A}{1+n}\right)^{\frac{1}{1-\alpha}}$$

Let $z = \frac{k^{1-\alpha}(1+n)}{(1-\alpha)A}$. Note that $k < k_{\max}$ implies that $z < 1$. Using (60)-(63), we obtain

$$\begin{aligned}
l_1(z) &= 1 - \left[\beta \frac{\Omega_o}{\Omega_y}\left(\frac{\beta\alpha(1+n)}{1-\alpha}\right)^{\frac{1-\mu}{\mu}} (1-z)\, z^{-\frac{1}{\mu}}\right]^{\frac{1}{1-b}} \\
l_2(z) &= \frac{(1-\mu)\,\Delta\Omega_y}{\mu(1-z) + (1-\mu)\,\Delta\Omega_y}
\end{aligned}$$

A steady state is defined as a value of z such that $l_1(z) \equiv l_2(z)$. After some manipulation, we deduce that

$$\left(\frac{\mu}{\mu(1-z) + (1-\mu)\,\Delta\Omega_y}\right)^{1-b} (1-z)^{-b} = \beta\frac{\Omega_o}{\Omega_y}\left(\frac{\beta\alpha(1+n)}{1-\alpha}\right)^{\frac{1-\mu}{\mu}} (z)^{-\frac{1}{\mu}}. \tag{64}$$

Note that the left hand side of (64) is increasing in z when $b < 1$, it takes a finite positive value when $z = 0$ and it diverges to infinite when $z = 1$. The right hand side is decreasing in z, it takes an infinite value when $z = 0$ and a finite positive value when $z = 1$. Therefore, there exists a unique steady state for which $l \in (0, 1)$, and $c > 0$.[10]

Using (64), we can also show the effect of an increase in the intergenerational leisure gap, defined by the ratio Ω_o/Ω_y. When this ratio increases, the right hand side of equation (64) shifts upwards which implies an increase in the steady state value of both z and l, since the left hand side is increasing. The increase in z implies that k increases, which in turn implies that the savings rate increases.

E Additional evidence

In this section we perform the same analysis as in Tables 3 and 4 but using a different measure for the savings rate, the one provided by the World Bank. More precisely, we use the variable "Gross savings (% of GDP)" from the World Bank national accounts data, and OECD National Accounts data files. Gross savings are here defined as "gross national income less total consumption, plus net

[10] When intergenerational externalities are not introduced, $b = 0$, and the existence of a steady state depends on a condition similar to Condition (30).

Dependent Variable: savings rate	(1)	(2)	(3)	(4)	(5)
Intergenerational leisure gap	0.548***	0.660***	0.741***	0.692***	0.682***
	(0.0988)	(0.0985)	(0.108)	(0.109)	(0.118)
Log of per-capita income		0.0203***	0.0196***	0.0408***	0.0547***
		(0.00310)	(0.00346)	(0.00505)	(0.00623)
Labor share			-0.174***	-0.120***	-0.179***
			(0.0287)	(0.0308)	(0.0355)
Human capital index				-0.0488***	-0.0624***
				(0.00804)	(0.00949)
TFP					-0.139***
					(0.0261)
Constant	-0.303***	-0.605***	-0.588***	-0.635***	-0.556***
	(0.0961)	(0.105)	(0.116)	(0.118)	(0.117)
Observations	1,123	1,123	1,028	964	964
R-squared	0.027	0.062	0.099	0.145	0.170
Fixed Effect	NO	NO	NO	NO	NO

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 7: Predictors of the savings rates, World Bank data - Pooled OLS

transfers.".

Table 7 presents the result of OLS regressions, pooling data from all countries, with each observation representing a country/year pair.

Table 8 presents the result of the panel regression with time fixed effects, controlling for year-specific unobserved factors like global economic trends and technological advancements.

As can be seen, results are in line with the main text in that the coefficient of the intergenerational leisure gap is positive, significant and with a remarkable stable magnitude across all the specifications.

Dependent Variable: savings rate	(1)	(2)	(3)	(4)	(5)
Intergenerational leisure gap	0.201**	0.267***	0.268***	0.352***	0.342***
	(0.0911)	(0.0875)	(0.0918)	(0.0901)	(0.0898)
Log of per-capita income		0.717***	0.0722***	0.0659***	0.0829***
		(0.00717)	(0.00781)	(0.00849)	(0.0119)
Labor share			-0.241***	-0.183***	-0.213***
			(0.0386)	(0.0401)	(0.0413)
Human capital index				-0.0592***	-0.0770***
				(0.0123)	(0.0136)
TFP					-0.0685***
					(0.0229)
Constant	0.0301	-0.680***	-0.565***	-0.474***	-0.496***
	(0.0898)	(0.112)	(0.125)	(0.121)	(0.121)
Within R-sq	0.0867	0.1833	0.2025	0.1541	0.1639
Between R-sq	0.0295	0.1025	0.2120	0.3149	0.3170
Observations	1,123	1,234	1,028	964	964
Number of country_num	84	84	72	66	66
Time Fixed Effect	YES	YES	YES	YES	YES

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 8: Predictors of the savings rates, World Bank data - Panel Time Fixed Effects

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